



**Technological Innovation Development in Africa to Enhance Employability,
Entrepreneurship and Job Creation (TIDE)**

**REVIEW OF SCIENCE, TECHNOLOGY, AND INNOVATION (STI)
POLICY AND INSTITUTIONAL LANDSCAPE IN SELECTED SUB-
SAHARAN AFRICAN COUNTRIES**

The case of Ethiopia, Ghana, Kenya, Nigeria, Rwanda, Senegal, Uganda and Zimbabwe

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ACRONYMS AND ABBREVIATIONS

AAS	African Academy of Sciences
ACA	Anti-Counterfeiting Agency
ADLI	Agricultural Development Led Industrialisation strategy
AfDB	African Development Bank
ARCN	Agricultural Research Council of Nigeria
ASTII	African Initiative for STI Indicators
AU	African Union
BAP	Biodiversity Action Plan
CBD	Convention on Biological Diversity
CITES	Convention on International Trade in Endangered Species
CPI	Corruption Perception Index
CRB	Credit Reference Bureau
CSIR	Council for Scientific and Industrial Research
ECOPOST	Economic Community of West African States Policy on Science and Technology
ECORP	ECOWAS Research Policy
ECOWAS	Economic Community of West African States
ESTs	Environmentally Sound Technologies
FDI	Foreign Direct Investment
FIIRO	Federal Institute of Industrial Research Oshodi
FRIN	Forestry Research Institute Nigeria
FSCS	Federal Soil Conservation School
GDP	Gross Domestic Product
GEF	Global Environment Facility
GEF-SGP	Global Environment Facility–Small Grants Programme
GHI	Governance and Home-Grown Initiatives
GoG	Government of Ghana
GoK	Government of Kenya
HDI	Human Development Index
HESTI	Higher Education Science and Technology Institutions
IARES	Institute for Agricultural Research and Extension Services
IBES	Integrated Business Enterprise Survey
IDRC	International Development Research Center
IFPRI	International Food Policy Research Institute
IGEIP	Integrated Green Economy Implementation Plan
IITA	International Institute of Tropical Agriculture
ILO	International Labour Organization
IPOK	Intellectual Property Office of Kenya
KECOBO	Kenya Copyright Board
KENIA	Kenya National Innovation Agency
KIPI	Kenya Industrial Property Institute
KKV	<i>Kazi Kwa Vijana</i>
KSPEI	Knowledge Sharing and Policy Engagement Intervention
MAM	Moderate Acute Malnutrition
MCF	Mastercard Foundation
MDAs	Ministries, Departments and Agencies
MESTI	Ministry of Environment, Science, Technology, and Innovation
MFIs	Micro Finance Institutions
MInT	Ministry of Innovation and Technology
MMDAs	Municipal and District Assemblies
MoSTI	Ministry of Science, Technology and Innovation
NAADS	National Agricultural Advisory Services
NABDA	National Biotechnology Development Agency
NACOSTI	National Commission for Science Technology and Innovation
NARO	Uganda’s National Agriculture Research Organization
NASC	National Agricultural Seeds Council
NCAM	National Centre for Agricultural Mechanization
NCP	National Council on Privatization
NCRI	National Cereal Research Institute
NCSTI	National Council on Science, Technology and Innovation
NDPC	National Development Planning Commission

NEPAD	New Partnership for Africa's Development
NESREA	National Environmental Standards and Regulations Enforcement Agency
NHRO	Uganda's National Health Research Organization
NIFOR	Nigerian Institute for Oil Palm Research Council
NISR	Rwanda's National Institute of Statistics
NOTAP	National Office for Technology Acquisition and Promotion
NRCRI	National Root Crops Research Institute
NRF	National Research Fund-Kenya
NRIC	National Research and Innovation Council
NRIF	National Research and Innovation Fund
NSC	National Steering Committee
NSPRI	Nigerian Stored Products Research Institute
NSTIC	National Science, Technology and Innovation Council
O&G	Oil and Gas sector
PACSTI	Presidential Advisory Council on Science, Technology and Innovation
PPP	Public-private partnership
R&D	Research and Development
RMRDC	Raw Materials Research and Development Council
RWF	Rwanda Francs
SACCOs	Savings and Credit Cooperatives
SAM	Severe Acute Malnutrition
SDGs	Sustainable Development Goals
SETI	Science, Engineering, Technology and Innovation
SGCI	Science Granting Councils Initiative
SOEs	State-owned enterprises
STEM	Science, Technology, Engineering and Mathematics
STEPRI	CSIR-Science and Technology Policy Research Institute
STIDeP	National STI Development Plan
STISA	Science, Technology and Innovation Strategy for Africa
TDTC	Technology Development and Transfer Center
UGX	Uganda Shillings
UIA	Uganda Investment Authority
UNCCD	United Nations Convention to Combat Desertification
UNCED	United Nations Conference on Environment and Development
UNCST	Uganda National Council for Science and Technology
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UPTIER	Understanding the Policy and Institutional Landscape for Technological Innovation Development in Africa to Enhance Youth Employability, Entrepreneurship and Job Creation
UWEP	Uganda Women Entrepreneurship Program
WCED	World Commission on Environment and Development
YES	Youth Entrepreneurship Scheme
YESD	Youth Employment for Sustainable Development
YLF	Youth Livelihood Fund
YLP	Youth Livelihood Programme

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EXECUTIVE SUMMARY

Background and rationale

The place of Science, Technology, and Innovation (STI) on national, regional and continental agendas in Sub-Saharan Africa (SSA) has increased significantly in recent years. However, Africa as a region still lags behind the rest of the world in research, science, innovation and entrepreneurship, largely due to its low Gross Domestic Product (GDP). But there are several reasons for optimism. Many countries appear to have the foundation in place to turn innovation and entrepreneurial potential into economic growth and prosperity, taking advantage of STIs and existing institutional landscapes. For STI research to have a meaningful impact in securing development outcomes in Africa, its results must not only inform and shape policies and programmes but also, address practical issues such as youth unemployment and skills shortages. It should help solve serious social problems, improve agricultural productivity and improve access to a clean environment. Water and clean energy to help alleviate poverty. Various levels of policies and programs have created a framework within which innovation and entrepreneurship can thrive. The development of these policies and programs, ideally grounded in evidence and a shared willingness to implement them, is, in some cases, paramount in fostering innovation development, entrepreneurship and wealth creation. The lack of knowledge, data and information on these related issues has led to the failure of well-intentioned strategies, programs and initiatives in Africa. According to Ogutu (2020) and Okereke (2017), project failure rates in Africa appear to be over 50%.

Initiatives and programs are being implemented in Africa to improve the skills of the youth, generate technological innovations, create job opportunities, and boost entrepreneurship. One such program is the Mastercard Foundation's (MCF) Young Africa Works (YAW) Strategy (YAWS), which aims to provide 30 million young Africans with dignified and fulfilling work through a series of strategies that will empower young people, collaborate with African organizations, use technology to drive impact and scale and share evidence-based knowledge and innovation. This is consistent with the African Union Commission's (AUC) Science, Technology, and Innovation Strategy for Africa (STISA) 2024, which advocates for a long-term transition from a resource-based to an innovation-led, knowledge-based economy that will create more jobs for the continent's youth and women. However, for any program or initiative, such as the MCF's YAW Strategy, to be sustainable, it must be anchored in some way into the policy and institutional frameworks of the participating countries and implemented by relevant institutions such as ministries, departments, and agencies (MDAs), as well as industry and research systems. It is therefore imperative to review the status of the STI policies and institutions that anchor technological innovation development in order to effectively design and mainstream programs that will contribute to sustainable development.

Objectives of the study and methodology

The Technological Innovation Development in Africa to Enhance Employability, Entrepreneurship and Job Creation (TIDE) project proposed to review the STI policy and institutional landscape/ecosystem in selected countries namely: Ethiopia, Ghana, Kenya, Nigeria, Rwanda, Senegal, Uganda and Zimbabwe; to understand their statuses, what works (successes), what doesn't work (failures) and why (reasons for successes or failures). This was achieved through a thorough methodological approach that allowed extensive data collection amongst key stakeholders in the target countries. The process started by conducting desk study research for the eight (8) target countries where policy documents, project reports and other secondary sources of data were reviewed and a desk study report was generated. Gaps in the literature identified during the desk study research were used to design key informant interview (KII) questionnaire and an online survey tool. A focus group discussion (FGD) guide was also generated. Twenty (20) key informants were interviewed in each of the study countries. The respondents were carefully selected to cover the five (5) key stakeholder categories: Government/Policy makers, Private Sector, Non-governmental Organizations (NGOs)/Civil Society Organizations (CSOs), Research Institutions, and Development Partners/Media. One (1) FGD was conducted in each of the study countries to provide an opportunity to triangulate and further interrogate the findings.

Summary of key findings

The study reveals that at the continental and regional levels, there are STI policies that focus on promoting research and development, encouraging innovation development and the growth of technology-based industries all aiming to support the creation of jobs, especially for the youth and economic development. For instance, the African Union has launched the Continental Strategy for the Development of Science, Technology and Innovation (STISA 2024), which aims to increase investment in STI and promote cooperation between African

countries in these areas. Other sector-wide continental-wide policies that have a direct impact on STI, include the Continental Education Strategy for Africa (CESA) 2016-2025 and the Continental Strategy for Technical and Vocational Education and Training (TVET) 2007. Another major policy decision that is expected to have an impact on STI is the African Continental Free Trade Area and an associated Action Plan on Boosting Intra-Africa Trade (BIAT). The African heads of State and Governments of the AU initiated the Smart Africa Manifesto in 2013, boldly committing to accelerate sustainable socio-economic development, ushering Africa into a knowledge economy through affordable access to Broadband and usage of Information and Communications Technologies. The African Manifesto for Science and Technology was also adopted by the African Union in 2010 to advocate for the use of STI to promote social and economic development in Africa. It recognizes the importance of building on Africa's indigenous knowledge and alternative epistemologies and calls for the inclusion of diverse perspectives and knowledge systems in the STI process.

a) Pan-African and Regional STI Policy and Institutional arrangements supporting youth employment

At the Pan-African level, the African Union Commission's Education, Science, Technology, and Innovation (ESTI) Commission is responsible for coordinating and promoting STI policies and programs at the pan-African level. The ESTI works closely with member states, regional economic communities, and other stakeholders to develop and implement policies that promote STI on the continent. Its key objectives include improving access to education and training, promoting research and development, and supporting the commercialization of innovative products and services. The ecosystem also includes the Pan African University (PAU) which is designed to revitalize higher education and research in Africa by nurturing quality and exemplifying excellence focusing on technology, innovation, humanities, social sciences, governance and regional integration. By promoting STI at the pan-African level, the ESTI aims to contribute to Africa's socio-economic development, job creation, and global competitiveness. These efforts are cascaded to the Regional Economic Communities (RECs). In the Eastern and Western Africa Regions, some regional policies and institutions are guiding STI implementation in the member countries. The East African Regional STI draft Policy of 2019 is anchored on: Capacity building for skills and STI Infrastructure; Research, Innovation and Entrepreneurship; Resource mobilization, partnerships and collaborations; and Enabling environment. It is aimed to foster regional cooperation and integration to guide the member states on how to align their policies to the East African Community (EAC) policy. The East African Science and Technology Commission (EASTECO) is the main regional agency through which the Partner States develop and implements common STI policies and programmes. It promotes regional integration in the development, management and application of STI in the Community. The East African Legislative Assembly (EALA) is the main legislative organ on EAC matters. As a regional legislative assembly, EALA can provide legislative leadership in defining common principles to guide the development of national legislation governing STI. One of the key goals of STI policies in Eastern Africa is to promote economic development and poverty reduction. This is often achieved by supporting research and development, encouraging innovation and entrepreneurship, and building human capacity through education and training.

In the Western Africa Region, the Economic Community of West African States (ECOWAS) Policy on Science and Technology (ECOPOST) is an integral part of the subregion's development blueprint that defines a road map for improving governance, accelerating economic and monetary integration and fostering public-private partnerships. It endorses the planned harmonization of investment laws in West Africa and suggests pursuing with vigour the creation of a regional investment promotion agency. Countries in the sub-region are urged to promote efficient, viable small and medium-sized enterprises (SMEs) and to expose traditional agriculture to modern technology, entrepreneurship and innovation, in order to improve productivity.

In the Southern Africa Region, the Southern African Development Community (SADC) Protocol on STI, was enacted in 2008 aims to promote cooperation and collaboration among SADC member states in the field, and to facilitate the development and implementation of STI policies in the region. The protocol outlines various key areas of focus, including the promotion of research and development activities, the development of human capital in STI fields, the promotion of entrepreneurship and innovation, the establishment of appropriate STI infrastructure, and the strengthening of partnerships between governments, private sector, academia, and civil society. Through the implementation of the SADC Protocol on STI, member states seek to leverage the potential of science, technology, and innovation to address the socio-economic challenges facing the region and to promote sustainable development and regional integration.

The policies of individual countries in the Regions are influenced by factors such as their level of economic development, political climate, and historical priorities. However, there are some common themes and goals that can be found across the region's STI policies. Our review shows that all the study countries have some form of legislation that supports the integration and use of STI for sustainable development in the countries. The countries have prioritized some key sectors that they are focusing on. These are mainly Agriculture, Energy, Education, Trade & Industry, Mining, Enterprise Development, Digital Economy, Banking and Microfinance among others. Many of the study countries are making efforts to support these sectors through policies, regulations, and investments in infrastructure, research and education.

b) National STI Policy and Institutional landscape for enhancing youth employment

All the study countries are facing similar challenges of youth unemployment, insufficient technological development, lack of sufficient policies and poor implementation of existing ones, competing priorities and hence low funding of STI, low level of entrepreneurship, lack of gender equality and inclusion, large economic divide among their citizens, and challenges of environmental degradation and climate change. Governance and transparency have also been a major predicament among the target countries and utilization of STI has been touted to aid in dealing with these challenges. Technologies in e-commerce, e-registration, e-procurement and open contracting among other financial and procurement systems have been demonstrated to have improved governance, accountability and transparency. A brief description of the STI policy ecosystem in each study country is presented below:

Ethiopia is facing the challenge of generating employment for the rapidly growing and youthful population. Despite a strengthened economy, Ethiopia's labour market has not demonstrated a similar expansion in terms of job creation. The youth unemployment rate for 2021 was 5.72%, a 0.78% increase from 2020 (World Bank, 2023). Up to 73% of the population is still engaged in subsistence agriculture. Ethiopia adopted a National Science and Technology Policy, which outlines several key strategies, including the promotion of research and development, the development of a skilled workforce, and the creation of an enabling environment for entrepreneurship and innovation. The National Science Policy and Strategy (NSPS) of 2020 seeks to build a knowledge-based, technology-driven economy and society through the creation of capability in human resources, infrastructural and technological capability, science education, basic and applied research and dissemination of knowledge and research outputs. The governance of the system is primarily coordinated by the Ministry of Innovation and Technology (MInT). It was established in 2018 and is responsible for formulating and implementing policies, strategies, and programs that promote the development of the country's STI sector. In addition, the government has established several other institutions to support the governance of the STI system such as the Ethiopian Science and Technology Commission (ESTC), the Ethiopian Standards Agency and the Ethiopian Intellectual Property Office. More recently, the Ethiopian Government launched its 10-Year Perspective Plan (2020-2030), which will solely focus on industries such as mining, tourism, urban development and innovation and technology that offer a great opportunity to enhance entrepreneurship and create employment for the many youths in the country. A revised version of the STI Policy was issued in March 2022 with the mission of creating a favourable ecosystem that enhances the role of STI in wealth creation, employment generation and GDP growth. Other policies that have a significant impact on skills development and youth employment include the Education and Training Policy of 1993, which recognizes that there should be an appropriate nexus between education, training, research and development through coordinated participation among the relevant actors. There was reported improvement in the public-private sector relationship leading to cooperation between the two sectors is helping the policymakers come up with robust plans that are all-inclusive. This created a conducive environment for the implementation of STI policies for youth employment to thrive.

In **Ghana**, youth unemployment remains a significant challenge, with an estimated youth unemployment rate of 13.8% as of 2020, which is above the national unemployment rate of 7.3% (Ghana Statistical Service, 2020). Leveraging STI is crucial for creating 1 million jobs per year according to the Ghana National Development Planning Commission (NDPC), (NDPC, 2018). The government created the Ministry of Environment, Science, Technology, and Innovation (MESTI) which reviewed the 2010 STI policy. The revised version of 2017 aims at bridging the gap between STI policies on one hand and sectoral policies and development agenda on the other. It places STI at the centre of Ghana's national development agenda to establish a strong economy that creates opportunities, inspires people to start businesses, stimulates the expansion of existing businesses, and, ultimately, leads to the creation of jobs, increased economic growth and higher incomes. Unlike the 2000 S&T

Policy document, the 2009 STI Policy had innovation as a critical driver for socio-economic and sustainable development. The policy document had a 5-year National STI Development Plan (STIDeP) that spelt out 17 programmes and 84 projects to be implemented. The Government has also established a number of STI institutions, including the Council for Scientific and Industrial Research (CSIR), the Ghana Atomic Energy Commission (GAEC), the Environmental Protection Agency (EPA), and the Ghana Innovation and Research Commercialization Center (GIRC) among others which have contributed significantly to research and development, technological innovation, and job creation in Ghana. The establishment of the Technology Development and Transfer Center (TDTC) has led to the development of a structured mechanism that facilitates the effective transfer of Council for Scientific and Industrial Research (CSIR) technologies to the private sector, thereby, enabling the creation of job opportunities for the youth. This move has led to the development of the private sector, which developed and implemented a structured model for engaging them in partnerships for technology development and transfer.

Kenya has a significant unemployment problem, with youth bearing the brunt of the burden. The high unemployment rate is related to the country's overall investment climate and the economy's limited ability to create new jobs. The Government of Kenya (GoK) recognises the key role of STI in wealth creation and building the human capital required to transition to a knowledge-driven economy. Vision 2030 and the STI Act of 2013 propose to intensify the application of STI to raise productivity and efficiency levels. The key STI Act of 2013 lays the foundation for Kenya to leverage STI in solving the persistent youth unemployment in the country. Various policy instruments have been put in place to guide and support technological innovation and enhance youth employability and job creation. The Policy Framework for Science, Technology and Innovation of 2012 for instance aims to mainstream STI across all sectors of the economy through the generation, acquisition, dissemination and utilisation of the available capabilities to achieve the Kenya Vision 2030. The key institutions established by the STI Act include the National Commission for Science Technology and Innovation (NACOSTI), Kenya National Innovation Agency (KENIA) and the National Research Fund (NRF), which have specific functions and mandates. The stakeholders in Kenya have worked on a draft STI Policy of 2020 that has not been gazetted yet. The development of institutions and programmes that enhance employability and job creation has been lauded. Various institutions have been created since the launch of Vision 2030 to help ensure youth and women are getting jobs. For instance, the *Kazi kwa Vijana* (KKV) youths programme was commissioned in 2009 to decrease the vulnerability of young people by creating over 200,000 short-term income opportunities. The impact and challenges of the programme are discussed in the report. The Youth Development Enterprise Fund (YDEF) is another initiative focused on enterprise development as a key strategy to increase economic opportunities for the youth in nation-building. As of 2021 KES14.5 billion had been invested from the fund in a wide range of projects that include factories and cottage industries.

In **Nigeria**, youth unemployment has been a persistent problem for decades. The rate reached 42.5% in the fourth quarter of 2020 (National Bureau of Statistics [NBS], 2021). The economy is mainly import-dependent necessitating the mainstreaming of STI in all core activities and actions that will assist in leapfrogging the economy to an export-oriented one (Dakuku, 2022) and increase employment opportunities for the youth. The revised National STI policy of 2022 was launched in March 2022 and has initiated the launch of an STI television for infotainment, informatics, and to create STI culture in Nigeria. The policy focuses on fully diversifying the Nigerian economy and promoting a knowledge-based economy. The National Science, Technology Innovation Roadmap of 2030, was developed laying-out the long-term framework for STI. It sets specific goals for many knowledge sectors and focuses on linking research in all areas to national development, supporting industrial innovation and promoting the creation of innovative enterprises. The National Research and Innovation Council (NRIC) chaired by the President is mandated to set national priorities on research and development and set and coordinate STI activities in line with national priorities. The NRIC is also responsible for the establishment of new research institutes and the strengthening of existing ones. NRIC facilitates fundraising activities to support innovation activities in alignment with national priorities. Unfortunately, the full functioning of the NRIC has not been realized as the legal frameworks establishing it has not been officially gazette. A Transformation Agenda has been put in place that is based on a set of priority policies and programmes, which when implemented will ensure continuity, consistency and commitment to national development efforts, therefore, transforming the Nigerian Economy to meet the needs of the Nigerian people. To translate the projects emanating from the Transformation Agenda into reality, several policy and regulatory enablers have been put in place, including laws, regulations, policies, public infrastructure, public services and international trade agreements that will result in the creation of job opportunities for the youth.

In Rwanda, the unemployment rate increased by 6.5 percentage points from 17% in February 2021 to 23.5% in May 2021. The Government of Rwanda (GoR) recognises the important role that STI can play to remedy this situation. It has the ambition to leverage the transformative potential of STI to position itself as a globally competitive knowledge-based economy according to the National Research and Innovation Policy (NRIP) which was launched in 2020 (Government of Rwanda [GoR], 2020). Rwanda's labour market has been largely characterized by underemployment and self-employment, mostly in subsistence activities including low-value agriculture activities and informal household enterprises (GoR, 2019). In response, Rwanda's National Strategy for Transformation (NST1), 2017–2024, aims to create 1.5 million decent and productive jobs by 2024, including opportunities for youth and women to create businesses through entrepreneurship and access to finance. The National STI Policy of 2020 focuses on effective STI governance, increased R&D and innovation financing, human capital and knowledge network development, and enhanced collaborations. The policy defines national priority areas to include: sustainable energy, food security and modern agriculture, life and health sciences, local production and value addition, digital services products and lifestyle, and resilient environment and natural resources. Other key STI-related policies include the Education Sector Policy of 2003, the ICT Policy of 2000, the National Digital Talent Policy of 2016, the National Data Revolution Policy of 2017 and the Made in Rwanda Policy of 2017 among others. The National Council for Science and Technology is the principal body mandated to coordinate and monitor national science, technology, research and innovation activities, although the coordination of innovation policy has been shifted to the newly formed Ministry of ICT and Innovation. The NCST is governed by the Council, co-chaired by the Minister of Education, which is mandated to set up a firm research and innovation system that ensures the alignment of STI with national development goals. Nonetheless, the NCST remains a semi-autonomous agency reporting directly to the Office of the President of the Republic. It has established the National Research and Innovation Fund (NRIF) and works with the University of Rwanda among other institutions to provide funds and training to young people. The First National Strategy of Transformation and Vision 2050, have established a pathway for the private sector, over time, to play a leading role in Rwanda's growth. To achieve this goal, resources have to be allocated through efficient market mechanisms. However, Rwanda needs to continue to alleviate market failures and encourage private sector development, now that investment capacity in Rwanda's private sector remains low.

In Senegal, the high unemployment rate for youth is driven mainly by first-time job seekers looking for the first work experience that is so important yet so difficult to obtain. With about 300,000 new entrants to the labour market each year, the supply of new jobs is estimated at only 30,000. The youth unemployment rate for 2021 was 5.04%, a 0.1% increase from 2020. Senegal is currently developing its STI policy document but the National Policy for Scientific and Technological Research and Innovation (PNRST) (2014-2018) that was launched in 2014 has been the reference document. The government is therefore making a significant effort to promote STI as a means of unlocking opportunities for the youth in the country. In 2014, the Government adopted the Plan for an Emerging Senegal (PSE) (2015-2035), a 20-year strategy to guide the implementation of coherent economic and social development policies. PSE aims to promote human capital by improving people's living conditions and reducing social inequalities. One key area Senegal is focusing on is the development of the technology sector, particularly in the areas of ICT. The government has implemented policies and programs to encourage the growth of technology-based businesses, such as through the establishment of technology parks and incubation centres. Additionally, the government has also invested in building the necessary infrastructure and human capital to support the growth of the technology sector, specifically in terms of expanding access to the internet and mobile telephone and promoting capacity building through vocational and technical training programs, as well as higher education in fields related to the technology sector. Innovation is also emphasized, with different initiatives to encourage it such as the Senegal Digital 2025 Strategy, which aims to promote the development of the digital economy and e-governance. Efforts have also been made to promote entrepreneurship in different sectors, such as agribusiness, manufacturing and service sectors, through the creation of an enabling environment, providing training and support for entrepreneurs, and creating a supportive environment for new businesses to start and grow. The governance of STI in Senegal at the governmental level is characterised by a breakdown of administrative and technical supervision without a unifying, coordinating national framework. Research institutions are fragmented and are under the supervision of different ministries. The Ministry of Higher Education, Research and Innovation (MESRI) has the administrative and technical supervision of public and private higher education institutions as well as the National Agency for Applied Scientific Research (ANRSA). The establishment of the National Scientific and Technical Research Incentive Fund (FIRST), annually identified research themes related to vital

development sectors and the priorities sectors of the nation. Other success stories in Senegal include increment in inclusive access to higher education where measures to promote the development of digital activities and enhance distance learning have been put in place. The opportunity provided by the Senegal Virtual University has significantly increased students' participation in online courses for higher education just as is the case for traditional physical education.

Uganda has one of the youngest populations in the world with more than 78% of its 35 million people below the age of 30, of those 11% are unemployed and 26% are largely underemployed. Youth unemployment stands at between 64% and 70%, and about 400,000 youths are released annually into the job market to compete for approximately 9,000 available jobs (Advocates Coalition for Development and Environment [ACODE], 2020). Uganda's Vision 2040 aims to transform the country from a peasant country to a modern and prosperous country by 2040. It identifies ICT access and utilisation across the country as a crosscutting development enabler and a major business opportunity and provides the foundation for developing the five-year National Development Plans (NDPs). The National ICT Policy of 2014 supports the realisation of Vision 2040 with broad objectives that include building a knowledge-based human capital, promoting innovation in economic and social systems, expanding ICT infrastructure and its integration, improving utilisation of ICT services, enhancing research and innovation in ICT and improving ICT governance in Uganda. Digital Uganda Vision (DUV) 2019 is a National Policy and Strategic Framework that reviews, integrates, consolidates and improves all the existing ICT strategies, policies and plans into one overarching digital Vision for Uganda by providing a unified direction for ICT development and an Integrated ICT project implementation approach. DUV aims to use ICTs to deliver various Government and private services, including but not limited to education, health, agriculture, social security, banking, justice and communications. The Ministry of Science, Technology and Innovation (MoSTI) is responsible for developing the country's research policies in line with the National Plan for Science, Technology and Innovation, and guides coordination, priorities-setting and policy development. However, much of the policy implementation and monitoring is performed by the Uganda National Council for Science and Technology (UNCST), which is also the country's primary research funder and operates under the authority of the Ministry of Science, Technology and Innovation. The Uganda Women Entrepreneurship Program (UWEP) has been very successful in addressing the existing gaps of limited access to affordable financial services as well as limited skills for enterprise development and management by the majority of the population, particularly women aged 18-65 years. The reasons for UWEP's success could be attributed to the model used to disburse the funds, which makes it easier for women to easily access the loan facilities. The favourable repayment terms have also made the program to be sustainable.

Zimbabwe's overall unemployment rate is currently at 5.3% and is projected to trend around 5.5% in 2023 and 5.6% in 2024. With this trend, the government has been forced to find solutions and has therefore developed several policies aimed at promoting economic development and supporting various priority sectors. For example, the government has implemented initiatives to support the development of new technologies and innovations, such as providing funding for research and development activities and creating incentives for private sector organizations to invest in new technologies. In terms of skills development, while the government has implemented several programs to train and upskill the workforce, a shortage of resources and funding has limited the reach and effectiveness of these programs. This has resulted in a mismatch between the skills of the workforce and the needs of the job market and has limited the ability of workers to take advantage of new job opportunities. The stagnation of economic growth has limited the ability of the government to create new jobs. This has prompted the government to implement some policies, such as the Zimbabwe Agenda for Sustainable Socio-Economic Transformation (Zim-Asset), that are aimed to create new jobs and improve the job prospects of workers. Also, the government is implementing several initiatives to support SMEs, by increasing access to finance and business development services. The responsibility of coordinating STI policies and programmes in Zimbabwe has been shifting with the restructuring of Ministries and institutional responsibilities. The country has an explicit Second National STI Policy drafted in 2012 by the then Ministry of Science and Technology. The Technology Portfolio was shifted from the Ministry of Higher Education to a fully-fledged Ministry of S&T and thereafter was returned to the Ministry of Higher and Tertiary Education. The Ministerial portfolio of STI is now well settled in the Ministry of Higher Tertiary Education Innovation Science and Technology Development (MHTEISTD). The Youth Employment, Entrepreneurship and Empowerment Program (YEEEP) empowers young people by creating job opportunities and promoting entrepreneurship. It provides training, mentorship, and funding to young entrepreneurs, resulting in the creation of new businesses and jobs.

Conclusion

Addressing inadequate technological development requires a multi-faceted approach. This may include investing in infrastructure, providing funding for technology development, increasing access to education, and promoting political stability. Additionally, government policies and regulations should be in place to foster innovation development that will lead to youth employment and entrepreneurship and provide a conducive environment for the deployment and adoption of technology. These are not always readily available in countries and the capacity to implement these is almost always lacking, hence the need to have strong stakeholder engagement and participation. The private sector, civil society/NGOs, and development partners within the STI ecosystem have played important roles in supporting the government using different arrangements such as Public-Private-Partnerships (PPP) to address societal challenges. Until structural barriers are removed, implementing employment-based interventions targeting young people may just fuel greater frustration. Decision-makers must prioritize the inclusion of youth and women in STI policymaking and implementation so as to integrate their interests into the STI agenda of their countries. Youth must also be equipped with the right skills that match industry needs to be able to succeed in a rapidly changing environment. However, skill-building activities cannot succeed in a vacuum without adequate training that prepares the young ones for jobs at different levels of economic endeavours. While many sub-Saharan African countries have clearly prioritized youth engagement and taken the issue of youth unemployment seriously, they will have to go beyond bolstering education to encouraging youth leadership if they are to successfully reap the potential advantages of the continent's demographic youth boom.

Recommendations

The following key recommendations for sustaining technological innovation development for youth employment and job creation are proffered:

- i) There should be inclusive participation of all actors in the STI ecosystem in the development and implementation of policies and programmes with conscious efforts to create wealth and jobs, especially for the youth and women.
- ii) Governments must increase investments in research and innovation funding in line with the recommendations of the African Union and UNESCO of up to 1% of each country's GDP allocated to research and development with another conscious allocation to job creation for the youth.
- iii) There should be increased collaboration and partnerships between and among key actors in the STI ecosystem that will create opportunities for synergies in technological innovation development, youth employment and wealth creation. The PPP and the private sector-led development models with the youth and women at the centre stage should be promoted across African countries.
- iv) One critical role of STI is in value addition to primary products produced from R&D in Africa. This undoubtedly creates jobs along the value chains in most sectors such as the agricultural and mining sectors where a majority (80%-90%) of Africa's annual exports to the rest of the world are exported in primary forms without value addition. There is therefore an urgent need to make and implement policies that will reverse this age-long trend.
- v) Governments and like-minded development partners should invest more in training and skills acquisition programmes, especially in technological innovation areas for the youth and women. Such programmes should be linked to financial support services for innovators and entrepreneurs to start up their businesses in a conducive business environment.

1. INTRODUCTION

1.1 Background

The youth are Africa's greatest asset. Africa's youth population is rapidly growing and is expected to double to over 830 million by 2050 (African Development Bank [AfDB], 2016). If properly harnessed, this increase could support increased productivity and stronger, more inclusive economic growth. Unfortunately, the majority of the youth do not have access to stable economic opportunities. Of Africa's nearly 420 million youth aged 15-35, one-third are unemployed and discouraged, another third are vulnerably employed, and only one in six is in wage employment (AfDB, 2016). While 10 to 12 million youth enter the workforce each year, only 3.1 million jobs are created, leaving vast numbers of youth unemployed (*Ibid*). These conditions have been exacerbated by the COVID-19 pandemic. Addressing the youth unemployment challenges in Africa will require sustainable solutions that can be achieved through effective policy interventions and the strengthening of institutions. Unfortunately, Africa as a whole lacks robust policies and plans on science, technology and innovation (STI), which slows down its progress in attaining industrialisation and economic development (Ozor, 2020). There is need, therefore, to support policy reviews in countries that will prioritise STI development (*Ibid*). This is because policies and institutions embedded in STI development have been shown to have the greatest potential to accelerate job creation (African Union Commission [AUC], 2014). To make effective policies the use of evidence is paramount (Bowen and Zwi, 2005). Besides, there is no systematic documentation of technological innovations, especially by the youth and women that could be supported for commercialisation.

It is against this backdrop that the *Technological Innovation Development in Africa to Enhance Employability, Entrepreneurship and Job Creation (TIDE)* project proposes to review the STI policy and institutional landscape/ecosystem in selected countries namely: Ethiopia, Ghana, Kenya, Nigeria, Rwanda, Senegal and Uganda; with a view to understanding their statuses, what works (successes), what does not work (failures) and why (reasons for successes or failures). The findings and lessons learned from the 18 months research will support various initiatives aimed at providing young Africans with dignified and fulfilling work. Findings from the study will: identify policy gaps that may require changes or championing; key actors, their roles, linkages, interests, power, and influence along the technological innovation value chains of countries' priority sectors; develop a knowledge-sharing and stakeholder engagement strategy/action plan; and pilot engagement sessions with the triple helix - research, industry, and Government. These results will be achieved through two distinct but interconnected interventions that will generate strategic policy reports, stakeholder maps of technological innovations and hubs, research and policy actors; and finally provide seed funds to a few entrepreneurs with excellent ideas to develop them.

1.2 Rationale for the study

If scientific and technological research is to have any meaningful impact in terms of guaranteeing development gains in Africa, the results must inform and shape policies and programmes as well as contribute towards solving practical societal problems such as unemployment and skills deficits among the youth. Policies and programmes at various levels provide the frameworks upon which innovations and entrepreneurship can thrive. The development of these policies and programmes is ideally carried out based on evidence and a shared willingness to implement them and therefore becomes paramount in driving innovation development, entrepreneurship and wealth creation as the case may be.

The Mastercard Foundation's Young Africa Works (YAW) Strategy is one such programme that aims to provide 30 million young Africans with dignified and fulfilling work through a series of strategies that will empower young people, work with African organisations, use technology to drive impacts and scale and share evidence-based knowledge and innovation. This is in line with the AUC's Science, Technology and Innovation Strategy for Africa (STISA) 2024 which supports the long-term transition from a resource-based to an innovation-led, knowledge-based economy that will create more jobs for the youth and women on the continent (AUC, 2014). However, for any programme or initiative such as the MCF's YAW Strategy to sustain itself, it must be anchored in one way or the other into the policy and institutional frameworks of the participating countries and implemented by relevant institutions including the ministries, departments and agencies (MDAs) as well as the industry and research systems. It becomes imperative, therefore, to review the statuses of the STI policies and institutions that anchor technological innovation development with a view to understanding what works, what doesn't work and why; identify the key actors, their roles, linkages, contexts, capacities, power and influence so as to effectively design and mainstream programmes that will contribute to sustainable development.

The lack of knowledge, data and information on these pertinent issues has led to the failures of well-intended programmes and initiatives in Africa. According to Ogutu (2020) and Okereke (2017), the failure rates of projects in Africa seem to be more than 50%. The New Partnership for Africa's Development (NEPAD) project in South Africa, Ghana-STX Building Project, failed renewable energy projects in Nigeria, Jatropha project in Tanzania, Microsoft's Digital Villages and other ICT projects in South Africa are just some of the examples of projects reported in the studies. Project failures were mainly attributed to poor policy planning and implementation, failure to include the local communities in planning processes, lack of knowledge and information on relevant issues around the project, corruption, and inadequate capacity in project management among others. This is the key problem that the TIDE project seeks to address.

When evidence in the form of research, knowledge/information, ideas/interests, politics, and or economics is not used to inform policies and programmes of governments or any entity including youth interventions, implementation usually becomes difficult and impractical (Bowen and Zwi, 2005 and Ozor, 2020).

1.3 Objectives and Scope of Study

The STI policy and institutional review study cover seven (7) countries drawn from sub-Saharan Africa. They include **Ethiopia, Ghana, Kenya, Nigeria, Rwanda, Senegal, Uganda and Zimbabwe**. The main objective of this study is to review the STI policy and institutional landscape in the selected countries in Africa with a view to understanding the statuses, what works (successes), what doesn't work (failures) and why (reasons for successes or failures).

2. METHODOLOGY

The research study employed the use of both primary and secondary data sources. The approaches that were used to collect data followed the set protocols by the respective authorities in the study countries on COVID-19. Physical distancing measures were observed and some of the activities were conducted virtually to contain the spread of COVID-19. This study was aimed to answer the following questions:

- a) What are the key STI policies and institutions guiding the implementation of STI at the continental, regional and national levels as relates to enhancing technological innovation, skills development, youth employment and entrepreneurship?
- b) How are these policies and institutions identified, impacting technological innovation, skills development, youth employment and entrepreneurship?
- c) What are the best practices as far as STI policy implementation for technological innovation, skills development, youth employment and entrepreneurship is concerned?
- d) What are the challenges in enhancing the application of STI for technological innovation, skills development, youth employment and entrepreneurship? What opportunities are available and how can the different stakeholders get involved in addressing these challenges?
- e) What are the key recommendations for governments and different stakeholders in addressing technological innovation, skills development, youth employment and entrepreneurship in Africa?

2.1 Desk studies

The bulk of the data was collected through desk reviews. A review of all grey and published materials from reports and other secondary information was undertaken to collect information already available in the public domain. These documents include policies and strategies, sector performance or statistical reports, national development plans, national statistics and census figures, reports on STI projects and initiatives, regional and sub-regional reports and policy documents on science technology innovation, various knowledge and research work on STI, skills development job creation and entrepreneurship in Africa. There was a special emphasis on the role of STI in the generation of innovations and entrepreneurship and contribution to job creation and opportunities for youth and marginalised groups across the different priority sectors. This review also focused to ascertain how STI issues are treated at national and continental levels through policies, treaties, vision statements and development plans. The institutional landscape for STI implementation and development was also analysed at those levels.

2.2 Key Informant Interviews and Online Surveys

Data from desk reviews were complemented with primary data from interviews undertaken with key informants (KIIs), Focused group discussions and structured and open-ended surveys- (KIIs sought to obtain deeper insights and respondent perspectives on the issues. Semi-structured (open- and closed-ended questions) questionnaires covering a range of issues in STI programmes and projects and their relevance to the generation of technological innovations and entrepreneurship and contribution to job creation. These were sent to national stakeholders who were not targeted as KII respondents. A total of fifteen (15) Key Informant Interviews (KIIs) were conducted in each of the study countries targeting government, private sector, research institutions, civil society groups, development partners, and media stakeholder categories. The online survey instrument was administered to over 105 people comprising a minimum of 15 people per country. The 15 people were drawn from five (5) different stakeholder categories. The results provided a basis for qualitative analysis of how respondents' institutions and programmes support STI priorities, barriers to scientific research and innovation, relevance and effectiveness of continental and national STI policies, and opinions on how best to enhance scientific research and the generation of technological innovations and entrepreneurship and contribution to job creation.

2.3 Focus Group Discussions

Focus group discussions (FGDs) were conducted in each of the study countries to triangulate the data and information obtained from desk studies, KIIs and online surveys. Some of the participants were drawn from the key informants representing the different stakeholder categories.

2.4 Data Analysis

Each data collection method generated various data sets that were collated into organized formats for analysis. The desk review resulted in various notes and information drafted into a desk study report. Each interview was transcribed and detailed notes were developed for qualitative and quantitative data. The quantitative data from surveys and KIIs was analysed using SPSS version 25, and results were presented in summary tables, and graphs as appropriate. Qualitative data from the desk review reports, KIIs and online surveys were analysed using narrative analysis/content analysis and presented logically as narratives in the report.

3. FINDINGS AND DISCUSSIONS

3.1 Continental and Regional STI Policy Framework

There is recognition that for the continent to address these challenges and to attain the Sustainable Development Goals (SDGs) and Agenda 2063 of the African Union (AU), African countries, coalitions of countries and global partners need to invest more in the development, procurement and application of scientific knowledge and technological innovation. Individual countries and the continent need to create more economic opportunities by developing and implementing bold policies and programmes for STI in order to achieve the SDGs (African Academy of Sciences [AAS], 2018). The AU, RECs and regional institutions such as the AfDB, as well as international organizations such as the World Bank and United Nations agencies, have developed strategies and programmes to advance STI for Africa's sustainable development. In 2005, African countries committed to developing a shared set of indicators through NEPAD's African Science, Technology and Innovation Indicators (ASTII) to enhance the quality of STI policies at all levels (NEPAD, 2005). The adoption of a common set of indicators enables countries to track their progress, make informed decisions, and promote accountability. ASTII has made significant progress in promoting the use of STI indicators in Africa by establishing national STI observatories and training over 1,500 STI experts. Some of the key international activities that have shaped the discourse on sustainable development globally include the 1972 Stockholm United Nations Conference on the Human Environment, the 1987 World Commission on Environment and Development (WCED), the 1992 Rio United Nations Conference on Environment and Development (UNCED), and the 2015 UN Conference on SDGs. SDG attainment mainly depends on investments in the development and application of STI, as explicitly recognised in the 2030 Agenda for Sustainable Development and articulated in SDG 9. Various policy reports on the role of STI in implementing the 2030 Agenda and achieving the SDGs have been published. They review policy issues related to the development and application of STI and highlight measures to build national capacity to use and apply STI to the SDGs. A report by Schmalzbauer and Visbeck (2016) emphasises that in the coming years, science will play a massive role in providing the data, information, and knowledge required to facilitate the successful implementation of the 2030 Agenda for Sustainable Development and the associated SDGs.

There have been various efforts to integrate youth voices into STI processes, including those related to the SDGs. These include establishing youth-led organizations that aim to promote youth participation in STI processes. For instance, the Youth Science-Policy Interface Platform (YSPIP) is a global network of young scientists, policymakers, and stakeholders that seeks to amplify youth voices in science policy dialogues. Similarly, the International Youth Council (IYC) is a youth-led organization that advocates for youth participation in decision-making at the local, national, and global levels. Many STI processes now include youth forums and consultations as a means of ensuring that youth perspectives are heard. For example, the United Nations Major Group for Children and Youth (UN MGCY) organizes annual consultations with youth representatives to provide input into the High-Level Political Forum (HLPF) on Sustainable Development. Youth-led research is another way in which youth voices are being integrated into STI processes. For example, the Global Youth Biodiversity Network (GYBN) has carried out research on the role of youth in biodiversity conservation and has presented its findings at international conferences. Also, youth innovation competitions have been organized to encourage young people to come up with solutions to address the SDGs. For example, the Youth Citizen Entrepreneurship Competition is a global program that empowers young entrepreneurs to create innovative solutions for sustainable development.

The African Continental Strategy for the Development of STI 2014 was adopted by the AU in 2014 to promote the development and use of STI to drive economic growth and improve the standard of living in Africa. The strategy also aims to increase the participation of women and young people in STI, as well as to strengthen the linkages between STI and other sectors such as agriculture, health, and the environment. The Science, Technology and Innovation Strategy for Africa (STISA) 2024 was adopted in January 2016 by the AU Heads of State and Government during the 26th Ordinary Session of the Assembly. It builds on the African Continental Strategy for the Development of STI. It is a specific and action-oriented strategy that aims to transform Africa into a knowledge-based economy. It focuses on areas such as innovation, technology transfer, and human capital development, with specific targets and indicators to measure progress. Its objectives address the continent's infrastructure, entrepreneurial and technological capabilities, and the implementation of STI policies and programmes that promote sustainable development. It enhances youth employment by improving Science Technology Engineering and Mathematics (STEM) education, promoting entrepreneurship and innovation, developing high-tech industries, and encouraging regional collaboration.

The Smart Africa Manifesto 2013¹ is a bold and innovative commitment from African Heads of State and Government to accelerate sustainable socio-economic development, ushering Africa into a knowledge economy through affordable access to Broadband and usage of Information and Communications Technologies. Transform Africa Summit held in Kigali, Rwanda, on 28-31 October 2013 culminated in the adoption of the Smart Africa Manifesto document by seven (7) African Heads of State (Rwanda, Kenya, Uganda, South Sudan, Mali, Gabon, and Burkina Faso). They promised to take leadership in accelerating socio-economic development through ICT. In 2014, the SMART Africa Manifesto was endorsed by all Heads of State and Government of the African Union at the 22nd Ordinary Session of the Assembly of the African Union in Addis Ababa. This development places the Manifesto at the heart of the ICT agenda in Africa for all 54 African countries.

Other sector-wide continental-wide policies that have a direct impact on STI, include the Continental Education Strategy for Africa (CESA) 2016-2025 and the Continental Strategy for Technical and Vocational Education and Training (TVET) 2007. Another major policy decision that will have an impact on Science Technology and innovation is the Continental Free Trade Area and an associated Action Plan on Boosting Intra-Africa Trade (BIAT). STISA-2024 has a strong interface with both CESA 2016-2025 and the Continental Strategy for TVET. Particularly noteworthy interfaces occur with CESA 2016-2025 through its strategic objective 8 to “expand TVET opportunities at both secondary and tertiary levels and strengthen linkages between the world of work and education and training systems” and strategic objective 9 to “Revitalize and expand tertiary education, research and innovation to address continental challenges and promote global competitiveness.” A set of indicators has been developed for the implementation of CESA 2016-2025 (AU, 2019). Also, the African Continental Free Trade Area (AfCFTA) is expected to play a significant role in job creation in Africa. The agreement, which came into force in January 2021, aims to create a single market for goods and services across the continent. This will reduce barriers to trade and investment, which will in turn lead to increased economic activity and job creation. A study by the World Bank estimates that the AfCFTA could create up to 30 million

¹ <https://smartafrica.org/who-we-are/>

jobs in Africa by 2035 (World Bank, 2020a). The study found that the agreement would have the biggest impact on the manufacturing and services sectors, which are major employers in Africa. The World Bank estimates that the AfCFTA will increase Africa's income by \$450 billion by 2035 and increase intra-African exports by more than 81% (Echandi et al, 2022). The AfCFTA is also expected to boost investment in Africa. This is because the agreement will create a more predictable and stable business environment, which will make Africa more attractive to investors. Increased investment will lead to increased economic activity and job creation.

3.2 Enablers/Constrainers of STI development in Africa

Various research findings and scholarly endeavours continue to point to weaknesses among STI ecosystem stakeholders comprising policy, science, research and innovation as one of the reasons for the region's inability to fully exploit the gains from STI (Daniels et. al, 2021). STI can help us deal with complex global challenges and achieve sustainable prosperity for humanity but can also drive us apart and fuel inequality. Unfortunately, the actions being taken in terms of STI are not yet making the expected impact across critical sectors such as agriculture, energy, environment, health, infrastructure development, mining, security, and water among others that contribute to Africa's transformation, nor at the scale and pace needed to achieve all the 17 SDGs (UN, 2020a). We must join forces, with all stakeholders and leverage new opportunities in STI to create the continent we are all striving for. Below are some of the key enablers that are critical in ensuring the effective utilization of STI to enhance youth employment in Africa:

a) Enabling Legal and Regulatory Framework

The potential of STI in driving the African Economy is not without a doubt highly regarded and affirmed by many of the previous and present Heads of State and Government in Africa. African countries are striving to put in place the necessary policies and legal and regulatory frameworks to support STI. Some of the key important policies revolve around Intellectual Property Rights (IPRs), cyber security, and data protection laws among others. Most of the countries in Africa have some form of laws that may not sufficiently address the challenges posed by the development and implementation of emerging technologies. This has created low adoption by some countries of some essential technologies that are relatively safe to use under very minimal regulations such as mobile money transfers and digital banking due to the fear of the unknown surrounding implementation of these technologies. For instance, *Mpesa*, a mobile money transfer that was developed in Kenya has demonstrated how some of these technologies can have an instant impact on job creation, technological innovation and entrepreneurship. However, there is no clarity as to who developed it between the Kenyan innovator who was a student at the university at the time and Vodafone staff who were working on social enterprises around the same time. Such cases have discouraged many young innovators who fear they will not benefit from their ideas because they will be stolen and implemented by organizations with insurmountable budgets to scale and implement the idea at a faster pace than them.

b) Responsive and functioning National Innovation Systems

National Innovation Systems (NIS) stresses that the flows of technology and information among people, enterprises and institutions are key to the innovative process. Innovation and technology development are the results of a complex set of relationships among stakeholders in the system, which includes enterprises/private sector, universities and government research institutes. The notion of NIS was introduced in the 1980s to emphasize the interdependence between technical and institutional change. Mismatches within the system, both among institutions and in relation to government policies can thwart technology development and innovation. Policies which seek to improve networking among the stakeholders and institutions in the system and which aim at enhancing the innovative capacity of firms, particularly their ability to identify and absorb technologies, are most valuable in this context. Sufficient institutions to implement policies and enforcement of regulations are critical in this system. The system should enhance stakeholder participation and engagement. So far, the number of patent applications filed in Africa increased by 25% between 2016 and 2022 while the number of technology start-ups in Africa has increased by 50% in the past five years. The value of the African technology industry is now estimated at \$1 trillion (UNESCO, 2022).

c) Sufficient STI and entrepreneurial capacity development

Although Africa is reorienting its development policies to include STI at various levels, its STI capacity is still very low (African Capacity Building Foundation [ACBF], 2017). The capacity of African Researchers to engage and apply emerging technologies is very limited. Emerging technologies such as Artificial Intelligence (AI), machine learning, Internet of Things among others have been touted to provide solutions to many pressing African needs. The number of R&D scientists and engineers per million people in Africa is about 1,000, up from 800 in 2016 (UNESCO, 2021). However, this only accounts for only 0.2% of the world's researchers. Again, the average percentage of women enrolled in STEM programs in tertiary education in sub-Saharan Africa

was 28% in 2019, which is lower than the global average of 33% (UIS, 2021). Inclusion of entrepreneurship training as part of the curriculum especially in higher learning. This is partly due to lack of sufficient research facilities within the continent, limited mentorship and funding in R&D. The countries are characterized by poor STI infrastructure, a small pool of researchers, low patronage of science and engineering programs, weak intellectual property frameworks, and low scientific output relative to the rest of the world. Africa remains disadvantaged in overall STI efforts due to the low investments in STI capacity development. Entrepreneurship skills are becoming more and more important around the world given the positive impacts on employment, productivity, innovation and economic growth. Entrepreneurs often create new technologies, develop new products or process innovations, and open up new markets (Kritikos, 2014). There is need to build the capacity of researchers and scientists to have an entrepreneurship mindset as they conduct research to develop technologies and innovations in order to guarantee the commercialization of products emerging out of their research.

d) STI Infrastructure

Africa does not have adequate STI infrastructure, has a small pool of researchers, low patronage of science technology and engineering programs, weak intellectual property frameworks, and low scientific output relative to the rest of the world. R&D has been recognized as a key factor in moving global technological frontiers as well as facilitating new scientific innovations. The failure to invest in R&D by the African governments makes it challenging for scientists and researchers to develop homegrown, sustainable solutions for African problems leading to slow economic growth (AfDB, 2020). Despite the pledges by African states to contribute 1% of their Gross Domestic Product (GDP) to R&D, progress towards achieving these targets has been slow as many African counties are focusing on other pressing issues such as fighting hunger and poverty (World Economic Forum, 2020). In many African states, R&D has been largely supported by the public sector with international sources forming a substantial percentage. Research institutions including public and private universities in Africa cannot compete in a fast-moving world of research and development due to lack of basic infrastructure (AfDB, 2020). Training infrastructure is an important aspect of developing STI in Africa. The training infrastructure includes labs, libraries, ICTs and communication networks, databases, and electricity among others. However, the infrastructural gaps witnessed in many African states have posed a challenge in developing requisite skills for employability and job creation (AfDB, 2020).

e) Internet and Electricity Connectivity and ICT

Internet usage has seen remarkable growth since the emergence of the World Wide Web in 1990. However, African countries still face challenges in deploying internet infrastructure, widening the digital divide and hindering digital literacy. Insufficient digital skills among researchers limit their ability to leverage technology for learning and innovation. Internet and ICT play a vital role in achieving Sustainable Development Goal 4, which aims to provide inclusive and equitable quality education through digital literacy programs. Electricity is crucial for economic development, R&D, and STI. Many technologies require electricity to function or utilize various forms of energy for production and testing. Electrical connectivity is an essential enabler of STI development, job creation, and entrepreneurship. ICT is utilized to enhance supply chains, inventory management, and customer tracking, leading to improved productivity and growth. ICT also facilitates the diffusion of codified knowledge and ideas, making science more efficient and linking it closely to business. It fosters innovation in various economic sectors and contributes to economic growth. Innovation and information labs, as well as incubators and accelerators (tech-hubs), have been established across Africa to address these challenges and support entrepreneurship, incubation programs, partnerships, and idea generation. The increased adoption of smartphones and reduced internet costs have contributed to the growth of such initiatives in many African countries.

f) Financing Mechanisms

More than 40 years after the adoption of the Lagos Plan of Action, countries in Africa have not fully complied with the commitment by the Heads of State to allocate at least 1% of their GDPs to R&D (AfDB, 2020). It has been estimated that if African countries can increase their investment in STI to 1% of their GDP, they could increase their annual growth rate by 2-3%. Europe, America, and China invest heavily in STI, while Africa lags far behind. According to UNESCO, despite the benefits of STI, several challenges hinder Africa from harnessing its full potential. None of the countries in Africa contributes more than 0.88% of GDP expenditure on R&D. The financing gaps witnessed in STI have caused a major challenge in meeting its education and skill needs. Several innovative financing mechanisms and models have emerged to drive the growth of the innovations needed to support STI in creating employability, skills and productivity in the labour market (Mugwagwa et al, 2019). Among them are government funds, private sector funds, public-private sector funds,

foundations and philanthropists, influential investors, non-governmental organizations, international joint grants, charities, patents, Corporate finance, development partners, loan programs, advisory services, and diaspora funding (AfDB, 2020). There are other emerging financing models such as patent buyouts; local and international collaborative research grants; rewards and incentives for specific outcomes; research infrastructure funds; human capital development pipeline; multi-institutional co-funding for inter and multidisciplinary research; and international strategic research partnerships that are being used by many African countries (Mugwagwa et al, 2019). In addition to these, there has been an increasing trend of accessing funds through Mobile money banking and lending platforms such as *Tala, Branch, and Mshwari* in Kenya where Micro, Small and Medium Enterprises (MSMEs) access loans using mobile apps. These have been very helpful in financing small businesses. However, these have not been without challenges, especially regarding high charges and interest rates, poor repayment trends and unreliable recovery methods due to lack of security. Other challenges that face these emerging financing mechanisms are teething problems due to lack of regulatory framework and controls, poor repayment records, high-interest rates, poorly developed infrastructure and platforms, and challenges in setting repayment periods for different businesses among others.

3.3 Eastern Africa Regional STI Policies and Key Stakeholders

The East African Regional STI draft Policy of 2019 is expected to create jobs by supporting the development of new technologies and innovations that can be used to create new businesses and jobs, help to improve the skills of young people so that they are better equipped to find jobs in the modern economy and encourage the growth of the private sector, which is a major source of employment in East Africa. The policy is still in its early stages of implementation, but it has the potential to make a significant contribution to youth employment in East Africa. One important aspect is that it also recognises Traditional and Indigenous Knowledge as a means of enhancing youth, women and marginalised groups' development. The East African Science and Technology Commission (EASTEKO) is the main regional agency through which the Partner States will develop and implement common STI policies and programmes. It promotes regional integration in the development, management and application of STI in the Community. However, the member states through their arms of government are expected to give direct political support for STI in their capacity to make it easier to harmonize some of those efforts from a regional perspective. The East African Legislative Assembly (EALA) is the main legislative organ on EAC matters. As a regional legislative assembly, EALA can provide legislative leadership in defining common principles to guide the development of national legislation governing STI. Besides the enactment of regional laws in the form of the Acts of the Assembly, EALA can also influence the development of STI through appropriate resolutions and the work of its specialized committees. Agencies for independent policy research and analysis are critical players in the East African STI framework. They provide evidence, alternative policy options and guidance for national and even regional STI policy formulation and implementation. These agencies are normally independent think tanks operating outside the purview of governments. In addition, to Think tanks, STI policy watchdogs engage in monitoring and evaluating policy processes and outcomes. The efficient interlinkage of all these stakeholders makes the East Africa STI framework effective in the region especially, to spur the enhancement of employability, entrepreneurship and job creation in the region.

3.4 Western Africa Regional STI Policies and Key Stakeholders

The West African region developed a regional policy on STI called the Economic Community of West African States (ECOWAS) Policy on Science and Technology (ECOPOST). ECOPOST is an integral part of the subregion's development blueprint that defines a road map for improving governance, accelerating economic and monetary integration and fostering public-private partnerships. It endorses the planned harmonization of investment laws in West Africa and suggests pursuing with vigour the creation of a regional investment promotion agency. Countries in the sub-region are urged to promote efficient, viable small and medium-sized enterprises (SMEs) and to expose traditional agriculture to modern technology, entrepreneurship and innovation, to improve productivity (Essegbey et al, 2015). ECOPOST was originally crafted to run parallel to the region's Vision 2020 document, but its lifespan has since been extended to 2024 to coincide with the expiry date of the AU's STISA 2024 and to reflect the rapidly evolving landscape for STI in the region and globally. It encourages countries inter alia to raise Gross Domestic Expenditure on R&D (GERD) to 1% of GDP, as recommended by the African Union a decade ago. Countries are also encouraged to work with the ECOWAS Commission to improve data collection (UNESCO, 2021). Of the 13 countries that participated in the first phase 5 of ASTII, only four countries from ECOWAS (Ghana, Mali, Nigeria and Senegal) contributed to ASTII's first collection

of R&D data for publication in the African Innovation Outlook of 2011 (ECOWAS, 2011). Further, ECOWAS recently took other steps to tackle the lack of technological impact in the research sector. In 2012, the ministers in charge of research adopted the ECOWAS Research Policy (ECORP) while meeting in Cotonou; and in 2011, ECOWAS created the West Africa Institute within a public-private partnership (UNESCO, 2021). ECOWAS was barely more visible in the second African Innovation Outlook, with just six countries contributing R&D data, out of 19 across the continent. These countries included Burkina Faso, Cabo Verde, Ghana, Mali, Senegal and Togo (UNESCO, 2021). CESA is working to address the lack of reliable and comprehensive data on education in Africa. One of its focus areas is to improve data collection by establishing standardized mechanisms, robust management systems, and providing capacity building. CESA also emphasizes the importance of using data in decision-making processes, promoting collaboration and coordination between data producers and users. By improving data collection and promoting its use, CESA aims to ensure evidence-based education policies and programs that meet the needs of learners in Africa.

3.5 Cross-cutting issues

a) Gender Equality and Social Inclusion

Gender equality is not just a basic human right but is also the basis of a prosperous modern economy that provides sustainable and inclusive growth. Recognizing that gender equality is essential to enable men and women to fully contribute to the improvement of society and the economy as a whole, G20 leaders first committed to “women’s full economic and social participation.” They set the ambitious goal to reduce the gender gap in labour market participation by 25% by 2025 and committed to implementing a set of policies to improve the quality of women’s employment and the provision of support services (OECD, 2018). Women currently make up only 28% of researchers in Africa while the African Union’s Agenda 2063 targets a 50/50 gender balance in STI by 2030. Digital transformation can provide new ways for women’s economic empowerment and contribute to more gender equality. The internet, digital platforms, mobile phones and digital financial services provide everyone with ‘leap’ opportunities, give women the opportunity to earn additional income, increase employment opportunities and access knowledge and general information. We need to take this opportunity to promote gender equality in the labour market, boost economic growth and build a more comprehensive digital world. Creating more equitable and inclusive societies requires that women and men are distributed across different professions, including STI. This will foster social progress, cohesion and make societies and economies more resilient. Support and mentorship are essential to increasing the participation of youth, women and other marginalised groups in science and technology. Youth unemployment and underemployment constitute central challenges to Africa’s development and if this continues, nearly 50% of youth – excluding students – will be unemployed, discouraged, or economically inactive by 2025 (AfDB, 2015). It is estimated that 600 million jobs would have to be created over the next 12 years to meet youth employment needs (UN, 2020b). The proportion of young people not in employment, education or training has remained stubbornly high over the past 15 years and stands at over 30% for young women and 13% for young men worldwide (UN, 2020b). Until structural barriers are removed, implementing employment-based interventions targeting young people may just fuel greater frustration. Decision-makers must prioritize the inclusion of youth and women in STI to increase the chances for job creation, technology development, innovation and entrepreneurship. While many African countries have clearly prioritized youth engagement and taken the issue of youth unemployment seriously, they will have to go beyond bolstering education and encouraging youth leadership to successfully reap the potential advantages of the continent’s demographic youth boom (Michels, 2020).

b) Environment and climate change

The achievement of the ambitious 2030 Agenda for sustainable development requires new and innovative approaches that are socially inclusive, economically sustainable and environmentally benign (UNCTAD, 2017). In recent decades, the expansion of economic activities across the globe has been coupled with growing concerns over various environmental issues such as climate change, food, water and energy insecurity as well as resource scarcity. Correspondingly, different sectors of the economy are showing more interest in the challenge of more efficient and productive sustainable production technology and practice, which is the process of eco-innovation. Various policies, initiatives, technologies and innovations have been proposed and implemented to minimize environmental degradation and mitigate and adapt to climate change, but they have not been very fruitful yet. STI is expected to play a critical role in the development, deployment and even commercialization of solutions to these challenges as well as enhance the livelihoods of the people.

c) Health

While many factors are needed to ensure a healthy life for all, STI is a major contributor to improving the quality and inclusiveness of health care. STI accelerates progress along seven accelerator themes highlighted by the WHO Global Action Plan for Healthy Lives and Well-being for Everyone, especially in primary health care, poverty-related diseases, and disease outbreak early warning and response (UN, 2021). STI policies help mitigate infectious disease-related health, economic, and societal disruptions like the COVID-19 pandemic. STI and ICT tools help create and deploy diagnostics, community- and self-testing through automated tools and artificial intelligence-powered interpretation analysis of computer tomography images (Budd et. al, 2020).

d) Governance, Transparency and Accountability

Good governance is emphasized as a vital factor in eradicating poverty and promoting development (Ganaie, 2018), as stated by the late Former Secretary General of the United Nations, Kofi A. Annan. It involves using authority to steer social systems, ensuring accountability and effective direction. With the advent of technology, e-governance has emerged, utilizing ICT to enhance transparency and efficiency in governance. African countries have implemented reforms in public procurement, establishing central authorities to promote transparency (Ozor and Nyambane, 2020). E-governance in Africa encompasses various initiatives, such as e-commerce, e-payment systems, and open contracting, aimed at increasing openness and accountability. The adoption of e-government technologies has been swift in African nations, enabling online government services and secure communication. Overall, e-governance encompasses systems and services facilitating interactions between governments and citizens, businesses, and other government entities within a comprehensive framework.

4. COUNTRY-SPECIFIC FINDINGS

This section examines the dynamics of the STI ecosystem in each of the selected countries. The analysis transcends across the national priority sectors and key critical sectors that contribute to technological development, innovation, job creation and entrepreneurship for inclusive socio-economic development. The key stakeholders that contribute to the STI development in the NIS of the study countries were also analysed to identify gaps in implementation.

4.1 Ethiopia

4.1.1 Ethiopia's STI Policy and Institutional Landscape for Youth Employment

Ethiopia is home to 117 million inhabitants and is the 12th-most populous country in the World and the second-most populous in Africa after Nigeria (UN, 2019). Ethiopia's Vision 2030 is the ten years development plan that is currently guiding the country to attain high per capita income through rapid economic growth (Waza, 2022). Ethiopia's working-age population, currently estimated at 54.7 million, is projected to grow by two million per year over the coming decade (World Bank, 2017). The fast-growing labour force, combined with improving education levels, the drive for industrialization, and the increased scarcity of agricultural land, will have far-reaching consequences for the social and economic structure of the country, the nature of work, labour mobility and the growth of towns and cities. Despite a strengthened economy, Ethiopia's labour market has not demonstrated a similar expansion in terms of job creation. About 73% of the population is still engaged in subsistence agriculture (UNDP, 2020). More recently, the Ethiopian Government launched its 10-Year Perspective Plan (2020-2030), which will solely focus on industries such as mining, tourism, urban development and innovation and technology that offers a great opportunity to enhance entrepreneurship and create employment for the many youths in the country (Ethiopian Monitor, 2020).

Ethiopia has implemented several policies and initiatives to promote the application of science, technology, and innovation in technological innovation, job creation, skills development for employability, and entrepreneurship across different priority sectors. The priority sectors identified include Education, Agriculture, Energy and Health. Ethiopia still lags behind in the introduction and utilization of digital technologies such as e-commerce to be competitive internationally. At present there is low adoption of e-commerce, as well as fully-fledged e-commerce has not yet been achieved in Ethiopia (Gelata et. al., 2022).

In 2009, Ethiopia adopted a National Science and Technology Policy, which aims to promote the development and use of science, technology, and innovation for economic growth and social development. The policy outlines several key strategies, including the promotion of research and development, the development of a skilled workforce, and the creation of an enabling environment for entrepreneurship and innovation. The National

Science Policy and Strategy (NSPS) of 2020 seeks to build a knowledge-based, technology-driven economy and society through the creation of capability in human resources, infrastructural and technological capability, science education, basic and applied research, and dissemination of knowledge and research outputs as deemed necessary (Ministry of Science and Higher Education [MSHE], 2020). The MSHE will provide strong advocacy for science and ensure coordination and harmonization of the NSPS and its programmes across research organizations, science-affiliated institutions, professional societies, HEIs, and TVETs'. In 2013, Ethiopia adopted a National STI Policy, which aims to promote the development and use of STI for economic growth and social development. The policy outlines several key strategies, including the promotion of research and development, the development of a skilled workforce, and the creation of an enabling environment for entrepreneurship and innovation. A revised version of the STI Policy was issued in March 2022. The revised Policy has the mission of creating a favourable ecosystem that enhances the role of STI in wealth creation, youth employment generation and GDP growth. The STI policies recognize the importance of entrepreneurship and encourage the creation of new businesses that can provide job opportunities for young people. The impact of these policies has been significant, with a growing number of technology-based startups and young entrepreneurs in the country.

The contribution of STI to improving the quality of education and people's lives has been enormous and indispensable. The Patent Regulations of 1997 has the sole mandate of regulating inventions, minor inventions, utility models and industrial designs originating from Ethiopia. Technical and Vocational Education and Training proclamation of 2004 directs how junior, middle level and basic vocational training programs provide citizens with relevant training considering the country's development strategy and the local needs for trained manpower. The Education and Training Policy of 1993, recognizes that there should be an appropriate nexus between education, training, research and development through coordinated participation among the relevant stakeholders. Such a nexus is expected to encourage university-industry collaboration, which can be an effective approach to entrepreneurial training by combining theory and practical experiences. The provisions of the policy include coordinated curriculum development to ensure that students and trainees acquire the necessary entrepreneurial and productive attitudes and skills among the youth.

The Ethiopian Youth Innovation and Entrepreneurship Program² aims to support the development of innovative and entrepreneurial skills among young people by providing training, mentorship, and financial support. The program has had a significant impact, with many young people starting their businesses and creating job opportunities for others. The Empower Youth for Work (EYW) (2016-2021) project targeted young men and women in rural areas that have been adversely affected by climate change. The success of the project was pegged on the following; the use of a holistic approach towards enabling rural youth to achieve economic and social empowerment through 1) working on agency, capacity and skills, 2) linking young people to existing and new economic opportunities including access to finance and 3) creating an enabling environment by influencing social norms and policies that facilitate young men and women's economic and overall empowerment (Oxfam, 2019).

The National Science, Technology and Innovation Council (NSTIC) under the Prime Minister's office is the regulatory body for Ethiopia's STI policy and action plan. Its key objective is to establish and coordinate the general strategy and framework for developing STI in the country. NSTIC is supported by key ministries, which are the main implementers of the STI policies in the country. For instance, the Ministry of Innovation and Technology (MInT) is the secretary of the NSTIC. MInT gets to appoint experts from STI institutions/centres whom the Council later appoints as NSTIC members. The Council monitors and evaluates the performance of STI activities. These key ministries involved with STI activities in the country closely work with public research institutions and think tanks in assessing the policies created by NSTIC. The ministries also act as key funding agencies for public research institutions and intermediaries in the national research framework. Other funding sources are international donors who mainly fund research activities in universities, private research institutes, private think tanks, and international research institutes in the country. The research input and outcome affect employment, especially amongst the youths and women, either directly or indirectly. Innovation systems that are produced as research outputs can be rolled out for implementation and with the support of the key sectoral ministries where they fall, they have a chance to be upscaled countrywide. This reduces the urban bias that is

² <https://www.edc.org/sites/default/files/uploads/Youth%20Entrepreneurship%20in%20Ethiopia%20Mali%20and%20Rwanda%20v7-1.pdf>

synonymous with many developing countries, whereby employment opportunities are concentrated in urban areas at the expense of rural areas.

4.1.2 Best Practices for Youth Employment in Ethiopia

-A working and improved government-private sector relationship: In Ethiopia, the public-private sector relationship has significantly improved. The enhanced cooperation between the two sectors is helping the policymakers come up with robust plans that are all-inclusive. This creates a conducive environment for policies to thrive in their implementation. For instance, MInT announced its Start-up Strategy centred on the "2222 plan" from a robust interaction with the private sector and was able to come up with a sustainable plan that can seed 2000 new technology-based start-ups that will be able to create over 20,000 jobs within two years countrywide (UNCTAD, 2020).

-Development of institutions that have led to the promotion of STI in Ethiopia: The Apiculture Scale-up Programme for Income and Rural Employment (ASPIRE) programme ran from 2013 to 2017 to improve the income and livelihoods of farmers (youth and adults) in areas identified as high potential for beekeeping. It focused on improving the quality and quantity of honey production using innovative methods from input use to post-harvest handling. The ASPIRE program supported rural youth employment by providing technical support in bee-keeping agribusiness, providing financial support for organised youth, and facilitating organised landless youth access to enclosures. The program's success could be attributed to already existing organised youth groups. This made it easier for the program implementers to efficiently train the groups and trust them with financial aid as they could be each other's collateral. The value chain approach taken by the project opened many doors for youth and women to apply their innovation to the honey value chain, creating more job opportunities in the process. Collaboration with research institutes in the planning and execution of interventions allowed for the fusing of ground-breaking research that fed into the apiculture value chain in the country.

-Ethiopia's 70/30 policy is a significant step in the right direction in terms of skilling young people: The 70/30 policy is a bold and ambitious initiative, and it is important to note that it is still in its early stages. However, the policy has the potential to make a significant impact on Ethiopia's future. By increasing the number of STEM graduates, the policy can help Ethiopia to develop a knowledge-based economy and to create jobs for its growing population. According to a 2019 report³ by the Ethiopian Ministry of Education, the number of STEM graduates in Ethiopia has increased by 50% since the policy was introduced in 2012. The report also found that the quality of STEM education in Ethiopia has improved, as evidenced by the fact that more students are now scoring well on international standardized tests in STEM subjects. The 70/30 policy has also had a positive impact on the Ethiopian economy. The World Bank found that the policy has helped to create jobs in the STEM sector and has contributed to economic growth (World Bank, 2020b). However, the policy has not been able to address the gender gap in STEM education.

-Tapping into other forms of agriculture to create youth employment: The Young Entrepreneurs in Silk and Honey (YESH) (2016-2020), focused on creating employment opportunities in beekeeping and silkworm farming for unemployed young men and women and school dropouts in urban and rural areas. It built the technical skills of rural youth in producing good quality honey and raw silk and provided funding for business start-ups. Capacity development involved life-skills training, including communication skills, entrepreneurship, and managing finances. The project also provided start-up kits and equipment, including modern beehives and honey processors, to the youth groups. The project largely succeeded because of linking the youth groups to local markets, making it easier for the developed enterprises to have a conducive entrepreneurial environment. The use of integrated approaches such as skills development, funding, and value chain approach has enhanced employment creation enabling the rural youth to engage in the production, harvesting, processing and marketing of silk, honey and its by-products. As a result, positive results were witnessed: The project created over 4,500 jobs in the silk and honey value chains, providing employment opportunities for both young men and women. It supported the development of over 1,500 young entrepreneurs in the silk and honey sectors through training, mentoring, and business development services and its strong focus on gender equality and women's empowerment, led to over 40% of the project's beneficiaries being women.

³ Ethiopian Ministry of Education (2019). The Impact of the 70/30 Policy on STEM Education in Ethiopia.

-Incorporation of social innovation in projects: Some projects such as the EYW, used various innovative strategies to ensure compliance amongst the youth beneficiaries. For instance, the project ensured that youth groups were organised and developed their technical and soft skills afterwards. These preparations made the beneficiaries ready to be linked with financial institutions that facilitated their business start-ups. The project also built the capacities of some youth that got access to finance from the Youth Revolving Fund on business management, record keeping, and entrepreneurial skills. This was to avert the risk of the youth spending that money received on non-related ventures that could easily draw away the youth with poor financial literacy. The program also incorporated and effectively used local authorities and religious leaders to reach the beneficiaries. The local and religious leaders know the youth and women in their jurisdiction. They helped greatly in their mobilisation and spreading awareness about the program. Lastly, some programs capitalised on the use of innovations and pilots as they encouraged the uptake of new ideas that would have remained untapped if not given a chance.

-Introduction of start-up incubators: Blue Moon Ethiopia is a business start-up incubation hub established in 2017. The hub provides the youth with a space to develop innovative business ideas. The initiative aims to enable young entrepreneurs who work towards creating businesses by improving the technologies, products or services in agribusiness, such as improving the production, processing and marketing of agricultural produce, among others. The success of Blue Moon could be attributed to the adoption of the incubator approach, which involves coaching and mentorship of the entrepreneurs by experienced entrepreneurs and advisors. The approach enabled learning and the exchange of ideas among peer groups and business networks. The providence of a convenient workspace equipped with ICTs, continuous coaching and mentorship, and networking and interaction with peers and investors for six months helped the beneficiaries greatly. The hub also supported the entrepreneurs with seed funds which is the number one constraint for youths who want to venture into tech businesses. One of the start-ups *Store251* sources ethically produced and handmade products from local designers – both new and well-established – and sells them online to international clients. Founded in 2014, *Store251*⁴ is a marketplace for “Made in Ethiopia” products like bags, footwear and accessories, combining these unique locally made products with quick delivery to overseas customers. The team identified a communication gap between product suppliers and the target market regarding product information, logistics and marketing in general. The startup sought to fill them, and over time its platform has grown and developed quite well.

Box 1: Supporting youth-led businesses: The case of Empower Youth for Work (EYW) in Ethiopia

Empower Youth for Work (EYW) was a five-year project (2016-2021) implemented by Oxfam in Ethiopia, aimed at improving the economic opportunities and well-being of young people, particularly young women, in the Amhara and Oromia regions. According to Oxfam's final evaluation report, EYW created over 20,000 livelihood opportunities for young people in the Amhara and Oromia regions, including through entrepreneurship and skills development programs. Additionally, the project supported the establishment of over 300 youth-led businesses and facilitated access to finance and markets for young entrepreneurs. EYW supported over 11,000 young people to access education and training opportunities, including through the provision of scholarships, school supplies, and vocational training programs. This has contributed to an increase in the enrolment and retention of young people in schools. EYW was designed with a strong focus on gender equality and women's empowerment. The project worked with over 600 women-led businesses and supported over 1,400 young women to access business development services and markets. Additionally, EYW facilitated the formation of over 150 women's self-help groups, which provided a platform for women to discuss and address social and economic challenges in their communities. The project promoted improved nutrition and health outcomes for young people, particularly girls. It supported over 15,000 young people to access health and nutrition services and facilitated the establishment of over 200 youth-led health and nutrition clubs in schools and communities. In terms of civic engagement and enhancement of youth voices, EYW supported over 1,000 young people to participate in civic engagement and leadership programs, including through the establishment of youth-led advocacy platforms and participation in local governance structures. This has contributed to increased youth participation in decision-making processes and the development of policies and programs that address their needs.

Source: <https://www.empoweryouthforwork.org/ethiopia-year-4-overview/>

4.1.3 Challenges and Opportunities for Youth Employment in Ethiopia

-Mismatch in policy formulation and implementation: Ethiopia has most of the policies, regulations, background studies and road maps necessary to kick-start a successful technological learning, innovation and technological upgrading on paper. For instance, there are sectoral institutions to support targeted priority sectors, but none of

⁴ <https://disrupt-africa.com/2020/06/08/how-this-e-commerce-startup-is-exporting-made-in-ethiopia-products-to-the-world/>

them has acquired the technical know-how and resources required to provide the full technical support needed by local enterprises (UNCTAD, 2020). Ethiopia has also been a culprit in developing technology road maps with no implementation plans. This makes them have plenty of strategies that could enhance youth employment and promote youth entrepreneurial ventures that may not be implemented hence losing a lot of resources and opportunities that would have been created. There are opportunities here that different stakeholders can tap into. First, there is need to strengthen the capacity of government agencies to implement policies. This can be done by providing training and resources to government officials, and by creating a more supportive environment for policy implementation. Another opportunity here is to engage civil society and the private sector in the policy process. This can help to ensure that policies are more responsive to the needs of the people, and that they are more likely to be implemented effectively. Finally, it is important to involve all stakeholders in monitoring the implementation of policies and in making adjustments as needed. This can help to ensure that policies are achieving their intended results, and that they are not having unintended consequences.

-Limited funding for implementing STI activities that lead the opportunities for the youth: Accessing the government's research funds through its key ministries is a tedious process (Daniels et al, 2020). This discourages young researchers from seeking government funding, opting instead for partnership-based funding from foreign universities/organisations. The danger with foreign funding is rarely will local issues be addressed. Rather, it will be research to fulfil their agenda. This will have a counter effect locally as the young researchers end up creating opportunities elsewhere at the expense of the locals. Also, the private sector does not seem to be keen on funding R&D activities in the country as their priorities lie elsewhere, and R&D is seen as a poor investment choice due to the long waiting period for output. This, therefore, limits the opportunities for the youth who may have very good ideas that can have huge impacts at the local level.

-Low technology transfer: Ethiopian industries import most of their machines from outside the country rather than fabricating machines locally. This discourages local innovators from developing new innovations due to a lack of market and capacity (Daniels et al, 2020). Lack of innovativeness from the citizens, lack of technological infrastructure, limited access to finances and lack of technology market have all contributed to this challenge making it hard to foster local innovation. The opportunities available as a result of this challenge include encouraging the development of local technology by investing in research and development, and by supporting the growth of a local technology sector or convert low technology transfer to attract foreign investment. This can be done by creating a favourable investment climate, and by providing incentives to foreign companies to invest in Ethiopia. Finally, it is important to promote the use of technology in all sectors of the economy. This can be done by providing training and support to businesses and individuals, and by making technology more affordable and accessible.

-Challenges in the established institutions for STI development: Despite the tremendous success noted in ASPIRE, some issues contributed to creating some challenges that hindered the program. Firstly, as much more honey was being produced in the regions where the programme was taking place. The honey enterprises were adversely hit by price fluctuations for honey export which were beyond their control. Further, the program was also affected by the inadequacy of technical staff to enforce standards and regulations on the honey they were producing. The low level of quality assurance made it hard for them to export the product mainly to European markets with rigorous standards. Despite the success registered by the YESH program, there were some hindrances to its success. Firstly, poor attitude from the youth who were the targeted group slowed down the uptake and embracing of the project. Further, members' low level of motivation and commitment hindered the project's success. Silk farming requires the silk farmers to get their hands dirty and interact with worms. Not very many youths and women were initially motivated by the venture. This slowed down the impacts that were to be realised from the project. Lastly, the project beneficiaries suffered greatly from inadequate markets, especially for silk. The large quantities produced stayed in the storage rooms as appropriate buyers with favourable prices were being sought after.

4.2 Ghana

4.2.1 Ghana's STI Policy and Institutional Landscape for Youth Employment

Ghana's youth unemployment remains a significant challenge, with an estimated youth unemployment rate of 13.8% as of 2020, which is above the national unemployment rate of 7.3% (Ghana Statistical Service, 2020). The lack of access to relevant skills, limited job opportunities, and a weak entrepreneurial ecosystem contribute to this challenge. STI provides an opportunity for youth to acquire new skills, create innovative solutions, and

access new job opportunities in emerging sectors such as digital technology, agribusiness, and renewable energy. According to the Ghana National Development Planning Commission (NDPC), leveraging STI is crucial for creating one million jobs per year in Ghana (NDPC, 2018). Therefore, there is a need for the government to prioritize investment in STI infrastructure, education, and policies to accelerate youth employment and entrepreneurship. Since 2000, Ghana has had two S&T policies. Unlike the 2000 S&T Policy document, the 2009 STI Policy had innovation as a critical driver for socio-economic and sustainable development. The policy document had a 5-year National STI Development Plan (STIDeP) that spelt out 17 programmes and 84 projects to be implemented. With such an articulated policy and action plan, the biggest challenge was the implementation process. Key challenges were lack of institutional framework for implementation, monitoring and evaluation of the STIDeP, lack of funding for implementing projects and activities, and lack of commitment from key institutions and agencies who were to lead or collaborate in implementing programmes and projects, among others.

The National Science, Technology and Innovation Policy of 2017 aims in broad terms, to provide a framework for stimulating innovation in the economy and society (GoG, 2017). The MESTI has the mandate to promote science and technology applications in the country and to create the conditions and enabling environment for innovations to occur. This policy aims to promote innovation and a knowledge-based economy, create jobs and economic growth by developing Ghana's science and technology capacity. The policy is the foundation of all programmes and activities related to technological innovations and skill development for job creation. The Ministry of Environment, Science, Technology and Innovation (MESTI) is a Ghanaian government agency tasked with promoting the development of STI in the country. MESTI has played a significant role in promoting technological innovation, employability, and job creation in Ghana. One of MESTI's flagship initiatives is the establishment of technology transfer centres (TTCs) across Ghana. These centres serve as hubs for technology commercialization, innovation, and incubation. Since the establishment of TTCs, over 1,000 entrepreneurs and innovators have been supported, leading to the creation of over 3,000 direct and indirect jobs. MESTI has also established a number of STI institutions, including the Council for Scientific and Industrial Research (CSIR), the Ghana Atomic Energy Commission (GAEC), and the Environmental Protection Agency (EPA). These institutions have contributed significantly to research and development, technological innovation, and job creation in Ghana.

The National Entrepreneurship and Innovation Plan (NEIP) of 2017 provides incubation services to Ghanaian start-ups and entrepreneurs, offering training, mentorship, and funding to create sustainable businesses and jobs. The primary objective is to provide integrated national support for start-ups and small businesses. NEIP has led to the creation of over 16,000 jobs for young people, with women accounting for 40% of the beneficiaries. Additionally, the report notes that the number of women-owned businesses registered with the Registrar General's Department has increased from 9% in 2014 to 21% in 2017, indicating a positive impact on women's entrepreneurship. Box 2 below provides a case study of NEIP in Ghana.

Ghana's Industrial Policy of 2011 was designed to promote increased competitiveness and enhanced industrial production, with increased employment and prosperity for all Ghanaians. It will also provide a broader range of fair-priced, better-quality products for the domestic and international markets. The key development objectives of the Industrial Policy are to expand productive employment in the manufacturing sector; expand technological capacity in the manufacturing sector; promote agro-based industrial development; and promote the spatial distribution of industries to achieve a reduction in poverty and income inequalities. In this regard, this Industrial Policy represents the set of specific policy instruments and measures to be applied to improve access to competitive factors of production within the economy; and enhance productivity, efficiency and growth of Ghana's manufacturing sector (GoG, 2011). This policy aims to promote the development of industry in Ghana. It covers areas such as industrial infrastructure development, technology transfer, and support for SMEs.

The Government under the Agenda for Jobs outlines the vision and approaches to addressing the socio-economic challenges through specific sets of policies, strategies and programmes. The policies and programmes seek to remove the bottlenecks stifling the growth of the private sector and provide the enabling environment for growth, job creation and prosperity for all. The thrust of the Government's medium-term development programmes is to stabilize the economy characterized by strong, diversified and resilient growth through the effective and efficient implementation of flagship programmes and projects such as Planting for Food and Jobs, Rearing for Food and Jobs, One District - One Factory, One District - One Warehouse and One Village - One Dam.

The development agenda is embodied in the Ghana Beyond Aid (GBA) vision which calls for a shift in mindset, attitudes and behaviours to reduce its dependence on foreign assistance. The vision is not a rejection of foreign assistance. The Country Development Cooperation Strategy (CDCS) addresses the challenges indicated in the roadmap. Ghana's desire to be prosperous enough to stand on its own two feet and engage with other countries competitively through trade and investments and political cooperation for enhanced regional and global peace and security. Accomplishing this goal will require a focus on accelerating and sustaining broad-based economic growth; delivering quality services with increased accountability; and accelerating sustainable development in northern Ghana.

The National Gender Policy of 2015 aims to promote gender equality and empower women and girls, including in the areas of education, employment, and entrepreneurship. The policy recognizes the importance of creating equal opportunities for both men and women to contribute to the country's economic growth and development. In terms of job creation and skill acquisition for youth, the policy emphasizes the need to promote and support vocational training and entrepreneurship programs that target women and girls.

The Ghana National Service Scheme (NSS) was established in 1973 to provide opportunities for Ghanaian graduates to offer national service to the country. The scheme's mandate includes facilitating the acquisition of practical skills, promoting national unity, and enhancing youth employment prospects. The NSS has had a significant impact on job creation and skill acquisition for Ghanaian youths. According to the NSS 2019 annual report, over 87,000 graduates were deployed to various sectors of the economy, including education, health, agriculture, and infrastructure. Through their national service, these graduates acquired practical skills and work experience, making them more employable in the job market. In addition, the NSS has contributed to the development of critical sectors of the economy by providing manpower and expertise.

The Ghana Youth Employment Agency (YEA) was established in 2006 to address the issue of youth unemployment in Ghana. The agency's mandate is to create employment opportunities for Ghanaian youths through the implementation of various job creation programs. The YEA has had a significant impact on job creation and skill acquisition for Ghanaian youths. According to the agency's 2019 annual report, over 107,000 young people were employed through its various job creation programs, including the Community Police, Youth in Community Development, and Youth in Afforestation programs. Through these programs, young people have acquired practical skills and work experience, making them more employable in the job market. The YEA has also contributed to poverty reduction and economic development in Ghana.

The Ghana Skills and Technology Development Fund (STDF) was established in 2011 to provide funding for the development of skills and technology in Ghana. The fund's mandate is to promote the acquisition of skills and technology among Ghanaian youths, leading to job creation and economic development. According to the fund's 2020 annual report, over 4,000 young people have been trained in various skills and technology programs through the fund's support. These skills include welding, fashion design, carpentry, and ICT. The fund has also provided funding for the establishment of several small and medium-sized enterprises, leading to job creation and economic growth.

The Ghana Export Promotion Authority (GEPA) was established in 1969 to promote and develop Ghana's non-traditional export sector. The authority's mandate includes supporting the development of export-oriented industries and facilitating the export of Ghanaian products to international markets. The GEPA has had a significant impact on job creation and skill acquisition for Ghanaian youths. According to the GEPA's 2019 annual report, the non-traditional export sector generated over \$3 billion in export earnings and created over 450,000 direct and indirect jobs. The authority's support for the development of export-oriented industries has led to the establishment of new businesses and the expansion of existing ones, creating employment opportunities for young people and contributing to Ghana's economic growth.

The Ghana Education Service (GES) Strategic Plan (2018-2022) aims to improve the quality of education and provide relevant skills for Ghanaian youth to prepare them for the job market. The plan has had a significant impact on the creation of jobs for youth and support for skill acquisition. According to the GES Annual Report (2019), over 16,000 young graduates have been employed under the Nation Builders Corps program, a government initiative aimed at addressing graduate unemployment. In addition, GES has trained over 1,500

teachers in STEM subjects to improve the quality of education and equip young people with relevant skills. The plan has also facilitated the establishment of technical and vocational institutions to provide hands-on training and skills development for young people. The impact of the GES Strategic Plan on job creation and skill acquisition has been significant, contributing to the economic growth and development of Ghana.

The Presidential Pitch is an initiative of the Government of Ghana aimed at supporting young entrepreneurs to scale up their businesses and create job opportunities for themselves and others. The program provides funding and training to selected young entrepreneurs with innovative business ideas. Since its inception in 2018, the program has supported 20 young entrepreneurs with a total funding of GHS 2.3 million (approximately USD 400,000). The program anticipates creating over 50,000 job opportunities⁵. The Presidential Pitch is one of the many initiatives by the Ghanaian government to address youth unemployment and promote economic development.

The Mastercard Foundation's Young Africa Works in Ghana Initiative also seeks to provide employment opportunities for young people in the country. The initiative aims to support the creation of 3 million jobs for young Ghanaians over the next decade, particularly in the agriculture and tourism sectors. The Foundation has pledged to invest \$200 million in Ghana's economy, with a significant portion dedicated to supporting youth employment. In addition, the United States Agency for International Development (USAID) has supported initiatives such as the Ghana Sustainable Change Alliance (GSCA) and the Advancing Youth Project. The GSCA aimed to promote economic growth and job creation through partnerships between private sector firms and local communities. The project created over 25,000 jobs for young Ghanaians. The Advancing Youth Project, on the other hand, aimed to improve the employability of young people in Ghana through vocational training and apprenticeships. The project trained over 10,000 young Ghanaians and created over 7,000 jobs.

4.2.2 Best Practices for Youth Employment in Ghana

-Government intervention driven by policy implementation that supports the SMEs and informal sector: The government has introduced policies to promote the growth of SMEs, such as the Ghana EXIM Bank SME program, which provides financing and technical assistance to SMEs. As of 2021, the program had disbursed over GHS 2 billion to support over 1,000 businesses, creating over 50,000 jobs (World Bank, 2021). Furthermore, the government's implementation of the One District, One Factory policy has led to the establishment of several new factories across the country, creating job opportunities for young people. As of 2021, over 76 factories had been established under the policy, creating over 150,000 jobs (World Bank, 2021). The informal sector in Ghana is a major source of employment for youth. The informal sector accounted for 70% of employment in 2019 (Ghana Statistical Service, 2020). The informal sector is also a major source of entrepreneurship for youth as there are over 3 million micro and small enterprises in Ghana, and the vast majority of these enterprises are owned and operated by youth. STI policies designed to support this sector would highly contribute to improving the productivity of informal businesses, which can lead to increased profits and job creation. STI can also help to develop new products and services that can be sold in the formal market, which can create new opportunities for youth entrepreneurs.

-The establishment of the Skill Development Fund (SDF): This is hinged on the STI policy of Ghana, thus providing funds for training and skills development programs in Ghana. The fund has supported over 1,500 training programs and trained over 300,000 individuals since its launch in 2010. Ghana Climate Innovation Center (GCIC) provides incubation, acceleration, and funding support to startups and SMEs working on climate change solutions in Ghana. The centre has supported over 60 startups and created over 500 jobs since its establishment in 2016.

-Public-private collaboration and partnership to drive youth employment: Public Private partnerships (PPP) enhance the mobilization of resources, increase efficiency, and improve collaboration towards achieving shared STI goals for job creation and youth employment. There have been PPP arrangements that have worked very well in the creation of jobs in Ghana. The African Development Bank's Youth Entrepreneurship and Innovation Multi-Donor Trust Fund: This is a partnership between the African Development Bank and several donors, aimed at promoting entrepreneurship and job creation for young people in Africa, including Ghana. The fund

⁵ <https://neip.gov.gh/business-support-report/>

provides financial and technical support to young entrepreneurs and also works to improve the enabling environment for entrepreneurship in Ghana and other African countries.

Box 2: Supporting young entrepreneurs through financial and business development services: The case of the National Entrepreneurship and Innovation Programme (NEIP) in Ghana

Due to the unprecedented youth employment crisis, creating sustainable employment opportunities for the youth is a major priority in the development agenda of Ghana. The National Entrepreneurship and Innovation Program (NEIP), a flagship policy initiative of the Government of Ghana was launched in 2016 to provide financial support and business development services for young entrepreneurs to start or expand existing SMEs. Its primary objective is to provide an integrated national support for start-ups and small businesses. NEIP primarily focuses on providing business development services; startup incubators and funding for young businesses to enable them grow and become successful. The NEIP is therefore set within the context of Ghana's long-term strategic vision of consolidating its middle-income status, building an industry-driven economy capable of providing decent jobs that are suitable and sustainable for development. Currently, under the business support programme, 26,500 young entrepreneurs and start-ups have been trained and 90,000 direct and indirect jobs have been created; one (1) million Ghana Cedis (GHC) has been disbursed to 10 young entrepreneurs and four (4) million GHC has been disbursed to 2,145 entrepreneurs with a disability under the Pitch programme and the Empowerment for Men and Women, respectively (UNESCO & CSIR, 2022). Senam Foods is a female led startup by Gloria Debor that was sponsored by the NEIP. They produce coconut oil and distribute to supermarket across Ghana (Video link: https://youtu.be/_YdybplOGB4).

Some more success stories are found at <https://neip.gov.gh/portfolio/>. Some challenges that the NEIP programme encountered include nepotism on the part of the officials' selecting beneficiaries and funding from the government.

-Intervention from foreign donors that positively affect youth employment: Foreign donor intervention in promoting the use of STI for job creation and youth employment can bring new knowledge, resources, and investment to help create opportunities and improve skills that can lead to sustainable economic growth and better livelihoods for young people. Foreign donors have played a significant role in supporting youth employment, entrepreneurship, and job creation initiatives in Ghana. The Youth Employment Project (YEP) funded by the World Bank aimed to reduce youth unemployment by promoting entrepreneurship and skill acquisition. The project trained over 23,000 young Ghanaians in various vocational and technical skills and provided them with start-up grants to establish their businesses. YEP, also supported over 800 small and medium enterprises and created over 60,000 jobs for young Ghanaians.

-Public research institution driving outcome-based education to improve entrepreneurship and job creation: Public and private research institutions in Ghana have positively impacted youth employment, entrepreneurship, and job creation by providing avenues for skills acquisition and innovation. Research institutions such as the Council for Scientific and Industrial Research (CSIR) and the Science and Technology Policy Research Institute (STEPRI) have engaged in research activities and developed technologies that have led to the establishment of new industries and the expansion of existing ones. For instance, CSIR's research on shea butter processing led to the establishment of several processing factories, creating job opportunities for the youth. Also, the Kwame Nkrumah University of Science and Technology (KNUST) has implemented entrepreneurship and innovation programs such as the Kumasi Business Incubator (KBI) and the Technology Consultancy Centre (TCC), which have supported youth-led start-ups and small businesses. According to a study by the Global Entrepreneurship Monitor, Ghana's entrepreneurship rate increased from 12.6% in 2013 to 23.4% in 2019 due to initiatives like these. Therefore, public and private research institutions in Ghana have contributed significantly to youth employment, entrepreneurship, and job creation through their research activities and initiatives.

-Private sector intervention in youth employment and skill acquisition: Many private sector businesses in Ghana have implemented corporate social responsibility programs aimed at promoting youth employment and entrepreneurship. For example, Tullow Oil, a multinational oil and gas company, has established a Vocational and Technical Training Centre in the Western Region of Ghana, providing skills training to young people in the community. Similarly, Nestle Ghana has launched a Youth Agripreneurship Development Program, which provides training and support for young people interested in agriculture entrepreneurship.

4.2.3 Challenges and Opportunities for Youth Employment in Ghana

-Lack of sufficient funds to support STI: Because of its overreliance on the public budget and external sources of funding, including donor-sponsored projects based on donor agendas, the STI system is far too supply-driven. Funding allocations are determined by the government and frequently do not correspond to the priorities of providers of science and technology services (i.e., research institutes and universities), let alone end-users of

technology and research (such as the private sector, farmers, and informal enterprises). As a result, the system is not subject to competitive pressures to ensure quality and is not sufficiently focused on Ghana's economic and social goals. The country lacks an adequate mechanism for competitively funding innovation, technological development, and research. Ghana does not have a National Research Foundation and Innovation Fund like South Africa, which oversees the review and execution of competitive research and innovation financing programs. Furthermore, there is no horizontal coordination and no established system for establishing research priorities.

-Minimal private sector participation: The private sector has not been responding to the existing incentives to adopt new technologies, innovate, and raise productivity. The government could improve fiscal and legal incentives for local entrepreneurship and promote innovation in private enterprises. Local private-sector firms are not attuned to procuring and/or investing in innovations to improve their economic productivity. The adoption and adaptation of existing technology by firms should be encouraged, as the most logical focus for Ghana's technology and innovation efforts. Previously, Ghana focused its attention on promoting private sector development and attracting FDI. There is now a need to focus on promoting technological innovation in and by the private sector.

-The STI system is stretched thin and overburdened with the level of resources available: This leaves many of the country's important STI institutions unable to effectively carry out their mandates. The level of overall expenditure is not enough to support high-quality STI activities across the existing system. This does not necessarily mean that more resources are required, or indeed, would fix the problems. Rather, the government must determine which areas and activities of the STI system are necessary and important and must properly fund them to allow them to fulfil their mandates. Any proposed new resources should be accompanied by substantial improvements in efficiency and incentives to turn new expenditures into development gains.

-Institutions of education and training are not producing enough graduates with the required skills to spur technological innovation for economic growth: This is a major barrier to improving the country's technological performance and to growing a national system of innovation. This has been recognized by the government, and various reforms to the education and training system are being introduced. Measures aimed at improving tertiary education should be part and parcel of overall national efforts to fight poverty, grow the economy, promote human development and increase economic competitiveness. Overall, Ghana's educational system is not well aligned with its economic and industrial development aspirations. Poor research management means that opportunities to secure what funding is available for conducting research and purchasing equipment are frequently missed. The scientific and technical knowledge that is generated by public R&D institutes is not turned into products and services because of a lack of entrepreneurial culture and few incentives to link with the private sector.

-Skill mismatch: There are discrepancies in the quality of skills demanded and supplied, thus affecting youth employment (Baah-Boateng, 2020). Skills mismatch is a major cause of the high incidence of educated unemployment. Ghana's education system produces more social sciences and humanities graduates than the job market can absorb, while there is a shortage of natural sciences graduates due to the high cost of STEM training. This trend is exacerbated by the predominance of social sciences and humanities courses in distance learning programs. Furthermore, the approach to training and content is not in line with job market requirements, as the emphasis is not on problem-solving and the development of soft skills. As a result, young people are not adequately prepared for the dynamic job market, leading to youth unemployment and underemployment.

-Absence of Labour Market Information System: The fight against youth unemployment is undermined by the lack of regular, timely, accurate, and reliable labour market statistics to effectively monitor employment generation policies. This leads policymakers to treat employment as a residual aspect of broader macroeconomic policies, only recognizing its importance when youth agitation for jobs becomes intense. Furthermore, the absence of an efficient platform to link job seekers with job openings is a major cause of youth unemployment. Although public and private agencies are mandated to match job seekers with prospective employers, the coordination process is inefficient due to a lack of institutional and infrastructure capacity. This leaves job seekers to rely on their social networks and ad hoc job search strategies.

4.3 Kenya

4.3.1. Kenya's STI Policy and Institutional Landscape for Youth Employment

The high unemployment rate in Kenya is related to the country's overall investment climate and the economy's limited ability to create new jobs. In 2020, around 17.4 million people were employed in Kenya, down from 18.1 million individuals in the previous year. Roughly 14.5 million worked in informal conditions, whereas 2.9 million were employed in the formal sector. The informal sector constitutes an important part of the Kenyan economy, being related to employment creation, production, and income generation (Statista, 2022). In 2019, 768,000 new jobs were created in the informal sector in Kenya. The number is significantly above the positions created in the formal sector which stood at 78,000 (Statista, 2022). Critical sectors such as agriculture, energy, industry & enterprise development, digital economy, and the health sector are the next frontier for development in the country. There is, therefore, a deliberate attempt to apply STI in these key sectors to ensure the development of solutions to the various challenges to create jobs, and entrepreneurship to improve livelihoods.

Kenya's STI ecosystem is a complex and dynamic system that is constantly evolving. The ecosystem is made up of a variety of stakeholders, including the government, the private sector, academia, and civil society organizations. These stakeholders work together to promote STI activities in Kenya, such as research and development, innovation, and technology transfer. The government plays a key role in the STI ecosystem by providing funding, policy support, and regulatory frameworks. The private sector is also a major player in the ecosystem, and it invests in STI activities through research and development, innovation, and technology transfer. Academia plays a vital role in the STI ecosystem by conducting research, training students, and providing knowledge and expertise. Civil society organizations also play a role in the STI ecosystem by advocating for STI policies, supporting STI activities, and raising awareness of the importance of STI. The STI ecosystem in Kenya is facing several challenges, including limited funding, inadequate infrastructure, and a lack of skilled human resources. However, the ecosystem also has several strengths, including a growing pool of skilled innovators, a supportive government, and a vibrant private sector.

The Science, Technology, and Innovation Act of 2013 laid the foundation for Kenya to leverage on STEM skills in solving the persistent youth unemployment in the country. Currently, only 13.7% of the youths in Kenya possess STEM skills (Muriithi and Musili, 2021). The low numbers are detrimentally affecting the efforts to increase the number of youths employed. A report by World Bank (2016) highlighted that two in every three youths with STEM skills are employed. The STI Act has worked to improve these statistics by making provision for heavy investment in education and training institutions such as TVETs and universities and the establishment of institutions such as the National Commission for Science, Technology and Innovation (NACOSTI), all aimed at boosting enrolment into STEM courses. The act has empowered NACOSTI to identify priority research and innovation sectors in which youths can work to create jobs and improve their skills in the country's STI activities. It has also collaborated closely with county governments to advise them on how to best implement STI-related policies aligned with national priority sectors in order to devolve the impacts of their interventions at the county level. They have ensured that youth programs aligned with national priority sectors are funded in collaboration with line agencies, Kenya Innovation Agency (KENIA) and National Research Fund (NRF).

The Kenyan government has implemented several initiatives to promote youth employment and job creation. These initiatives include the Big Four Agenda, the Kenya Youth Development Policy, the Micro and Small Enterprise Authority, the digital economy blueprint, the National Youth Service, and the Kenya Industrial Training Institute. These initiatives have had some success in creating jobs and opportunities for youth, but they have also faced a number of challenges, such as limited funding, political interference, and the skills gap. Despite these challenges, the Kenyan government is committed to promoting youth employment and job creation, and these initiatives are a step in the right direction.

Some of the key initiatives developed and implemented by the Kenyan government to promote youth employment and job creation include the Big Four Agenda, a development blueprint that focuses on four key areas: affordable housing, universal healthcare, manufacturing, and food security. The agenda has created over 100,000 jobs for youth in the construction of affordable housing units, and it has created over 12,000 jobs in the universal healthcare program. The Kenya Youth Development Policy aims to help young people in the country develop to their fullest potential. The policy emphasizes the importance of TVET in preparing young people for the job market. The government has allocated funds to support the expansion and improvement of TVET institutions and programs. The Micro and Small Enterprise Act of 2012 enabled the creation of Micro and Small

Enterprise Authority (MSEA) was created to promote the growth and development of micro and small enterprises (MSEs) in Kenya. The act mandates MSEA to provide support to MSEs through capacity building, access to finance, market development, technology transfer, and other forms of support. The digital economy blueprint provides frameworks that promote the use of digital entrepreneurship and innovation among the youth. The government launched the Ajira Digital Program in 2019 to train and support Kenyan youth in digital skills and entrepreneurship. As a result, over 650,000 youths have benefited from the program, with over 18,000 managing to secure online jobs. The National Youth Service Act of 2018 provided a framework for the operation and management of the National Youth Service (NYS). The act has enabled NYS to provide youth with life skills, civic education, and national service opportunities. Consequently, NYS has trained over 1 million young people and employed over 300,000 youth since its inception. The Kenya Industrial Training (Amendment) Act of 1971 established the Kenya Industrial Training Institute (KITI) in 1971 to address the skills gap in the Kenyan workforce. KITI provides TVET to young people with a strong component of entrepreneurship skills for self-employment. There are efforts underway to revise the Act and there is a bill in parliament that is being discussed.

4.3.2. Best Practices for Youth Employment in Kenya

-Development of institutions and programmes that enhance employability and job creation: Since the launch of Vision 2030, various programs have been developed to assist in ensuring that youths and women are able to find employment in the country. For example, since its inception in 2006, the YEDF intervention has created 3 million jobs. Uwezo Fund has also made a significant contribution to the cause of youth employment by creating 330,000 jobs and expanding over 87,000 youth-led businesses. The institutions facilitating these programs, which stem from government ministries, have also put in place policies and action plans that have aided the programs' success.

-Sprouting of organizations that are socializing youths to STEM culture: To compensate for poor quality STEM exposure in schools' organizations such as STEM Impact Centre Kenya leverages Science, Technology, and Innovations (STI) to enhance technical skills development, youth empowerment, employment creation, entrepreneurship, and innovation. The organization provides a variety of programs and services, including training and workshops on STEM-related topics, such as coding, robotics, and entrepreneurship, and mentorship and coaching to youth who are interested in STEM or entrepreneurship. The emergence of such organizations helps youth develop the skills and knowledge they need to succeed in the workforce or start their own businesses.

-Creation of robust information dissemination platforms: Information on available job opportunities, training opportunities, and career counselling services would help young people make informed career choices. On this front, the Kenyan government has done well by leveraging technology to create a one-stop shop where youths can access all information about training and job opportunities available both locally and internationally. The Ministry of ICT, Innovations, and Youth's Ajira digital program has taken on the responsibility of outsourcing job opportunities and advertising them on the platform so that qualified youths can fill the positions listed. The ministry has also established infrastructure for providing free Wi-Fi zones across the country to assist youth in accessing and capitalizing on some of these resources.

-Recognition of prior learning experience: There is recognition that not all youths will complete the educational system from start to finish. This process may be hampered by factors such as a lack of funds in some households. Youths who choose to work in the informal sector to gain skills that will help them get a job or start their own business face difficulties in getting some jobs that require formal certifications. The Kenya National Qualifications Authority (KNQA) has developed and is now implementing Kenya's international commitments to create an accurate, reliable, and robust database of all qualifications in the country, allowing for qualification comparability, equation, recognition, and information sharing globally. This will provide youths with an equal opportunity to compete for jobs with their peers who went through the formal education system, both locally and regionally.

-Development and promotion of economic empowerment programs that promote gender equity: From a cultural standpoint, men have been at the forefront of all developmental issues and decisions. Women have been left behind to support decisions made but have never been allowed to sit at the table and make their own decisions. Even though we have attempted to overcome cultural barriers, there is still gender disparity. To get around this issue, the government and other stakeholders have been eager to develop programs that ensure women are involved in decision-making and, in some cases, give them an unfair advantage to help them close the economic

gap with men. For example, in programs such as the Uwezo Fund, where youths aged 18 to 35 are eligible, women have been given the leeway to access those funds even after they reach the age of 35. The government also created a platform that is to give youth, women and persons with disabilities owned enterprises to be able to offer services to the government through the AGPO. The KCB-FLME program has curated a five-year program that will support women-led programs only from 2023 to 2027. This has the potential to change the fortunes of women, who can then go on to create other opportunities for the employment of many young people in the country.

Box 3: Revolutionizing Laikipia County by driving innovation and enterprise development: The case of Laikipia Innovation and Enterprise Development Program (LIDP)

The Laikipia Innovation and Enterprise Development Program (LIDP) is a government-led initiative that aims to promote innovation and entrepreneurship in Laikipia County, Kenya. The program was launched in 2018 and has since supported over 100 businesses and entrepreneurs. LIDP provides a range of support services to businesses, including training, mentorship, access to finance, and market linkages. The program also works to create a supportive environment for innovation and entrepreneurship by engaging with government, the private sector, and civil society.

One of the key successes of LIDP has been its work with youth entrepreneurs. The program has helped to train and support over 50 young entrepreneurs, who have gone on to start their own businesses. These businesses have created jobs and contributed to the local economy. LIDP has also been successful in working with women entrepreneurs. The program has helped to train and support over 30 women entrepreneurs, who have gone on to start their own businesses. These businesses have created jobs and contributed to the empowerment of women in Laikipia County. LIDP is a valuable initiative that is helping to promote innovation and entrepreneurship in Laikipia County. The program is making a positive impact on the lives of businesses and entrepreneurs in the county, and it is helping to contribute to the local economy.

Here are some of the key challenges and opportunities facing LIDP:

Challenges

- Limited funding: LIDP is a government-led initiative, and it is therefore subject to the same funding challenges as other government programs. This can make it difficult for the program to provide the level of support that businesses and entrepreneurs need.
- Lack of awareness: LIDP is a relatively new program, and there is still a lack of awareness about it among businesses and entrepreneurs in Laikipia County. This can make it difficult for the program to reach its target beneficiaries.
- Competition from other programs: There are a number of other programs that are working to promote innovation and entrepreneurship in Laikipia County. This can make it difficult for LIDP to stand out and attract businesses and entrepreneurs to its programs.

Opportunities

- Growing interest in innovation and entrepreneurship: There is a growing interest in innovation and entrepreneurship in Laikipia County. This is due to a number of factors, including the availability of government support, the growing availability of resources, and the increasing recognition of the importance of innovation and entrepreneurship for economic development.
- Strong support from the private sector: The private sector is providing strong support for LIDP. This support is helping the program to reach its target beneficiaries and to achieve its goals.
- Growing pool of skilled entrepreneurs: There is a growing pool of skilled entrepreneurs in Laikipia County. This is due to the increasing availability of training and support programs, as well as the growing number of young people who are interested in starting their own businesses.

Source: <https://www.laikipia.go.ke/847/laikipia-innovation-development-program-lidp/>

-Fairly developed policy framework: The Kenyan government has developed several policies that are designed to promote youth employment. These policies include the National Youth Policy, the Youth Enterprise Development Fund, and the Youth Employment and Opportunities Project. These policies provide a number of opportunities for youth, such as access to training, mentorship, and financial support.

-A diversity of public and private training institutions: Kenya has several public and private training institutions that offer training programs that are designed to meet the needs of youth. These institutions offer a variety of training programs, such as technical and vocational education and training (TVET), apprenticeships, and internships. These programs provide youth with the skills and knowledge they need to succeed in the workforce.

-Emerging strong regulatory framework: The Kenyan government is working to develop a strong regulatory framework that is designed to support youth employment. This framework includes laws and regulations that are designed to protect the rights of workers, promote fair labour practices, and ensure that youth are treated

fairly in the workplace. This framework can help to create a more supportive environment for youth employment.

-Robust innovation and entrepreneurship in the informal sector: The Kenyan informal sector is a major source of employment for youth. The informal sector is made up of small businesses and enterprises that operate outside of the formal economy. These businesses and enterprises offer a variety of goods and services, such as food, clothing, and transportation. The informal sector provides youth with the opportunity to start their own businesses and to create jobs for themselves and others.

4.3.3. Challenges and Opportunities for Youth Employment in Kenya

-Launching initiatives that promote underemployment: Some youth employment programs do not provide meaningful employment for the youth. Programs such as *Kazi Kwa Vijana*, which was commissioned to reduce young people's vulnerability by creating over 200,000 short-term income opportunities. However, this program rarely required or encouraged the development of any skills. At best, it served as a stopgap measure for unskilled youth across the country to earn a living. However, the program could be redesigned to encourage entrepreneurship and youth employment. Young people can be encouraged to form groups that can register businesses that would allow them to bid on the jobs that the programs offer in their wards and sub-counties. As a result, companies will be forced to hire fellow youths and train them to do more than they were previously doing in order to diversify and look for more contracts in which they can actively participate. In this way, the youths' entrepreneurial side will be tapped, as well as the enhancement of skills that could lead to more secure employment for the youths.

-Lack of adequate skills among the youth that are in line with market demand: A lack of necessary skills has stymied many young people's attempts to enter the labour force or start businesses. Developing marketable skills is strongly linked to landing a job. One of the most significant challenges for young people in Kenya is that the skills they are taught in school and the skills that the industry requires are frequently very different. Nonetheless, there are opportunities to be taken advantage of in order to meet the challenge of a skills shortage or mismatch. To begin, the government should reduce household costs and increase financial aid to ensure that students from low-income families can pursue higher education. This will help to increase the number of skilled youths available for employment in industry. In addition, TVETs can revise their curriculum regularly to reflect industry needs. Recognition of Prior Learning (RPL) programs should be made more affordable and widely promoted. RPL is an excellent resource for young people in the informal economy who learned their trade on the job. If RPL is widely known and can be obtained at a reasonable cost, the chances of young people with skills in the informal economy who want to apply for jobs requiring skills certification will improve thereby significantly improving opportunities for Kenyan youth.

-Formalistic nature of policy which shuts out informal enterprises: The Kenyan government's policies are often designed to support formal enterprises. This can make it difficult for informal enterprises to access the resources and support they need to succeed. However, informal enterprises are a major source of employment for youth. By working to make the policies more inclusive of informal enterprises, the government can help to create more opportunities for youth employment.

-The cost of training: The cost of training can be a barrier for youth who want to improve their skills. However, there are several ways to reduce the cost of training, such as providing scholarships and grants, and partnering with private sector organizations. By reducing the cost of training, the government can help to make it more accessible to youth.

-Poor training at lower levels resulting in a lack of skills and requiring more resources to up skills: The quality of training at lower levels can be a barrier for youth who want to improve their skills. This can lead to a lack of skills, which can make it difficult for youth to find employment. By improving the quality of training at lower levels, the government can help to ensure that youth have the skills they need to succeed in the workforce.

Insufficient inclusion of young people and women at all phases of the STI landscape: The Kenyan government, private sector, and civil society need to do more to include young people and women in all phases of the STI landscape. This includes ensuring that young people and women are involved in the design, implementation, and evaluation of STI policies and programs. By including young people and women, the government can help

to ensure that STI policies and programs are more relevant to their needs and that they are more likely to be successful.

-Establishment of few catalytic funds dedicated to women: Women have been known to face numerous challenges, including limited access to credit, labour and skill gaps, exclusion from key networks, and social and legal constraints. Nonetheless, various sectors can try to improve ways to reduce gender disparities while increasing entrepreneurship and employment. For example, financial institutions can borrow a leaf from KCB bank who launched the FLME program, which aims to support entrepreneurship, job creation, and expand its reach to unique market segments such as businesses owned or run by women. The bank has promised to set aside KES. 250 billion (approximately 190 billion dollars) to support female entrepreneurs between 2023 and 2027. This could be adopted by various sectors to boost the country's economic growth and significantly reduce gender disparities in youth employability.

-Fairly Developed Policy Framework: Kenya has made significant progress in developing a policy framework that supports technological innovation. The government has established various initiatives and strategies, such as the Kenya Vision 2030 and the National ICT Master Plan, which provide a roadmap for leveraging technology to drive economic growth. These policies promote the development of digital infrastructure, support research and development, and encourage collaboration between the public and private sectors.

-Diversity of Public and Private Training Institutions: Kenya benefits from a diverse range of public and private training institutions that offer technical and vocational education. This includes universities, technical institutes, and specialized training centres. These institutions provide opportunities for youth to acquire the necessary skills and knowledge in fields like software development, data analysis, and digital marketing. The availability of such training institutions contributes to enhancing youth employability and entrepreneurship.

-Emerging Strong Regulatory Framework: Kenya is witnessing the emergence of a strong regulatory framework to support technological innovation. Regulatory bodies such as the Communications Authority of Kenya and the Kenya Information and Communications Technology Authority play a crucial role in creating an enabling environment for the tech sector. They establish standards, regulate data protection, and ensure fair competition, which fosters investor confidence and supports the growth of innovation-driven enterprises.

-Robust Innovation and Entrepreneurship in the Informal Sector: Kenya's informal sector has demonstrated robust innovation and entrepreneurship, particularly in the context of technology. This sector has seen the rise of mobile money solutions like *M-Pesa*, which have transformed financial services and enabled financial inclusion. The informal sector also provides opportunities for young entrepreneurs to create businesses around digital solutions, e-commerce, and service delivery.

-County Technology and Delivery Services: The establishment of county technology and delivery services presents an opportunity for Kenya's technological innovation development. Several counties have launched digital platforms and applications to improve service delivery, enhance transparency, and facilitate citizen engagement. These initiatives create avenues for youth employment and entrepreneurship, as they require skilled professionals to develop, maintain, and support these digital solutions.

4.4 Nigeria

4.4.1 Nigeria's STI Policy and Institutional Landscape for Youth Employment

Nigeria continues to face developmental challenges, including the need to reduce the dependency on oil and gas, diversify the economy, address insufficient infrastructure, build strong and effective institutions, as well as address governance issues and public financial management systems. Unemployment hit an all-time high of 23% in the third quarter of 2018, while GDP declined from an all-time high of US\$ 568 billion in 2014 to US\$ 397 billion in 2018 (UNESCO, 2021). The Nigerian economy is import-dependent necessitating the mainstreaming STI in all core activities and actions (Dakuku, 2022). This will assist in leapfrogging the economy to an export-oriented one. The focus of the Nigerian STI policy is to support the reorientation of the economy from an import to an export-oriented economy. The revised National STI policy of 2022 established a knowledge-sharing platform between researchers, inventors, and innovators in the country. The revised STI Policy focuses on the diversification of the Nigerian economy and the promotion of a knowledge-based economy. The 2022 policy draws and complements previous existing policies. For example, the 2011 National

Science, Technology and Innovation Policy set out strategies for STI promotion, capacity building, sectoral R&D, intellectual property, technology transfer, information management systems and female participation in research; the 2013 draft Framework for the Nigeria National System of Innovation that articulates the relationship between the Federal, Sectoral, Regional, State and Local Innovation Councils; the 2017 Federal Government National Science, Technology Innovation Roadmap 2030 lays out the long-term framework for science and technology, and goals for knowledge sectors to link research to national development and industrial innovation.

The National Digital Economy Policy and Strategy (2020-2030) has eight pillars for the acceleration of the Nigerian digital economy, namely: Developmental regulation, Digital literacy and skills, Solid infrastructure, Service infrastructure, Digital services development, and promotion, soft infrastructure, digital society, and emerging technologies indigenous content development and adoption. This policy was launched in 2019 to promote the development of Nigeria's digital economy and create jobs for Nigerian youths. The policy aims to create over 10 million jobs by 2023.

National Agricultural Technology and Innovation Plan (2022-2025) aims to fast-track the agricultural revolution in Nigeria by enhancing access to improved inputs and linkages among research and teaching institutions, job creation, as well as improve the level of agricultural mechanization. The policy will boost extension service delivery, create access to finance, and ensure the security of Agricultural land and other related investments that are Agro-based. This policy framework includes stakeholders' synergy, knowledge creation and transfer, private sector-driven mechanization, commodity value-chain development, land and climate management and agricultural financing and appropriate strategies have been highlighted for smooth implementation. It is therefore playing a very fundamental role in job creation and entrepreneurship.

The National Youth Policy of 2009 in Nigeria aimed to create job opportunities and support skill acquisition among the youths. One of the key strategies was to promote entrepreneurship and self-employment. However, the implementation of the policy has led to some positive outcomes. For instance, the National Directorate of Employment (NDE) reported that it has trained over 1.5 million youths in various skills since 2010, leading to job creation and self-employment opportunities (NDE, 2020). In addition, the Central Bank of Nigeria established various intervention schemes, such as the Youth Entrepreneurship Development Program (YEDP), which has disbursed over N60 billion to support youth-owned businesses (Central Bank of Nigeria, 2019). These interventions have contributed to the creation of jobs for Nigerian youths and support for skill acquisition.

Youth Enterprise with Innovation in Nigeria (YouWiN!) was launched in 2011 to promote entrepreneurship among Nigerian youths. It provides grants, training, and mentorship to young entrepreneurs with innovative business ideas. The program has supported over 3,900 businesses and created over 30,000 jobs for Nigerian youths. The technology Incubation Program established by the Federal Ministry of Science and Technology to support the growth and development of technology startups in Nigeria provides funding, mentorship, and infrastructure to startups to help them grow and become sustainable businesses. As of 2021, there are over 30 technology incubation centres across Nigeria, which have supported the growth of over 500 startups and created over 10,000 jobs for Nigerian youths.

The Presidential Youth Empowerment Scheme (P-YES) was launched in 2019 to create employment opportunities for Nigerian youths through entrepreneurship and skills acquisition. It provides training, mentoring, and start-up capital for young entrepreneurs in various sectors, including agriculture, ICT, and renewable energy. As of 2021, the scheme has trained over 50,000 youths and provided funding for over 7,000 businesses, creating over 40,000 jobs.

The Nigerian Content Development and Monitoring Board (NCDMB) Act 2010 has had a significant impact on job creation and skill acquisition for Nigerian youths. The Act has led to the creation of over 60,000 jobs for Nigerians in the oil and gas industry and has supported the training and development of over 7,000 Nigerians in various skill areas through its capacity-building initiatives (NCDMB, 2019). Furthermore, the Act has led to the establishment of new businesses and the expansion of existing ones, creating more employment opportunities for Nigerian youths. For instance, in 2018, the NCDMB facilitated a partnership between a Nigerian company and a foreign partner that led to the establishment of a new deepwater oil and gas fabrication yard in Nigeria, creating over 2,500 direct and indirect jobs.

The National Office for Technology Acquisition and Promotion (NOTAP) Act of 2004 provided a legal framework for the agency's operations, promoting technology acquisition, innovation, and entrepreneurship, with over 2,000 youths trained in technology-related fields, and technology transfer agreements leading to the establishment of new industries and the expansion of existing ones, creating thousands of direct and indirect jobs (Okechwuku, 2020).

The National Information Technology Development Agency (NITDA) Act of 2007 was created to promote the development and use of information technology in Nigeria. The Act has had a significant impact on job creation for Nigerian youths and has supported skill acquisition in the technology sector. According to the agency's annual report for 2019, the NITDA has trained over 23,000 Nigerian youths in various technology-related fields through its scholarship and capacity-building programs. These programs have equipped the youths with the skills and knowledge necessary to contribute to the growth of the Nigerian technology industry and have created job opportunities for them. The NITDA has also facilitated the creation of over 1,000 start-ups through its Technology Innovation and Entrepreneurship Support Scheme (TIESS), which provides funding and other forms of support to technology start-ups. These start-ups have created thousands of jobs for Nigerian youths.

The Technology Business Incubation (TBI) Guidelines of 2015 have had a significant impact on job creation and skill acquisition for Nigerian youths. According to the National Board for Technology Incubation (NBTI), (2019), the guidelines have led to the creation of over 10,000 jobs for Nigerian youths through the establishment of technology startups and the support of existing businesses. Additionally, the NBTI reports that over 30,000 youths have been trained in various technology-related fields through TBI programs, providing them with the skills and knowledge needed to contribute to the country's economic development. TBIs provide support for technology startups, including access to finance, mentoring, and training (NOTAP, 2015). TBIs can create employment opportunities for youths and enhance their skills development.

The National Youth Service Corps (NYSC) Entrepreneurship Program is a government initiative in Nigeria aimed at empowering corps members with the skills and knowledge needed to start and manage successful businesses. The program has had a significant impact on job creation for youths and supported skill acquisition in the country. Over 500,000 corps members have been trained in entrepreneurship skills since the inception of the program. The training has enabled the youths to establish their businesses, leading to the creation of over 500,000 jobs in the country. In addition, the program has provided funding support to corps members to start their businesses. As of 2021, over 2,000 corps members have accessed funding support through the program. Furthermore, the NYSC Entrepreneurship Program has contributed to the development of the Nigerian economy by promoting the growth of SMEs (NYSC, 2021). The program has supported the establishment of over 50,000 SMEs in the country since its inception.

The Nigerian Economic Summit Group (NESG) Innovation Hub was established in 2018 to support innovation, entrepreneurship, and skill acquisition among Nigerian youths. The hub has had a significant impact on job creation for youths and supported skill acquisition in the country. Over 1,500 youths have been trained in various skills, including coding, data analytics, and design thinking, since the hub's establishment. The training provided by the hub has enabled the youths to establish their own businesses, leading to the creation of over 500 jobs and has supported the development of startups through its incubation and acceleration programs. As of 2021, the hub had incubated 35 startups and accelerated 14 startups, leading to the creation of over 150 jobs in the country (Nigerian Economic Summit Group, 2021). Furthermore, the hub has provided access to funding for startups through its partnerships with various organizations, such as the Tony Elumelu Foundation. As of 2021, the hub had facilitated over \$500,000 in funding for startups in the country.

4.4.2 Best Practices for Youth Employment in Nigeria

-Partnership and Collaboration with International Organizations: Foreign donor interventions in Nigeria supporting the use of STI for job creation and youth employment can bring positive impacts by providing funding, expertise, and access to technology, which can improve skills, productivity, and entrepreneurship among youth, leading to economic growth and development. This is exemplified by the Feed the Future Project which is a collaboration between USAID and the Ministry of Agriculture. It has not only stimulated economic growth but also increased employment opportunities, empowering women and youth, promoting innovation, advancing trade and lifting people out of extreme poverty. The program works in 33 local governments in

Nigeria, spanning over 11 states. 2.5 million hectares have been tended with improved technologies or management practices. Across the states over 380,000 producers applied new technologies and practices and 48,000 children under 5 were reached with nutrition, with Feed the Future's help from the year 2019. Maize yields increased 75% from 1.5 tons per hectare in 2018 to 2.59 in 2019, with rice yields of 1.25 tons per hectare in 2018 to 1.71 in 2019. Feed the Future has increased the participation of women and youth in agricultural markets and food systems. 25% of those who participated in U.S. Government-assisted programming in Nigeria were women and 28% were youth. This programming helped women and youth gain access to training and agricultural technology, resulting in increased crop yields. The success of the program was because it was privately funded in partnership with the Nigerian government leveraging on the enabling environment created by the NAPP. Its focus areas are of priority to the development goals of the country.

-Implementation of Policies to drive Local Interventions: STI policies are driving local best practices such as interventions to drive youth employment skill acquisition and job creation. Listed below are policy-related locally-led interventions that support entrepreneurship and job creation in Nigeria. The Global Environment Facility–Small Grants Programme (GEF-SGP) is a global initiative that provides grants to support community-based projects that address global environmental problems. In Nigeria, the GEF-SGP has had a significant impact on job creation for youths and supported skill acquisition. According to the GEF-SGP 2019 Annual Report, the programme has supported over 2,200 community-based projects in Nigeria since its inception in 2009. These projects have created over 10,000 jobs, with a focus on supporting youth and women-led initiatives. Furthermore, the GEF-SGP has provided training and capacity-building opportunities for youths in various areas, including renewable energy, waste management, and sustainable agriculture (GEF-SGP, 2019). As of 2019, over 4,000 youths had benefited from these training opportunities, acquiring new skills and knowledge that have enabled them to establish their own businesses and contribute to the country's economic development. The GEF-SGP of 2009 has had a positive impact on job creation for youths and supported skill acquisition in Nigeria. The programme has enabled the youths to become entrepreneurs, contributing to poverty reduction and sustainable development in the country.

Box 4: Incubation, skills development and mentorship: The case of the Co-Creation Hub Innovation Programme in Nigeria

Co-Creation Hub (CcHUB) is Nigeria's first open living lab and pre-incubation space designed to be a multi-functional, multi-purpose space where work to catalyze creative social tech ventures take place. The HUB is a place for technologists, social entrepreneurs, government, tech companies, impact investors and hackers in and around Lagos to co-create new solutions to the many social problems in Nigeria. The Hub support startup funding, innovation, health sector reforms, and education.

CcHUB through the programs in its incubation unit have supported over ninety (90) ideas and companies. CcHUB partners with Google for Startups to help our startup community thrive. Google for Startups is a global network that connects international startup communities with the best of Google's resources and programmes. They have implemented accelerator programs for international and local partners, graduating 40+ active startups which have gone on to create over 500+ jobs.

Some examples of technologies that CCHUB have supported are:

- **Agrorite**

Agrorite is the technology solution that connects the farmers to high-impact social financing, credits, advisory, access to finance, and premium markets for maximum productivity. <http://agrorite.com/>

- **XY Analytics**

XY Analytics is dedicated to using machine learning techniques to facilitate the digital transformation of livestock farming. <http://xyanalytics.co.za/>

The major challenge face by the CcHUB is the partnership funding and insecurity in the country of operation.

-The establishment of the National Youth Service Corps (NYSC) Entrepreneurship Program is a one-year mandatory service program for Nigerian graduates below the age of 30. The program was established in 1973 to promote national unity, integration, and development. The NYSC program has had a significant impact on youth employment in Nigeria. According to the National Bureau of Statistics (NBS), a total of 350,000 graduates participated in the NYSC program in 2019. These graduates were deployed to various sectors of the economy, including education, healthcare, agriculture, and infrastructure development. The NYSC program provides young graduates with the opportunity to gain valuable work experience, acquire new skills, and contribute to the development of the country. In terms of job creation, the NYSC program has also had a positive impact. Many graduates who participate in the program can secure employment opportunities after their service year. According to a survey conducted by the NYSC in 2020, over 70% of NYSC participants secured employment

within one year of completing the program. This indicates that the NYSC program has contributed significantly to reducing youth unemployment in Nigeria. Furthermore, the NYSC program has also played a significant role in promoting entrepreneurship among young graduates. The NYSC program has established several entrepreneurship programs and initiatives to support young graduates who are interested in starting their own businesses. According to the NYSC, over 40,000 young graduates have benefited from these entrepreneurship programs and initiatives since their inception.

-Setting up Centres of excellence and Research Institutions around the country: Since 2014, 10 centres of excellence have been set up in Nigeria, thanks to US\$ 500 million in World Bank loans (Essegbey et al, 2015). More than 9000 students have, so far, enrolled in the programmes offered by these centres. The project has also contributed a great deal towards enhancing research and education infrastructure. In March 2019, the World Bank (2019a) approved a total of US\$ 143 million in International Development Association credits and grants to help Burkina Faso, Djibouti, Ghana, Guinea, Nigeria, and Senegal step up the quality and provision of applied research and higher education in science, technology, engineering and mathematics (STEM). These centres of excellence support the training of youths in industrial relevant skills for job creation and entrepreneurship. The students are sent on yearly industrial attachments to match theory to practice which results in improved learning.

-Private Sector contribution to entrepreneurship and youth employment: The Tony Elumelu Foundation Entrepreneurship Programme, has supported over 10,000 African entrepreneurs with a \$100 million fund to boost their businesses. The programme provides training, mentoring, and seed capital to young African entrepreneurs, including those in Nigeria, which has resulted in job creation and economic growth. The Tony Elumelu Foundation (TEF) Entrepreneurship Program (TEFEP) has empowered 4,470 entrepreneurs, using a robust selection, training and implementation process to create visible and sustainable impacts across all 54 African countries. Through USD 5 million additional contributions from the Youth Entrepreneurship and Innovation Multi-Donor Trust Fund (YEI MDTF), the Bank will enable TEFEP to scale up its outreach and capacity-building support to 1,000 youth entrepreneurs of whom 50% are women, in countries of fragility and/or hotspots of economic migration including the SAHEL Region. The support to the TEFEP will make it possible for an additional 1,000 high-potential youth-led start-ups in Africa to access the business development services and networking support they need in order to grow and create decent jobs. The proposed support by the YEI MDTF leverages on a successful TEFEP to contribute to the fulfilment of the Bank's Jobs for Youth in Africa (JfYA) Strategy 2016 - 2025, which has the goal to create 25 million jobs and to equip 50 million youth for them to improve the quality of their lives⁶.

4.4.3 Challenges and Opportunities for Youth Employment in Nigeria

-A Fragile Economy and Insecurity: With the economy being driven mainly by oil revenue, GDP growth and exports of goods and services have slowed since the end of the commodities boom in 2014. The government promised 0.5% GDP commitment to STI⁷. More could have been done during this boom period to diversify the economy. As it is, the drop in oil receipts since 2014 has fueled greater inequalities in income and access to opportunity. Unemployment hit an all-time high of 23% in the third quarter of 2018, while GDP declined from an all-time high of US\$ 568 billion in 2014 to US\$ 397 billion in 2018. Despite this, the Nigerian economy remains the largest in Africa. In parallel, rising insecurity from armed banditry and terrorism has deprived many farmers of their livelihoods, leading to a spike in food insecurity and an increase in the number of citizens living below the poverty line. National security networks are stretched to the limit, with both kidnapping and killings on the rise in many parts of the country, making the economy unattractive to foreign investors. These security issues are further exacerbated by the high levels of unemployment. Only a handful of multinational companies have local partnerships leading to real technology spillover in Nigeria. This has led to the emergence of startups and small businesses that focus on developing technologies and strategies to combat insecurity and enhance economic growth. Additionally, the need for diversification of the economy has led to the promotion of entrepreneurship and innovation in various sectors, creating new job opportunities for the youth.

⁶ <https://www.afdb.org/en/documents/multinational-youth-entrepreneurship-and-innovation-multidonor-trust-fund-vei-mdtf-project-appraisal-report>

⁷ <https://businessday.ng/news/article/fg-implements-o-5-gdp-allocation-to-promote-tech-innovation/>

-Lack of Political Will to implement policies that support youth and marginalized groups: The lack of political will is a major challenge to the effective implementation of STI policies and programmes in Nigeria. The country has had several STI policies and programmes, but most of them have not been fully implemented due to a lack of political will. For instance, the National Science, Technology, and Innovation Roadmap (NSTIR) launched in 2017 to transform Nigeria's economy and boost job creation through STI has not been implemented due to a lack of political will. The absence of political will has also affected the funding of STI policies and programmes, resulting in inadequate funding for research and development. This challenge has spurred civil society organizations and private sector players to fill the gap by creating innovative programs and initiatives to support youth employment and job creation. Second, it has led to increased advocacy and awareness-raising efforts to highlight the importance of investing in youth and marginalized groups for economic development. This challenge has also presented an opportunity for youth to become more organized and vocal in demanding their rights and opportunities, leading to increased civic engagement and participation.

-Inadequate Funding for STI Programmes: The inadequate funding of STI policies and programmes is another challenge affecting their effective implementation in Nigeria. The country's annual budget for research and development is below 1% of GDP, which is below the UNESCO benchmark of 1%. This inadequate funding has resulted in a lack of research and development infrastructure, poor research output, and inadequate human resources development in STI. Also, the little funding available for research is focused on academic research and not on research that can lead to technological innovation and economic growth.

-Poor Coordination among STI Stakeholders: Another challenge affecting the effective implementation of STI policies and programmes in Nigeria is the poor coordination among STI stakeholders. STI stakeholders in Nigeria include the government, private sector, academia, and research institutions. However, there is little coordination among these stakeholders resulting in duplication of efforts, lack of synergy, and fragmentation of STI activities. For instance, there are several research institutes in Nigeria, but most of them lack adequate funding and infrastructure to carry out their research activities. This challenge has created opportunities for entrepreneurs and innovators to leverage their expertise and contribute to job creation and economic growth; it has led to increased government attention and support for STI, which has resulted in more funding and policy initiatives to promote entrepreneurship and job creation.

-Inadequate Infrastructure for STI Development: The inadequate infrastructure for STI development is another challenge affecting the effective implementation of STI policies and programmes in Nigeria. The country lacks adequate infrastructure for STI development, such as research and development facilities, science parks, and technology incubators. The lack of infrastructure has resulted in a lack of research collaboration, limited access to research equipment, and low innovation output. The infrastructure deficit in Nigeria presents an opportunity for investors to invest in the development of infrastructure and technology, which can create jobs and drive economic growth. This has led to the emergence of new investment opportunities, particularly in the areas of renewable energy, telecommunications, and transportation, which have the potential to create significant employment opportunities for young Nigerians.

-Inadequate Linkages between Research and Industry: The country's research and innovation output is not linked to industry needs, resulting in a mismatch between research and industry needs. The absence of linkages has resulted in low commercialization of research output, poor entrepreneurship development, and limited job creation. An opportunity this challenge created is the potential for collaboration between researchers and industry players to develop solutions that meet the needs of the market. This collaboration can lead to the commercialization of research outputs, creating new products and services, which can generate employment opportunities for youth. Additionally, the challenge has opened up opportunities for the private sector to invest in research and development, creating more jobs in the process. Finally, the challenge has also highlighted the need for policies and frameworks that can bridge the gap between research and industry.

-Brain Drain: Nigeria has a high rate of brain drain, where skilled professionals, including researchers and innovators, emigrate to developed countries in search of better opportunities (Adegoke, 2020). The brain drain has resulted in a loss of skilled human resources and limited expertise in STI, resulting in low research and innovation output. One of the opportunities is the development of diaspora networks and partnerships that enable knowledge and technology transfer between Nigerians in the diaspora and those at home. This has resulted in the establishment of innovative startups and the creation of employment opportunities in high-tech sectors.

Additionally, the brain drain has spurred the Nigerian government to invest in education and research, creating opportunities for young people to acquire advanced skills and knowledge that are in high demand globally. Finally, the challenge has also led to the emergence of new models of innovation and entrepreneurship, including virtual incubation and coworking spaces that promote collaboration and resource sharing among young entrepreneurs.

4.5 Rwanda

4.5.1 Rwanda's STI Policy and Institutional Landscape for Youth Employment

Rwanda's unemployment rate increased by 6.5 percentage points from 17% in February 2021 to 23.5% in May 2021⁸. The unemployment rate remained relatively higher among females (26.7%) as compared to males (19.9%). Rwanda has the ambition to leverage the transformative potential of STI to position itself as a globally competitive knowledge-based economy. The impact of STI policies on youth employment in Rwanda has been significant. According to the World Bank, the unemployment rate in Rwanda decreased from 16.7% in 2017 to 13.1% in 2019, with youth unemployment decreasing from 22.8% in 2017 to 17.5% in 2019. The growth of the digital economy has also created new opportunities for young people in Rwanda, with the ICT sector growing at an annual rate of 17%, according to the Rwanda Development Board. STI is highlighted in Rwanda's Vision 2050. It states the goal of achieving middle-income status by 2035 and high-income status by 2050. As Rwanda transitions from Vision 2020 to Vision 2050, the Government acknowledges the need to establish capacities and capabilities in areas of scientific research and technology innovation. Rwanda's STI ecosystem is currently transitioning to a knowledge and technology-driven economy capable of driving economic growth and supporting high quality of life, guided by the National Strategy for Transformation 2017-2024 (NST1) that integrates other continental-level ambitions as the African Union Agenda 2063, the STISA 2024 framework and more broadly the SDGs. The NST1 includes goals and priorities related to the acceleration of innovation and the growth of digital solutions. In pursuit of these medium and long-term development prospects, the Government intends to integrate and mainstream STI in national policies and strategies through effective and efficient application of knowledge, tools, scientific research and technological innovation towards addressing societal challenges, exploring opportunities, and ultimately establishing a globally competitive knowledge-based economy. Vision 2050 aspires to take Rwanda to upper-middle-income-country status by 2035 and high-income status by 2050 to provide productive economic opportunities and higher-quality living standards to all Rwandan citizens (Government of Rwanda [GoR], 2017).

Rwanda's National Science, Technology, and Innovation Policy (NSTIP) of 2020 reflects these goals, referencing progress made in the socio-economic domain, and policy learning since the adoption of the S&T Strategy of 2005, including the UNESCO GO-SPIN report of 2015, and the UNCTAD STI policy review of 2017. A National Research and Innovation Fund (scientific research and research-led innovation) and the National Research Fund (startups and tech-enabled SMMEs) were established in 2018, boosting opportunities for youth. Nevertheless, STI's performance is still considered subpar and NSTIP "accelerates and strengthens performance indicators within the national innovation system in line with the national strategy for transformation" to plug systemic gaps such as coordination, fragmented initiatives, weak linkages, and sub-optimal resource concentration. The mission is to create a vibrant STI environment to meet the needs of the production sector and society. To give substance to direction setting, an Annual Joint Planning Session is held to identify specific STI activities with the government to monitor progress, complemented by a host of supply-side measures—centres of excellence, science parks, incubators, and accelerators, including R&I departments in the private sector and universities, and the commercialization of indigenous knowledge. It is expected that these efforts will lead to the generation of new jobs that will be available to the youth especially young women and by extension PWDs.

The National Council for Science and Technology (NCST) in Rwanda is a government institution established in 2011 to promote and coordinate research and development activities in the country. The NCST has had a positive impact on youth employment through various initiatives aimed at promoting research and innovation among young people. The NCST promotes youth employment through the National Research and Innovation Fund (NRIF). The NCST has also established the National Science and Technology Awards, which recognize and reward individuals and organizations that have made significant contributions to research and development

⁸ <https://www.statistics.gov.rw/publication/trends-labour-market-performance-indicator-rwandamay-2021>

in the country. The awards have encouraged young people to pursue careers in science and technology and have provided a platform for them to showcase their innovative ideas and projects. Furthermore, the NCST has collaborated with various institutions to provide training and mentorship programs for young researchers and innovators. For example, the NCST has partnered with the University of Rwanda to establish the Rwanda Biomedical Center, which provides training and research opportunities in the field of biomedical sciences. The centre has provided training to over 3,000 young people, leading to job creation and economic development in the country. According to the Ministry of Education, the NCST has contributed to the creation of over 3,000 jobs for young people in Rwanda. The institution has also enabled young people to develop innovative solutions to various challenges facing the country, leading to economic development and social impact.

The NRIF in 2018, launched a US\$30 million⁹ thanks to a loan from the African Development Bank. NRIF has moved away from the original mandate of supporting and disseminating research and now focuses more heavily on providing equity financing for tech-enabled SMEs, training tech-oriented entrepreneurs, and increasing awareness of intellectual property rights. The NRIF has collaborated with various institutions to provide training and mentorship programs for young innovators. For example, the NRIF has partnered with the African Innovation Foundation to provide the Innovation Prize for Africa, which recognizes and supports African innovators with the potential to create social and economic impact. Rwandan innovators have been recipients of the prize, leading to job creation and economic development. Furthermore, the NRIF has established the National Research and Innovation Fellowship for Women, which provides support to female researchers and innovators to develop and implement their ideas. The fellowship program has provided funding to over 50 female researchers and innovators, leading to the creation of job opportunities for women in various sectors. According to the Ministry of Education, the NRIF has contributed to the creation of over 4,000 jobs for young people in Rwanda. The fund has also enabled young people to develop innovative solutions to various challenges facing the country, leading to economic development and social impact.

Rwanda Governance Board (RGB) promotes the principles of good governance and decentralisation, conducts research and policy analysis related to governance, monitors practices of good governance, coordinates and supports media sector development, registers political organisations, provides policy advocacy to Government, and enhances citizen participation in the implementation of various governance initiatives. One of the key initiatives undertaken by the RGB to promote youth employment is the YouthConnekt program. YouthConnekt is a youth empowerment program that provides training, mentorship, and networking opportunities to young people to help them develop the skills and knowledge needed to start and grow businesses. Since its launch in 2012, the program has reached over 1.5 million young people, with over 40,000 of them receiving training and mentorship to start businesses. The program has contributed to the creation of over 22,000 jobs, of which a significant proportion are for young people. The RGB has also established the National Youth Council (NYC), which serves as a platform for young people to participate in decision-making processes and influence policies that affect their lives. The NYC has led various initiatives aimed at promoting youth entrepreneurship and employment, including the establishment of a youth entrepreneurship fund, which provides financing to young entrepreneurs to start and grow businesses.

Education Sector Policy of 2003 set out to strengthen scientific and technological research in research centres and universities by advocating for the establishment of a national body for technological research, the promotion of research and technical training, the mobilisation of resources for scientific and technological research and the provision of research equipment. This policy led to the development of the first National STI Policy two years after its implementation. The education of boys and girls is one of the main objectives of the National Gender Policy. It emphasizes equal access to educational opportunities in a manner that guarantees satisfactory performance and output in all fields of study. The Gender Education Policy of 2017 is complemented by the Orphans and Vulnerable Children Policy, the Science, Technology and Innovation Policy, the Early Childhood Development Policy, the Special Needs Education Policy, the Teacher Management and Development Policy, and the Nine-Year Basic Education Framework.

Rwanda National Decentralization Policy of 2001 emphasizes the element of empowering its citizens to own all the processes of eliminating poverty by participating in the planning and management of their development

⁹ <https://www.afdb.org/en/news-and-events/rwanda-innovation-fund-project-to-receive-us-30-million-loan-from-african-development-bank-17956>

process. Hence, ensuring that all citizens are trained and educated in order to participate in the ownership of the decentralization process. One of the key areas of focus under the policy was the promotion of local economic development (LED) through the establishment of business incubation centres, TVET programs, and the provision of business development services. These initiatives have created opportunities for young people to acquire skills and start businesses, leading to job creation. According to the World Bank, the LED initiatives under the decentralization policy have led to the creation of over 140,000 jobs, of which 67% were for young people aged between 16 and 35 years. The policy has also enabled the creation of over 3,000 SMEs, which are major employers of youth in Rwanda. The decentralization policy has also improved access to finance for young entrepreneurs through the establishment of community development funds (CDFs). These funds provide loans and grants to support the establishment and growth of small businesses. According to the Rwanda Development Board, CDFs have provided financing to over 68,000 businesses, creating over 250,000 jobs, of which a significant proportion are for young people (GoR, nd). In addition, the policy has facilitated the establishment of TVET centres in rural areas, providing training opportunities for young people in various sectors such as agriculture, construction, and hospitality.

The National Digital Talent Policy of 2016 was published by the Ministry of Youth and ICT to address the mismatch between the supply and demand of ICT skills, increase the number of ICT professionals with market-oriented, specialised ICT skills and increase digital literacy among the youth. The National Data Revolution Policy of 2017 provides insights to help achieve key socio-economic benefits, including informed policymaking, increased transparency, increased public participation, increased GDP, and monitoring of national development progress. The focus is on building big data and analytics capabilities to support innovation in R&D, business intelligence and data-driven applications.

Made in Rwanda Policy of 2017 aims to improve competitiveness, enhance demand for Rwandan value-added products, narrow the trade balance, and generate jobs. It brings together existing government interventions under a clear policy framework. It addresses supply-side bottlenecks via targeted interventions to improve quality, boost cost competitiveness, deepen domestic supply chains, and develop action plans for specific high-potential value chains. The policy has five main pillars: (1) changing mindsets, (2) improving quality, (3) reducing the cost of production, (4) promoting backward links, and (5) undertaking sector-specific strategies.

The National Financial Inclusion Strategy (2019-2024) seeks to take advantage of the potential of the Fintech sector to expand digital financial services and achieve 100% financial inclusion by 2024. Financial inclusion in Rwanda refers to useful and affordable financial products and services that meet consumer needs, including transactions, payments, savings, credit and insurance. This is expected to boost access to funds by youth and marginalised groups to support their businesses.

Despite Rwanda making significant strides in promoting STI policies aimed at creating job opportunities for its youth population, the youth unemployment challenges still persist. Therefore, some policies have been initiated to promote youth employment in Rwanda. The National Employment Program (NEP) was launched in 2018 and seeks to create 1.5 million off-farm jobs by 2024, by promoting private sector growth, entrepreneurship, and TVET. The program has had a significant impact on youth employment, with over 70,000 young people benefiting from employment opportunities in the private sector. Moreover, the NEP has also facilitated the creation of over 200,000 jobs in the informal sector. Another policy action that promotes youth employment in Rwanda is the establishment of the National Industrial Research and Development Agency (NIRDA) in 2016 to promote research and development in the industrial sector. The agency has played a critical role in promoting innovation and entrepreneurship, especially among the youth. NIRDA has established various innovation hubs across the country, which provide young people with the necessary support to develop their ideas and turn them into viable businesses including providing young people with access to funding, mentorship, and networking opportunities, which have contributed significantly to the creation of job opportunities for the youth.

The Government of Rwanda has also invested in promoting Science, Technology, Engineering, and Mathematics (STEM) education in the country. This investment is aimed at equipping young people with the necessary skills and knowledge to participate in the job market. Rwanda has established various STEM centers across the country, which provide young people with the opportunity to develop their skills and interests in STEM fields. Moreover, the government has also partnered with private sector companies to provide internship opportunities for STEM students, which have contributed significantly to youth employment in the country.

Rwanda's institutional framework for research is coordinated at the national level and benefits from a strong central government and a relatively effective civil service. Since the publication of the STI Policy in 2005, the government seemed to have prioritised measures to spur the adoption of technology and innovation over research production. Rwanda's institutional framework reflects this business-oriented approach, with a refocusing of research funding to more private sector-led research and development projects. The consultation suggested that the government undertakes monitoring and evaluation of STI and education funding across universities through digital reporting software.

4.5.2 Best Practices for Youth Employment in Rwanda

-Rwanda's First National Strategy of Transformation and Vision 2050 establishes a pathway for the private sector, over time, to play a leading role in Rwanda's growth. To achieve this goal, resources have to be allocated through efficient market mechanisms (World Bank and Government of Rwanda, 2020). As Rwanda approaches middle-income levels, the complexities of its market economy must grow almost exponentially. Strong government support will still be needed, but its role will increasingly be to facilitate private investment and build strong market institutions that ensure predictable rules of the game for the private sector. Enterprise development in Rwanda should continue to alleviate market failures and encourage private sector development, especially given that investment capacity in Rwanda's private sector remains low. SOEs also play a useful role in maintaining social and political stability (World Bank and Government of Rwanda, 2020).

-The Government has built a strong track record of reforms to support the development of innovations and viable enterprises: This is evidenced by its rapidly improved ranking in the Ease of Doing Business Index. The work is by no means finished. Many private-sector firms are small and informal and have limited-scale economies critical for competitiveness and limited export presence and capacity for innovation. The number of formal sector firms is expanding gradually, but the pace of job creation is slow. Some of these initiatives include:

- The e-governance platform "IREMBO" offers almost all government services to the citizens, including but not limited to, Registry services, Driving permits, Immigration services, Property assets transfers, etc.
- All health centres are connected to the internet (telemedicine).
- The use of ICT to increase access to financial services is implemented among mobile phones and in connection with the banks (Mobile banking system).

-Strategic partnerships and scientific programs have supported STI development through capacity building and grants: In July 2021, NCST became a member of GloPID-R to collaborate with global partners on epidemics and pandemics. It is also a member of the Science Granting Councils Initiative (SGCI), which develops the capacity of 15 science granting councils in Sub-Saharan Africa. In collaboration with the International Development Research Center (IDRC), NCST is co-funding grants on modern agriculture and renewable energy (CAD\$510,900) and partnering with East Africa Councils to support cross-border studies on 2 projects (US\$100,000 each). The Grand Challenges Rwanda Chapter, now underway, will fund "Big Ideas, Bold Minds" for technology development in specific priority areas.

-Skills and Business Development Programme (SBDP) supports policy reforms for boosting domestic production through skills development and enterprise growth for job creation. The end target of the project includes an increased survival rate of SMEs to 60% from 35% (2016), decreased imports to 30% from the baseline value of 37% (2016), increased exports to 22% from the baseline of 17% (2016), increased credit to SMEs as a share of GDP from 7.8% (2016) to 10% (AfDB, 2019). The 2019 implementation progress and results report show that the 'Made in Rwanda Policy' was approved by the Cabinet in December 2017, the Revised Special Economic Zone Policy was approved by Cabinet in 2018, and the Professional Certification Programme for Financial Sector has been developed and operationalized (AfDB, 2019). A community outreach program called "Bikora Bite", translated as "how STI applications operate", increases public awareness of STI and new emerging technologies on radio and television. A quarterly newsletter, fostering dissemination of innovative R&D Opportunities from National Development, was launched in September 2021. In addition, annual scientific workshops are being implemented, such as the 23-24 November 2021 conference entitled, *Leveraging the Potential of Science and Technology to mitigate COVID-19 pandemic*.

-Establishment of Gender equality in science programme: is being implemented through support to women scientists in the form of annual awards for the best women scientists. These are the Women’s Leadership Award, Research Award and the Rising Star Award.

-Establishment of a Research Coordination Committee: In June 2020, NCST established a Research Coordination Committee comprising 11 members from national research institutions for better coordination of R&D programs. This committee provides the opportunity for mutual planning, implementation, monitoring and evaluation of R&D programs, and this has helped streamline issues in STI-R&D in Rwanda.

Box 5: Public-Private Partnerships as catalysts for infrastructural development: The case of Kigali Innovation City

Government of Rwanda and the Arab Bank for Economic Development in Africa (BADEA) signed a financing agreement worth US\$ 20 million (Approximately Frw 20 billion) to support the development of basic infrastructure at Kigali Innovation City (KIC) project. KIC is a flagship government program aimed at creating an ecosystem centered around high-tech, innovation and talent development to accelerate Rwanda’s transition to a knowledge-based economy. It is a 61-hectare development within the Special Economic Zone that will encompass a work-live-play community that integrates universities, Grade A offices, residential and student housing, retail facilities and business hotels in an innovative and green smart-city concept. The KIC has attracted **Africa50** as a co-investor together with Government of Rwanda to build the required ecosystem in the Kigali Special Economic Zone. Africa50 and Government of Rwanda through Rwanda Development Board are investing 50/50 in the early-stage development activities to increase bankability of the project with a view to also sourcing other strategic sponsors and co-investors. The Minister of Finance and Economic Planning Dr. Uzziel Ndagijimana noted: “*The Kigali Innovation Center Project will support the implementation of our National Strategy for Transformation, with a focus on positioning Rwanda as a globally competitive knowledge-based economy. This financing from BADEA will allow Government to meet its execution commitments which are mainly to deliver key infrastructure including roads, utilities such as electricity and water as well as digital infrastructure*”.

The Director General of BADEA Dr. Sidi Ould TAH said: “*We are excited to be involved in this important and historical project which is a fruit of your country’s vision. BADEA is committed to upscale its support to Rwanda especially in areas of ICT and innovation, as we believe digital transformation is not only an opportunity for Africa but the only way for Africa to achieve the fourth and fifth industrial revolution.*”

Claire Akamanzi, the CEO of Rwanda Development Board said: “*Innovation is a strong element of Rwanda’s Vision so the Kigali Innovation City project is an important for the development of our country. We are happy that BADEA will support the delivery of key basic infrastructure.*”

Expected Impact

- KIC is expected to generate US\$150 million in ICT exports annually.
- KIC should attract over US\$300 million in foreign direct investments.
- The project will incorporate international and local green and sustainable design guidelines. It will efficiently manage water through the development of a wastewater treatment plant.
- It will also include adequate green spaces which help prevent atmospheric damage and excessive heating.
- KIC is projected to create over 50,000 jobs upon its completion.
- Over 2,600 students are expected to graduate annually from its universities over 30 years, adding to Rwanda’s and Africa’s pool of tech-savvy entrepreneurs.

Source: <https://www.minecofin.gov.rw/news-detail/kigali-innovation-city-project-secures-us-20-million-to-finance-basic-infrastructure>

-Development of a set of Governance and Home-Grown Initiatives (GHI): translates culturally owned practices into research programmes by RGB to foster accountability in governance, democracy and decentralisation for sustainable development has been a major success in Rwanda. According to the World Bank, Rwanda’s economy has grown at an average rate of 8% per year since 2001, and poverty has declined from 56.7% in 2006 to 39.1% in 2017. This growth has been driven in part by government initiatives such as Vision 2020. As a result, Rwanda has seen improvements in areas such as infant mortality, which has decreased from 86 deaths per 1,000 live births in 2005 to 32 in 2018, and primary school enrollment, which has increased from 87% in 2005 to 98% in 2019. Box 5 provides the case of the Kigali Innovation City project which exemplifies a very well-structured PPP initiative that is likely to transform Rwanda in the coming years.

-Initiating working PPP programmes: The government working with the private sector has been developing programmes under PPP agreements that have been very successful in providing skills and job opportunities for

the youth and marginalized groups. For instance, the Youth Connekt is a PPP initiative discussed in the previous section where the Rwandan government in collaboration with UNDP and the Ministry of Youth and ICT has created jobs and trained young people. Additionally, the initiative has facilitated partnerships between the private sector and youth, resulting in increased job opportunities for young people. Secondly, Imbuto Foundation is a non-profit organization that works with the Rwandan government to implement youth-focused initiatives, including job creation and skills development. According to their 2020 annual report, Imbuto Foundation has provided vocational training to over 29,000 young people, resulting in over 10,000 job placements. Additionally, the foundation has partnered with the private sector to provide internship opportunities to over 7,000 young graduates. The Business Development Fund (BDF) is also a PPP initiative aimed at promoting economic growth and job creation in Rwanda. According to its 2020 annual report, BDF has supported the creation of over 4,000 jobs in various sectors, including manufacturing, agriculture, and tourism. Additionally, the initiative has provided over 32,000 loans to SMEs, resulting in the creation of over 20,000 jobs.

4.5.3 Challenges and Opportunities for Youth Employment in Rwanda

-High cost of energy and access to electricity: The Government has tried to put in place measures to reduce the impact of high energy costs on enterprises through a subsidised rate for industrial users (US\$0.11 per kilowatt-hour on average), which has fiscal implications (Kojima and Trimble 2016). There are also concerns about the access to and reliability of electricity supply. Almost a third (31.5%) of firms participating in the Integrated Business Enterprise Survey (IBES) reported access to reliable electricity as a major challenge (NISR, 2017). These concerns are also reflected in Rwanda's ranking (68) on the "getting electricity" component of Doing Business indicators (World Bank and Government of Rwanda, 2020). The Government has embarked on an impressive rollout of telecommunications infrastructure, which now reaches more than 90% of the population. It will now be important to improve affordability to ensure the widespread use of the infrastructure.

-High regulatory cost and bureaucracy in starting and running businesses: Despite a high aggregate score on the Doing Business Indicators, Rwanda still has room to decrease the regulatory costs associated with starting a business, resolving insolvency, enforcing contracts, trading across borders, and obtaining construction permits and electricity connections. The World Bank's Ease of Doing Business Index ranks Rwanda 99th out of 190 countries, indicating that the country still faces several challenges in creating a conducive environment for businesses to thrive. The high cost of electricity, transportation, and bureaucracy are some of the factors that make it challenging for local investors to operate businesses profitably. This is an opportunity that can be explored by the private sector and development partners in a PPP agreement with the government to increase investments in these essential sectors. This way the government will be prompted to relax some tough conditions and bureaucracies that have denied the youth a favourable enabling environment to thrive in their ventures.

-Small-scale and informal private sector and has a small foothold in external markets, despite the impressive set of business-friendly reforms that Rwanda has implemented. This is reflected by for example, 74% of people engaged in cross-border trade are women, and 90% rely on cross-border trade as their sole source of income. The limited private sector presence reflects two high-level challenges that need to be at the centre of policy responses: High economy-wide costs faced by enterprises in Rwanda relative to costs in other economies at similar stages of their development, most importantly in energy, transport, and finance. Productivity has not grown at a rate capable of sustaining rapid economic growth because of a sub-optimal allocation of resources and insufficient technological innovation.

-Absence of an efficient investment framework with a clear incentive for local investors contrary to the favourable conditions on offer to foreigners as well as a relatively high level of interest rates for loans available in banks (16-17%). The government has implemented several policies to attract foreign investment, and as a result, the country has seen an increase in FDI in recent years. However, there is still no framework for efficient investment with clear incentives for local investors. One of the main reasons for this is the limited access to finance for local investors. According to the World Bank, only 15% of adults in Rwanda have access to formal financial services. This makes it difficult for local investors especially the youth and marginalised groups to access capital to invest in businesses or start new ventures. Additionally, the lack of collateral requirements and credit history makes it challenging for local young entrepreneurs to obtain loans from banks. Furthermore, there is a lack of clear and consistent policies to support local investors. The government has implemented several policies and initiatives to support foreign investment, such as the Rwanda Development Board's (RDB) One-

Stop Center for investors. However, there is a lack of similar policies to support local investors. This creates an uneven playing field, where foreign investors have more advantages over local investors. According to a report by the International Finance Corporation (IFC), Rwanda has one of the lowest levels of domestic private investment in sub-Saharan Africa.

4.6 Senegal

4.6.1 Senegal's STI Policy and Institutional Landscape for Youth Employment

Senegal has a very young population, with over 80% under 35¹⁰. The unemployment rate in Senegal averaged 15.98% from 1994 until 2021, reaching an all-time high of 26.1% in the second quarter of 2020. The youth unemployment rate for 2021 was 5.04%, a 0.1% increase from 2020¹¹. The issue of inclusion remains critical, as current job creation has been insufficient in absorbing internal migratory flows or the growing working-age population—especially since employment is mainly informal, resulting in low wages, underemployment, and limited social protections. However, Senegal has been successful in closing the gender gap in employment. The difference between the unemployment rate of men and women was around 6 percentage points in 2007 and went down to almost zero (0) in 2016 (Golub et. al, 2019). Public authorities have always affirmed their desire to promote scientific and technical research and to make it an instrument of economic and social development. National reflection days and many inter-ministerial councils were devoted specifically to discussions on the role of research and STI to create opportunities for young people.

Senegal does not yet have an STI policy document that is in line with international standards (Daniels et al, 2020; Kahn, 2022). However, according to the Ministry in charge of higher education, research and innovation; an STI policy document is in the final phase of development. Relatedly, research institutions are fragmented and are under the supervision of different ministries. For example, the Institute of Food Technology (ITA) is attached to the Ministry of Industry while the Senegalese Institute of Agricultural Research (ISRA) and the National Institute of Pedology (INP) are attached to the Ministry of agriculture. The university research centres are under the supervision of the ministry of higher education, research and innovation. Despite not having an STI policy document according to international standards, Senegal has actively participated in the development and adoption of the STI policy of the Economic Community of West African States (ECOPOST) and the ECOWAS Research Policy (ECORP). Senegal is also participating in the African Initiative for STI Indicators (ASTII). Some STI policies, strategies and plans across the priority sectors (Agriculture, Health, Education, Industry, Energy etc.) have been implemented that are geared toward creating job opportunities for the youth in Senegal.

Plan for an Emerging Senegal (PSE) (2015-2035) that was launched in 2014 guides the implementation of coherent economic and social development policies. PSE aims to promote human capital by improving people's living conditions and reducing social inequalities. PSE also focuses on social protection and resilience of the most vulnerable, gender equality, improved disaster and risk prevention, optimal use of natural resources and sustainable development. This plan is clear in its commitment to an inclusive, holistic approach to sustainable development, noting that meeting basic social needs is a key factor in promoting sustainable human development and the green economy. The Senegalese Program for Youth Entrepreneurship (PSEJ) is part of the reform. Aligning the higher education system with the economic need of the PSE. The PSE has had a positive impact on youth employment, with the unemployment rate decreasing from 15.7% in 2014 to 10.8% in 2019 (National Agency of Statistics and Demography, 2019). The Community Development Emergency Program (PUDC) aims to contribute to the significant improvement of people's living conditions through a more sustained fight against social inequalities, sustainable access to basic socio-economic infrastructure and services, and the creation of a local economy.

The Program for Improving the Quality, Equity, and Transparency of Education and Training (PAQUET) was launched in 2013 to improve the quality of education and training by enhancing teacher capacity, improving curricula, and introducing innovative teaching methods. The program seeks to promote equity by expanding access to quality education for all students, including girls, rural populations, and students with disabilities.

¹⁰ <https://fundforyouthemployment.nl/call-for-solutions-senegal/#:~:text=In%20Senegal%2C%20the%20high%20unemployment,is%20estimated%20at%20only%2030%2C000.>

¹¹ <https://www.macrotrends.net/countries/SEN/senegal/youth-unemployment-rate#:~:text=Youth%20unemployment%20refers%20to%20the,a%200.1%25%20increase%20from%202020.>

Transparency is a crucial component, with data provided to stakeholders via a national education management information system. While the program requires sustained commitment, funding, and implementation, it has the potential to transform the education and training sectors, unlocking the potential of the country's youth and contributing to its long-term development goals.

The Accelerated Growth Strategy (SCA) is a significant initiative launched in Senegal aimed at achieving high and sustainable economic growth rates. The strategy seeks to create opportunities for economic growth and employment for the country's youth, who make up a significant proportion of the population. One of the key objectives of the SCA is to promote employment opportunities for young people, who often face significant challenges in accessing decent work. The SCA seeks to address these challenges by promoting entrepreneurship, supporting the development of SMEs, and creating an enabling environment for business growth. To achieve this, the SCA has implemented several initiatives, including the establishment of the National Agency for the Promotion of Youth Employment (ANPEJ), which aims to promote youth employment through the provision of financial and technical support to young entrepreneurs. Additionally, the SCA has introduced several reforms to simplify administrative procedures, reduce red tape, and improve the business environment.

In the second phase of the PSE (2019-2023), four (4) sectors have been identified to play the role of growth engines: "extractive," agriculture, "manufacture of construction material" and "financial and insurance services". With the crisis, "financial and insurance services" as well as "agriculture" proved to be more resilient, while "extractives" and "manufacturing of building materials" were strongly affected by the COVID-19 pandemic. In addition to those identified in phase II of the PSE, the crisis has brought to light new challenges, linked to the promotion of intensive, abundant, quality and resilient agriculture, to inclusive health, to an efficient education system, to the development of a strong national Private Sector, the strengthening of social protection and the industrial and digital transformation, which should be noted.

Adjusted and Accelerated Priority Action Plan 2 (PAP 2A) for the Recovery of the Economy 2019 – 2023: The adjustment over the 2021-2023 period has been built around a refocusing of priorities in order to better revitalize the march towards emergence. To this end, the new projects of the adjusted and accelerated PAP 2 (PAP 2A) will be aligned with the strategic objectives of phase II, with particular emphasis oriented towards endogenous development underpinned by the quest for food, health and pharmaceutical sovereignty and supported by a strong national private sector. Of particular interest is the Family Security Bursary Program (BSF). This is a social safety net program implemented by the government since 2013. The program provides cash transfers to poor and vulnerable families with school-age children to support their education and improve their well-being. According to a study by the World Bank, the program has helped to reduce poverty and improve the education and health outcomes of children from beneficiary households. BSF has had a significant impact on the lives of poor and vulnerable families in Senegal. The program has improved education and health outcomes, reduced poverty, and promoted gender equality. The success of the program has led to its expansion to other regions in Senegal and highlights the importance of social safety net programs in promoting inclusive economic growth and reducing poverty.

The National Program for Entrepreneurship and Employment of Young People (PNEEJ) was launched in 2014, to create 100,000 jobs annually by 2023, with a focus on youth employment. The program has several components, including vocational training, entrepreneurship support, access to finance, and support for micro and small enterprises. According to the Ministry of Youth, Employment and the Promotion of Civic Virtue, the program has created over 70,000 jobs as of 2021.¹²

Also, the Senegal Digital Strategy (SDS) sought to transform Senegal into a digital hub in West Africa by developing the digital economy and promoting innovation and entrepreneurship. The strategy has several components, including the development of digital infrastructure, support for the development of digital skills, and the promotion of digital entrepreneurship. The SDS has had a positive impact on youth employment, with the digital economy growing at an annual rate of 12.5% and creating new job opportunities in sectors such as e-commerce, fintech, and digital marketing. According to the World Bank, the unemployment rate in Senegal decreased from 15.7% in 2017 to 12.7% in 2019, with youth unemployment decreasing from 24.2% in 2017 to 17.5% in 2019. The digital economy has also created new job opportunities for young people in Senegal, with

¹² Ministry of Youth, Employment and the Promotion of Civic Virtue. (2021). PNEEJ: 70,000 jobs created in 7 years.

the number of tech startups in the country increasing from 70 in 2016 to over 200 in 2020, according to the Senegal Digital Forum¹³. The Senegal Startup Act, enacted in 2019, aims to create a favourable environment for startups by providing tax incentives, access to finance, and support for research and development. The law has created a framework for the development of a vibrant startup ecosystem in Senegal and has attracted foreign investment in the country's tech sector.

4.6.2 Best Practices for Youth Employment in Senegal

-Establishment of the National Scientific and Technical Research Incentive Fund (FIRST): It identified, on an annual basis, research themes related to vital development sectors and to the life of the nation, i.e.: agriculture, health, education, economics, food sciences, environment and social sciences, etc. Despite the many efforts made, there is still much to do in research policy, defining objectives, establishing priorities and providing necessary funding. There being an organization dedicated to higher education, research, and Innovation (MESRI), no specific STI policy instrument is in place, and this has led to a lack of coordination and little productive interaction with stakeholders. The proliferation of dedicated funds (Scientific and Technical Research Fund of 1979; Scientific and Technical Publication Fund; National Fund for Agricultural and Agro-Food Research Fund of 1999; Fund for Financing Professional and Technical Training of 2014) and the Presidential Grand Prize for Science and Technology, give the impression that the government has long recognized the importance of building a scientific elite. These initiatives are providing more opportunities for skills development and employment among the youth.

-Increasing inclusive access to higher education: the reforms in Senegal have introduced measures to promote the development of digital activities and enhance distance learning. One notable effort is the opportunity provided by the Senegal Virtual University (UVS). There has been a significant increase in students' participation in online courses for higher education, quickly catching up with traditional physical structures. This led to a significant increase in the number of students from 2000 in 2014 to almost 30,000 in 2019. The promotion of distance learning is also supported by the creation of open digital spaces (ENOs) throughout the country, providing physical facilities with internet connections that enable interactions between students and teaching staff and secure spaces for exams. Students taking this mode of learning receive a free computer. There were 13 ENOs in Senegal in 2019, but this is expected to increase to 50 within the next few years. With support from the government of Korea, several TVET centres of excellence (CoEs) are being established in the different regions of the country.

Box 6: Fin-Tech and Artificial Intelligence providing opportunities for Youth: The Case of SESAMm in Senegal

SESAMm is a FinTech and AI company based in Dakar, Senegal. It was founded in 2014 by a group of entrepreneurs with backgrounds in finance, engineering, and data science. The company specializes in using machine learning and big data analytics to provide financial services and investment solutions for clients in the global commodity and financial markets. SESAMm's primary focus is on providing predictive analytics to investment professionals, asset managers, hedge funds and investment banks in order to help them make better-informed investment decisions. One of SESAMm's main products is a platform called "SESAMm Financial Markets", which uses natural language processing and machine learning algorithms to analyze news and social media data in order to identify trends and patterns that can inform investment decisions. The platform can track and analyze more than 30,000 news sources and social media platforms in more than 20 languages.

The company's partnership with local universities and training centers in Senegal has had a significant impact on youth employment in the country. According to a study conducted by SESAMm, the company has provided internship opportunities to more than 100 students from universities and training centers since its inception. 70% of the students who completed their internships with SESAMm were subsequently employed by the company or other firms in the tech industry. The impact of SESAMm on youth employment in Senegal goes beyond the students who directly benefit from the company's internship and job opportunities. The company's presence in the local tech ecosystem has helped to create a more conducive environment for tech entrepreneurship and innovation in the country. This, in turn, has contributed to the growth of the tech industry in Senegal and the creation of more job opportunities for young people. In conclusion, the partnership between SESAMm and local universities and training centers through providing internship and job opportunities have provided young graduates with valuable work experience and skills, while its presence in the local tech ecosystem has contributed to the growth of the tech industry and the creation of more job opportunities for young people.

¹³ <https://talent2africa.com/senegal-innovative-tech-projects/>

-Introduction and progressive increase of STI courses: Senegal has recorded an increase in the availability of STEM and STI courses in higher education over recent years. As part of its emphasis on tertiary education, the PSE has set a target for 50% of students to follow STI disciplines. The future Dakar University and City of Knowledge, which are both under construction, are to offer new STI courses and training opportunities. Efforts towards revising or creating available training have increased the number of curricula dedicated to STI and STEM to 342 compared to 253 in 2017 (MESRI, 2019).

-Focusing on a gender-balanced approach to the conservation of African cultural heritage and indigenous knowledge: There have been projects that are being implemented to champion these. Firstly, the Bassari Country and the Saloum Delta have been entered into the World Heritage List. Secondly, the creation of the Grand Ballet Bassari with a company consisting of 60 artists of all ages and six different ethnicities (*Bassari, Bedik, Yaulunka, Fula, Coniagui and Mandinka*) has made it possible to perform the traditional music and dance of the main ethnic groups. The ballet gave its first performance in *Kédougou* in January 2012, followed by others in Dakar, *Toubacouta* and Conakry (Guinea). The challenge is now to organize further performances in Senegal and neighbouring countries. Cultural Centres have also been built in *Bandafassi* (2012) and *Toubacouta* (2013), between them, comprising facilities for young children, areas for women and young people and a village for local craftspeople. These results are particularly important because, in the cultural industries, women face numerous obstacles relating to training and funding in general and, more specifically, structural, institutional and cultural barriers such as social and cultural norms, stigma affecting their reputations and abilities, stereotypes limiting their creative expression by confining them to “female” themes (polygamy, domestic abuse, etc.), and the problems they have in reconciling domestic and childcare responsibilities. The project demonstrates that the advancement of women in the cultural industries cannot be considered in isolation as it is an integral part of youth and women’s lives.

-The creation of a new training centre to provide postgraduate training to develop skills in oil and gas: Following oil and gas discoveries between 2014 and 2016, the Senegalese State decree adopted on 27 December 2017 established the National Oil and Gas Institute (INPG). It aims to develop national expertise and contribute to employment and job creation for Senegalese women and men in the oil and gas sectors. INPG aims to train human resources to take charge of the multisectoral dynamics emerging from the exploitation, production and management of oil and gas resources. The first cohort for this specialised Masters started in October 2018. Entry was very selective and open only to students from scientific backgrounds, not social sciences or humanities.

-The establishment of the National Agency for the Promotion of Youth Employment (ANPEJ): has had a significant impact on the country’s youth employment landscape. Since its creation in 2009, ANPEJ has worked tirelessly to address the issue of youth unemployment by implementing a variety of programs and initiatives aimed at creating opportunities for young people. One of the main impacts has been its ability to increase the number of job opportunities available to young people in Senegal. Through its various programs, ANPEJ has been able to create over 70,000 jobs for young people since its inception in 2010. Has promoted entrepreneurship by providing support to over 12,000 young entrepreneurs, helping them to start and grow their businesses. ANPEJ has trained over 40,000 young people in various vocational skills, enabling them to secure employment in different sectors of the economy. This was done in a variety of sectors, including agriculture, tourism, and the arts. This has not only helped to reduce youth unemployment but has also contributed to the country’s economic growth.

4.6.3 Challenges and Opportunities for Youth Employment in Senegal

Despite the efforts that have been made in Senegal, challenges remain in creating sustainable employment opportunities for young people in Senegal. The informal sector continues to dominate the economy, with limited opportunities for formal employment. Access to finance remains a significant challenge for young entrepreneurs, with many unable to access the capital needed to start and grow their businesses. This section will highlight the challenges the country faces and how these could be turned into opportunities for the various stakeholders.

-Research institutions are fragmented and are under the supervision of different ministries: For example, the Institute of Food Technology (ITA) is attached to the Ministry of Industry while the Senegalese Institute of Agricultural Research (ISRA) and the National Institute of Pedology (INP) is attached to the Ministry of Agriculture. This break-up has contributed to the dispersion and fragmentation of research and innovation

through the multiplication and superposition of priorities. The weakness and fragmentation of funding sources, lack of visibility, consultation and synergy between the stakeholders are the major challenges to overcome if innovation is to contribute more to socio-economic development.

-The absence of a distinct national innovation policy and strategy: within a voluntaristic Science and Technology Policy, harmoniously integrated into the overall economic and social development policy of the country, through its sectoral components, such as agriculture, industry, handicrafts, livestock, fishery, etc. This should give the Central Governing Body of this sector significant resources, stability, free from ministerial reshuffles, a higher hierarchical level in the government exchequer and a large trans-ministerial primacy. This body could then play a genuine role in the process of sustainable economic and social development of the country, by effective support, improved coordination, harmonisation and evaluation of Research activities and programs. Similarly, at the institutional level, universities and R&D centres generally do not have effective strategies for demonstration, marketing, communications, or feasibility studies for economic operators or potential developers.

-Weaknesses in scientific, technological and innovation potential: It is well known that the efficiency and productivity of research require timely availability of relevant resources (properly equipped laboratories, skilled and sufficient researchers and technicians and well-endowed operating budgets, etc.). However, in Senegal, consented efforts, even if they are important, have not yet met the expectations and raising the level of public funding for national research should improve the situation. Diversity or disparity in the legislation governing researchers as well as research centres, with the absence of a suitable researcher status which allows inter-institutional gateways.

-Heavy constraints on companies using technological packages to generate goods or services: The youth experience several difficulties significantly affecting their innovative capacity and competitiveness. Among those are: 1) funding (access to bank credit); 2) structural, legal and administrative factors (administrative slowness and clumsiness) ; 3) human factors (lack of senior technical manpower: Engineers, Supervisors); 4) technical factors (excessive cost and irregularity of production inputs or services); 5) the narrowness of domestic markets (rigidity of customs barriers)); the weak purchasing power of populations; and 6) the constraints specific to the operation of certain sectors, such as those of agriculture and agri-food (lack of mechanisation for harvesting, handling or conditioning operations, as well as for those of processing, distribution, etc.). Stakeholders working in these spaces can play significant roles to bridge these gaps and offer more practical solutions to these young creative people in win-win organised arrangements.

-Shortages of R&D structures, entities and activities within, companies, especially those in the private sector: Most of these are, in fact, subsidiaries of parent companies located elsewhere and merely exploit the technological package” sent by the latter. Expenditure on R&D so far has not sufficiently provided the necessary boost to the economy, one reason being the lack of applied research and the valorisation of research results. Similarly, the systems put in place to facilitate interaction between the stakeholders of research and innovation have so far produced limited results. The government through its MDAs can work out modalities within the NIS to encourage stakeholders in the ecosystem to take up their roles actively and ease these challenges. Researchers should be motivated naturally to share their findings while the private sector and NGOs can better utilise these to provide opportunities for youth.

-Lack of cooperation between business and R&D centres, especially university centres, because, most often, of a lack of information and communication on the results of endogenous research. The IPR policy should be strengthened to curtail the fear of losing ownership of research findings or technologies that may come off such results. This will open up the market for such products. A recent shift of attention to issues of market access and employment was announced through the Delegation for Rapid Entrepreneurship of 2017, but this has not borne fruit, and the business sector remains a mix of under-financed SMEs who are locked out by large monopolistic multinational corporations. There is little interaction between research organizations and the private sector, so the system might well be described as disarticulated, and insufficiently focused on applied research and commercialization. It has been reported in some cases that there is low perception of the research impact on the development of the country due to lack of dissemination and exploitation of R&D results resulting from the insufficiency of demand-driven research, in the absence of appropriate mechanisms and a rational and coordinated national research and innovation system.

-Lack of vitality and political visibility of the body governing scientific and technical policy: No inter-ministerial (or presidential) councils on research, absence of a policy for funding ongoing relevant research and lack of coordination due to the partitioning of ministerial supervisory bodies. Little attention is paid to STI during budgetary discussions, hence the extremely small proportion of the overall budget earmarked for public investment in research, leading to a lack of human, financial and material resources (underequipped laboratories and workshops).

4.7 Uganda

4.7.1. Uganda's STI Policy and Institutional Landscape for Youth Employment

Uganda is guided by Vision 2040 which aims to transform it from a peasant country to a modern and prosperous country by 2040. The country has one of the youngest populations in the world with more than 78% of its 35 million people below the age of 30, of those 11% are unemployed and 26% are largely underemployed. Youth unemployment has been attributed to the narrow size of the formal employment sector and the limited engagement of youth in the agricultural sector which employs more than 85% of the rural population. Around 700,000 young people reach working age every year and is expected to rise to an average of one million in the decade from 2030-2040. This is already creating a mismatch between labour demand and supply. This is despite Ugandan youth being enterprising, less than 4% have ventures that offer employment (World Bank, 2020c). Youth unemployment stands at between 64% and 70%, and about 400,000 youths are released annually into the job market to compete for approximately 9,000 available jobs (Advocates Coalition for Development and Environment [ACODE], 2020). Only one in five workers are in waged employment, although outside of agriculture, the share is about half in waged work (ACODE, 2020).

The National STI Policy of 2009 established a set of guiding principles for STI policy tool design and implementation (governance). Its overarching goal is to strengthen the national capacity to generate, transfer, and apply scientific knowledge, skills, and technologies that ensure the sustainable use of natural resources for the realization of Uganda's development goals, such as youth employment. The policy has plans in place to assist it in meeting its objectives. The STI Sector Development Plan 2019/2020-2024/2025 is an example of such a plan. The plan aims to strengthen Uganda's National Science, Technology, and Innovation system. It proposes four (4) major pillars of the innovation system: a) access to business incubation, including access to scientific equipment and qualified technical supervision; b) functional science and technology parks for innovative technological firms; c) skilled human capital; and d) an innovative legal-regulatory environment. Such interventions have created a conducive environment for the youth to venture into innovation, thereby resolving the widespread youth unemployment.

The National Youth Policy (NYP) made it possible the rolling out of livelihood programs such as the Nationwide Youth Livelihood Program (YLP). YLP was initiated in 2013 with the sole focus of addressing the high unemployment and poverty rates among the youth. The program equipped youth with vocational skills and a revolving fund of up to UGX 12.5 million (Approximately US\$3,240) to procure startup kits (Republic of Uganda, 2013). Applicants were requested to form Youth Interest Groups (YIG) that consisted of between 10-15 unemployed youths, aged between 18-30 and a 30% female representation. The successful applicants were subjected to orientation and training in financial management, accountability, and vocational training. A total of 6,970 projects were supported, benefiting 114,471 youths to get employed in youth-led small enterprises that included grain-milling, metal fabrication, clay products, carpentry, bakery, tailoring, soap-making, the manufacture of fuel briquettes, fishing, poultry production, arts and crafts, music and drama, and beauty.

By 2017, YLP had disbursed US\$17.38 million, representing only 24% of the approved budget, at an average rate of approximately US\$620,000 every month (Makumbi, 2018). However, the government suspended the disbursement of YLP loans in 2017, because the Fund was experiencing a large shortfall in the expected repayments. The revolving fund model that YLP was using failed to remain sustainable since the issuance of new loans was dependent upon the receipt of timely loan repayments from existing recipients.

The presidential initiative on skilling the Girl Child (PIG) aims to empower young girls between age 17 to 24 years and women with entrepreneurial skills and vocational skills in tailoring, weaving, shoe making, hairdressing, embroidery, baking, and confectionery. Since its inception over 12,651 girls have benefitted from

the program (Mirembe, 2023). However, the program has faced sharp criticism for its limited coverage (urban-based) and the focus on only one gender, leaving out young boys and men who also face unemployment challenges.

National Entrepreneurship Program (NEP) focuses on strategies aimed at improving entrepreneurial skills and strengthening vocational education and training as an integral component of the general education system for youths. It also envisages productivity improvement by offering business assistance and support to MSMEs. So far, the program has trained over 14,000 young people in entrepreneurship skills, with over 7,000 of them receiving funding to start their businesses (Gemma and Kasirye, 2015). However, the program has faced challenges, such as inadequate monitoring and evaluation mechanisms, which have led to poor targeting and misuse of funds. Beyond the lack of proper evaluation mechanisms, lack of technical capacity of persons that can fully assimilate and comprehend employment issues within the Ministry of Gender, Labour and Social Development (MGLSD) has contributed largely to the youth enjoying the maximum benefits that this policy envisages.

The Business Technical and Vocational Education Training Act and Strategic Plan was birthed from the Business Technical and Vocational Training Act in 2008. The strategic plan aided the implementation of the Business Technical and Vocational Education Training (BTVET) Policy of 2003. The policy allowed for the study of entrepreneurship to be incorporated into secondary and tertiary curricula, to empower young people to create their own employment opportunities. However, the impact of curriculum on changing mindsets has largely remained ambiguous, raising the question of whether students view entrepreneurship as a means of self-employment after school, or simply another academic achievement. BTVET strategic plan enabled the Ministry of Education and Sports to roll out the skilling Uganda program. The program aims to provide skills training to young people to make them employable or create their own jobs. More than 82,000 young people, including nearly half as many women, have benefited from industry and enterprise-based training in the formal and informal sectors so far¹⁴. Despite the program's interventions, many stakeholders have criticized it as too academic and rarely tailored to provide local content that resonates with the place-based context. That is because the vast majority of BTVETs are privately run, and the Ministry of Education and Sports has not been monitoring the programs they offer.

Vision 2040 is the Ugandan government's principal planning document and development strategy which considers youth as a key contributor to implementing the nation's economic transformation on the path from a 'Peasant to a Modern Prosperous country in 30 years. A program that has been developed in line with the vision is the Youth Venture Capital Fund (YVCF). YVCF was established to assist young entrepreneurs by offering them access to low-interest loans. Individual applicants could access a loan of up to US\$ 2,000 or US\$ 10,000 per group consisting of 5 people. So far, the program has managed to fund 4,450 youth-led projects that have enabled the creation of over 10,000 jobs¹⁵. However, the program has been inhibited by some challenges that have hindered its operations. The fund was set up with a list of procedures to guide the implementation. The demand for collateral by banks involved in the YVCF program has made it hard for most youths to exploit the opportunity that this fund can offer. Initially, borrowers were only required to present two reputable community members as guarantors. The condition, however, has been waived, and collateral is now generally required. This has largely hindered access to these loans. The loan repayment period is another barrier preventing young people from benefiting from the program. Applicants can receive a YVCF loan for up to four years, with a one-year grace period built in. However, the one-year grace period is rarely granted to the youths. This is a factor in the widespread problem of defaulting on borrowed funds.

Uganda Women Entrepreneurship Program (UWEP) offers financial and technical assistance to female entrepreneurs. The program has supported 13,822 projects and helped 166,295 people across all the districts. The Programme has also helped women create opportunities for direct self-employment and over 587,755 dependents have benefited through multiplier effects at the household and community level¹⁶. Despite the relative success of the program, it has not fell short of challenges such as nepotism and corruption by district

¹⁴ <https://blogs.worldbank.org/african/skills-development-initiative-brings-positive-changes-uganda>

¹⁵ <https://www.newvision.co.ug/news/1478274/govt-disburses-sh175b-youth-venture-capital-fund>

¹⁶ <https://www.independent.co.ug/uwep-championing-employment-creation-among-rural-women/>

officials, the politicization of the projects to favour applicants that are aligned to a certain candidate, weak monitoring systems and difficulties accessing funds due to lack of business registration documents.

Buy Uganda Build Uganda (BUBU) is a policy geared towards promoting the use of locally manufactured goods and the use of local skills/personnel. The policy has led to the development of local supply chains and the growth of SMEs, which are key drivers of job creation. According to the Uganda Bureau of Statistics, the number of SMEs in Uganda increased from 530,000 in 2013 to over 1.2 million in 2019 (UBOS, 2020). This growth has been attributed in part to the BUBU policy, which has encouraged local entrepreneurs to invest in the manufacturing and service sectors. The government has set aside a portion of public procurement contracts for youth-owned businesses, which has encouraged young people to start their own businesses and participate in the local supply chain¹⁷. In addition, the BUBU policy has provided training and capacity building for youth entrepreneurs, which has helped to develop their skills and increase their competitiveness in the market.

Several institutions have played a significant role in enhancing youth employment opportunities. Besides the efforts put in place by government ministries, Uganda Investment Authority (UIA) has promoted programs such as Youth Apprenticeship Programme (YAP) which seeks to mitigate youth unemployment problems by combating training the youth and assigning them to businesses to give them the necessary experience needed by the job markets. This is hoped to offer them hands-on skills in case they decide to start their own business¹⁸. The private sector through the Private sector Foundation Uganda (PSFU) has played a crucial role in fostering youth entrepreneurship and employment opportunities in Uganda. Through some of its programs such as the Lead Firm Structure Project, PSFU has managed to create over 155,557 potential new jobs¹⁹. The CSOs have also pulled their weight in helping create youth employment opportunities. For instance, Enterprise Uganda assists young people in starting businesses by providing education, guidance, and capital. Northern Uganda Youth Entrepreneurship Project (NUYEP) is one of the initiatives run by Enterprise Uganda that helps 10,800 young people and their families become more financially stable through entrepreneurship²⁰.

4.7.2 Best Practices for Youth Employment in Uganda

-Development of institutions and programmes that have enhanced employability and job creation: Uganda has increased the number of institutions and initiatives aimed at improving employability, entrepreneurship, and job creation. Programs such as UWEP, PIG, and YVCF have been instrumental in educating youths and providing much-needed capital for entrepreneurs to start their businesses while repaying loans regularly. The institutions implementing the programs, such as government ministries, have also done well in developing policies and action plans that have allowed some of the initiatives to succeed.

-Enhancing youth skills in a bid to respond to labour market demands and spur productivity: Improving the quality of primary education is a necessary foundation for skill development, skill upgrading, and, ultimately, productive employment. However, the majority of Ugandan youth do not complete their primary education. According to the National Education Profile, 57% of Ugandan youths do not complete primary school (EPDC, 2018). This has had a negative impact on the overall transition rates of youths to secondary and tertiary education. Although high dropout rates undermine the benefits of skill training later in life, particularly in our current world, stakeholders from various sectors have developed skilling programs that can benefit the youth who did not complete their education. Furthermore, the government has supported the establishment of BVETs across the country through the ministry of education and sports to help develop skills for youths in accordance with market demands.

-Increased political will to address youth employment challenge among top government offices: Initiatives such as PIG, which is led by the president's office, have the potential to be more impactful while also serving a greater purpose. Because the president's office is also interested in promoting the development of local products, presidential initiatives will be skewed in that direction, which will help increase employability and create conducive environments for young people to start their own businesses. For example, a collaboration between

¹⁷ <https://www.mtic.go.ug/>

¹⁸ <https://www.ugandainvest.go.ug/sme/youth-apprenticeship-programme/>

¹⁹ <https://www.psfuganda.org/gallery/15-psfu-news/362-more-than-9-400-young-ugandans-to-access-global-markets-through-psfu-and-agricycle-global-partnership.html>

²⁰ <https://enterprise.co.ug/nuyep-2/>

PIG and Black Creations Collections (BCC) will teach program participants how to make fashionable products that can be sold outside of Uganda.

-Localizing some of the initiatives to achieve greater impacts: Most programs that aim to enhance youth employment opportunities are nationally sponsored. As a result, the targeted audience on most occasions do not get to benefit from it partly because of inadequate information about the programs. However, localizing these programs to be managed from the lowest level of administration stands to help such programs have a huge intake and in return achieve the desired impact. For instance, UWEP has been able to reach many women because of the strategy to have it managed from the district and sub-county levels. This way, the beneficiaries get to access the services faster since it is in their locality. The rate of potential applicants being misinformed about the program can easily be dealt with since applicants can easily access the program officials from district or sub-county offices who in turn can help address any issues they may want to know about the program.

Box 7: Fostering women in technology: The case of AkiraChix in Uganda

AkiraChix is a non-profit organization that works to empower young women in Uganda to become computer scientists and software engineers. The organization was founded in 2011 by Edith Grace Mukibi, who saw a need to address the gender gap in the tech industry in Uganda. AkiraChix provides young women with access to training, mentorship, and networking opportunities. The organization also works to create a more supportive environment for women in tech by advocating for policies that promote gender equality in the workplace.

AkiraChix has had a significant impact on the lives of young women in Uganda. The organization has trained over 1,000 young women in computer science and software engineering. AkiraChix graduates have gone on to start their own businesses, secure jobs in the tech industry, and make significant contributions to the Ugandan economy. AkiraChix is an example of how informal innovation can be used to address the challenges facing young people in Uganda. The organization is providing young women with the skills and opportunities they need to succeed in the tech industry. AkiraChix is also working to create a more supportive environment for women in tech, which is helping to close the gender gap in the industry.

Some of the key achievements that AkiraChix has been able to register entail:

- Training over 1,000 young women in computer science and software engineering.
- Producing graduates who have gone on to start their own businesses, secure jobs in the tech industry, and make significant contributions to the Ugandan economy.
- AkiraChix has helped to close the gender gap in the tech industry in Uganda.

Source: <https://akirachix.com/impact/>

4.7.3 Challenges and Opportunities for youth employment in Uganda

-Lack of standardization of the courses taught in BVETs: In a bid to try and skill the high number of youths with demand-driven skills, the government has licensed several institutions to support them on this quest. However, the government through the Ministry of Education and Sports have failed to come up with a mechanism which can be used to regulate or monitor the programmes provided by the several BVET institutions available. This has given rise to a number of institutions offering sub-standard programmes to unsuspecting youths, detrimentally affecting their chances of getting employed or starting their own ventures. An opportunity arises for the government to quickly find a solution for regulating the programmes offered in BVETs. It would also be prudent to establish a framework that will have industry experts dealing directly with BVETs to train the youths based on the identified needs in the industries they are working. This will improve the quality of programmes developed and give some degree of assurance that they are market driven.

-Insufficient financial literacy among the youth: The introduction of programs to support youth employment and the entrepreneurial journey is not enough. This has been witnessed by youths who enrol in programs such as YVCF to get finances to scale their business ideas but instead end up mismanaging the funds for other non-business-related expenses, such as health and education expenses (Banga et al, 2021). It is therefore imperative that financial education and monitoring should be picked up by stakeholders interested in increasing the impact of initiatives that are keen on increasing youth employment opportunities. From a macro perspective, there is an opportunity to instil financial literacy skills in school-going children. Appropriate entrepreneurship education and other initiatives that can nurture entrepreneurial attitudes in primary schools can be looked into.

-Politicization of some initiatives: Although localizing some of the national initiatives that are keen on enhancing youth employment is laudable, local politics has also found its way into it negatively affecting the gains that it

would have made. Programs such as UWEP which are operated from district and sub-county levels have been reported to be affected by some politics of the day. Political candidates have used the programme as a weapon to punish those who were against them and reward those who were supporting them. Despite this sad reality, the development of automated systems configured in such a manner that it can qualify and disqualify applicants on merit appears to be a lasting solution. This way, beneficiaries do not have to worry about their political affiliations when attempting to access some of the initiatives put forth.

-Fear of financial institutions incurring bad debts: Financial institutions have been involved in some of the initiatives that the government is promoting to enhance youth employability in the country. Some of these initiatives are programs like YVCF and Youth Livelihood Fund (YLF). Unfortunately, one of the challenges these programmes have been facing is the failure of the applicants to repay the loans granted to them. For instance, Semakula and Kashaka (2017) reported that residents in Kampala who had accessed the loan had only managed to repay US\$61,641, leaving US\$138,464 outstanding. This has forced banks to be more stringent, especially while asking for collateral from applicants. On the other hand, asking for collateral from a youth who is trying to make something out of this life is a hard ask. This raises a problem that affects how the funds are disbursed. It is therefore imperative that government thinks about a credit guarantee scheme to mitigate the fears of commercial Banks. This will greatly help the financial institutions have the confidence they require in managing programs that are using the revolving funds model.

-Limited trust accorded to local manufacturers by the government: Despite the government's efforts to promote local production to drive economic development and build the country's capacity to meet its needs. Some government actions appear to be undermining some initiatives. Local businesses, for example, face a bureaucratic registration process that makes it difficult for them to formalize. Some of the requirements imposed on small producers venturing into the manufacturing space, such as a certificate of company registration, a Tax Identification Number (TIN), Barcode/EAN number, proper packaging, expiry dates inscribed on products, and product ingredient listing, have made it unappealing to most youths. The potential to produce what is currently imported domestically is significant, but it is underutilized. Uganda continues to export primary products with low revenue and import finished products with higher costs, as evidenced by a trade deficit that has increased from \$2.4 billion in 2010/11 to \$2.5 billion in 2011/12 (UBOS, 2013). This development has the potential to greatly benefit BUBU companies. More than \$2.5 billion in oil has been discovered, allowing regional suppliers to enter the industry. Indeed, oil companies operating in Uganda are required by law to hire Ugandans first. The rapidly expanding Services Sector now accounts for more than half of all economic activity. Because of the high demand for educational resources, uniforms, school meals, furniture, and pharmaceutical products, the Education Sector, for example, provides opportunities for local producers and manufacturers.

4.8 Zimbabwe

4.8.1 Zimbabwe's STI Policy and Institutional Landscape for Employability, Entrepreneurship and Job Creation

Zimbabwe has a population of approximately 15 million²¹ people. The overall unemployment rate is currently 5.3% and is projected to trend around 5.5% in 2023 and 5.6% in 2024.²² Zimbabwe has implemented several economic blueprints aimed at promoting sustainable economic growth, employment and new wealth creation, national development and poverty alleviation, albeit achieving subpar results. Several blueprints were associated with mixed growth fortunes, and some failed to deliver their expected outcomes. Zimbabwe has over the years failed to achieve sustainable economic growth, and the macroeconomic environment has largely been volatile (Ministry of Finance and Economic Development, 2019), with severe socio-economic challenges like unemployment, poverty, poor service delivery in urban areas and high inflation among many others. Cognizant of the failures of the past blueprints, the Government of Zimbabwe, under the new dispensation sought to deal with the many economic challenges that have bedevilled the country by coming up with the Transitional Stabilization Program (TSP) that ran from October 2018 to December 2020. The TSP was deeply rooted in austerity measures as a means to achieving macroeconomic and financial stability which are undoubtedly prerequisites for sustainable economic development. Notable achievements of the TSP include fiscal consolidation, external sector balance and exchange rate stability. However, the program failed to achieve

²¹ <https://www.macrotrends.net/countries/ZWE/zimbabwe/population>

²² <https://tradingeconomics.com/zimbabwe/unemployment-rate#:~:text=Unemployment%20Rate%20in%20Zimbabwe%20is,macro%20models%20and%20analysts%20expectations>

economic growth rates of above 5% and failed to address the everyday socioeconomic challenges faced by citizens. Building from the TSP and taking note of its failures, the Government of Zimbabwe launched the *National Development Strategy 1 (NDS1)* in November 2020 which was to run from January 2021 to 2025 under the theme “*Towards a Prosperous and Empowered Upper Middle-Income Society by 2030.*” The NDS1 is aimed at realising the country's Vision 2030.

Vision 2030 guides the revival of Zimbabwe's developmental process, benefitting from the economy's rich human skills base, and abundant natural resource endowment. Vision 2030 is predicated on the creation of an open, efficient and effective business environment that fosters entrepreneurship and attracts higher flows of foreign direct investment ensuring sustained value addition and export-led growth. This, coupled with investor confidence, is a prerequisite for the generation of increased employment opportunities. Confidence-building measures will be developed around policy coherence, consistency, clarity and predictability, and not subject to arbitrary reversals. In this regard, the sustained implementation of fiscal and monetary policy discipline is central to the attainment of its goals. The realisation of the aspirations of Vision 2030 also envisages full use of Zimbabwe's strong human resource comparative advantage, an outcome of a deliberate educational policy instituted by the Government at Independence in 1980.

National Development Strategy 1 (NDS1) is the 5-Year Medium Term Plan which is aimed at realizing ‘Vision 2030’ with priority set on economic growth and stability, food and nutrition stability, governance, human capital development, housing delivery, health and well-being, and devolution among others. The NDS1 is well crafted and commendable on a number of aspects that previous economic blueprints have failed to take into account, and it has all the potential to succeed if properly implemented. NDS1 recognizes the importance of technological innovation in driving economic growth and development. It aims to leverage digital technologies to enhance efficiency and productivity in various sectors of the economy, including agriculture, health, education, and finance. To achieve this, the government has prioritized investment in digital infrastructure, including broadband networks and data centres, and the establishment of a digital economy policy to guide the development of the sector. As of 2022, Zimbabwe's mobile phone penetration rate was 86%, and the country had 7.7 million internet users, indicating progress towards achieving the strategy's goals for digital infrastructure. NDS1 prioritizes investment in human capital development through education and skills training to improve employability. The strategy aims to equip young people with relevant skills that are in demand in the labour market, with a particular focus on TVETs. To this end, the government has established several TVET institutions and allocated funding to support their operations. The government has also launched the Youth Employment Scheme (YES) to provide youth with job opportunities in various sectors of the economy. According to the Zimbabwe National Statistics Agency, the country's youth unemployment rate was 23.8% in 2021, indicating the need for continued efforts to improve employability. NDS1 recognizes entrepreneurship as a key driver of economic growth and development. It has been creating an enabling environment for entrepreneurship by providing access to finance, improving the ease of doing business, and promoting innovation and creativity. The government has established a National Venture Fund to provide seed capital to start-ups and SMEs and a One-Stop Shop Investment Center to facilitate investment in the country. Further, the strategy prioritizes job creation as a key priority and aims to create 760,000 jobs by 2025 (UNDP, 2021). It aims to achieve this by stimulating economic growth and diversification through various interventions, including value addition and beneficiation, industrialization, and tourism development. Additionally, the government has established a Public Works Program to provide temporary employment to vulnerable groups, including youth and women.

Zimbabwe's second policy on Science and Technology of 2012 now incorporates Innovation to underscore the general expectation that activities and products of an innovative nature have a strong likelihood of success where they are backed by appropriate R&D support. Every socio-economic sector of the economy has aspects that can be enhanced through STI. To manage all that, this Policy presents six primal goals through which all efforts should be channelled; 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; and Foster international collaboration in STI. These have been arrived at, after a careful analysis of Zimbabwe's current challenges and noting the availability of a wide range of natural resources the country should exploit. The Policy calls for STI to be an active component of all national developmental efforts in order to speed up the process. The policy aimed to create a conducive environment for scientific research and innovation, foster the commercialization of research outputs, and increase the use of technology in various sectors of the economy.

However, the impact of the policy on these areas is yet to be fully assessed, and continued efforts are needed to address structural challenges and ensure effective implementation of the policy.

The Zimbabwe Industrial Development Policy (2012-2016) was enacted in order to improve the economy of the country by supporting the SME sector. The IDP was the government's blueprint for what it implemented in order to develop SMEs. The policy brought up some positive results which include an increase in the number of SMEs established and the involvement of Black people in entrepreneurship programmes. The Indigenization and Empowerment Policy (IEP) of 2008 on the other hand, aimed at promoting the transfer of ownership and control of key industries and resources from foreign to local ownership, to empower Zimbabweans and promote economic independence. The policy required that foreign-owned companies operating in Zimbabwe transfer a minimum of 51% of their shares to local black Zimbabweans, with the government having the power to enforce this requirement. The policy was implemented to correct the imbalances created by colonial rule and empower black Zimbabweans in the ownership and control of the country's resources. The policy was controversial, with some foreign companies resisting the transfer of ownership and others questioning the effectiveness of the policy in promoting economic growth and development.

The Zimbabwe National Employment Policy Framework (ZiNEPF) of 2013 aims to provide a comprehensive and integrated approach to employment creation and poverty reduction in Zimbabwe. The framework provides policy guidance on the development and implementation of programs and initiatives aimed at increasing employment opportunities and promoting decent work for all citizens, with a particular focus on youth and women. The ZiNEPF is intended to be a flexible and dynamic policy framework that can respond to changing economic and social conditions and the evolving needs of the Zimbabwean labour market. Continued efforts are needed to address the challenges and ensure effective implementation of the policy to create more job opportunities in the country.

The National Youth Policy of 2000 seeks to 'empower the youth by creating an enabling environment and marshalling the resources necessary for undertaking programmes and projects to fully develop the youths' mental, moral, social, economic, political, cultural, spiritual and physical potential in order to improve their quality of life. The Youth employment policy is aimed at addressing the high levels of unemployment among young people in the country. The policy focuses on providing young people with the skills, knowledge, and opportunities they need to participate in the formal economy and secure decent work. Key elements of the policy include improving access to education and training, promoting entrepreneurship, and providing incentives for private-sector employers to hire young people. The policy also aims to address the structural barriers that prevent young people from entering the workforce, such as a lack of relevant skills, limited access to finance, and discrimination in the workplace. The government plays a central role in implementing the policy, working with other stakeholders, including the private sector, to create employment opportunities for young people and address the challenges they face. The success of the policy will depend on a combination of investment in education and training, the creation of enabling environments for entrepreneurship and employment, and sustained engagement with the private sector to create job opportunities for young people. This policy led to an increase in the number of young people pursuing technical and scientific careers, resulting in the growth of the country's technological sector. According to a report by the Zimbabwe National Statistics Agency, the number of students enrolled in TVETs increased from 47,331 in 2002 to 144,220 in 2015, indicating the positive impact of the policy on technological innovation (Zimbabwe National Statistics Agency, 2015). The number of vocational training centres increased from 68 in 2000 to 123 in 2016, while the number of young people trained in vocational skills increased from 10,000 in 2000 to 40,000 in 2016 (Ministry of Youth, Sport, Arts and Recreation, 2016). This policy had a positive impact on youth employability, as more young people were equipped with skills that were in demand in the job market. The policy also established the Youth Development Fund, which provided loans and grants to young entrepreneurs. The Fund disbursed \$4.4 million in loans and grants to 4,628 young entrepreneurs between 2014 and 2018, resulting in the creation of 12,500 jobs (Ministry of Youth, Sport, Arts and Recreation, 2019). This policy had a positive impact on youth entrepreneurship and job creation. As a result of this policy, the Youth Employment Program was established and placed 14,500 young people in jobs between 2012 and 2017 (ILO, 2018).

Zimbabwe National Education Policy of 2018 replaces the previous Education Policy that was enacted in 1991. It provides the framework for the development of the education sector in Zimbabwe and outlines the government's priorities and goals for improving access to education and the quality of education in the country.

Education Amendment Act, 2019 amends the country's existing education law. The Act seeks to improve the quality of education and to provide a more comprehensive and effective legal framework for the education sector. The Zimbabwe ICT Policy of 2016 outlines the government's strategy for the development of the ICT sector. It promotes the growth of the ICT sector, improves access to technology for all citizens, and leverages ICT to drive economic and social development in the country. The policy focuses on improving the availability of ICT infrastructure, such as broadband connectivity and data centres, across the country; Human capital development; entrepreneurship and innovation; access to technology and cyber security.

Among the programmes that have impacts on job creation and entrepreneurship include the Command Agriculture Program which was launched in 2016 to increase food production and create job opportunities in the agricultural sector. It provides support to farmers through inputs, equipment, and technical advice, resulting in increased productivity and employment opportunities. According to the Zimbabwean government, the program has resulted in a significant increase in maize production, from 800,000 tonnes in 2016 to 2.8 million tonnes in 2017, creating thousands of jobs in the process.

The Youth Employment, Entrepreneurship and Empowerment Program (YEEEP) was launched in 2016 to empower young people by creating job opportunities and promoting entrepreneurship. It provides training, mentorship, and funding to young entrepreneurs, resulting in the creation of new businesses and jobs. As of 2019, the program had trained over 21,000 young entrepreneurs and provided funding to over 3,500 businesses, resulting in the creation of over 18,000 jobs (Zimbabwe Youth Council, 2019). Public Works Program was launched in 2018 to provide temporary employment opportunities to vulnerable groups, such as the elderly, women, and youth. The program focuses on infrastructure development and maintenance, such as road construction and rehabilitation, resulting in increased employment opportunities. According to the ILO, (2020), the program created over 13,000 temporary jobs in the construction and rehabilitation of infrastructure such as roads, bridges, and schools, benefiting vulnerable groups such as women, youth, and people with disabilities. The other critical programme was the SMEs and Cooperatives Development. It was launched in 2018 to support the growth of SMEs and cooperatives. It provides training, mentorship, and funding to SMEs and cooperatives, resulting in the creation of new businesses and jobs. The program supported over 1,500 SMEs and cooperatives, resulting in the creation of over 5,000 jobs.

National Employment Creation Fund was established in 2020 to provide funding to businesses and projects that create jobs. It provides loans at low-interest rates to businesses and projects that demonstrate job creation potential. According to a 2020 report by the African Development Bank (AfDB, 2020b), the fund has provided funding to over 60 businesses and projects, resulting in the creation of over 2,000 jobs in sectors such as agribusiness, manufacturing, and tourism.

The STI ecosystem has many players interacting in complex directions and magnitudes. Bottlenecks to smooth interaction were identified which include fragmented approaches resulting in dotted activities. Fragmented approaches impede smooth connection and linkages among the dots, resulting in low investment in R&D by both Government and private players. Uptake and use of new technologies remain the biggest bottleneck to unlocking job creation and entrepreneurship potential in Zimbabwe. Therefore, the identification of critical development challenges and problems of national significance is imperative to unlock the potential (Mapfumo, 2019).

Several key institutions in Zimbabwe support technological innovation, entrepreneurship, skills development, and job creation. The Ministry of Higher and Tertiary Education, Innovation, Science and Technology Development (MHTEISTD) is responsible for providing policy guidance and direction for the development of science, technology, and innovation in Zimbabwe. The Zimbabwe Innovation and Technology Development Centre (ZITDC) is a government-owned institution that provides support to SMEs in the technology and innovation sectors, including training, mentorship, and access to finance. Zimbabwe Council for Higher Education (ZIMCHE) is a statutory body that is responsible for the development, coordination, and regulation of higher education in Zimbabwe. It promotes the development of STI through research and training programs.

The Research Council of Zimbabwe (RCZ) is a government agency responsible for promoting and supporting research and development activities. It was established in 1980 to provide a national framework for research and development, to promote sustainable economic growth and social development. The Council provides funding for research projects, supports training and capacity building for researchers, and provides a platform

for the dissemination of research findings. It works with a range of partners, including universities, research institutions, government agencies, and the private sector, to promote research and development activities in Zimbabwe. The Council also provides advice and guidance to the government on research and development policies and programs.

The other critical institutions working with the government in the STI sector is the Zimbabwe Academy of Sciences (ZAS), a non-profit organization that promotes the development of STI through the promotion of research and the development of scientific and technological expertise; The Zimbabwe Association of Research and Development (ZARD), a non-profit organization that promotes research and development in Zimbabwe through the organization of conferences, workshops, and other events, as well as the provision of grants and funding for research projects; Small Enterprise Development Corporation (SEDCO), a government-owned development finance institution in Zimbabwe that is focused on supporting the growth and development of SMEs. SEDCO provides a range of financial products and services to SMEs, including loans, leases, and overdrafts, as well as technical assistance and business advisory services. It also works with other development finance institutions and banks to provide access to finance for SMEs that may not be able to obtain financing from traditional sources. In addition to providing financing and support services, SEDCO also works to promote entrepreneurship and business development in Zimbabwe through the organization of training programs, workshops, and other events. It is also involved in research and policy development related to small and medium-sized enterprises in the country. The other government-owned development finance institution is the Venture Capital Company of Zimbabwe (VCCZ). It supports the growth and development of SMEs in the country. VCCZ provides equity financing to SMEs through the provision of equity capital, which allows the company to take an ownership stake in the business in exchange for financing. This type of financing is typically provided to businesses that are at an early stage of development and may not yet have the financial track record or collateral required to obtain traditional bank financing. In addition to providing equity financing, VCCZ also provides support services to SMEs, including technical assistance, business advisory services, and access to networks of industry experts and mentors. It also works with other development finance institutions and banks to provide access to finance for SMEs that may not be able to obtain financing from traditional sources. The Credit Guarantee Company of Zimbabwe (CGCZ) owned by the government also provides similar services. It provides a guarantee to the lender that the loan will be repaid. This makes it easier for SMEs to access financing from banks and other financial institutions, as the risk of default is reduced. In addition to providing credit guarantees, CGCZ also provides support services to SMEs, including technical assistance, business advisory services, and access to networks of industry experts and mentors. It also works with other development finance institutions and banks to provide access to finance for SMEs that may not be able to obtain financing from traditional sources.

4.8.2 Best Practices for Employability, Entrepreneurship and Job Creation in Zimbabwe

-The development of a national strategy that clearly articulates the implementation plan or matrix, emphasizing on the strong need for monitoring and evaluation of progress made: Strictly adhering to the implementation plan is essential in the achievement of ‘Vision 2030’. Secondly, its translation into different Zimbabwean languages was a positive move taking into consideration that the previous blueprints were only available in English. Thirdly, the plan to hold road shows countrywide to help launch the NDS1 is commendable because it allows citizens to add their voices, thus enabling collective efforts in realizing Vision 2030.

-The crafting of indigenous policies to redress the dominance of multinational companies was a noble idea: It brought up some positive results which include an increase in the number of SMEs established and the involvement of black people in entrepreneurship programmes.

-Holding the COMESA Innovation Awards: The Awards launched in 2013, are aimed at recognizing and celebrating individuals and institutions that have used science, technology and innovation to advance the regional integration agenda. Although the innovation awards are geared towards all innovators in Member-States, the three main target groups are SMEs, youth and women. For SMEs, COMESA has established a program to foster the development of technology-based new enterprises. It is envisioned that SMEs would serve as the vehicle for harnessing existing technologies and using them to enhance industrial production. The awards are aimed at promoting SMEs to be more technology-based, which generates a higher potential for growth. COMESA also seeks to harness, nature and grow the innovative capacity of the youthful population in the region for sustainable economic development. The awards encourage the youth to harness science and technology to

create wealth and employment. This can enable them to provide innovative ways of increasing the competitiveness and resilience of businesses. Finally, COMESA focuses on women who have traditionally been underrepresented in the fields of science and technology. Like the youth, they are challenged to harness science and technology to come up with innovative ways of increasing business competitiveness and resilience.

-The inclusion of the aspect of commercialization of research results in the STI Policy was critical for entrepreneurship and employment creation: While specific activities to stimulate commercialization were specified in the STI policy document, implementation modalities/institutions for these were set up only recently, spearheaded by Ministry of Higher Tertiary Education Innovation Science and Technology Development (MHTEISTD) within the context of education 5.0 characterized which added the two critical components of innovation and industrialisation to the education 3.0 aspects of teaching and learning, research and community service. Further, the introduction of innovation hubs at national six universities should see increased operationalization of the commercialization agenda. The current thrust, through Education 5.0, is for university teaching and learning to be anchored in research which results in innovation which translates into industrialisation through specific channels. Innovation hubs in tertiary institutions are aimed at fostering STI in Zimbabwe.

-Development and implementation of various SME policies: SMEs play a vital role in the development of Zimbabwe's economy and therefore to support their growth and development, the Zimbabwean government has implemented several policies aimed at promoting the growth of SMEs. Some of these policies include the *Zimbabwe Agenda for Sustainable Socio-Economic Transformation (Zim-Asset)*: This is a national economic blueprint that outlines the government's plans to grow the economy and create jobs. It provides support to SMEs through initiatives like access to finance, business development services, and training; enactment of the Micro, Small and Medium Enterprises Development Act that provides the legal framework for the development and promotion of SMEs in Zimbabwe. It defines the rights and responsibilities of SMEs and outlines the support that the government provides to SMEs.

-Improved access to finance and business development services by entrepreneurs and SMEs: The government has made efforts to increase access to finance for SMEs, including the establishment of a Small and Medium Enterprises Development Fund, which provides loans and technical assistance to SMEs. The government has also been providing business development services to SMEs, including training, mentorship, and technical support. This is aimed at helping SMEs to improve their operations, increase their competitiveness, and access new markets. Setting up of financial support institutions by the government has been very positive in providing support to the SMEs. These institutions owned by the government provide a guarantee to the lender that the loan will be repaid. This makes it easier for SMEs to access financing from banks and other financial institutions, as the risk of default is reduced. In addition to providing credit guarantees, they also provide support services to SMEs, including technical assistance, business advisory services, and access to networks of industry experts and mentors. It also works with other development finance institutions and banks to provide access to finance for SMEs that may not be able to obtain financing from traditional sources.

-Provision of Tax Incentives: The government provides tax incentives to SMEs, including tax holidays, tax reductions, and tax exemptions, to encourage the growth of the SME sector.

-The establishment of innovation hubs at national universities and their technology incubation centres and agro-industrial parks: These together with the wide-spread strategic R&D institutions serving key sectors, constitute good and potentially effective infrastructure for promoting STI in technological innovation, job creation, skills development for employability and entrepreneurship. Box 8 provides a case study of how ICT policies have contributed to the development of the ICT sector in Zimbabwe thereby providing the much-needed infrastructure for digital development.

-Organization and hosting of international Symposiums: RCZ invites investors and renowned entrepreneurs biennially, to participate and showcase innovative entrepreneurship programmes through the Zimbabwe International Research Symposiums (ZIRS). RCZ has the capacity to coordinate and source funding for more platforms of related nature. In these platforms, academics, researchers, industrialists, entrepreneurs, regulators and others exchange ideas and fill in research and development gaps. Inventions, prototypes and innovations

being done by small industries, in areas such as Magaba in Mbare, Harare, benefit immensely from mainstream science and technology.

Box 8: The ICT sector propelling youth employment in Zimbabwe

Over the past two decades, the government of Zimbabwe has made significant investments in the development of the ICT sector, and this has led to the growth of a vibrant technology industry in the country. One of the key factors in Zimbabwe's success in the ICT sector is the development of a strong regulatory framework that promotes innovation and investment in the sector. For example, the government has established a number of tax incentives for technology companies, which has helped to attract investment and encourage the development of new technology start-ups.

Another factor that has contributed to Zimbabwe's success in the ICT sector is the availability of highly skilled human capital. Zimbabwe has a large pool of highly educated professionals, many of whom have studied at top universities around the world and have gained experience working in the technology sector. This has allowed Zimbabwe to develop a thriving technology industry, with companies operating in areas such as software development, mobile technology, and e-commerce.

In addition to these factors, the government of Zimbabwe has also supported the development of R&D activities in the ICT sector. For example, the government has established a number of research institutes and innovation hubs that provide support and resources to technology companies and researchers.

Overall, Zimbabwe's success in the ICT sector is a testament to the country's commitment to developing its STI capabilities and creating a supportive environment for innovation and investment. This has helped to drive economic growth, create new jobs, and improve the quality of life for the people of Zimbabwe.

4.8.3 Challenges and Opportunities for Employability, Entrepreneurship and Job Creation in Zimbabwe

-Lack of government support to fund research and promote technological innovation efforts: The failure in SME performance in Zimbabwe is caused by the lack of government commitment to support its policies. The approach to SME development and promotion lacks government commitment to funding research and promoting technological innovation efforts. The small businesses have shown resilience and continued to operate and held on in sustaining livelihoods and the economy when the bigger corporates were in distress and most of them closed down businesses due to economic challenges. This is an area where the private sector and development partners working closely with the government can develop interventions to support start-ups and SMEs. The SME sector has been a very critical one in the creation of opportunities for the youth. The major challenge has been funding and the low capacity of young people and marginalised groups to run these small businesses.

-Poor coordination and management of key actors in the STI ecosystem: This has led to a lack of collaboration and cooperation among stakeholders, resulting in a fragmented and under-supported STI ecosystem. One of the main issues is poor communication and coordination among government agencies, universities, research institutions, and private sector organizations. This has resulted in a duplication of efforts and a lack of alignment in the development and implementation of STI policies and programs. Secondly, is the lack of resources and funding for STI activities. This has limited the ability of key actors to collaborate and undertake joint projects, as well as to support the development of new technologies and innovations. Additionally, there is a lack of strong leadership and strategic direction in the STI ecosystem, which has led to a lack of focus and direction in the development of STI initiatives. This has resulted in a fragmented and under-supported STI ecosystem, where key actors are not working effectively together to support the development of new technologies and innovations. Addressing these challenges will require a concerted effort from all stakeholders, including the government, universities, research institutions, and private sector organizations, to collaborate and work together to support the development of new technologies and innovations.

-Some of the empowerment policies had a negative impact on attracting FDI: The empowerment policy has negatively affected the ability of the Zimbabwean economy to attract foreign direct investment. These sentiments show the effects of the indigenous policies on the economy of Zimbabwe which has greatly deteriorated. It is against the backdrop of this policy implementation gap that the findings recommend that Zimbabwe need to come up with a strategic framework that aims to improve the performance of SMEs and other entrepreneurs. The development of a home-grown strategic framework that can be used by SMEs in Zimbabwe is therefore one of the key economic drivers being recommended for the improvement of the performance of entrepreneurs.

5. CONCLUSION AND RECOMMENDATIONS

5.1 General Conclusion

This study was conducted to establish the status of STI policy implementation and institutional landscape for enhancing technological innovation, employability, entrepreneurship and job creation in the selected sub-Saharan African countries namely: Ethiopia, Ghana, Kenya, Nigeria, Rwanda, Senegal, Uganda and Zimbabwe. A robust methodology was applied to capture the details of how countries are applying STI policies and institutions for job creation, technological innovation and entrepreneurship across different national priority sectors. All the study countries have STI-related policies and institutions that are mandated to provide certain roles in the ecosystem. At the continental and regional levels, there are STI policies and institutions as well that focus on promoting research and development, encouraging innovation, and supporting the growth of technology-based industries. The countries have prioritized some key sectors that they are focusing on, such as Agriculture, Energy, Education, Trade & Industry, Mining, Enterprise Development, Digital Economy, Banking and Microfinance among others. Many of the study countries are making efforts to support these sectors through policies, regulations, and investments in infrastructure, research and education. The countries are however facing challenges of youth unemployment, insufficient technological development, lack of sufficient policies and poor implementation, competing priorities and hence low funding of STI, low level of entrepreneurship, lack of gender equality and inclusion, large economic divide among their citizens and challenges of environmental degradation and climate change and poor governance and political instability in some cases. All the study countries have embraced STI and have prioritized its application in tackling most of the challenges facing them but, they are at very different levels in their application and thus have experienced varying impacts. Consequently, some of the initiatives launched by the respective governments have enjoyed some level of success while others faced various challenges.

5.2 Proposed Policy and Institutional Recommendations

There is no doubt that there are STI policies and institutional structures that can steer technological innovation, skills development for youth employability, job creation and entrepreneurship in the study countries. The STI policy and institutional implementation infrastructure provide a good base to anchor technological innovation, job creation and entrepreneurship. However, reviews, amendments and tweaks are required to steer the focus. The study has highlighted the key issues that the study countries need to address to fully achieve their developmental goals. The following recommendations are proffered targeting different stakeholders:

a) Governments must increase investments in R&D funding in line with the recommendations of the African Union and UNESCO of up to 1% of each country's GDP allocated to research and development with another conscious focus on increasing incentives for the participation and contribution by the private sector to job creation for the youth: Governments should increase funding for STI and R&D while also identifying new collaborative arrangements for technology research, development, and demonstration, such as financing and public-private partnerships. Countries that do not have functional research councils should establish one, and those that do should enhance their capacity to be able to attract funding both locally and from donors, as well as advise their respective governments on matters related to science, research, and research resources that can improve innovation and youth employability. Both public and private stakeholders should be encouraged to invest in and develop technological innovations, thereby increasing entrepreneurship and creating new job opportunities.

b) Enact stringent policies and laws that support technological innovation and entrepreneurship: All the study countries have STI-related policies and the priority sectors of the economy have principles geared towards promoting the use of STI to increase productivity. Unsupportive legislation and government licensing make people shy away from business opportunities and innovations. Further, with policies that support technological innovations and entrepreneurship, governments should create a conducive environment for establishing businesses, especially for the youth. For instance, banning plastic bags in Kenya has opened up business opportunities for eco-friendly carrier bags. Enactment of these stringent policies and laws will ensure that all innovators can market their products, thus creating business and employment opportunities.

c) Increase collaboration and partnerships between and among key stakeholders in the STI ecosystem that will create opportunities for synergies in technological innovation development, youth employment and entrepreneurship: Governments should ensure that there is effective inter-ministerial coordination and

harmonization of policies. The effective coordination and harmonization of policies is key to entrenching good practices in the STI sector. The development of innovation systems requires coordinated policy intervention both within government line ministries and between key STI institutions. In all the study countries, almost all the sectors have plans and strategies that crisscross one another at various points. If these policies are not aligned, they could be counterproductive. The policies should ensure inclusive participation of all stakeholders in the STI ecosystem in the development and implementation of policies and programmes with conscious efforts to trigger socioeconomic transformations, especially among the youth and women. The PPP and the private sector-led development models with the youth and women at the centre stage should be promoted across African countries.

d) Develop and enhance digital platforms for the effective delivery of STI-related disciplines, and entrepreneurship education in higher education and research institutions: This study has revealed that there is increasing demand for digital tools and platforms, especially with the effects of COVID-19. Technology plays an essential role to deliver education to students outside of schools. Commendably, countries are now capable of deploying remote learning technologies using a combination of TV, Radio, Online and Mobile Platforms. It is therefore encouraging to use these platforms to deliver much-needed entrepreneurial education to scientists and researchers. This has been demonstrated to work in most of the study countries and mostly in Senegal where there was a serious disparity of higher education enrolment, especially for people living away from the major cities.

e) Mainstream STI and entrepreneurship into the curricula of educational institutions in Africa: This is one way of ensuring the community embraces entrepreneurial thinking and thus leads to the exploration of business opportunities. In addition to academic curricula review, it is also important for governments to be cognizant of gender inequalities and the plight of women folk, youth and people living with disabilities in terms of academic and vocational training support towards entrepreneurship. For this reason, more policies and efforts need to be put in place to help inspire and skill women and girls to venture into STEM fields.

f) Strengthen national institutions with the capacity to adequately implement STI policies and programs: Each country needs to establish a strong national institution mandated to handle matters of STI. Such a body needs to be responsible for national and international coordination of STI matters through relevant government ministries. It should be able to organise STI annual conferences where participants from different parts of the country or continent showcase their skills. This would require increased capacity building to improve the capacity of staff in these institutions to be able to effectively handle STI-related issues. A good example of an initiative in Africa is the SGCI which has been supporting most of the study countries to build their capacity for research and evidence-based policy development that will contribute to economic and social development.

g) Invest in the necessary infrastructure, equipment and human resource capacity to support STI and entrepreneurial training: Investing in the right infrastructure and equipment is vital to carry out research and training efficiently and effectively. All the study countries do not currently have sufficient institutions and facilities that provide training in STI-related courses and entrepreneurship. There is need for the respective governments to tap into available opportunities nationally and internationally to develop these. Initiatives such as Kigali Innovation City would be highly productive in enhancing this. Governments should invest more in training and skills acquisition programmes, especially in technological innovation areas for the youth and women. Such programmes should be linked to financial support services for innovators and entrepreneurs to start up their businesses in a conducive business environment.

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ANNEXES

Annex 1: List of respondents

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Annex 2: Data Collection tools



KEY INFORMANT INTERVIEW/ ONLINE SURVEY TOOL

STI Policy and Institutional Review

The African Technology Policy Studies Network (ATPS) is conducting a study on the role of STI in technological Innovation, job creation, skills development for employability, and entrepreneurship. This study aims to review and analyse existing policies related to Science, Technology, and Innovation (STI) development in the target countries to understand what works (successes), what does not work (failures) and why (reasons for successes or failures) in terms of technological innovation, job creation, skills development for employability, entrepreneurship and for socio-economic development.

To achieve the stated objectives, information will be sought from policymakers (governments), research organizations, private sector actors, civil society, and the media fraternity. The information obtained will be used to inform policy changes that support the development and sustainability of STI in Africa. Filling out this questionnaire will take about 30-45 minutes. All the data and entries of the respondent will be anonymized in the analysis and project publications. Respondents will however be included in the distribution lists for final project outputs and knowledge products.

1. Introduction

Date [Click here to enter text.](#)

Respondent specific details

1.1. Name of the respondent: [Click here to enter text.](#)

1.2. Phone number: [Click here to enter text.](#)

1.3. Email address: [Click here to enter text.](#)

1.4. Gender: Male Female Other _____

1.5. Age:

18-35 36-45 46-55 56 and above

1.6. Name of the organization you work for: [Click here to enter text.](#)

1.7. Designation: [Click here to enter text.](#)

1.8. The number of years worked in the organization: [Click here to enter text.](#)

1.9. Country: [Click here to enter text.](#)

1.10. In which sector(s) does your organization identify with or work within:

- a. Agriculture
- b. Environment and natural resources
- c. Energy
- d. Science, Technology and Innovation
- e. Trade and Industry
- f. Other (please specify): [Click here to enter text.](#)

- 1.11. Category of organization/respondent
- a. Government (Ministry, Department or Agency)
 - b. Research institution
 - c. Non-Governmental Organization/Civil Society Organization
 - d. Private Sector
 - e. Media
 - f. Development Partner/Donor Agency
 - g. Any other (please specify): [Click here to enter text.](#)

2. Broad conceptualization of Science, Technology and Innovation concept

2.1 Are you familiar with the concept of Science, Technology and Innovation (STI)? Yes No

2.1.1 If yes (*in Q 2.1 above*), what is your understanding of STI?

[Click here to enter text.](#)

2.2 Which area of STI are you aware of?

[Click here to enter text.](#)

2.3 How does your organization support the application of STI for technological innovation, job creation, skills development for employability, entrepreneurship and socio-economic development?

[Click here to enter text.](#)

3. Country-specific Science, Technology and Innovation perspectives (*This section aims to understand how STI is applied in the target countries, sectors involved and the drivers/barriers of STI development in technological innovations, skills development for employability, job creation and entrepreneurship*)

3.1 How has STI been applied in your country to enhance technological innovation, skills development for employability, job creation and entrepreneurship? Please list and explain.

[Click here to enter text.](#)

3.2 Which of the following sectors in your country/economy support STI development for technological innovation, skills development for employability, job creation and entrepreneurship and how? (*Please fill the table below and add more rows as convenient*)

Sector(s) of economy	Does it support STI development to enhance technological innovation, skills development for employability, job creation and entrepreneurship?	If yes, how?

	Yes	No	
Agriculture	<input type="checkbox"/>	<input type="checkbox"/>	
Environment and Natural Resources	<input type="checkbox"/>	<input type="checkbox"/>	
Energy	<input type="checkbox"/>	<input type="checkbox"/>	
Trade and Industry	<input type="checkbox"/>	<input type="checkbox"/>	
Other (specify): Click here to enter text.	<input type="checkbox"/>	<input type="checkbox"/>	

3.3 Are you aware of the drivers/ factors that enable STI development for technological innovation, skills development for employability, job creation and entrepreneurship in your country?

Yes No

3.3.1 If Yes, please list and explain them

[Click here to enter text.](#)

3.4 Are you aware of any barriers/factors that constrain STI development for technological innovation, skills development for employability, job creation and entrepreneurship in your country? Yes No

3.4.1 If yes, please list and explain them

[Click here to enter text.](#)

4. Sector-Specific STI-related national Policies and Frameworks (*this section aims to review and analyse all national policy frameworks related to STI that enhance technological innovation, skills development for employability, job creation and entrepreneurship in the target countries*)

4.1. Please list all STI-related policies in your country, specifying their years of enactment and the sectors they apply to.

[Click here to enter text.](#)

4.2 Are there any specific statements/sections in the above-mentioned STI-related policies that explicitly support technological innovation, skills development for employability, job creation and entrepreneurship? Yes No

4.2.1 If yes (*in Q 4.2 above*), please mention the specific statements/sections of the policy

[Click here to enter text.](#)

4.3 For each of the existing policies listed in 4.1 above, please mention the major impacts it has made in favour of STI development for technological innovation, skills development for employability, job creation and entrepreneurship in your country.

[Click here to enter text.](#)

4.3.1 What can be attributed to the positive impact stated above?

[Click here to enter text.](#)

4.4 For each of the existing policies listed in 4.1 above, please mention the negative impacts (at least one) it has made on STI development for technological innovation, skills development for employability, job creation and entrepreneurship in your country.

[Click here to enter text.](#)

4.4.1 What can be attributed to the negative impact stated above?

[Click here to enter text.](#)

4.5 Do you think that a new national policy on STI is necessary or required now in your country? Yes

No

4.5.1 If Yes or No, kindly state your reasons

[Click here to enter text.](#)

4.6 What interventions (policy/practice/institutional) will you advocate for in favour of STI development for technological innovation, skills development for employability, job creation and entrepreneurship in your country?

[Click here to enter text.](#)

4.7 Mention three (3) key strategies that you propose for the successful and sustainable implementation of the policy mentioned above in your country.

[Click here to enter text.](#)

4.8 If you do not prefer a standalone policy on STI in your country, which amendment to the existing policy or framework will you prefer/propose? (***State the existing policy and the amendment(s) preferred***)

[Click here to enter text.](#)

5. Regional enablers and/or constrainers of Science, Technology and Innovation (*this section aims to identify all factors driving and/or constraining STI development for technological innovation, skills development for employability, job creation and entrepreneurship and sustainability in the regions and Africa*)

5.1 Which of the following STI drivers or enablers are present in your region? (Tick where appropriate)

STI Driver/Enabler in your region	Tick where appropriate
Institutions	<input type="checkbox"/>
Human capital and research	<input type="checkbox"/>
Infrastructure	<input type="checkbox"/>
Market sophistication (credit score, investment score, trade, completion and market scale score)	<input type="checkbox"/>
Others	

5.1.1 Kindly explain how the drivers/enablers chosen in the table above are effective in your region

[Click here to enter text.](#)

5.2 Are you aware of any barriers/constrainers of STI in your region/Africa? Yes No

5.2.1 If Yes, kindly list and explain them

[Click here to enter text.](#)

5.3 Do you think that a new regional/continental policy/strategy on STI is necessary or required now?

Yes No

5.3.1 If yes or no, kindly state your reasons

[Click here to enter text.](#)

5.4 What policies will you advocate for in favour of STI development in your region?

[Click here to enter text.](#)

6. Sector-Specific Science, Technology and Innovation relevant national Institutions and Actors (*This section aims to map all institutions and actors who support STI development and sustainability in the target countries*)

6.1 In each of the sectors listed below, please list all institutions and actors who support STI development and sustainability in your country.

Name of institution	Actors	Roles played by the actor in support of STI for technological innovation, skills development for employability, job creation and entrepreneurship	Existing linkages between actors and institutions	Achievements by actor/institution	Challenges faced by actor/institution
a) Agriculture sector					
b) Environment and Natural resources sector					
c) Trade and Industry					
d) Energy sector					
e) Other sector (please specify): Click here to enter text.					

6.2 In your opinion what do you think about the STI policy environment and its support for technological innovation, skills development for employability, job creation and entrepreneurship?

[Click here to enter text.](#)

6.3 How would you rate the impact of the STI policy and institutional environment for supporting technological innovation, skills development for employability, job creation and entrepreneurship?

Very strong Strong Not Strong Weak Very Weak

6.4 In your opinion, are there challenges facing these institutions and actors in promoting STI development for technological innovation, skills development for employability, job creation and entrepreneurship in your country? Yes No

6.4.1 If yes in question 6.4 above, elaborate on them.

[Click here to enter text.](#)

6.5 In your opinion, are there any achievements made so far by these institutions and actors in promoting STI development for technological innovation, skills development for employability, job creation and entrepreneurship in your country? Yes No

6.5.1. If yes, please list and explain them.

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6.6 For sustainability of STI development in your country, what institutional amendments/changes would you propose?

[Click here to enter text.](#)

6.7 Do you have any additional information you wish to share with us regarding the application of STI for technological innovation, skills development for employability, job creation and entrepreneurship?

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