

On the Wings of Innovation

Science, Technology and Innovation for Africa

2024 STRATEGY

STISA-2024

April 2014



*“We shall accumulate machinery and establish steel works, iron foundries and factories; we shall link the various states of our Continent with communications; we shall astound the world with our hydroelectric power; we shall drain marshes and swamps, clear infested areas, feed the undernourished, and rid our people of parasites and disease. It is within the possibility of **science and technology** to make even the Sahara bloom into a vast field with verdant vegetation for agricultural and industrial developments”.*

President Kwame Nkrumah,
First speech at the foundation summit of the
Organization of African Unity,
Addis Ababa, 24 May 1963

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I Foreword

(To be written after the adoption of the STISA by head of states. Foreword from the AUC.)

II List of Acronyms

AAS	African Academy of Sciences
AAU	Association of African Universities
AfDB	African Development Bank
AIDA	Accelerated Industrial Development for Africa
AMCOST	African Ministerial Council on Science and Technology
AOSTI	African Observatory of Science Technology and Innovation
APF	African Program Fund
ASF	Africa Start-up Fund
ASTII	African Science, Technology and Innovation Indicators
ASRIC	African Scientific, Research and Innovation Council
AU	African Union
AUC	African Union Commission
ALC	African Laser Centre
AIMS	African Institute for Mathematical Sciences
ARIPO	African Regional Intellectual Property Organization
CAADP	Comprehensive African Agriculture Development Programme
CAMES	Conseil Africain et Malgache pour l'Enseignement Supérieur
CPA	AU Africa's Science and Technology Consolidated Plan of Action
EU	European Union
FARA	Forum for Agricultural Research in Africa
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
HEI	Higher Education Institute
ICT	Information and Communication Technologies
ICSU-ROA	International Council for Science - Regional Office for Africa
IPR	Intellectual Property Right
MDGs	Millennium Development Goals
M&E	Monitoring and Evaluation
NEPAD	New Partnership for Africa's Development
NPCA	NEPAD Planning and Coordinating Agency
NSTIH	NEPAD Science, Technology and Innovation Hub
OAPI	Organisation Africaine de la Propriété Intellectuelle
PAIPO	Pan African Intellectual Property Organization
PAU	Pan African University
PIDA	Programme for Infrastructure Development for Africa
PMPA	Pharmaceutical Manufacturing Plan for Africa
R&D	Research and Development
REC	Regional Economic Community

S&T	Science and Technology
STC	Specialized Technical Committee
STI	Science, Technology and Innovation
STISA	Science, Technology and Innovation Strategy for Africa
TVET	Technical Vocational Education and Training
UN	United Nations
UNECA	United Nations Economic Commission for Africa
UNESCO	United Nations Educational, Scientific and Cultural Organization

III Executive Summary

On the Wings of Innovation, the AU Science, Technology and Innovation Strategy for Africa 2024 (STISA-2024) places science, technology and innovation at the epicentre of Africa's social- economic development and growth.

The STISA-2024 has been developed during a crucial period when the African Union is developing an African Union 2063 Agenda. The STISA-2024 is therefore the first of the ten-year incremental phasing strategies to respond to the demand for science, technology and innovation from various impact sectors including agriculture, health, infrastructure development, mining, security, water, energy, and environment among others. The strategy is anchored on six distinct priority areas that contribute to the achievement of the AU vision. These priority areas are: Eradication of Hunger and Achieving Food Security; Prevention and Control of Diseases; Communication (Physical and Intellectual Mobility); Protection of our Space; Live Together- Build the Society; and Wealth Creation.

The strategy further defines four mutually reinforcing pillars which are prerequisite conditions for its success. These pillars include upgrading and/or building research infrastructure, enhancing technical and professional competencies, innovation and entrepreneurship, and providing an enabling environment for STI development in the African continent. Continental, regional and national programmes will be designed and implemented in sync to ensure that their strategic orientations and pillars, achieve the developmental impact.

The implementation of this strategy will take place at three levels. At the national level, Member States should domesticate this strategy in their National Development Plans. At the regional level, RECs, regional research institutions, networks and partners should utilize the strategy as reference in designing and coordinating initiatives. At the continental level, the African Union Commission (AUC), the NEPAD Agency and their partners should advocate and create awareness, mobilize necessary institutional, human and financial resources, track progress and monitor implementation.

Continental, regional and national targets and indicators will be defined to ensure regular evaluation of the programmes. AOSTI, ASRIC and NEPAD Agency shall put in place a harmonised mechanism that will support Member States and RECs to collect data and report on performance annually. The analysis of data, reports and progress reviews will constitute an important management tool of the entire system.

While there are conventional mechanisms for funding R&D and Innovation, it is essential to have efficient and effective financing mechanisms to implement the strategy. The AUC and NEPAD Agency shall mobilize resources for technical support in developing and implementing regional and national plans and priority programmes. AU

Member States and RECs will take a lead role in mobilizing public, private and donor resources for implementing national and regional programmes.

IV Vision of the African Union and Mission of STI

The African Union is committed to achieve its vision of “**An integrated, prosperous and peaceful Africa, an Africa driven and managed by its own citizens and representing a dynamic force in the international arena**” through its historical and long-term Agenda 2063.

The AU Agenda 2063 recognizes Science, Technology and Innovation as a multifunctional TOOL and enabler for achieving continental development goals. The Agenda emphasizes that Africa’s sustained growth, competitiveness and economic transformation will require investments in new technologies and innovations in areas such as education, health, agriculture, and clean energy.

The Science, Technology and Innovation Strategy for Africa -2024 (STISA-2024) shall contribute to the achievement of the AU Vision (Fig. 1). Due to the cross cutting nature of STI, STISA-2024 is designed to meet the knowledge, technology and innovation demands in various AU economic and social sector development frameworks. STISA-2024 shall play a lead role in bringing efficiency (and avoiding duplication) in the design and implementation of national, regional and African Union policies on STI.

The Mission of STISA-2024 is to “**Accelerate Africa’s transition to an innovation-led, Knowledge-based Economy**”. This will be achieved by:

- Improving the state of STI readiness in Africa in terms of infrastructure, technical and professional competence, and entrepreneurship development; and
- Implementing specific policies and programs in science, technology and innovation that address societal needs.

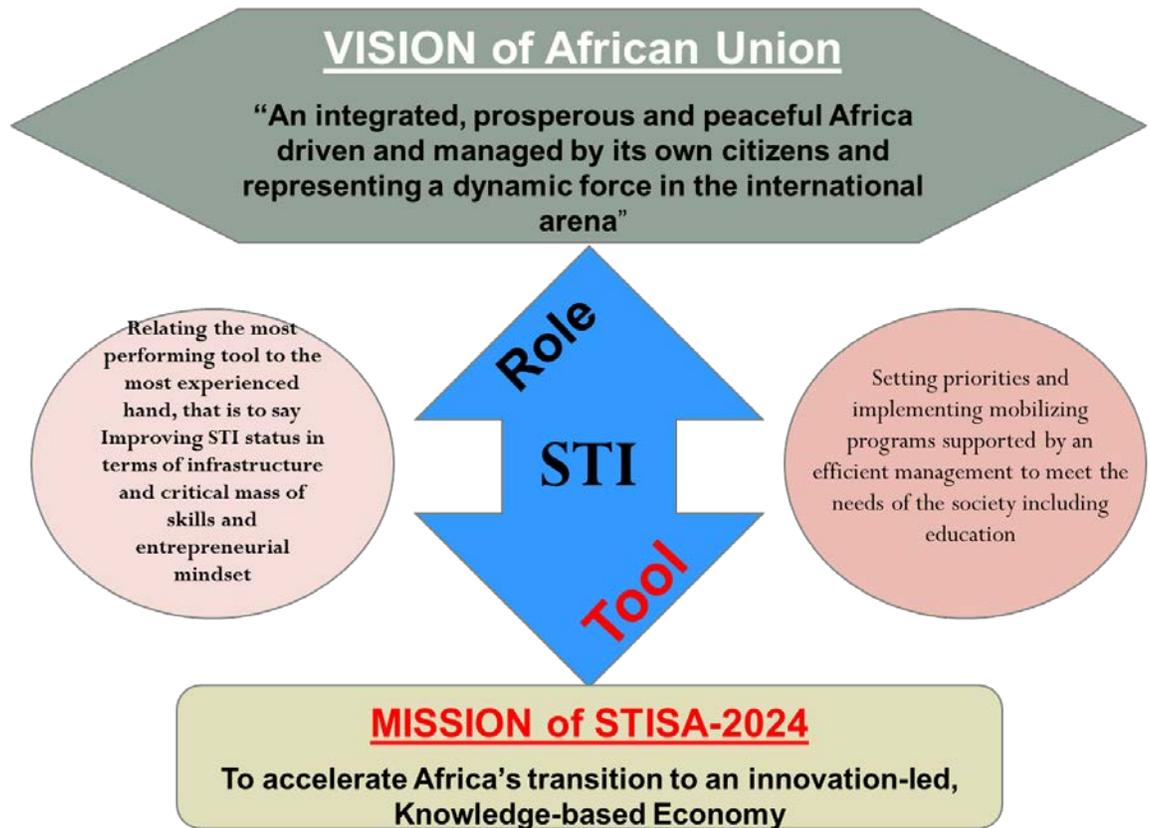


Fig. 1: The role of STI in achieving the vision of the African Union

Chapter 1: Introduction

1.1 Historical Background

African countries made a bold attempt to turn around their development fortunes by adopting in July 1979, the Monrovia Strategy and in April 1980, the Lagos Plan of Action (LPA) for the Economic Development of Africa [1980–2000] and the Final Act of Lagos. The LPA was a visionary, far-reaching and unprecedented blueprint on how to foster collective self-reliance and sustainable development of the continent. Subsequent attempts at charting Africa's development have drawn inspiration from that visionary framework.

Among many conferences that followed the Lagos plan of Action was CASTAFRICAII organized by UNESCO/OAU/ECA bringing together 26 African ministers and experts of Science and technology, for the purpose of developing strategies for the economic recovery of Africa. The adoption of the Abuja Treaty in 1994 on the establishment of an African Economic Community (AEC) for the economic integration of Africa constituted an important and forward looking act by the African Heads of State and Government. The transformation of OAU to AU in Lusaka, Zambia in July 2001 was envisioned to “build an integrated, prosperous and peaceful Africa, an Africa driven and managed by its own citizens and representing a dynamic force in the international arena”. It was also intended to accelerate the implementation of the Abuja Treaty, demonstrating a renewed commitment of African political leaders to the socio-economic advancement of the Continent.

The Constitutive Act of the AU made provisions for the following organs and Continental Institutions in accordance with the stipulations in the Abuja Treaty and the Sirte Declaration on the creation of the AU: The Assembly of the Union; The Executive Council; The Pan-African Parliament; The Court of Justice; The Permanent Representatives Committee (PRC); The Specialized Technical Committees (STCs); The Economic, Social and Cultural Council; two financial institutions, namely the Central Bank and the African Monetary Union and The Commission of the AU. The creation of AU was also associated with the adoption of the New Partnership for Africa's Development (NEPAD) at the July 2001 Summit in Lusaka. It also identified and established HRST as one of 8 technical departments of the African Union Commission with the mandate to advance science and technology education and human capital development in the continent.

The African Union Commission set-up a Conference of Ministers in charge of Science and Technology (AMCOST), to enable the Union periodically deliberate on science and technology issues in order to have a collective voice. The CPA was presented in 2005 as an instrument for the implementation of the decisions of the African Union Assembly of Heads of State and Government on science, technology and innovation since the first

Summit held July 2003 in Maputo, Mozambique. It was endorsed for immediate implementation in 2006 at the Khartoum Summit of the African Heads of State.

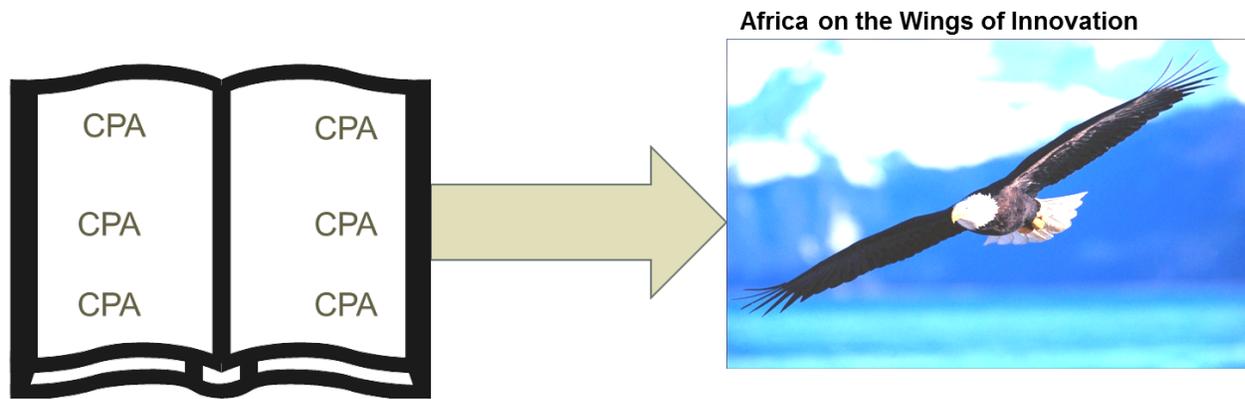
1.2 CPA Review outcome

The CPA was approved to be implemented within the following clustered key flagship research and development programmes: (1) **Cluster 1: Biodiversity, Biotechnology and Indigenous Knowledge:** Including (i) Conservation and Sustainable Use of Biodiversity; (ii) Safe Development and Application of Biotechnology; and (iii) Securing and Using Africa's Indigenous Knowledge Base; (2) **Cluster 2: Energy, Water and Desertification:** Including (i) Building a Sustainable Energy Base; (ii) Securing and Sustaining Water; and (iii) Combating Drought and Desertification; (3) **Cluster 3: Material Sciences, Manufacturing, Laser and Post-Harvest Technologies:** Including (i) Building Africa's Capacity for Material Sciences; (ii) Building engineering capacity for Manufacturing; (iii) Strengthening the African Laser Centre (ALC); and (iv) Technologies to Reduce Post harvest Food Loss; (4) **Cluster 4: Information and Communication Technologies:** Including (i) Information and Communication Technologies and (ii) Establishing the African Institute of Space Science; and (5) **Cluster 5: Mathematical Sciences:** including the next Einstein Initiative.

In order to ascertain the impact of the implementation of the CPA, strengthen the linkages with other AU and NEPAD development frameworks, boost investment, the CPA provided for a review to be conducted after five years of its implementation. The Bureau of the African Ministerial Conference on Science and Technology (AMCOST IV) resolved that the CPA review process should be conducted under the oversight of a High Level Panel of eminent scientists with support of a Working Group comprising representatives from the African Academy of Sciences, African Union Commission, NEPAD Agency, African Development Bank, ICSU, UNECA and UNESCO.

Significant achievements in the implementation of the CPA were realized in the following areas: (a) establishment of networks of excellence; (b) African Union Competitive Research Grants; (c) capacity development; and (d) improving policy conditions and building innovation mechanisms. Challenges were also encountered including (a) over-reliance on external financial support often targeting short-term activities and solutions, (b) limited scope of human and sustainable development; (c) inadequate linkage of the CPA to other continental frameworks and strategies.

The High Level Panel recommended and developed the African Union STI Strategy as a successor of the CPA taking into account the findings of the CPA review (Fig. 2) and the current development trends on the continent. In drafting the STISA-2024, one of the steps taken by the Working Group was to bring into the process wider consultations and perspectives including from the government, academia, industry and civil society, RECs, AMCOST and other regional and international forums. The achievements and the lessons learnt from implementing the CPA (Annex 1) were used as a basis to build the current strategy.



A (consolidated) Plan of Action

- Strategic Pillars of the CPA:
 - Capacity building
 - Knowledge production
 - Technological innovation
 (incorporated in pillars of STISA-2024)
- 5 flagship R&D program clusters
 (To be transformed into Mobilizing Programmes of STISA-2024)

A strategy

- Builds on the experience from CPA
- Part of the Agenda 2063 from which it is the first out of five ten-year phase
- Places STI at the epicenter of Africa’s social and economic development and Respond to the demand for STI from various impact sectors

Fig. 2: Moving from the STI plan to the STI strategy

1.3 Situational Analysis

The implementation of the CPA over the last years has influenced the role that science, technology and innovation play in Africa’s socio-economic development. These influences were translated at various levels of policy making processes into policy instruments to achieve transformative and emancipatory goals by means of institutions building and programmes implementation. The situational analysis builds on evidence generated by the surveys conducted on Science, Technology and Innovation Policy-making in Africa: An Assessment of Capacity Needs and Priorities¹, and the environment scan which supported the review of the CPA. The situational analysis of STI in Africa is described below.

- a) **Increased recognition by African leadership and the public of the critical role that STI plays in economic growth and human development.** Recent political, policy statements and instruments underscore the need for increased investment in STI to achieve socio-economic growth, reduce poverty, fight diseases such as HIV/AIDS and tuberculosis, and stem environment degradation. This is evidenced by the launch of a number of regional networks as implementation mechanisms for the CPA R&D flagship programmes in the areas of biosciences, biotechnology,

¹ AOSTI (2013), Science, Technology and Innovation Policy-making in Africa: An Assessment of Capacity Needs and Priorities, AOSTI Working Papers No. 2

biosafety, laser technology, mathematical sciences, water and energy as well as those programmes related to measurements of STI support to evidence based policy making.

- b) ***Insufficient funding for STI.*** Recent statistics from UNESCO and ASTII show that Africa is the continent that invests least in R&D and more than half of investment is from abroad. STI activities rely on short-term project funding and often linked to events such as workshops and consultancies and therefore most initiative are found not sustainable. Important aspects of STI policy development such as monitoring and evaluation are not budgeted for and thus not resourced in most Member States. By and large, this reflects the gap in reaching the target of 1% of the GDP agreed by AU Member States as Gross Domestic Expenditures on R&D..
- c) ***Organisational capacity by entities responsible for STI policy making.*** Most of the entities in charge of STI policy making have operated in isolation from the rest of other policy agencies and continue to have weak links to academic institutions and private sector. They are also not adequately linked to international and the few African think tanks in policy research. In these circumstances, these entities are not able to easily access empirical material and recent knowledge in STI policy-making. Ignoring inter-sectoral linkages and policy mixes make the impact study less reliable.
- d) ***Infrastructure to support innovation.*** Readiness to support innovation and to facilitate competitive business activities require infrastructure such as broadband Internet access, basic telecommunication services, reliable electricity supply, water, good transportation networks, laboratories facilities, and tax systems aligned to support innovation in the private sector, to name a few. The AU Programme on Infrastructure Development for Africa (PIDA) revealed different level of infrastructure readiness to support innovation in African economies. It is also reflected in the low score by Africa In many of the major classifications or indices such as the world's leading universities, competitiveness index, etc..
- e) ***Inadequate Expertise on STI policy development.*** Many of the officials involved in or required to be in charge of drafting policy documents are not sufficiently versed with or trained in STI policy and have no experience in evidence based policy making. Moreover, in most countries, entities in charge of STI policy do not have libraries or their staffs do not have easy access to sources of relevant information for policy-making purposes. There is a very limited evidence-based policy development in African countries.
- f) ***Emergence of African civil society organisations and think tanks dedicated to raise awareness of STI.*** Civil society organisations and think-tanks are championing the use of African traditional system as a support to sustained economic growth, public attitudes and understanding of science. They also contribute to STI policy debate in biosafety, climate change, biodiversity and

environment regulation, ICT to name a few. However, the debates are not supported by evidence.

- g) **Bilateral and multilateral cooperation.** Bilateral and multilateral partnerships have shaped STI development in Africa for example the European Union–Africa Joint Strategy, the India–Africa science and technology initiatives and the China–Africa Science and Technology Partnership. However, most of these interventions and cooperation mechanisms are not adequately evaluated to promote ownership, accountability and sustainability.
- h) **Scientific Output.** Africa is registering an increased number of scientific publications as well as acquisition of capital goods. Tunisia's number of scientific publications, for example, increased from about 300 to 3000 between 1990 and 2010 while the number of scientific papers published by Uganda increased by more than 1,200% during the same period. In terms of capital goods imports, about 18 African countries have seen a fourfold increase in imports of capital goods between 2000 and 2011. Steady investment in science and technology, expansion of R&D institutions and political support may account for this surge in technology acquisition and number of papers published.

1.4 Rationale

The STISA-2024 is developed during an important period when the African Union is simultaneously developing an African Union 2063 Agenda. The Agenda 2063 recognizes Science, Technology and Innovation as one of the major drivers and enablers for achieving development goals of the African Union and its Member States. The Agenda articulates that Africa's sustained growth, competitiveness and economic transformation will require investments in new technologies and innovations including in the areas of education, health and bio-sciences, agriculture, and clean energy. The Agenda also highlights the need to curb brain drain and retain high calibre and critical mass of individuals who excel in science, research and technology.

The focus of the STISA-2024 is to address the aspirations that are identified under the Agenda 2063 (Annex 2) and to link the achievements realized under the CPA implementation and the current and future opportunities in recognising STI development in the African continent. STISA-2024 is a short term strategy (1st decade incremental strategy) that is designed to address Africa's challenges with the ultimate goal of contributing significantly to the AU vision (Fig. 3). STISA-2024 responds to the demand for science, technology and innovation from various impact sectors including agriculture, health, infrastructure, mining, security, water, energy, and environment among others. Each of the anticipated five 10 year strategies will represent a milestone of a journey towards 2063 which will be evaluated at the end of its life span and based on the needs of the continent. Another set milestones will be planned for the subsequent 10 year period as we move towards 2063.



Fig. 3: Timing of the STI strategy within Agenda 2063

Chapter 2: Strategic Orientation

2.1 Priority Areas

This strategy is designed to respond to the need of transforming Africa into a knowledge based and innovation led society. This response is tailored along the various priorities that have been identified for the continent and contained in the AU sectorial frameworks and also reflects an AU Vision. The priority action areas have been developed by stakeholders of the research systems in impact areas including agriculture and food security, information and communication technologies, public health, and human studies, natural resources, biosciences, trade, governance and African integration – as a basis for African renaissance.

It is envisaged that the joint implementation of these priorities areas outlined below is a pathway to building an integrated and prosperous Africa where citizens are assured of; sufficient and quality food, good health, efficient communication systems, sustainable environment for future generation and peaceful communities.

Priority 1: Eradication of hunger and achieving food security

To alleviate poverty and spur social and economic transformation on the continent, the African Union pays a special attention to the development of Rural Economy and Agriculture. Statistics show that 239 million African do not have enough food to meet their basic nutritional needs, and also that 30% to 40% of children population under the edge of 5 years continue to suffer from chronic under-nutrition as result of food

insecurity². In view of this fact, the Heads of State and Government of African Union Member States, together with representatives of international organizations, civil society organizations, private sector, cooperatives, farmers, youths, academia and other partners unanimously adopted a Declaration to end hunger in Africa by 2025, in Addis Ababa in January 2013.

In this regard, Africa is required to build its response capacities and capabilities, to deal with emerging challenges, such as low commodity yields, climate change and variability, water and land management, and increasing price volatility in global markets which could undermine and scuffle its efforts to eradicate hunger and achieve food and nutrition security. Processing, conservation and distribution of agricultural products go far beyond the framework of rural and agricultural development sectors but requires a concerted intervention of STI.

Priority 2: Prevention and control of diseases

Every year millions of Africans are dying of diseases that are preventable and treatable; as a result of weak and fragmented health systems; inadequate resources for scaling up proven interventions; limited access to the health services and technologies; poor management of human resources; and extreme poverty. African countries will not develop economically and socially without substantial improvements in the health of their people.

The 2013 Abuja special Summit on HIV/AIDS, Tuberculosis, and Malaria highlighted the need to utilize/build on our research capacities to produce new and effective medicines, diagnostic tools, vector control tools and vaccines, and to promote research, invention and innovation in traditional medicine and strengthen health systems, taking into account the socio-cultural and environmental situation of the people.

In addition, the AU and its Member States need to establish and strengthen coordination within the health sector and among other sectors contributing to the development of science and technology as well as to build governance structures in order to promote ethics and increase public trust in research. This will require a collaborative effort among various actors to promote and implement key policies and programmes on primary health care, prevention and control of diseases.

Priority 3: Communication (Physical & Intellectual Mobility)

Africa is investing heavily in infrastructural development projects guided by the AU Programme on Infrastructure Development for Africa (PIDA). The development of a major infrastructure project needs to be supported by a sustainable knowledge system. While most of this knowledge has traditionally come from outside the continent, it is important for African institutions to build strong and sustainable knowledge production systems around the major physical and digital infrastructure programmes. Physical

²State of food insecurity in the world, FAO, 2013

communication is envisioned in terms of land, air, river and maritime routes and equipment, infrastructure and energy while ICT is referred as intellectual communications (Table 1).

Priority 4: Protection of our space

Monitoring and benefiting from Africa's abundant mineral and other natural resources, including biodiversity and associated indigenous knowledge, have high potential to contribute to the welfare of the people needs a robust space observation system. However, there is a huge gap in terms of the requisite infrastructure and suitably qualified human resource at all levels to fully realize the benefits that would accrue from these untapped resources.

Space Sciences presents a unique opportunity for cooperation and sharing of enabling infrastructure (including data) in proactively managing, among others, disease outbreaks; our natural resources and the environment; our response to natural hazards and disasters; weather forecasting (meteorology); climate change mitigation and adaptation; our agriculture and food security; peacekeeping missions and conflicts. Space derived services (earth observation, space observation, telecommunication, navigation and positioning) are critical to the economic development of the continent.

Priority 5: Live together – build the society

Live together in peace is becoming more and more a main challenge for Africans on the continent. In few years, Africa will have more than hundred (100) mega cities with more than one million habitants. Democracy and integration related issues are solved through the knowledge of African shared value to build the community.

Africa is building skills in governance as many African countries are reorganizing their state structures to make them more entrepreneurial so that government can be responsive to the needs of the people and act as a champion of innovation. STI will help strengthen the capacity of AU Member States to build necessary infrastructure, to train future generations of leaders, businesspeople, and scientists, and to generate and use science and innovation advice for economic development. This will involve a mix of disciplines including social sciences, humanities, and natural sciences and also fields as much important as African integration, human and social sciences which are looking for research outputs.

Priority 6: Wealth creation

Africa's greatest wealth for the continent development is obviously its human resource. The human resource that will lead Africa must be prepared through a better training which will certainly require innovations in training and technology acquisition. There is therefore the need to build creativity and innovation technology to locally process the

continent’s abundant natural resources in order to create more wealth and jobs for the youth on the continent.

This priority seeks to develop internal capacities, spur the co-creation, development and marketing of new or improved products and services through engagement with end-user communities, with the goal of creating new opportunities for value-added employment by adapting and commercializing the outputs of national and regional Innovation across Africa. Conducive political and financial environment is a must to strengthening creativity and technological innovation to trigger entrepreneurship by in new areas such as nanotechnology.

Table 1: Summary of STISA-2024 priority areas

P R I O R I T I E S		Research and/or innovation areas
1	Eradicate Hunger and Ensure Food & Nutrition Security	-Agriculture / Agronomy in terms of cultivation technique, seeds, soil and climate -Industrial chain in terms of conservation and/or transformation and distribution infrastructure and techniques
2	Prevent and Control Diseases and ensure well-being	-Better understanding of endemic diseases . HIV/AIDS, Malaria, Hemoglobinopathie -Maternal and Child health -Traditional Medicine
3	Communication	- Physical communications in terms of land, air, river and maritime routes equipment and infrastructure and energy. - Promoting local material - Intellectual communications in terms of ICT
4	Protect our space	- Environmental Protection including climate change studies - Biodiversity and Atmospheric Physics - Spatial, maritime and sub-maritime exploration - Knowledge of the water cycle and river systems as well as River basin management.
5	Live together – build the community	- Citizenship, History and Shared values - Pan Africanism and Regional Integration - Governance and Democracy, City Management, Mobility - Urban Hydrology and Hydraulics
6	Create Wealth	- Education and Human resource development - Exploitation and management of Mineral resources, Forests, Aquatics, marines etc. - Management of water resources

2.2 Strategic Objectives

- a) Enhance effectiveness of science, technology and innovation (STI) in addressing/implementing priority areas.
- b) Improve technical competencies and institutional capacity for STI development

- c) Promote economic competitiveness through fostering Innovation, Value Addition and Industrial Development /Entrepreneurship
- d) Protect knowledge production (inventions, and indigenous knowledge, etc) by strengthening Intellectual Property (IP) and regulatory regimes at all levels
- e) Facilitate STI policy reforms, harmonization, science diplomacy and Resources Mobilisation

2.3 Development of flagship programs

STISA 2024 strategy will be built on the successes and lessons learned from the implementation of the CPA. At the centre of the strategy Flagship programmes that effectively address the six priority areas will be developed and implemented. Furthermore the existing CPA R&D programmes will be streamlined to respond to the implementation of the strategy. According to the implementation phases of this strategy, flagship programmes and projects will be developed periodically by the scientific community through the African, Scientific, Research and Innovation Council (ASRIC), while recognizing a need to ensure incremental growth and sustainability of the established programmes to respond to long term STI goals in the African continent.

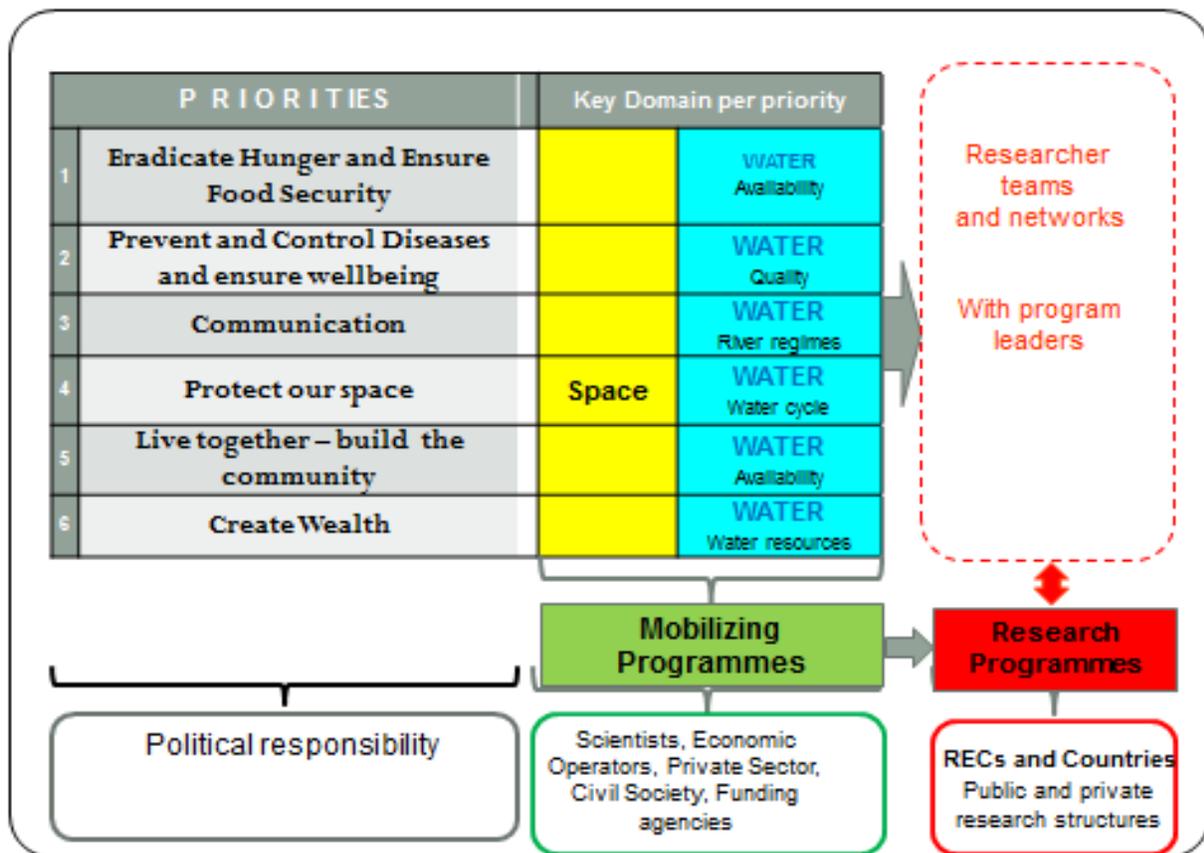


Fig. 4:..Example of Mobilising Programmes on Water

In fig. 4, Water, without which no life is possible, is needed to alleviate hunger, to prevent diseases and to ensure well-being as well as physical communication, construction of a city and safety of our space. It constitutes a typical example of a major field or key domain. Its importance will require setting up of flagship programmes such as those dealing with the knowledge of processes required to control hydrological cycles and types of common water reservoirs or rivers in different regions of the continent. A similar analogy applies to other key domains such as energy, space and agriculture.

Using the image of a bicycle wheel, a lead program will serve as the hub that supports many spokes which are the various programs developed at different levels including RECs, Member States and laboratories. Similarly through its priorities, flagship programs will be developed for STISA-2024.

Accordingly, this Strategy is indicative. It provides guidance on the types of instruments and measures that are needed. It can be used as a model for national and regional STI Strategic Plans. And, it recognizes that implementation is the responsibility of the national governments and, where applicable, the RECs.

2.4 Implementation Phases of the Strategy

STISA-2024 is a ten year strategy which rolling out will be accomplished along the following phases (fig. 5):

Phase 1: 2014: Institutional Setting: This includes putting in place required institutions at national, regional and continental levels through undertaking comprehensive stakeholder consultations, and launching of communication campaign of the strategy to garner buy in and support from every stakeholders. This will also facilitate the integration of the strategy in national and regional STI processes. The development of this phase will mainly be the responsibility of the African Union Commission.

Phase 2: 2015-2017: Development and Implementation of the first Set of flagship Programs. Three year programs will be elaborated, adopted and implemented. flagship programmes will build on past or on-going program at national and regional levels. The NEPAD Centres of Excellence, and /or other networks will be transformed/appointed to coordinate implementation of these programs in order to effectively co-ordinate sectoral areas of priority. Development of flagship programs will be co-ordinated through ASRIC to ensure broader co-ordination with other continental priorities using STI as a catalyst to address sectoral priorities and challenges.

Phase 3: 2018-2020: As in phase two, the second set of flagship programs will be elaborated, implemented and evaluated.

Phase 4: 2021-2023: As in phase three, the third set of flagship programs will be elaborated, implemented and evaluated.

Phase 5: 2024: Final evaluation of the strategy, lessons learned and responses to various priorities will guide the adoption of milestones for the next strategic plan.



Fig. 5: Detailed timing of STISA 2024

Chapter 3: Pillars

The implementation of the strategy requires a minimum set of requisite infrastructure, human resource with necessary skills and an enabling environment for the achievement of a knowledge based economy. The strategic priorities mentioned in the previous chapter require specific efforts from Member States for the implementation of the derived flagship programs. African Union countries and regions are at different stage of readiness in terms of infrastructural, human and organizational capacity to properly undertake STI activities. Therefore, to implement the STISA-2024 in the identified six priority areas, appropriate support will be provided to African countries in building their capacity to implement envisaged national STI priorities plans.

This chapter outlines necessary or essential actions that will be implemented to improve the level of STI readiness of member states.

Monitoring will be undertaken to assess progress in STI readiness of the Member States and RECs and ascertain their participation in the continental flagship programs.

In line with this, after taking stock in every Member State and with the support of RECs, upgrade programmes will be defined to regional or national plans in order to achieve required critical mass to undertake a coherent and especially efficient STI activity.

3.1 Infrastructure Development

The development of science, technology and innovation in Africa requires the upgrading of science laboratories and the establishment of world class STI infrastructure. This includes research facilities such as teaching labs, engineering labs, clinical trials and teaching hospitals, ICT infrastructure and equipment, innovation spaces, living labs, technology and prototyping centres etc. Existing physical and digital infrastructure and resources will be leveraged and networked to save cost of maintenance and increase utilization efficiency at the regional level. National Research and Education Networks (NRENs) will facilitate coordinated collaboration by education and research institutions with Innovation Spaces and Living Labs, thus strengthening the support available to entrepreneurs and other innovators. Engineering applications will be used to develop and maintain scientific equipment that would allow the conduct of good science. This will require partnerships between scientists and engineers in order to provide solutions for producing scientific equipment, and research and inventive genius led products. In sum, to develop infrastructure, a human capital base must be trained with the necessary competencies and capabilities to plan, organise, lead, coordinate and ultimately ensure that systems and resources are in place for implementation. This is evident when considering the repercussions of building competences of engineers and science, technology and engineering (STE) professionals. Governments will need to make the necessary steps to ensure this enabling environment exist towards building research innovations.

3.2 Technical Competence

In order for Africa to realise the full potential of Science, Technology and Innovation to support sustainable economic growth and development, it is firstly, necessary for Member States to increase their output and the expansion of doctoral education to improve Africa's competitiveness in global research and innovation. Secondly, It is necessary for Member States to establish a coordinated approach to creating the necessary critical mass of scientists, and computer engineers. The focus on human capital development will be at both secondary and higher education levels (including TVETs) with the aim of popularising science, technology, innovation and ICT research as potential career paths. The targets of these efforts are to increase the number of Africans trained in STI, significantly enhance research output at national and regional level and promote the expansion of research-intensive HEIs, TVETs and research centres (especially multi-stakeholder Centres of Excellence) on the continent. STI management should be considered as a full job, hence given the deserved attention in terms of human resource training and working conditions and resources. These measures are critical to the enhancement of technical competence on STI in Africa.

3.3 Entrepreneurship Development

Collaborative Innovation and Entrepreneurship are essential to achieving the Knowledge Economy and sustainable socio-economic development. Therefore increased networking and collaboration between researchers and private sectors is necessary to ensure commercialization of research outputs. One of the prerequisites to the successful implementation of the strategy is the commitment of Member States and RECs to valorise results of research. Such commitment will bring ownership, utilization of research outputs and technology acquisition for bettering the socio-economic situation of the continent. Technology transfer and commercialization efforts will target the development of those critical innovation systems needed to spur the development and marketing of new products, services, processes, business models and policies which will result in better public services, the creation of new economic sectors, wider employment opportunities in the formal economy and commercialization of technologies with regional relevance and global potential.

3.4 Enabling Environment

An overall enabling environment for STI must be created by Members States and RECs to achieve the priorities identified in the strategy. The creation of such an environment involves Member States, RECs and the AU having evidence based policies and programmes that encourage STI development. Every Member State requires a coherent national framework for actions that directly affect the promotion of STI.

National STI programmes should be developed by governments in consultation with all national and regional innovation stakeholders including public, private, education and research. Enabling environment would also imply building a science culture and

strengthening IP and regulatory systems. In this regards, policies will be developed and implemented to initiate and promote a movement for science culture across gender to eliminate many inhibiting prejudices.

In addition, appropriate functional legal and regulatory systems that enable science, technology and innovation will be put in place at the national and regional levels to promote the effective use of the IP systems as well as set intellectual property standards that reflect the needs of the African Union Member States.

Chapter 4: Governance and implementation arrangements

The success achieved when implementing STI policy primarily depends on the suitability of the chosen institutional arrangement and the institutions involved. Fig.6 provides an overarching arrangement of the different structures involved in the STISA processes. The most relevant stakeholders/actors include the following:

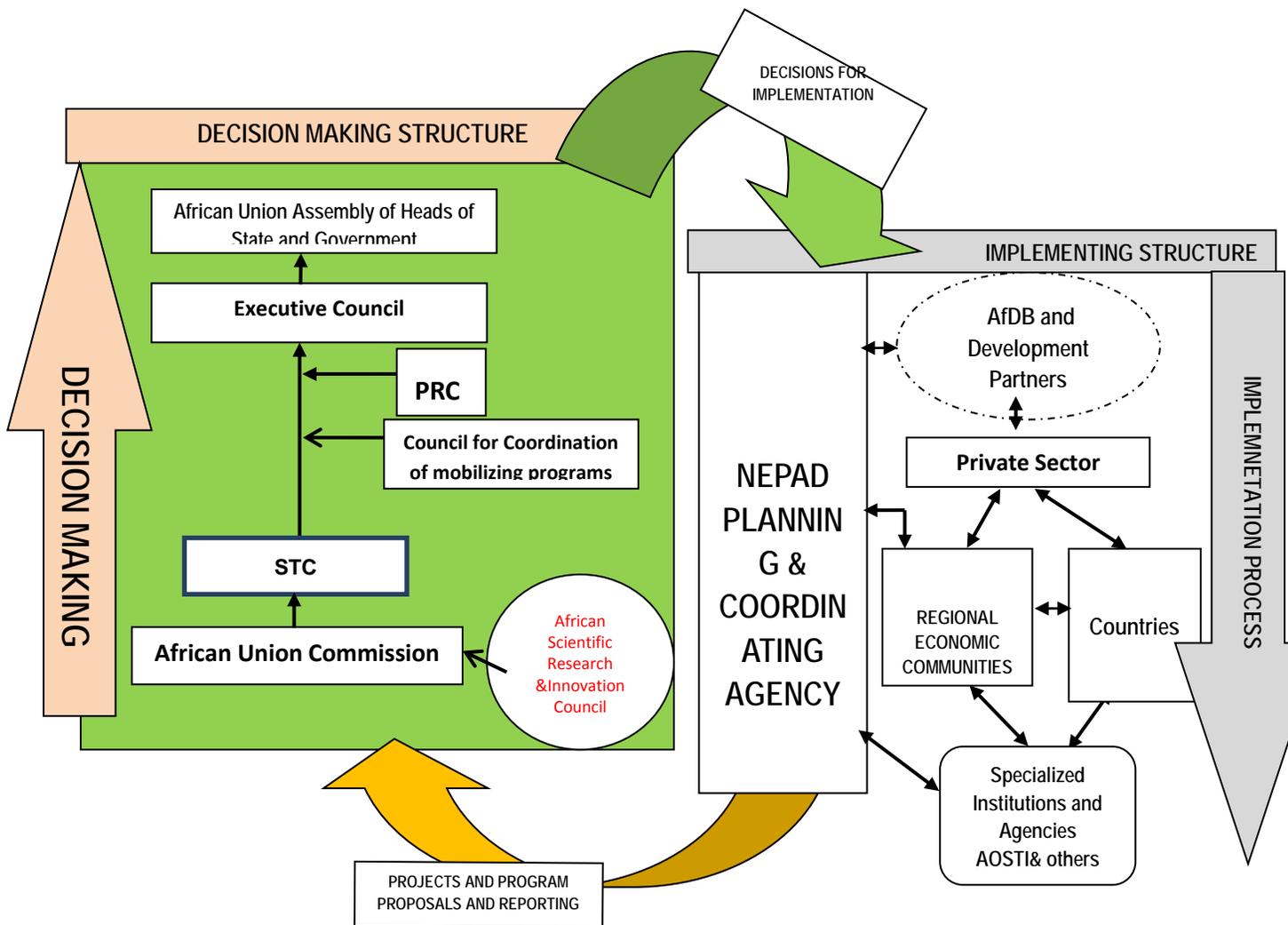


Fig.6 : Overview of Institutional Architecture for implementation of STISA-2024

4.1 Decision making institutions

- **African Head of State and Government:** They will support the STISA-2024 Strategy and also adopt its priorities. Heads of State and Government will champion and popularize the integration of STISA-2024 in the national, regional and continental

development programmes and frameworks. To strengthen and champion STISA-2024 at the continental level, it is important that a high level Support Committee composed of at least six Heads of State and Government supported by high level scientists from Africa or the Diaspora be formed to serve as STI ambassadors. From time to time, the Support Committee may invite eminent persons from the public, private, education and research, and funding sectors based on their expertise and complementary commitment without any form of discrimination to contribute to the activities of the Committee.

- **Executive Council:** The Executive Council will adopt the key domains of the strategy as well as the flagship programs. They will deliberate on the programs based on the follow-up reports every three years.
- **Ministerial Conference for Coordination and Harmonization of Flagship Programs:** To take into account the STI demand from all sectors, it is necessary to create over and above the current Conference of Ministers of the African Union, a coordination body responsible for examining the key sectors and flagship programs for the entire continent in order to harmonize them. This body will be chaired by the President of the STC on education science and technology and its membership will comprise all the chairs (with or without) the vice –chairs of all the other STC. This council will use the ASRIC-STRC as its main tool and could meet once, every two or three years.
- **Specialized Technical Committee (STC) in charge of Education and Science and Technology:** The African Union Specialized Technical Committee (STC) in charge of Education and Science and technology will serve as a technical committee to advise the AU Heads of State and Government on Science, Technology and Innovation matters. The Ministerial Conference segment on STI will be composed of all Ministers in charge of STI in AU member States. The STC is responsible for establishing policies, strategic priorities and coherent, coordinated approaches for developing and implementing strategies for STI. The STC will exercise policy oversight and mobilize resources in the implementation of STISA-2024.
- **African Union Commission:** The African Union Commission as the AU secretariat shall be responsible for providing political and policy leadership for implementation of this Strategy. Its specific roles will include: (a) convening meetings of the STC and ensuring that resolutions of such meetings are transmitted to the AU summits (b) initiating policy processes that are aimed at addressing specific science, technology and innovation issues (c) leading delegations to international processes and negotiations on science, technology and innovation issues (d) providing a focal point for liaising with the United Nations agencies, it's conventions and related scientific bodies on matters pertaining to policy, (e) convening annual partnership platforms and (f) creating various advocacy schemes for promoting science, technology, innovation and ICT.

4.2 Implementing institutions

- **Member States:** Member States will mobilize funds, active participation and contribution of public, private, education and research, societal and funding sector stakeholders to implement the various initiatives emanating from this Strategy.
- **Regional Economic Communities:** RECs will mobilize funding and align regional STI and ICT plans to this STI Strategy by integrating the Strategy in other sectoral development plans and coordinating programme implementation at regional level. They will also coordinate with the AUC and NEPAD Agency in implementation of the STI Strategy and submit implementation status reports bi-annually to the AMCOST.
- **NEPAD Agency:** The NEPAD Agency, through its Science, Technology and Innovation Hub (NSTIH), shall support the technical implementation of the program and in resource mobilization. Its specific roles will include: (a) mobilizing and directing technical expertise, including regional and continental networks of centres of excellence to implement the programmes and projects established during the implementation of this Strategy; (b) mobilizing financial resources for the provision of technical support to implement strategic programmes; (c) providing support to ASRIC-STRC in the development of national and regional strategies and action plans; (d) providing technical support to AU Commission's policy processes and activities.

Bodies under the African Union Commission

- **African Scientific Research and Innovation Council (ASRIC):** The African Research and Innovation Council is yet to be created. It will be an operational unit of the Ministerial Conference for Coordination of Flagship Programs and will be responsible of developing key areas and flagship programs. It will support RECs and Member States with its expertise.

In order to make ASRIC less burdened, it will not be a permanent organ. It will meet every six months or every year depending on its regulations. The STRC, which is an existing Specialize technical Office, will serve as the secretariat of ASRIC. On request from the African Union Commission (HRST Department), ASRIC-STRC can establish experts' commissions to deliberate on the flagship program.

- **STRC:** As the secretariat of ASRIC, the STRC will also be responsible for the inventory of research institutions, plans, programs, and others belonging to the African Union and to present a mapping to establish a harmonization policy. ASRIC will submit an inception report through the AUC (HRST) to the Ministerial Conference for Coordination and Harmonization of Flagship Programs.
- **African Observatory of Science Technology and Innovation:** AOSTI is a specialized Technical Office of the African Union. It is mandated to serve as the

continental repository for STI statistics and a source of policy analysis. It shall liaise with RECs and Member States in the implementation of measurement of STI programmes.

- **Pan-African University:** PAU is the pilot organ of the AUC for university research. Its five institutes that will support at least ten centers each were established based on thematic that largely include response to the demand for STI on the continent. Its research programs will be systematically based on STISA-2024 problems.
- **PAIPO:** Creation of PAIPO is currently in progress as a body that will deal with intellectual and industrial property (patents). It will be like other existing structures commissioned to implement the AU policy in the field of Intellectual Property. It will ensure dissemination of patent information and technical and financial support to invention, innovation and the promotion of research results.
- **African Development Bank (AfDB):** AfDB undertakes specific programs on STI and like the other partners, synergy and complementarity will be best achieved when such programs are aligned to the continental strategy.
- **Development Partners:** Similarly, international, continental and national development partner institutions, including civil society and the media will support the implementation of the STI Strategy at all levels by aligning their programmes and providing financial and technical assistance to the goals of the this Strategy. They will also play an important role in popularizing the importance of innovation in Africa's development.
- **Regional and International Research Institutions:** These institutions with regional or international mandate to perform research are encouraged to align their priorities to the strategy. They include but not limited to: CAMES, AAS, AAU, OAPI, ARIPO etc. They will provide technical support to the implementation of the strategy.
- **Private Sector:** The private sector will work closely with academia, R&D institutions and development agencies boost value added chain, technology transfer and to support building the necessary capacities and technical competencies required to achieve the objectives of the Strategy.

4.3 Implementation mechanisms

The strategy will be implemented at continental, regional and national levels. At each of these levels, programs will be designed, elaborated, implemented, communicated and evaluated. Member States will provide leadership to garner active participation and contribution of public, private, education and research, societal and funding sector stakeholders to design and implement the various flagship programs and initiatives resulting from STISA-2024 (table 2). RECs and AU Member States will also coordinate

with the AUC and NEPAD Agency in implementing the STI Strategy and submitting implementation status reports bi-annually to the STC on education science and technology.

International and continental development partner institutions (AfDB and UNECA) and other stakeholders, including civil society and the media will support the implementation of STISA-2024 by developing and/or aligning their programmes and providing financial and technical assistance. They will also play an important role in popularizing the importance of innovation in Africa's development.

The private sector will work closely with governments, academia, R&D institutions and development agencies to support building the necessary capacities and technical competencies required for Member States, RECs and other continental organizations to reach the requirement for meaningful contribution towards addressing the priorities set forth in this Strategy.

Table 1: Institutional Architecture for Implementation of STISA 2024

Institutions		Priority	Key domain	Flagship or collaborative programs	Regional or national program	Implementation
Assembly		Adoption				
Executive council			Adoption			
Ministers	Other sectoral ministers Conference		Harmonisation and Consolidation			
	AMCOST			Coordination		
African Union Commission			Overseeing implementation			
	ASRIC			Development conception		
	AOSTI				Monitoring of implementation	
	Others organs PAU, PAIPO					Implementation
NEPAD Planning & Coordinating Agency			Support Technical implementation and resource mobilization			
R.E.C.s					Adoption and monitoring	Implementation
Member states	State organs				Funding	Implementation

	Private sector					Implementation
International private sector						Implementation
AfDB and Others				Funding		
Development partners				Advisory, Funding, Implementation		

4.4 International Cooperation

In view of the importance of cooperation in repositioning STI in Africa, a number of partnership between Africa and other continents or countries exist and are managed within the African Union Commission. Cooperation in STI among African countries and bilateral between African countries and other countries in the world are also on the rise. STISA will promote mutually beneficial north–south and south-south cooperation to achieve its ambitious goals. This requires concerted efforts among all the actors involved (scientists, member states, RECS and African Union Commission etc.) so as to ensure that cooperation is anchored on the African priorities as indicated in this strategy.

STISA-2024 will seek to strengthen, widen and nurture effective partnerships that complement the African research infrastructure. It will endeavour to achieve scientific excellence, improved competitiveness and innovation through cooperation between researchers including the African Diaspora and industry and maximize the African participation in competitive research framework such as the Horizon 2020 on the basis of African research agenda.

Intra African and international cooperation will be revitalized both at bilateral and multilateral levels to ensure a robust STI component with agreed financial instrument and measurable goals. Through these smart partnerships, the stakeholders will be able to jointly mobilize and fund bilateral and multilateral projects and programs derived from the strategy. African engagement in international programs will be monitored and critical indicators on promotion and collaboration on international programs will be reported periodically.

Chapter 5: Funding mechanisms

STISA-2024 offers the continent an opportunity to rapidly move towards an innovation-led economy. The success of STISA-2024 depends on a number of factors, among them, is the increased R&D budgets at all levels. Each country is encouraged to take concrete actions to allocate at least 1% of GDP to R&D to ensure that Africa can own its developmental path with minimum reliance on external support. To ensure effective implementation of STISA-2024 at the regional and continental level, a strategy to mobilize domestic and alternative financial resources should be developed. Increased domestic funding would improve implementation and reduce over-reliance on external resources.

5.1 National and Regional Funding

Some African Member States have already established National Funds for Research, Innovation and, in some cases, entrepreneurship. A number of Member States have also established bi-lateral STI Calls to promote research collaboration. For instance, over the last five years, more than €60 million has been secured from the European Framework Programme by African institutions participating in collaborative research projects. However, some Member States have not yet adequately prioritized investment in STI and entrepreneurship.

At the national level, Member States are urged to streamline STI in their national development strategies. More importantly, they should establish STI funds that support the implementation of STISA-2024.

At the regional level, RECs are encouraged to set up regional funds to support existing or new regional centers of excellence that respond to STISA -2024 priority areas. The funds will drive regional initiatives and ensure sustainability.

5.2 African Science and Technology Innovation Fund (ASTIF)

STISA-2024 recommends that domestic resources should be mobilised for STI. The external technical and financial support should help strengthen the domestic funding base. Further, there is urgent need to set-up an African Science and Technology Innovation Fund (ASTIF) as a pan African financial instrument. To ensure that the proposed ASTIF is well endowed and functional, it is crucial that adequate financial resources are mobilized from the public and private sectors, and funding communities both inside and outside Africa and other alternative sources of funding.

Chapter 6: Communication and Publicity

Communication and outreach on STI are important to secure necessary political buy-in at government level, raise wider public awareness at grassroots level, and garner support from all key stakeholder groups. Public appreciation of STI is critical for successful implementation of STI policies and programs at national, regional and continent levels. Key public, private, education and research, societal and funding stakeholders need to be well informed on relevant programs. The practical and tangible benefits of STI must be communicated in simple, easily understandable language to build public trust and confidence. A comprehensive communication strategy will be an integral component of STISA-2024 and will contain, among others, the following:

6.1 Popularization of the Strategy

STISA-2024 will be popularized within AU structures, national, regional and international stakeholders. AU Member States and RECs need to develop appropriate and complementary national and regional plans for STI communication and outreach activities. Communication and outreach Plan should encourage dialogue with the public using their local language. A key aspect of communication and outreach is to regularly report progress and showcase local, national and regional achievements through case studies.

AUC, NEPAD and Member State STI communication and outreach programs should utilize a multi-channel approach. In Africa, the perceived relevance of STI by the society is weak. Often the public does not appreciate the impact of scientific and technological developments on their day to day lives. To increase public appreciation of STI and its role in development, there is need for; engaging STI ambassadors / champions, building capacity of the media in STI, and sensitizing the youth communities.

To achieve the goal of an “innovation-led” development pathway in Africa, utilization of scientific knowledge is critical. For STI champions, the media and youth communities to effectively advocate for STI, they need simple scientific information. The advocates for STI should be well-versed in the subject matter to convey consistent messages that clearly addresses the needs of the target communities. More importantly, suitable information, the medium of communication and preferred languages are essential elements for effective dissemination. The STISA communication strategy shall formulate training programmes on communication that will empower advocates for STI, the public, policy makers and decision makers. Access to tailor-made information will help stimulate demand for the utilization of STI knowledge in different socio-economic sectors in Africa.

6.2 Scientific Knowledge Utilization

Scientific and technological productions are outputs of the S&T system. To this end, optimal knowledge flows between research communities and industries as well as the management of technical change could be used to underpin the creation of competitive goods and services. These interactions between government, industry, universities and civil society are necessary conditions in nurturing innovation for development. In addition, the African STI community needs to contextualize excellence and relevance of S&T production by taking into account for example the African traditional knowledge system as a support to sustain economic growth.

6.3 Awards and Recognition

Science, Technology and Innovation are at the top of Africa's development, cooperation and political agendas. In January 2007, the AU Heads of State and Government "declared 2007 as the launching year for building constituencies and champions for Science, Technology and Innovation in Africa". In response to this political momentum and commitment, STISA-2024 underscores the need for AU Member States, Regional Economic Communities and other key stakeholders to contribute towards raising the profile of science and technology sector and building a scientific culture amongst African citizens.

Chapter 7: Monitoring and Evaluation

The absence of a Monitoring and Evaluation (M & E) system at the inception of the CPA made it difficult to demonstrate the achievements of the CPA and the contribution of STI in addressing Africa's challenges. There has been a limited focus on assessing how research efforts are contributing to solving the needs in agriculture, food and nutrition security, infrastructure, health, human capacity development and poverty reduction.

STISA is a strategic intervention of Africa's STI sector in support of the AU Agenda 2063. It has adopted a cross-sectoral and multi-disciplinary approach which intends to strengthen the use of STI in addressing socio economic challenges. An important feature of STISA-2024 is that it has, at inception, embedded Monitoring and Evaluation mechanisms that will enable continuous performance assessment as programmes and projects are rolled out by stakeholders.

The M & E system will:

- Facilitate learning, transparency and accountability;
- Guide the design, implementation and review of policies and programs;
- Enhance the processes of embedding STI in all development sectors;
- Ensure effective communication and build trust among stakeholders;
- Strengthen knowledge generation, management and translation; and
- Support the implementation and coordination of STI programmes.

7.1 Monitoring and Evaluation Implementation Plan

The M&E Plan shall consist of a **Conceptual framework** which outlines the problem definition, major drivers of the performance with regard to the effectiveness and efficiency; and a **Logical framework** which links goals, objectives and actions.

The following will be undertaken to implement the M&E plan:

1. **Definition of performance indicators** - In consultation with national, regional and continental stakeholders, the NEPAD Agency, AOSTI and ASRIC will, as part of the M & E Planning, define a set of agreed targets and performance indicators (2014-2015);
2. **Tracking performance** - NEPAD Agency and AOSTI will track a minimum set of performance indicators at continental level to measure achievement of priorities set in the STI Strategy (2014-2017). Each Member State and regional STI programme will incorporate a standardised monitoring and evaluation system to enable comparability (2014-2016). The need for comparability should not exclude the identification of context-specific national and regional targets and indicators;
3. **Integrated learning** - Lessons learnt, good practices and unintended impacts will be systematically documented by responsible institutions at national and regional level to allow knowledge sharing and inform bi-annual reviews of the

STI Strategy 2024 (2014-2018). Based on lessons learnt, multi-stakeholder dialogues will be established to ensure positive feedback into planning at national, regional and continental levels (2016-2024).

7.2 Reporting on Targets and Performance Indicators

Member States and RECs shall put in place an up-to-date and harmonised mechanism allowing both AUC (AOSTI) and NEPAD Agency to collect performance data annually, analyse the data, synthesize the reports, review progress and disseminate the results among the relevant stakeholders.

7.3 Risk Factors

The implementation of this Strategy is, to a large extent, dependent on the commitment and support from Member States and RECs. The awareness levels of the AU STI Strategy may not be sufficient to secure the necessary buy-in from these critical stakeholders. This risk should be mitigated by the AUC and NEPAD actively advocating and promoting the Strategy. An advocacy plan that outlines the key messages to different stakeholders should be developed. The contribution and impact of STI and ICT in Africa's development is not adequately assessed, recognized and prioritized in policy formulation. This risk should be lessened by integrating STI and ICT into all AU development frameworks, this response is expected to diffuse to national and regional initiatives.

7.4 Success Factors

The Strategy relies on active engagement by 54 Member States, all the Regional Economic Communities and several international agencies, which reduces the risk of failure. The proposed implementation mechanism is based on the experience gained over the last seven years of CPA that includes lessons learnt, best practices, failures and success stories.

Annexes

8.1 Annex 1: CPA Review report

8.2 AU Agenda 2063 Available at <http://agenda2063.au.int>

