

Workshop on Building Capacity and Exploring Resources to develop a Guidebook on STI for Sustainable Development Goals (SDGs) Roadmaps

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Chapter 5: Voluntary funding models on STI for the SDGs, STI Policy Instruments and Capacity Building in support of national implementation of the STI Roadmaps.

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1. Background: Voluntary funding models on Science Technology and Innovation (STI) are among the most suitable mechanisms to attain funding and implement programs that accelerate attainment of SDGs targets. In this regard, Rwanda National Council for Science and Technology (NCST) participated in the development of the United Nations (UN) Technology Facilitation Mechanism (TFM) to develop a Guidebook on STI for Sustainable Development Goals (SDGs) Roadmaps. This section specifically informs Chapter 5 of the Guidebook on Voluntary funding models on STI for the SDGs, STI Policy Instruments and Capacity Building in support of national implementation of the STI Roadmaps.

We draw our experience from several policy domains. These are based on Government of Rwanda's National vision 2050, Rwanda's STI Policy plan and its implementation, as well as national SDGs plans in the context of global, East African Community (EAC) and African Union (AU) goals and targets. The Government of Rwanda through its Vision 2050 aspires to become an upper-middle income economic by 2035 with GDP per capita of over USD 4,036, and a high-income country economy by 2050 with GDP per capita of over USD 12,476. Rwanda's goal is to achieve high quality and standards of living for her citizens ensuring that all citizens have increased opportunities that enable them to contribute to national development.

1. What are the most pressing financial barriers hindering STI progress towards achieving the SDGs, and how do these barriers vary across different SDGs and national contexts?

Context:

The most pressing barriers are unassociated with lack of or non-relevant African policies as most African countries have relevant and enabling policies that support funding STI for SDGs targets. For example, Rwanda's Vision 2050, National Strategy for Transformation-2 (NST-2) and STI Policy underscore Rwanda's vision to become a globally-competitive knowledge-based economy, with STI as a key driver of growth, competitiveness and achieving high quality of living.

In addition, the East African (EAC) STI Policy Mission is to harness STI for sustainable regional development, socio-economic transformation and global competitiveness. Furthermore, the Economic Community of West African States (ECOWAS) Policy on Science and Technology provides a strategy for better STI governance, faster economic and monetary unification and increased Public-Private Partnerships (PPPs). The policy goal is to support harmonization of investment in West African states to embrace modern technology, entrepreneurship and innovation, in order to boost production.

These policies are aligned with the AU AGENDA 2063 “The Africa we want” that emphasizes on application of STI to address socio-economic development through Science, Technology and Innovation Strategy for Africa 2024 (STISA 2024). The developed STI policy instruments further prioritize funding for research and experimental development (R&D) to develop technology and innovation suitable for African context, and well assigned to key priority areas of SDGs goals.

Key challenges and lessons learnt:

Critical competing national priorities hindering STI funding: *Most developing countries in Africa are faced with several pertinent national challenges that pose critical competing national priorities that hinder substantial STI funding and progress to achieve SDGs. Although STI performance indicators are informed by tracking financial and human resources devoted to (R&D), leading to increased R&D outputs and potential outcomes such as intellectual property (IP) rights, patent data, copy rights, trade marks, publication and other international trade in R&D-intensive industries, funding for R&D is below the AU recommendation for Gross domestic expenditure on R&D (GERD) of 1% of national GDP or R&D intensity. This results in most technology and innovation being developed from more affluent developed countries of Europe, US, China and some Asian countries.*

Insufficient funding for R&D and STI Programs: *Rwanda has witnessed slight increase in Gross Domestic Expenditure on R&D as % of national GDP from 0.69% (2018/19) to 0.79% (2022/23). Although Rwanda’s investment in R&D is still below the AU recommendation of 1% for African countries, it higher than most African countries but lower than that of Egypt, Tunisia, South Africa, among others. It should be noted that Africa invests around an average of 0.5% R&D intensity, while the global average is about 2% and for high income countries the average R&D intensity is approximately 3%. The low funding for R&D in most African countries is a barrier to attain SDGs targets, specifically SDGs Goal 9 on that seeks to build resilient infrastructure, promote sustainable industrialization and foster innovation. Thus, most African countries have a low ranking in Global Innovation Index (GII) that provides countries innovation capabilities.*

Insufficient and lack of private sector investment in R&D and STI program: *Various reports highlight low level of business and private sector R&D funding in Africa and low-income countries (below 30% of the total R&D funding in Africa) while in developed countries the business contribution is between 40% and 70%. Public spending by Governments is still the largest funder of R&D and STI programs in most African countries compared to European, US, China and Asian countries of South Korea, Japan, Singapore. This is due to low level of private sector capital investment in Africa as most industries are predominantly Small and Medium Enterprise (SMEs) with low capacity of national researchers, and modest institutional frameworks to access global grant funding for R&D and often deprived grant Management procedures. Thus, there is low research output, low technology and innovation growth as indicated by low IP, patents, trademarks, copyrights, industrial designs, publication outputs per year. Most developing African countries prioritize best practice spending on most crucial sectors with immediate demands. These include agriculture sector to address inadequate nutrition and food insecurity alleviate poverty in most rural impoverished areas of Africa.*

Lessons learnt from COVID-19 pandemic: *In recent years, most national expenditure priority has been funding for life saving interventions aligned to SDGs Goal 3 on Good Health and Well-being. Specifically, during COVID-19 pandemic, there was more national expenditure on health sector to address COVID-19 pandemic, and thereafter to build resilience to curtail and prevent the next epidemic and or pandemic.*

Some of the lesson learnt based on COVID-19 pandemic, in 2023 Rwanda established BioNTech for modular messenger ribonucleic acid (mRNA) vaccine manufacture facility in Kigali for COVID-19 vaccine. This facility aims to enhance high-tech manufacturing solution, capacity building, research capacity to promote sustainable vaccine production and end-to-end vaccine supply in Rwanda and other African states. A critical goal is also to establish a resilient vaccine ecosystem for future pandemic preparedness. The facility aims to become a lighthouse project for subsequent mRNA-based vaccine manufacturing facilities of smaller or larger scale to support clinical development or commercial-scale production in line with local or regional demand. BioNTech aims to progress the development of mRNA vaccine candidates for infectious diseases with high medical need, including vaccine candidates against tuberculosis, malaria, and HIV, as well as against infectious diseases with pandemic potential.

Effects of Climate Change: The effects of climate change and lack of resilient environment has often resulted in increased national expenditure demands upsetting funding for STI and SDGs programs. For example, the catastrophic effects of climate change in Rwanda in 2023 resulted in massive floods and landslides with devastating effects of loss of lives, physical damages and economic losses. As a result of floods and landslides in 2023, Rwanda needed over Frw 581 billion (USD 415 millions) to address physical damages and economic losses on infrastructure, food, shelter or temporary housings, and overall health and livelihoods.

Relying on External funding: Most of African countries and developing countries depend on external funding for STI programs, and this causes instability in funding flows that negatively impact on long-term priorities and commitment to local solution. This affect attainment of SDG Goal 1 on No poverty and SDG Goal 4 on improved Education, as well as attainment of SDG Goal 10 to reduce inequality, among others. In addition, the recent global crisis of wars, pandemics, natural disasters and financial crisis in most European, Middle East and several Western countries have resulted in fragmented funding for STI programs in Africa and beyond. Thus, funding from large partners for STI and SDGs such as Swedish International Development Cooperation Agency (SIDA), U.S. Agency for International Development (USAID), European Union funding for SDGs as well as International Development Research Centre (IDRC) is anticipated to continuously dwindle unless these global crises subside. Sub-Saharan Africa and least developed countries which often depend on external donor funding for the STI programs will continue to be largely affected by limited donor funding for STI to achieve SDGs.

Limited access to blended long-term financing: The use of public and philanthropist capital investment to address STI and SDGs through Philanthropist capital is often limited as most funding philanthropists are not willing to invest into large STI Projects and Programs that are considered long-term such as funding for energy sector or infrastructure and large-scale building ventures. For example, the Lake Kivu Methane Gas Extraction in Rwanda aimed at addressing SDG goal 7 on affordable and clean energy was initially solely funded by Rwanda Government until production was high and private sector entities were willing to invest in the project.

Fragmented, low and non-aligned financing mechanisms: In Africa, there is no unified instrument and mechanism for funding STI towards SDGs Agenda 2063: The Africa we want. The funding is fragmented across national budget, multilateral and multistakeholder. In most of the time the external funding is conditional. This fragmentation is as challenge and disproportionately affects Low- and middle-income countries and creates more disparity in economic development. Most financial institutions also offer vertical funding streams that target one issue or area such as HIV infection, malaria, Cancer, tuberculosis, and funding conditions are not flexible and non-broad to cover infrastructure like health centers and health posts to serve rural impoverished populations.

Recommendations for Public Private Partnership (PPP) funding for STI: Promotion of Academia-industry collaboration in STI funding to create incentives for private sector investment in STI is essential. This can be done through different innovative blended financing models and incentives for private companies to invest in competitive and sustainable innovations. This can contribute to achieve SDG 12 (Responsible consumption and production) which requires company to invest in renewable energy, environmentally friendly product such as green investment.

Rwanda's lesson on leveraging on unique strategic investment in STI programs: Rwanda continuous to make investments and achievements such as approval of STI policy in 2020, establishments of various STI and R&D performing institutions of Centers of Excellence (CoEs) at University of Rwanda (UR). The examples are African Center for Excellence in Internet of Things (ACEIoT), African Center for Excellence in Energy for Sustainable Development (ACE-ESD), African Center for Excellence in Data Science (ACEDS), African Centre of Excellence for Innovative Teaching and Learning Mathematics and Science (ACEITLMS), Regional Centre of Excellence in Biomedical Engineering and e-Health (CEBE), Regional Centre of Excellence for Vaccines, Immunization and Health Supply Chain (RCESCM), Center of Excellence in Biodiversity and Natural Resources Management (CoEB), Centre of Mental Health, and Centre of Geographical Information System (GIS) and Remote Sensing. In addition, Rwanda supports renown Universities and R&D institutions such as Carnegie Mellon University Africa (CMU-Africa), African Institute for Mathematical Sciences (AIMS-Rwanda), University of Global Health Equity (UGHE), and others. Furthermore, Rwanda launched National Research and Innovation Fund (NRIF) in 2018, a funding instrument for R&D; established Rwanda Innovation Fund (RIF) to support and boost innovations, and established Kigali Innovation City (KIC) with the aim of becoming regional innovation hub to accommodate world-class universities, R&D centers, technology companies, and innovation startups.

In 2013 Rwanda is among the countries that pioneered an Africa's homegrown Partnership for Skills in Applied Science, Engineering & Technology (PASET) to fund and develop human resources capacity for STI and R&D in Rwanda and Africa, and to offer MSc/PhD training through Regional Scholarship and Innovation Fund (RSIF). Moreover, Rwanda has established a technology center of excellence for industrial revolutions to enhance digitalization, R&D and advanced technological solutions as products and services in areas of emerging technologies such as Artificial Intelligence (AI), big data analytics, security and protection of critical infrastructure, as well Center for 4th Industrial revolution (C4IR).

More recently Rwanda established IRCAD Africa Center of excellence in minimally invasive surgery, and is developing capacities for surgeons in precision high tech surgery and other medical programs.