STI Solutions to Accelerating Implementation of SDGs: Case Studies in Africa

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Abstract

The implementation of Science, Technology, and Innovation (STI) plays a pivotal role in achieving sustainable development goals (SDGs) across Africa and globally. Both UN Agenda 2030 and African Union (AU) Agenda 2063, recognize STI as multi-functional tools and enablers for achieving sustainable development. The AU Consolidated Plan of Action (CPA) on STI Strategy for Africa (STISA 2024), addresses flagship research and development (R&D) programs. This policy framework outlines strategies for leveraging STI to achieve SDG #1, 2 ,13, 16, 17 within the context of the 2024 STI forum for SDGs.

Introduction

Identifying policy gaps is vital for enhancing the Science, Technology, and Innovation (STI) policy framework in Africa and globally, towards achieving the United Nations Agenda 2030 (UN, 2015) and African Union Agenda 2063 (AU, 2015) The key gaps include inadequate coordination of STI initiatives and breakthroughs, financing access, weak intellectual property rights enforcement, digital inequality, neglect of indigenous knowledge, data insufficiency, limited gender inclusion, networking and stakeholder engagement shortcomings. These barriers hinder effective STI deployment, alongside challenges such as poor infrastructure and human capital gaps. Addressing these gaps necessitates comprehensive policy analysis, stakeholder engagement, and iterative implementation processes. Through these efforts, African nations can fortify their policy frameworks to leverage STI for sustainable development, fostering prosperity and inclusivity.

The policy objectives for STI in Africa aim to leverage technological advancements to address poverty (SDG 1), enhance agricultural productivity (SDG 2), mitigate climate change (SDG 13), strengthen governance (SDG 16), and foster partnerships (SDG 17). These objectives seek to promote inclusive economic growth, ensure food security, adopt sustainable agriculture practices, enhance transparency and accountability in governance, and facilitate technology transfer and capacity building initiatives through collaboration between various stakeholders.

Policy framework and case studies on STI for SDGs

The policy framework for STI in Africa focuses on investment in R&D, promoting technological innovation, capacity building, policy coherence, cooperation, and monitoring. It encourages collaboration between governments, private sector, and research institutions to address development challenges like poverty and climate change.

As per the African Union Development Agency-New Partnership for Development (AUDA-NEPAD) the AU STISA 2024 (STISA, 2014). R&D programmes fall under four clusters, namely: (i) Biodiversity, Biotechnology and Indigenous Knowledge; (ii) Energy, Water and Desertification; (iii) Material Sciences, Manufacturing, Laser and Post- Harvest Technologies; and (iv) Information and Communication Technologies. By investing in education, streamlining regulations, and facilitating knowledge exchange, the framework aims to foster sustainable development. Strong political commitment, multi-stakeholder collaboration, and sustained investment are essential for successful implementation, accelerating progress towards achieving the SDGs and building a more inclusive, resilient, and sustainable future for Africa.

The AU Development Agency and New Partnership for Africa's Development (AUDA-NEPAD) whitepaper 2024-2033 (AUDA-NEPAD, 2021) documented some STI-driven milestones in the continent. In particular, the progress made on leveraging artificial intelligence and robotic technology to streamline processes, automate tedious tasks, and improve decision-making, leading to increased efficiency and competitiveness, is highlighted.

Policy and case studies for SDG 1

Poverty is more than just material deprivation, it also involves aspects such as lack of access to quality schooling and healthcare, vulnerability in the face of external events, or being excluded from decision-making processes. Since Covid-19 pandemic, the pace of diffusion of digital technologies has exceeded that of any prior innovation in human history, covering over 50% of the developing world's population in just two decades.

Access to Education: online teaching and learning has revolutionized education globally and particularly the African continent which has ripped huge benefits in terms of access to education. The Africa Centre of Excellence on Technology Enhanced Learning (ACETEL) was established in February 2019 and is located at the headquarters of the National Open University of Nigeria (NOUN), Abuja, Nigeria (AAU, 2022). The centre is one of the 54 centres supported under the World Bank ACE Impact project, receiving support from the Association of African Universities, and National Universities Commission (NUC) in Nigeria. The Centre focuses on the development of human capacity and research in digital solutions that will lead to the utilization of technology for education and its deployment to other sectors.

Access to finance: in Kenya, the mobile banking service that allow users of M-PESA to store and transfer money through their mobile phones, has revolutionized lives of many people in Kenya where more than 95% of the population has access to financial services through mobile banking. This technology has alleviated poverty among the population not just in Kenya but more than 10 countries where MPESA services are being used.

Policy and case studies for SDG 2

The Goal #2 policy framework aims to enhance agricultural productivity in Africa through technological innovation, ensuring food security and promoting sustainable practices. The global issue of hunger and food insecurity has shown an alarming increase since 2015, a trend exacerbated by a combination of factors including pandemic, conflict, climate change, and deepening inequalities (UN SDG #2:). Artificial intelligence (AI and drone technology have been used to solve various problems in agriculture to address food security. Innovations in weather prediction; soil monitoring; automated irrigation; new farming techniques with smart greenhouses; crop monitoring; harvesting. techniques using robotics for picking strawberries; and pests, diseases, and weeds prediction, among others, enhance agricultural productivity. Countries such as South Africa, Rwanda, Kenya, Zambia, have benefitted from AI technologies. Access to financial support is required to boost agricultural activities. For example, FarmDrive (FarmDrive, 2017), a Kenyan-based social enterprise, is unlocking access to financial services for over 50 million smallholder farmers in Africa.

Policy and case studies for SDG 13

SDG #13 emphasizes leveraging STI to drive the transition to a low-carbon and climate-resilient future, addressing social, economic, and environmental challenges associated with climate change adaptation and mitigation. Some of the case studies of climate action using STI initiatives include, Kenya's banned single-use plastic bags in 2017, a move that was lauded as groundbreaking. The national environmental authority indicated that 80% of the public have complied with the ban. In 2020, single-use plastics were prohibited in protected areas such as parks and forests. Kenya has invested heavily in both policies and law enforcement to win the fight against plastic pollution. The result of this investment is today boosting Kenya's environmental stewardship in Africa and the world (Biao, 2021). In Accra, Ghana, a team of researchers have used artificial intelligence (AI) to identify buildings to assess people's needs related to climate change depending on where they actually live (Lillian, 2023). AI has also been used as an early system warning to detect floods in some African Countries, such as Mozambique (Binda, 2023). Outside the African continent, in China, the Institute for Global Environmental Strategies (IGES) centre is collaborating with UNEP on Environmental Technologies to develop a tool namely, "Estimation Tool for Greenhouse Gas (GHG) emissions by the *Municipal Solid Waste Management, a Life Cycle Perspective*", in partnership with the Rock Environment and Energy Institute (REEI) (Menikpura, Gamaralalage and Singh, 2021). By adopting these strategies, African countries can enhance resilience, mitigate climate impacts, and achieve sustainable development.

Policy and case studies for SDG 16

SDG #16 advocates promotion of peaceful and inclusive societies, access to justice, accountable and inclusive institutions. STI strategies include promoting e-government and digital services, open data initiatives, blockchain technology, legal tech solutions, and capacity building for public officials. Use of digital technologies in managing and preventing conflict has seen some growth since 2015. In 2022 the global community witnessed more than 50% increase in

conflict-related civilian deaths. Examples include Ukraine, Israil-Gaza, and a number of West African countries. ICT has been applied to gather large volumes of information on peace and conflict. For example, in Kenya there is Ushahidi used to map election violence using data from Facebook, Twitter, WhatsApp/ SMS, etc. Other programmes include Uchaguzi, a telephone-based system; Uwiano platform for peace used to report incidents. Globally, ICT research centers, such as those at Stanford, Harvard and MIT, focus on everyday peace indicators (Kelly, 2019). There has been constant efforts to infuse new technologies in traditional legal structures in order to make it efficient and effective in dealing with the challenges of conflicts. Technology has been used to improve access to justice and its delivery system being more effective and efficient (Khan, 2024)).

Policy and case studies for SDG 17

Goal #17 advocates partnerships through regional and international investments and support to ensure innovative technological development. Strategies include establishing multi-stakeholder platforms, promoting public-private partnerships, strengthening Nort-South, South-South and triangular cooperations, facilitating technology transfer and intellectual property rights, and investing in capacity building and knowledge sharing. Some of the partnerships and networks in Africa include; the African Continental Free Trade Area (AfCFTA) which seeks to promote integration and economic growth among the 54 African states that have so far signed the AfCFTA Agreement (Beyleveld and Sucker, 2023). The AU-EU partnerships adopted a joint Innovation Agenda, which aims to transform and increase the innovative capacities and achievements of researchers and innovators (BAHRKE, 2020). Africa-U.S. STEM University partnership is a joint initiative aimed at enhancing the capacity of African universities in STEM fields (Najib, 2022).

Policy recommendation and conclusions

Attaining the UN Agenda 2030 on SDGs, African Union Agenda 2063 and Science, Technology and Innovation Strategy (STISA2024-2033) require the transformative potential of STI. Artificial intelligence (AI) has played an important role globally, and particularly, in Africa. The case study policy framework for STI implementation in Africa on SDGs 1, 2, 13, 16, and 17, outlines strategies to leverage STI for sustainable development. Prioritizing poverty eradication, agricultural productivity, climate change mitigation, governance, and partnerships, the African countries can achieve inclusive growth and resilience. Successful implementation of SDGs requires political commitment, collaboration, and investment. However, the barriers hindering effective deployment of STI in Africa include poor infrastructure; inadequate policy frameworks, systems and processes; insufficient investment and development partnerships; and gaps in human capital which can be addressed by fostering collaboration between academia, industry, and government. Notwithstanding the challenges, there is overwhelming evidence that AI and drone technological applications, have the potential to dramatically transform the socio-economic development of African countries as well as globally. Africa member states need to advance in STI technologies for their socio-economic development. This includes improving the education systems using digital technology as well as robust research, development, leading to industrialization.

The recommendations for implementing the case study policy framework for STI in Africa on SDGs 1, 2, 13, 16, and 17 include establishing clear implementation mechanisms, allocating adequate resources, promoting policy coherence, monitoring progress, promoting cooperation, empowering local communities, promoting ethical innovation, building institutional capacity, and fostering partnerships for resource mobilization. These measures aim to accelerate SDGs' achievements, promote inclusive and resilient development in Africa.

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