THE EAST AFRICA REGIONAL STRATEGY FOR SCIENCE, TECHNOLOGY, ENGINEERING AND MATHEMATICS

EXECUTIVE SUMMARY

The EAC development agenda recognizes the role that science, technology and innovations play. The leadership of the Partner States are fully aware of the need to promote science, technology and innovation as a means to attaining social and economic transformation. Therefore, the regional Science, Technology, Engineering and Mathematics (STEM) strategy has been developed as a guide for the Partner States to align policies and programs in such a way that the regional priorities and targets in STEM are met. It is aimed at contributing to the overall growth and development agenda of the region.

The strategy is in line with the mandate of the East Africa Science and Technology Commission (EASTECO). It is to steer the regional STEM agenda towards the needs, commitments and priorities of the region and ensuring that STEM is brought as quickly as possible to be at par with international standards and best practices. The Strategy is also anchored on the regional STI policy and those of individual Partner States. It is assumed that successful implementation of this strategy will lead to significant improvements in the performance of various priority sectors. Especially, the areas identified in the EAC Vision 2050, which embodies the region's economic and social transformation agenda. These sectors are Agriculture, Health, Education, Trade, Industry, Transport, Energy and ICT, among others.

In order to achieve the above goals, this strategy proposes a number of key strategic priority areas which must be the collective focus of the different stakeholders during the next ten years. The pillars representing these strategic priority areas are as follows:

- Pillar One: Identify and simulate STEM needs in the EAC to achieve Vision 2050.
- Pillar Two: Enhance the teaching and learning environment for STEM at all levels (pre-school, primary, secondary, universities, colleges and TVET) levels.
- Pillar Three: Strengthen the linkages between institutions of higher learning (universities, colleges, TVETs and research institutions) and industry (employers) players.
- Pillar Four: Raise general awareness of STEM and coordinate the efforts to implement the STEM strategy.

Under each pillar, a number of key interventions are proposed for their implementation. Some of these are interventions at the regional level while others are to be implemented at the national or even at local/school level. Furthermore, the strategy outlines framework for coordinating STEM projects, programs and initiatives in the region. The expected overall outcome is to ensure that STEM plays the expected role.

However, there will be a need to undertake further planning at regional level and at national level to detail the manner in which each intervention will be implemented. In addition, there is need to mobilize resources, enhance collective planning, coordination and commitment of national, regional and global stakeholders at all levels to the implementation of the strategy. An estimated 15,420,000 US is projected for implementation of the strategy for the 10-year period.

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ACRONYMS & ABBREVIATIONS

EAC	East African Community
ACALISE	ACE for Agro-Ecology and Livelihood Systems
ACE	Africa Centre of Excellence
ACEESD	ACE Energy for Sustainable Development
IoT	Internet of Things
ACEITLMS	Innovative Teaching and Learning Mathematics and Science
AIMS	Africa Institute for Mathematical Sciences
AU	African Union
CAP	Common Africa Position
CESAAM	Centre of Excellence for Sustainable Agriculture and Agribusiness Management
CREATES	Collaborating Centre for Research, Evidence Agricultural Advancement, Teaching Excellence and Sustainability
EASTECO	East African Science and Technology Commission
GDP	Gross Domestic Product
ICT	Information and Communication Technology
INSECFOODS	Sustainable Use of Insects as Food and Feeds
IRPM&BTD	Innovative Rodent Pest Management and Biosensor Technology Development
MINEDUC	Ministry of Education (Rwanda)
NGOs	Non-Governmental Organizations
OECD	Organization for Economic Cooperation and Development
PASET	Applied Science, Engineering, and Technology
PHARMTRAC	Pharm-Biotechnology and Traditional Medicine Centre
PTRE	Phytochemicals Textiles and Renewable Energy
SDGs	Sustainable Development Goals
STEM	Science, Technology, Engineering and Mathematics
STI	Science Technology and Innovation
STISA	Science, Technology and Innovation Strategy for Africa
TVET	Technical and Vocational Education and Training
UHC	Universal Health Coverage
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization

CHAPTER ONE: INTRODUCTION

1.1 BACKGROUND AND CONTEXT

The East African Community (EAC) comprises of six Partner States namely Burundi, Kenya, Rwanda, South Sudan, Tanzania and Uganda. The region is on the move to transform itself into a prosperous place with citizens enjoying high standards of living derived from increased income as envisaged in the Vision 2050 which *'articulates the dreams and aspirations of the East African peoples and makes a commitment to what they will do to achieve these dreams'*[1] . Specifically, it is assumed that by 2050, the region will be characterized by a per capita income of US$ 10,000.

The Vision 2050 is a blueprint for supporting the region's efforts towards growth and development. It is expected that a combination of some critical factors and an enabling environment will deliver the region's vision and aspirations of its people. To achieve this vision, it is noted that there will be need for *'conducive environment for investment, coupled with effective institutional capacities'* and this will enable the EAC region to *'expand its production capacity and widen its exports, both by composition and value'*. If this is accompanied by *'effective resource management, it is envisaged that East Africans will be prosperous, competitive, secure and politically united region.'*[2]

[1]EAC, East African Community, Vision 2050: Regional Vision for socioeconomic transformation and Development, Arusha Tanzania August, 2015.
[2]Ibid, pg 12

In addition to the regional Vision 2050 and other joint commitments, each of the Partner States has its own national commitments and obligations. For example, Rwanda has moved from its Vision 2020 to Vision 2035 to Vision 2050 to align with the regional vision; Uganda has Vision 2040, Kenya Vision 2030, Burundi Vision 2025 and South Sudan Vision 2040. This strategy attempts to explicate the role that Science, Technology, Engineering and Mathematics (STEM) can play in driving the region's socio-economic development agenda in the next 10 years while significantly contributing to the attainment of the Vision 2050.

1.2 ECONOMIC AND SOCIAL ENVIRONMENT

The EAC region's rate of economic growth in recent years has been impressive in comparison to the rest of sub-Saharan Africa. However, there remains untapped economic potential which can be unlocked if the region's agricultural, industrial, trade, health, education and manufacturing sectors are sufficiently developed and exploited. These sectors have the potential to contribute more to the economies of the region than they currently do. The fact that they do not contribute to the economies as possibly can partly be attributed to the weak or absent generation and deployment of focused scientific knowledge and innovations in the respective sectors.

The region, like in many other parts of Africa, has a predominantly young population that has the potential to contribute immensely to its development if properly skilled and managed. To address issues of youth unemployment and its attendant ramifications, there is need to invest substantially in the education of the population especially in providing the skills for a knowledge-based economic dispensation. These are also partly due to the inadequate development and utilization of science, technology and innovations within the region to address the region's needs in the key major sectors of the individual economies.

The leadership of the EAC recognizes that there is need to address the skilled labour and infrastructure needs of the region since they form the foundation upon which rapid economic transformation can be anchored. It is generally accepted that the various long-term goals of development and transformation of the region will not be achieved unless sufficient effort is made to develop the human and physical infrastructure needed to address the current and future needs of the region. As part of the approaches in dealing with this critical matter, the EAC set up the East African Science and Technology Commission (EASTECO) with a mandate to 'promote and coordinate the development, management and application of science and technology' within the Community as stipulated in Articles 5, 12 and 103 of the EAC protocol. The EASTECO was established on 18th June 2007 during the 5th Extra-ordinary Summit of the EAC as an institution of the EAC through EASTECO Protocol.

As specified in the Protocol, the specific objectives of EASTECO are to promote:

i. the cooperation in the development of regional science and technology policies;

ii. the joint mobilization, utilization, management and development of resources, both material and human, for the development of science and technology in the Community;

iii. the cooperation in the joint research and development in science and technology;

iv. the development, adoption and utilization of information and communication technology, as well as the adoption of new and emerging technologies;

v. the promotion of scientific and technological innovation and invention within the Partner States; and

vi. The development of mechanisms for the identification, promotion and growth of special talents in science and technology, with particular emphasis on the youth and gender parity.

The EAC Vision 2050 identifies EASTECO as the main regional agency through which the Partner States will develop and implement common policies and programs on Science, Technology and Innovation (STI). The Vision 2050 recognizes STI and R&D as key enablers of the 6 pillar areas: i) Infrastructure Development, ii) Agriculture, Food Security and Rural Development, iii) Industrialization, iv) Natural Resources and Environmental Management, v) Tourism, Trade and Services Development, and vi) Human Capital Development. The Vision envisages ten-fold growth in per capita incomes in the Community to US$ 10,000 by 2050, thereby transforming the regional block into an upper-middle income category. This target is based on a shared intent of EAC Partner States to transit towards knowledge-based economies. Unlike oil-based economies, the EAC has a relatively diverse economy with significant contributions from a number of sectors including agriculture, manufacturing, retail, services and tourism. This diverse economy has enabled the region to weather shocks occasioned by global financial crises, provide greater opportunities for entrepreneurship and create a larger and growing middle class. During the last decade, the economic growth of the region stood at 6.2% over the period 2004-2013, which was in the top one-fifth worldwide. Exports in the Community expanded in a wide range of goods and services outside the traditional agricultural sector.

To ensure the fulfillment of its mandate, the EASTECO developed its first Strategic Plan, 2017/18-2021/22, which was adopted by the EAC Council in April 2017. This Plan is composed of 4 priority intervention areas (Strategic Priorities) and 12 strategic objectives, which are critical to the achievement of EASTECO's objectives and functions with clear indicators of achievement. These Strategic Priorities will enable the Partner States to cooperate on a set of regional interventions and activities that transcend boundaries and that would be impossible for them to undertake separately. In order to attain the EAC and EASTECO objectives with regard to enhancing the regional scientific and technological innovation capability, adequate human resource is required. The Commission therefore identified the development of Regional STEM programs, including strengthening of STEM education and training as one of its strategic objectives for the five-year period, 2017/18 to 2021/22.

1.3 RATIONALE FOR STEM STRATEGY

Although it has been noted that the EAC region as a whole registered impressive economic growth rates in the last decade, there is the potential to register even higher rates of growth if a number of underlying challenges that curtail more rapid and sustainable economic growth trajectory are dealt with. Key among these are the low contribution from industrial and manufacturing sectors to the economies of all partner countries. The growth and development of the industrial and manufacturing sectors requires skilled human resource in diverse disciplines which are serviced by competencies in science, technology, engineering and mathematics (STEM). In order to attain the EAC objectives of enhancing the regional scientific and technological innovation capability, adequate skilled human resource and infrastructure capacity is prerequisite. The Vision 2050 provides a list of capacity and skills requirements needed to drive the region to its 2050 targets.

Furthermore, to stimulate and sustain a high economic growth in EAC Partner States, a transition must be made from resource-driven to higher-value-added growth. This transition can only be achieved by investing in skills development in order to raise capacity in technology development and absorption as well as enhancing innovation. In recognition of this reality, and in order to address this gap, the East African Science and Technology Commission (EASTECO) identified strengthening of STEM as one of its strategic objectives for the five-year period, 2017/18 to 2021/22. The EAC Vision 2050 also identified the need to develop human capacity in STEM to put EAC on the path to sustained economic growth, and to transform EAC Partner States to the level of upper middle-income economies. This will require increased number of STEM professionals and industrial skilled human resources, and will reinforce the capacity to transform research results into societal and economic benefits. For example, the vision envisaged the transformation to require changes in the ratio of engineers to the total population to evolve from 1:5500 in 2014, to 1:3000 in 2030 and 1:1500 in 2050.

According to the East African Community Vision 2050, one of the aspirations of the community is the articulation of policies that link employment targets to skills development. In this regard, Science, Technology and Innovation (STI) education was identified as a key enabler to achieve the Vision. Education programs are needed to develop skills for employment and job creation, guided by the needs of different sectors while leveraging on technology. A well-educated, enlightened and STEM literate work force is seen to be a sine qua non for efficient production, knowledge transfer, technological adaptation and innovation, and is therefore crucial for the region's economic growth.

While the EAC Partner States possess a number of higher learning institutions and TVET organizations, the Community lacks a regionally agreed program on Science, Technology, Engineering and Mathematics (STEM)[3]. In addition, there is limited capacity to respond to opportunities such as the growing industrial and manufacturing sector, the discovery and exploitation of natural resources that require specialized skills or engaging in developmental and innovative activities that demand a certain expertise. The Community's ability to respond to challenges such as the development of infrastructure is also low with most of the STEM jobs being outsourced to multinationals. While the Partner States' governments sign infrastructure contracts with developed nations, there are challenges within most contracts regarding the availability of highly skilled technical workforce.

In order to reduce the region's dependence on external support for STEM skills, the Community needs a STEM strategy that will generate a STEM literate society that will actively participate in the acceleration of the region's growth and development. Without a focused and consistent strategy on STEM, the EAC region will continue to face challenges to the attainment of the Sustainable Development Goals (SDGs) and other national and regional commitments.

[3] EASTECO STEM Concept Paper, 2020.

A regional strategy on STEM is also important as it enhances cooperation and coordination of efforts as well as a more efficient allocation of resources to STEM, thereby driving the productive sectors in the region to be competitive in the global economy resulting in more and better paying jobs for citizens, accelerating growth and commercial diversification, reducing poverty and raising living standards of the citizens of the region.

Though the EAC launched a number of Centers of Excellence for advanced training in scientific disciplines under the World Bank ACEII programs, Training in STEM in the region's education systems is below the level required to reduce the skills shortages that exist in these domains. In addition, there is the fact that women continue to be underrepresented in STEM yet they make up the larger proportion of the population in the Community.

To foster economic transformation, industrialization and address challenges such as climate change, food security, energy supply, health and digitalization, there is need to invest in a labour market which will meet the demands of innovation for growth in a knowledge-driven economy. To meet this labour market's demand the Science, Technology, Engineering and Mathematics (STEM) domains need to be vigorously harnessed. To do so, there is need to develop responsive national STEM strategies in order to tackle the skills mismatch and to live up to the demand for STEM competences within the Partner States and in the EAC bloc as a whole.

This strategy attempts to provide a blueprint for addressing the above-mentioned gaps in the region's scientific knowledge, research and innovation. It has been developed through consultations with different stakeholders at country level within the EAC including representatives of universities, NGOs, development partners, public service institutions and individual experts.

1.3 1 Global Context

The adoption of the Sustainable Development Goals (SDGs) in 2015, after the completion of the MDGs, marked a significant milestone in the global economic and social policy agenda. Since the mid−nineties, the ideas of the knowledge economy and knowledge society were championed by economists and policy makers as the next frontier for overcoming the constraints to rationalized investment in STEM and ICT education in low to middle income countries as necessary for economic growth. The sustainable development agenda rejects an instrumentalist view of science and technology at the service of economy and society. Sustainable development is now understood within the rhetoric of global policy as social and economic progress within planetary boundaries (United Nations 2014).

The attainment of the SDGs is hinged upon the ability of science and technology to drive innovations that will address the constraints within the key priority areas of intervention. It is expected that global collaboration in science, research and innovation will drive the global effort to reduce inequality and address the challenges faced by developing countries. Science and technology are drivers of economic growth

This STEM Strategy focuses on the key areas of policy interventions that demonstrate high potential to contribute to transformative change towards sustainable development. STEM is underpinned as important in contributing to the AU Agenda 2063: A peaceful integrated prosperous Africa driven by its own competent and skilled citizens. The AU also developed the Continental Education Strategy for Africa 2016-2025 (CESA 16 - 25), FAWE/AUCIEFFA commissioned Gender Equality Strategy for CESA 16-25 and the Science, Technology and Innovation Strategy for Africa (STISA 2014 – 2024), all of which underpin science, technology and innovation as multi-function tools and enablers for achieving continental development goals.

To achieve this the Agenda envisages enhance the collaboration and partnership with development partners, public and private sectors, NOGs, scientific think-tanks to advocate and promote STEM and TVET education and professional opportunities. In line with this, there was a review of policies and strategies at national, regional levels in line with AU agenda, education sector plans, responsive budgeting in STEM and TVET education.

1.3.1 Regional Context

The EAC Vision 2050 is the collective vision of the region's socioeconomic transformation up to the year 2050. This Vision recognizes the role of STEM as a catalyst for enhancing the pace of socioeconomic transformation As already discussed in section 1.2 above, STEM is one of the possible array of tools that can be utilized to push the regional economy by unlocking the potential in certain key sectors By creating conducive environment for investment, coupled with effective institutional capacities, the region will expand its production capacity and widen its exports, both by composition and value.

The Partner States of the East African Community (EAC) recognize the role that the promotion of Science, Technology and Innovation (STI) can play in transforming key sectors of their economies thereby accelerating the journey towards sustainable development. This is in line with the aspirations and priority areas of the Vision 2050 of the EAC and in line with the actions put forward for attaining the African Union's Agenda 2063, the UN Agenda 2030 Sustainable Development Goals and the STI Strategy for Africa (STISA-2024).

The East African Community (EAC) treaty emphasizes cooperation and channeling of investments especially in education and research to prepare citizens to operate effectively in a globalized economy (EAC, 2013). Key issues include harmonization of curricula and education systems. This includes developing harmonized programs for the primary, secondary and tertiary education cycles including TVET. It is anticipated that the adoption of a common framework will promote equal access to STEM education opportunities, harmonized quality assurance and accreditation systems across the region with greater opportunities for labour mobility within the region.

1.3.3 National Context

Within each Partner State, there are various programs and initiatives promoting STEM with different emphasis often supported by national governments, international organizations, or private organizations. In each Partner State, there are also hosted a number of regional initiatives. These include the Nelson Mandela African Institute of Science and Technology in Arusha (NM-AIST-Arusha), which is a network of Pan-African Institutes of Science and Technology located across the continent; The African Institute for Mathematical Sciences (AIMS) in Rwanda, which is a Pan-African Network of Centers of Excellence that offers quality postgraduate education, research innovation and public engagement for the advancement of STEM in Africa.

CHAPTER TWO: EAC STEM STUATIONAL ANALYSIS

2.1 SWOT ANALYSIS

In the section below, a summary of the SWOT analysis of the region with regard to STEM is presented.

2.1.1 Regional strengths

- All the Partner States have a vision which highlights the importance of science and technology in the nation's development agenda
- There is some institutional framework for the promotion of science and technology in each Partner State e.g. national commissions or councils for science and technology.
- The policy and legal framework for promoting STEM is fairly developed in all the partner countries
- There is some form of collaboration among the public, private and non-government stakeholders in promoting STEM
- Clear mandates of the different national commissions of science and technology.

2.1.2 Weaknesses & Threats

Although it is clearly understood that STEM will play a major role in transforming the EAC region, there a number of constraints to the deployment of STEM in the region. These have been identified as the following:

- Not putting in practice commitments to investing in STEM in the national plans;
- No clear data on demand and supply of skills in STEM in all the critical sectors;
- Uncoordinated efforts among STEM stakeholders at regional, national and sometimes local levels;
- Underdeveloped linkages between researchers, public and private sectors
- Low private sector investment in technology acquisition + low skills /capacity for new technologies uptake
- No clear linkage between STEM interventions and the needs of society

2.1.3 Opportunities

- There is a clear political commitment within the member states to promote science, technology and innovations at country level and at the regional level. This can be judged from the fact that among other things, each Partner State has now established a national science and technology commission.
- Institutional framework is slowly being established at regional level beginning with the establishment of EASTECO
- There are funding avenues for STEM programs and activities through international organizations such as UNESCO, World Bank
- There is a network of stakeholders including specific government ministries/agencies, academies and universities, international organizations and the civil society.

2.2 STAKEHOLDERS ANALYSIS

There are a number of stakeholders in the STEM field within the region, who are committed to ensuring that the region has competitive STEM education system, and that the STEM programs and initiatives are adaptive to the changing world. They do this by focusing resources on STEM, creating a climate of high expectations, giving access to STEM education and opportunities. These include the EAC regional organs, Centers of Excellence, national governments, local governments, private sector, NGOs and CBOs, academia, researchers, science and technology professionals, development partners, and the general public. The roles of these played by these stakeholders are as follows:

2.2.1 Regional Organs & Centers of Excellence

The main regional organ for promotion of STEM is the East African Science and Technology Commission (EASTECO). EASTECO is a semi-autonomous institution of the EAC, which is mandated to coordinate and promote the development, management and application of Science and Technology in Partner States to support regional integration and socio-economic development. Among other responsibilities, the commission promotes the exchange and utilization of scientific information, and supports the dissemination of research and development findings in Partner States.

The other regional bodies are the Africa Centers of Excellence (ACEs), which help to build the capacity of the host universities to provide quality postgraduate education with relevance to the labour market, and to conduct high quality applied research that seeks innovative solutions to key development priorities. The centers produce Masters and Doctorate of Philosophy (PhD) graduates relevant to the labour market needs from the region, research that is relevant to the region and work closely with the private sector to address skills and research gaps.

2.2.2 National STI Commissions/ Councils

National Science and Technology Commissions/Councils provide strategic advices and recommendations to the Partner States governments on all matters relating to policies, legislation and regulation in the fields of science, technology, research and innovation and monitor the implementation of such policies and legislation. They also serve as science and technology think-tank for the respective government in the setting of priorities for national science and technology innovation, research and development agenda, and are entrusted with the responsibility of coordinating and promoting science and technology development activities in the country. Thus, Councils/commissions help harness the potential of science, technology, innovation and research and integrate it into national development strategies and plans.

2.2.3 Line Ministries & Agencies

Line ministries like the Ministry of Education and the Ministry of ICT have a mandate to promote science, technology and research. This is due to the fact that these countries have decided to shift to a knowledge-based economy. The following provides likely roles to be played by line ministries and agencies.

Ministry/Agency	Role	Strategic Actions
MINISTRIES AND AGENCIES IN CHARGE OF ICT & INNOVATION	Promote STEM would create a better understanding on how engineering contributes to economic development and quality of life.	• Build messaging campaigns of existing initiatives that alert students, parents, the public, policy makers, employers and the community that STEM is an essential tool for the region • Advocate for availability of ICT facilities and contents for learning within STEM Infrastructure • Use existing framework between industry and government to support programs that encourage and recognize innovations • Promote the expanded provision, and take-up of STEM course with vocational aspects • Advocate for the involvement of citizens in the research process

MINISTRIES AND AGENCIES IN CHARGE OF BASIC EDUCATION	Position STEM as a career of choice, attract the best talent into the STEM field and increase public awareness of the impact that STEM has on community when all is included.	• Support national programs that increase awareness and understanding and encourage participation in STEM as a career of choice • Develop a program and support materials for schools that educate teachers, careers advisors and parents about STEM careers • Develop and promote girls in STEM to increase female participation in STEM related careers • Support national programs that encourage participation in STEM by underserved groups in remote areas, and those from low socio- economic backgrounds
MINISTRIES AND AGENCIES IN CHARGE OF HIGHER EDUCATION	Build capability in STEM based on the needs of the society and bring real life solutions	• Ensure interactions and communication with instructors, and students on 'why' STEM subjects are crucial for future career opportunities, and economic development • Support programs that encourage participation in STEM, ranging from institution of higher learning, colleges and TVET • Discuss the value of STEM study at national education conferences and events • Facilitate collaboration between government, industry and academia to support nationally measurable STEM initiatives and outcomes.
MINISTRIES AND AGENCIES IN CHARGE OF LABOUR	Sustain supply and availability of competent STEM professionals & Workforce	• Promote the need for more STEM specialists to fill existing and future vacancies in all sectors • Work with industry to promote inclusive and diverse work environments and provide workplace flexibility in STEM career • Work with industry to incorporate structured and positive career planning for STEM professionals into senior leadership roles, and engaging employers to facilitate career advancement • Use expertise to help industry up skill by creating opportunities for more experienced STEM professionals to give back to the field.

2.2.4 Higher Learning & Research Institutions

To empower the region for effective employment for the 21st century, a great responsibility falls upon the institutions of higher learning; colleges, universities, science centers and other educational centers including TVETs. These institutions play a big role in ensuring that the region does not only increase the number of individuals pursuing STEM but also in building a STEM based-economy and a STEM literate society. Institutions of higher learning facilitate the transfer and adoption of technology in an enabling policy environment for these skills investments to pay off. Improving the labour market relevance of higher education would require aligning STEM teaching and research activities at public and private universities with market signals.

2.2.5 NGOs, Civil Society & Development Partners

The NGOs, CSOs and Development partners play a very important role in developing and financing programs and strategies for STI implementation in line with their missions and development priorities. They will also advocate for the participation of the special interest groups and disadvantaged groups in STEM. Because the activities of NGOs or CSOs are not limited to the national level of public policy-making, they also play an important role in mobilizing and representing public interests in debates about the societal implications of scientific and technological innovation at the regional level. There are also development partners whose primary mandate is to reduce the technological disparities, and their approach to achieving this aim involves engaging with various communities to find sustainable ways of improving their involvement in STEM field.

2.2.6 Private Sector Players

Bridging the skills gap and building the right talent for the region's future cannot be left to government alone. The private sector needs to be looped in to adopt a more collaborative and concerted approach to help drive initiatives that will build STEM capacity at the scale and speed required. Private sector players have been very instrumental in research and innovation, offering apprenticeship, internship and employment opportunities for STEM labour force.

CHAPTER THREE: STRATEGIC DIRECTION

3.1 VISION, MISSION & SCOPE

3.1.1 Vision

The shared vision for the strategy is to position EAC as a thriving and innovative economic bloc with Science, Technology, Engineering and Mathematics (STEM) driving the region's growth, productivity and future sustainability.

3.1.2 Mission

The mission of the strategy is to position STEM as a career of choice, attract the best talent into the STEM field and increase public awareness of the impact that STEM has on community, build capability in STEM based on the needs of the society and bring real life solution, and sustain supply and availability of competent STEM professionals and reliable workforce.

3.1.3 Scope

This STEM strategy presents a 10-year trajectory (2021-2031) that will transform the region's economic and social landscape in line with Vision 2050, Vision 2063 as well as the visions of the individual Partner States. This strategy will be driven by a number of guiding principles that will inform all the interventions that are expressed in the strategy.

The strategy proposes that the education system and STEM skills acquired should be those that can deliver the desired growth in productivity in the industries and sectors that utilize the Science, Technology, Engineering and Mathematics (STEM) skills. In doing so, the proposed scope of the strategy starts at inculcating the culture of STEM at early age- at the pre-school, primary and secondary levels of education. It is also proposed that putting in place the STEM Infrastructure at all levels is crucial for enhancing the quality and quantity of STEM graduates from institutions of higher learning, colleges and TVETs.

This is on the backdrop that there are a number of students graduating in STEM field, but are unable to find employment. This situation is particularly acute with minority students and female students, who are still significantly under-represented in both STEM Education and in the workforce.

This strategy is based on the following pillars/key priorities

i. Identify and simulate STEM needs in the EAC;

ii. Enhance the teaching and learning environment for STEM at all levels (pre-school, primary, secondary, universities, colleges and TVET) levels;

iii. Strengthen the linkages between institutions of higher learning (universities, colleges, TVETs and research institutions) and industry (employers);

iv. Raise general awareness of STEM and coordinate the efforts to implement the STEM strategy.

3.1.4 Guiding Principles

a. Alignment of national priorities to regional priorities

b. Collective approach and commitment to planning, monitoring and reporting progress

c. Shared focus in terms of curriculum, technical support, institutional capacity and the general policy environment for promoting STEM

d. Stronger partnerships within individual Partner States among stakeholders, at the regional level and at the international level.

e. Commitment to raising the number of, and attracting underrepresented groups, such as women, into STEM related industries and education.

3.2 STRATEGIC PRIORITIES OF THE STEM STRATEGY

Below is a summary of the above strategic priorities/pillars of the STEM strategy.

3.2.1 Pillar One: Identify and simulate STEM needs in the EAC to achieve Vision 2050

Key objectives

- Identify all the existing STEM programs, initiatives at regional, national and local levels
- Undertake STEM supply and demand analysis in the key sectors of the economies
- Global Sustainable Development Goals
- Align STEM with Africa's Agenda 2063, Science, Technology and Innovation Strategy for Africa 2024 (STISA–2024), and Strategy for Education in Africa 2016-2025 (CESA 16-25)
- Ensure measured milestone in achievement of common STEM indicators

Key interventions/actions

- Undertake a scoping study to document existing STEM resources in the region
- Undertake a detailed mapping study to document all STEM stakeholders and the programs they run at regional level, national and local levels;
- Design a system that captures information about STEM interventions, initiatives, programs and activities at all levels and share this information periodically through publications;
- Undertake national level labour studies to simulate the STEM skills requirements to achieve vision 2050

3.2.2 Pillar Two: Enhance the teaching and learning environment for STEM at all levels (pre-school, primary, secondary, universities, colleges and TVET) levels.

Key objectives

- Raise the quality of teaching and learning in STEM
- Produce sufficient numbers of STEM graduates as needed by the market;
- Address disparities in access to STEM in terms of gender access and rural urban disparities
- Provide for the roles of Teacher Training Colleges
- Review Teaching and Learning methodology for STEM
- Ensure uniformity in mode of teaching across the region
- Undertake STEM Assessment that not only favour the gifted learners, but also give of opportunity to young innovators/talents
- Develop ICT for enhanced teaching and learning of STEM
- Attract top students to pursue and teach STEM
- Apply Research and Development

Key interventions

- Develop teaching guidelines for STEM for use in pre-primary, primary and secondary schools, universities and TVET colleges emphasizing contextual relevance and practicality;
- Develop and make readily available STEM resources that are understood by learners and teachers from various backgrounds (STEM learning resources available in different languages);
- Support the development and adoption of a core STEM curriculum for use at all levels of education at national levels;
- Design programs that attract sufficient numbers of students to STEM programs.
- Periodically undertake surveys to measure attitudes and career interests of learners to identify teaching and learning experiences that positively shape perceptions about STEM;
- Identify and provide technical support to more STEM model schools in each Partner State for demonstrating best practices and effective STEM teaching and learning;
- Undertake regular reviews of teacher experience with STEM materials and learning environment;
- Design innovative programs encouraging more female students to enroll in STEM programs at secondary school, universities and TVET levels through internships, fellowships, scholarships, and other training opportunities
- Develop a sustained campaign to advocate for the allocation of sufficient funds at national level to STEM education and research through sustained public and private investment;
- Equip schools with proper STEM facilities to inspire and arouse interest as well as enhancing completion rates for girls;
- Develop interventions and innovations that bridge rural-urban disparities in terms of access to STEM resources

3.2.3 Pillar Three: Strengthen the linkages between institutions of higher learning (universities, colleges, TVETs and research institutions) and industry (employers) players

Key objectives

- Identify existing and potential mutually beneficial linkages between universities and industries that utilize STEM skills
- Develop university-industry ties to facilitate student experience
- Update STEM students with career related information
- Undertaking STEM Human Resource assessments
- Bridge Gender Disparities in STEM teaching and learning
- Ensure Geographical Reach of the STEM within National territories: Slums, Urban and rural areas.
- Provide context Sensitive STEM interventions considering different levels of development at each Partner State or even in regions within the Partner States
- Take into Consideration of persons with disability in all STEM programs
- Support those from poor background who may not afford STEM Education
- Provide incentives to STEM graduates

Key interventions/actions

- Provide regular periodic information to students of STEM on industrial attachment opportunities;
- Arrange periodic engagements with industry players to gain insights on the changing demands of industry with regard to STEM skills;
- Identify and establish twinning partnerships between specific industry players with specific STEM needs through jointly developed programs and sponsorships.
- Design good partnership models between schools and employers that demonstrate champions of STEM
- Strengthen partnerships with other key stakeholders to foster collaborative research and professional development opportunities and to attract extramural funding in STEM field
- Support research, development, and dissemination of effective trans-disciplinary STEM education practices, programs, and policies
- Design an employer recognition system that awards employers for engaging with institutions of learning, providing feedback and supporting STEM professionals with on the job skilling and related assistance.

3.2.4 Pillar Four: Raise general awareness of STEM and coordinate the efforts to implement the STEM strategy

In order to effectively implement the STEM strategy, there will be a need to set up an effective coordination and implementation framework that brings together stakeholders at regional, national and local levels. With the guidance of this strategy, stakeholders will work together to ensure that STEM interventions are making impact in the field nationally, regionally and locally. This is possible by developing and implementing common metrics and shared matrices for tracking progress towards the attainment of each strategic objective. Others will include taking consideration of the contexts under which effective STEM can thrive, documenting and disseminating information to foster a more diverse and inclusive STEM community with common programs and practices across the region.

Key objectives

- Ensure that Partner States adhere to the national and regional commitments in this strategy
- Agree on the metrics/indicators for measuring progress in the implementation of this strategy
- Create awareness on Contribution of informal sector to STEM
- Partner with angel investors to promote STEM skills incubation and transfer
- Advocate for expansion of manufacturing sector to absorb more STEM graduates
- support or collaborate with private schools to provide STEM education
- Advocate for ease of movement by STEM specialists across the region within the common market framework

Key interventions

- Put in place STEM Coordination Steering Committee that brings together all the actors identified in the strategy for coordination of STEM at regional levels
- Create the administrative infrastructure necessary to support planning, coordination, assessment, and continuous improvement of STEM initiatives
- Undertake coordination of STEM, related information and offer guidance by developing action plans for achievement of the objectives of this Strategy
- Develop Annual Action Plan for implementation of STEM Strategy activities
- Disseminate examples, best practices, and lessons learned and outcomes with stakeholders as well as through media outlets

3.3 GENERAL CONSIDERATIONS

3.3.1 Schools

Schools combine the challenging roles of providing the foundation for STEM professionals of the future on the one hand, with developing a scientifically literate and numerate society on the other.

Inspirational teaching at schools is crucial for nurturing student interest in science and influencing their study and career choices.

- Incentives to encourage high-achieving students to enroll in STEM education programs to become potential STEM teachers should be introduced where possible.
- The recruitment and in-service support for all teachers should be improved to ensure well-versed teachers in STEM disciplines.
- The teaching qualifications within the region need to be harmonized and an agreed accreditation criterion implemented. These require students to have achieved a discipline-specific qualification, relevant to the curriculum or other recognized areas of schooling provision.
- Teaching time devoted to STEM at different levels should be reviewed in primary schools and secondary schools and where necessary changes made to allow sufficient time is devoted to STEM subjects.

3.3.2. Post-Secondary Education

- Incentives such as bursaries and scholarships need to be regularly provided to students who have chosen to take STEM programs at tertiary institutions;
- The widespread use of flexible sequences of study that make it possible to master STEM and non-STEM disciplines together should be encouraged;
- Introduce incentives to enroll on STEM courses by ring fencing specific jobs in certain sectors for STEM graduates;
- Student study trends in universities and in VET should be closely monitored so that incentives can be introduced to ensure that important disciplines do not wither because of a present lack of student interest;
- Transfer with appropriate credits between various parts of the education sector (and even within) should be seamless to the student;
- The value of discipline-based content and the underlying process of STEM methods should both be highlighted.
- Provide regular updates to students on career opportunities in STEM
- Hold fairs and exhibitions on STEM on a regular basis to showcase the work of STEM professionals already in the field.

3.3.3. Education and Labour Force

- Existing linkages between the supply and demand sides of the STEM labour force in the EAC must properly address workplace needs into the future – including those of the research workforce.

- Commit to funding for skilling and reskilling the workforce.
- Strong partnerships between industry and education providers should be built to ensure that graduates are 'work-ready' for the current demands of the workplace, while broadly educated in both discipline content and the scientific method to be able to adapt to future workforce needs.
- Continuing professional development (CPDs) opportunities for the workforce should be ensured through formal and informal training.
- To reverse the trend for decreasing STEM participation in schools, the EAC and the Partner States need to cooperate to drive the school education system away from educating students as is done now towards a more focused targeting and preparing students for a future increasingly bound to STEM and the projected demands of STEM skills. These changes encompass educational values, curriculum, and accreditation procedures so that school leavers will be well-equipped to participate in the labour market.

3.3.4. EAC Level Interventions

At the regional level, through the EASTECO, a number of interventions can be undertaken:

- Provide technical support to National Science and Technology Commissions and other stakeholders to provide information on the methodology of teaching STEM, the structure of the curriculum, the teacher-pupil ratios for STEM, the available infrastructure etc.
- This information will allow EASTECO to set up a regional repository of STEM data that will enable reliable tracking of disparities that exist in STEM at national and regional levels as well as sharing of experiences and best practices. Bringing all the information together will also improve ownership of STEM priorities and create a collective sense of urgency. Finally, being able to gather information on the participation of various stakeholders in STEM with corresponding initiatives and programs will provide an opportunity to gauge effectiveness and impacts.
- There is need to harmonize the priorities and initiatives of STEM at national level with regional priorities. This calls for a standard structure of policies, strategies and interventions so as to create a synergy between national and regional frameworks;
- EASTECO must continue providing technical support to national stakeholders including support to develop national policies and programs This can be done by organizing regular conferences, exhibitions, symposia,
- EASTECO must lead the discussion on harmonization of curricula for STEM so as to arrive at a 'regional' STEM curricula or at least common guidelines at all levels of education
- EASTECO shall lead
- EASTECO must monitor and prepare periodic working papers on the status of STEM in the region

3.3.5 Community Outreach STEM Programs

- There is need to raise the level of engagement and trust in science within the local communities in the EAC region. Through better engagement with science and mathematics in schools by inviting the public to science fairs, setting up community
- Adequate support and coordination frameworks should be introduced, to encourage and promote such citizen science as a means to engage the community (and teachers) more with STEM on an avocational basis.
- Museums, libraries, botanical gardens and others should be supported to offer systematic outreach activities.

CHAPTER FOUR: STRATEGY OPERATIONAL ENABLERS

4.1 INTRODUCTION

Strategic operational enablers support the successful implementation of the strategy. Without them, there is a risk of the strategy not being successfully implemented, possible resource wastage and generally reduced impact including delays. Below, some of the most crucial ones are presented.

4.2 POLICY & REGULATION

The Partner States of the East African Community (EAC) recognizes the role that Science, Technology and Innovation (STI) can play in transforming key sectors of their economies drive strategic actions towards sustainable development. The EAC Vision 2050 pinpoints the rationale as that of proving catalyst for the region to enhance transformation for growth and development and move the community to higher income cohort and subsequently achieving an upper middle-income status. By creating conducive environment for investment, coupled with effective institutional capacities, the region will expand its production capacity and widen its exports, both by composition and value.

EAC Treaty for the Establishment of the EAC which recognizes the fundamental role of science and technology in economic development and stipulates, in the Chapter 16, Article 103, that the community shall promote cooperation in the development and application of science and technology within the Partner States. Article 80, on industrial development further reinforces the need for development of science and technology to accelerate socio-economic development in the community.

The EAC Regional IP Policy creates a dynamic, vibrant and balanced IP system in EAC Partner States. It aims to use the IP system as a means for stimulating innovation and creativity, as well as promoting advancement in the exploitation of Traditional/Indigenous knowledge (TK/IK), Traditional Cultural Expressions (TCEs) and biological resources. The EAC Regional IP Policy is intended to encourage technological innovation and creativity, as well as promotion of industrial and commercial use of inventions, in order to contribute to the social, cultural, economic, industrial and technological development of the EAC Partner States.

4.3 MATERIAL & HUMAN RESOURCES

The strategy will require substantive technical capacity, financial and material resources. Most importantly, the STEM Coordination Committee should have specifically assigned individuals who are motivated, committed and competent. There should be financial resources to cover costs related to their activities. Other resources that would be required include action plans, manuals, evaluation tools, communication and advocacy plans for implementation of the STEM Strategy.

These resources may be developed by the committee or through external consultants depending on the availability on the agreeable formula and financial resources. Finally, a lot more technical support will be required in terms of effort data collection, analysis, reporting, and dissemination of information at every activity level. This is because the availability of quality and reliable data will be a key driver in achieving the objectives of this strategy.

4.4 COORDINATION & PARTNERSHIP

The main regional organ for coordination of STEM is the East African Science and Technology Commission (EASTECO). EASTECO is a semi-autonomous institution of the EAC, which is mandated to coordinate and promote the development, management and application of Science and Technology in Partner States to support regional integration and socio-economic development. Among other responsibilities, the commission promotes the exchange and utilization of scientific information, and supports the dissemination of research and development findings in Partner States.

The other regional bodies are the Africa Centers of Excellence (ACEs), which help to build the capacity of the host universities to provide quality postgraduate education with relevance to the labour market, and to conduct high quality applied research that seeks innovative solutions to key development priorities. The centers produce Masters and Doctorate of Philosophy (PhD) graduates relevant to the labour market needs from the region, research that is relevant to the region and work closely with the private sector to address skills and research gaps.

National Science and Technology Commissions/Councils provide strategic advices and recommendations to the Partner States governments on all matters relating to policies, legislation and regulation in the fields of science, technology, research and innovation and monitor the implementation of such policies and legislation. They also serve as science and technology think-tank for the respective government in the setting of priorities for national science and technology innovation, research and development agenda, and are entrusted with the responsibility of coordinating and promoting science and technology development activities in the country. Thus, Councils/commissions help harness the potential of science, technology, innovation and research and integrate it into national development strategies and plans. Line ministries like the Ministry of Education anticipate in the promotion of Science Technology and Research, with the aim to promote education for the country is Knowledge-based Economy. Promotion of the STEM in Education system is regarded as enhancing quality education.

To empower the region for effective employment for the 21st century, a great responsibility falls upon the institutions of higher learning; colleges, universities, science centers and other educational venues, which include TVETs. These institutions play a bigger role in ensuring that the region does not only increase the number of individuals pursing STEM but also in building a STEM based economy and society. The institutions of higher learning enable the transfer and adoption of technology in an enabling policy environment for these skills investments to pay off. Improving the labour market relevance of higher education would require aligning STEM teaching and research activities at public and private universities with market signals.

The NGOs, CSOs and Development partners play a very important role in developing and financing programs and strategies for STI implementation in line with their missions and development priorities. They will also advocate for the participation of the special interest groups and disadvantaged groups in STEM. Because the activities of NGOs or CSOs are not limited to the national level of public policy-making, they also play an important role in mobilizing and representing public interests in debates about the societal implications of scientific and technological innovation at the regional level. There are also development partners whose primary mandate is to reduce the technological disparities, and their approach to achieving this aim involves engaging with various communities to find sustainable ways of improving their involvement in STEM field.

Bridging the skills gap and building the right talent for the region's future cannot be left to government alone. The private sector needs to be looped in to adopt a more collaborative and concerted approach to help drive initiatives that will build STEM capacity at the scale and speed required. Private sector players have been very instrumental in research and innovation, offering apprenticeship, internship and employment opportunities for STEM labour force.

4.5 IMPLEMENTATION FRAMEWORK

Pillar one: Identify and simulate STEM needs in the EAC to achieve Vision 2050														
				Year of intervention/activity										Regional /National/ local implementing/ reporting institution(s)
Key outcomes	Key intervention	Baseline	Target by 2030	1	2	3	4	5	6	7	8	9	10	
	Undertake a scoping study to document existing STEM resources in the region	Existing national reports					x				x			EASTECO, National Commissions of Science and Technology
	Undertake a detailed mapping study to document all STEM stakeholders and the programs they run at regional level, national and local levels					x			x			x		EASTECO, National Science and Technology Commissions
	Design and implement a regional STEM information management system that captures information about STEM interventions, initiatives, programs and activities at all levels and share this information periodically through publications					x			x			x		EASTECO
	Undertake national level labour studies to simulate the STEM skills requirements to achieve vision 2050						x				x			EASTECO, National Commissions of Science and Technology, National Institutes/Bureaus of Statistics, Ministry of Education
Pillar Two: Enhance the teaching and learning environment for STEM at all levels (pre-school, primary, secondary, universities, colleges and TVET) levels.														
				Year of intervention/activity										Regional /National/ local implementing/ reporting institution(s)
Key outcomes	Key intervention	Baseline	Target by 2030	1	2	3	4	5	6	7	8	9	10	
	Develop teaching guidelines for STEM for use in pre-primary, primary and secondary schools, universities and TVET colleges emphasizing contextual relevance and practicality				x		x		x		x		x	EASTECO, National Science and Technology Commissions, National Curriculum Development Centres
	Develop and make readily available STEM resources that are understood by learners and teachers from various backgrounds (STEM learning resources available in different languages)			x	x	x								

	Support the development and adoption of a core STEM curriculum for use at all levels of education at national levels			x	x	x	x	x						
	Design and introduce programs that attract sufficient numbers of students to STEM programs.			x	x	x	x	x						
	Equip schools with proper STEM facilities to inspire and arouse interest as well as enhancing completion rates for girls			x	x	x	x	x	x	x	x	x	x	
	Develop a sustained campaign to advocate for the allocation of sufficient funds at national level to STEM education and research through sustained public and private investment			x	x	x	x	x	x	x	x	x	x	
	Develop interventions and innovations that bridge rural-urban disparities in terms of access to STEM resources			x	x	x	x	x	x	x	x	x	x	
	Design innovative programs encouraging more female students to enroll in STEM programs at secondary school, universities and TVET levels through internships, fellowships, scholarships, and other training opportunities			x	x	x	x	x	x	x	x	x	x	
	Periodically undertake surveys to measure attitudes and career interests of learners to identify teaching and learning experiences that positively shape perceptions about STEM					x			x			x		
	Identify and provide technical support to more STEM model schools in each Partner State for demonstrating best practices and effective STEM teaching and learning			x	x	x	x	x	x	x	x	x	x	
	Undertake regular reviews of teacher experience with STEM materials and learning environment				x		x		x		x		x	

Pillar Three: Strengthen the linkages between institutions of higher learning (universities, colleges, TVETs and research institutions) and industry (employers) players														
				Year of intervention/activity										Regional /National/ local implementing/ reporting institution(s)
Key outcomes	Key intervention	Baseline	Target by 2030	1	2	3	4	5	6	7	8	9	10	
	Provide regular periodic information to students of STEM on industrial attachment opportunities;				x		x		x		x		x	
	Arrange periodic engagements with industry players to gain insights on the changing demands of industry with regard to STEM skills;			x	x	x	x	x	x	x	x	x	x	
	Identify and establish twinning partnerships between specific industry players with specific STEM needs through jointly developed programs and sponsorships.			x	x	x	x	x	x	x	x	x	x	
	Design good partnership models between schools and employers that demonstrate champions of STEM			x	x	x	x	x	x	x	x	x	x	
	Strengthen partnerships with other key stakeholders to foster collaborative research and professional development opportunities and to attract extramural funding in STEM field			x	x	x	x	x	x	x	x	x	x	
	Support research, development, and dissemination of effective trans-disciplinary STEM education practices, programs, and policies			x	x	x	x	x	x	x	x	x	x	
	Design and implement an employer recognition system that awards employers for engaging with institutions of learning, providing feedback and supporting STEM professionals with on the job skilling and related assistance			x	x	x	x	x	x	x	x	x	x	

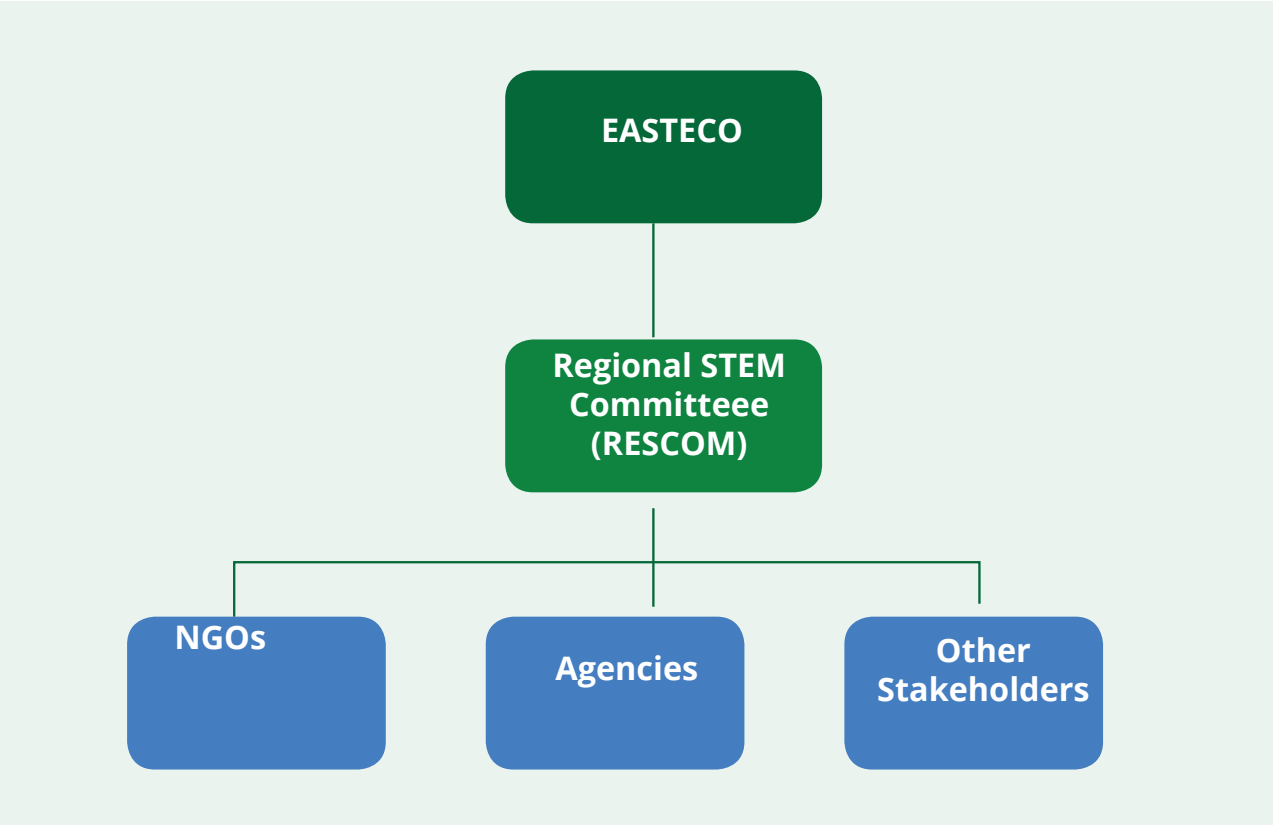
Pillar Four: Raise general awareness of STEM and coordinate the efforts to implement the STEM strategy													
				Year of intervention/activity									Regional /National/ local implementing/ reporting institution(s)
Key outcomes	Key intervention	Baseline	Target by 2030	1	2	3	4	5	6	7	8	9	10	
	Put in place STEM Coordination Steering Committee that brings together all the actors identified in the strategy for coordination of STEM at regional levels and organize regular meetings				x		x		x		x		x	
	Create the administrative infrastructure necessary to support planning, coordination, assessment, and undertake continuous improvement of STEM initiatives				x		x		x		x		x	
	Undertake coordination of STEM, related information and offer guidance by developing action plans for achievement of the objectives of this Strategy			x	x	x	x	x	x	x	x	x	x	
	Develop Annual Action Plan for implementation of STEM Strategy activities			x	x	x	x	x	x	x	x	x	x	
	Disseminate examples, best practices, and lessons learned and outcomes with stakeholders as well as through media outlets			x	x	x	x	x	x	x	x	x	x	

CHAPTER FIVE: MONITORING & EVALUATION FRAMEWOK

This M&E framework forms an integral part of the strategy and its purpose is to provide a clear mechanism by which progress towards achieving the objectives of this strategy can be tracked. It is built on the information, best practices and needs identified from the existing baseline status of STEM within EAC Partner States and at the regional level. The general aim of the M&E Framework is to give a road map for effective implementation of the Strategy with corresponding outcomes, activities, indicators and means of verification, baselines, targets, timelines and responsibilities at every levels. The framework has carefully adopted the overall goal or desired impact that the regional STEM Strategy is to make, the stakeholders and audience the Strategy seeks to benefit, as we as specific interventions.

The coordination Structure is one key element of Successful implementation of the STEM Strategy at regional level and within Partner States. This is because it provides roadmap for monitoring performance at every level to ensure achievement of overall goals. Accordingly, the proposed coordination framework is at three levels; at the regional level led by central organ in charge of the STEM Strategy, Partner States Level and the combination of the two levels in a committee set up as discussed below:

Table 1: Coordination Structure



5.1 STRATEGY IMPLEMENTATION FRAMEWORK

The East African Science and Technology Commission (EASTECO) is the main coordinating institution for the implementation of the STEM strategy. A successful implementation of the strategy requires the commitment of Partner States institutions especially the national science commissions, the relevant ministries, national specialized agencies, the various regional centers of excellence as well as NGOs, development partners, relevant UN institutions, universities and the private sector players. As well as being the custodian of the strategy, EASTECO has the greatest role in coordinating its implementation. The roles of EASTECO include but are not limited to:

- Coordinating the activities leading to the development, validation & approval of this Strategy
- Presenting the Strategy to different member states
- Communicating the Strategy to different Stakeholders
- Supporting member states in implementing the national activities indicated in the strategy through guidance and or any other means
- Sensitizing and bringing together all stakeholders
- Mobilizing the resources for effective implementation of the Strategy
- Developing Action Plans for the implementation of the strategy
- Evaluating the Strategy at agreed intervals
- Commissioning data collection & dissemination
- Establishing linkage with external partners, governments and multinational organizations

5.2 ROLE OF EAC PARTNER STATES

Although the strategy is developed at the regional level, it is the Partner States that have to implement most of its recommendations. This means that the Partner States take the lead in the implementation of the measures that will make STEM strong in the region. Governments of the Partner States will have to own the strategy and commit themselves to its implementation by mobilizing the political good will needed to make the implementation possible. As has already been indicated, the strategy requires a number of conditions to be met for it to be satisfactorily implemented. These are collectively called the strategy enablers. It is the governments of the Partner States for example that have to mobilize the financial and other resources needed to implement the strategic priorities.

There are existing public institutions in the Partner States that are charged directly or indirectly with the promotion of STEM. These public institutions are responsible for or involved in the formulation of policies, design of programs, monitoring of programs and policy implementation and well as liaising with industry players. In some Partner States, some of these institutions may require additional technical assistance to make them capable of taking on additional tasks such as the implementation of this strategy. In some cases, this may involve a restructuring of the institutional framework within a country. All this is the work of national governments to undertake.

Consequently, the involvement of these institutions and agencies from Partner States will be very crucial in terms of the following:

- Adopting common indicators for measuring progress towards agreed targets, outputs and outcomes
- Identifying priorities and proposing activities where there are no specific government programs, initiatives and projects for STEM or where specific improvements may be proposed;
- Using the strategy as a reference tool for strategic orientation of future government STEM interventions and programs
- Assigning a representative(s) to the proposed national and/or regional STEM coordinating committees

5.3 ROLE OF NATIONAL STEERING COMMITTEES

As indicated above, EASTECO will work with the EAC Partner States to establish national STEM Steering committees whose members or representatives will form the regional STEM Committee (RESCOM). The national STEM committees will have the following roles and responsibilities:

- providing a forum that brings together all the actors identified in the Strategy for coordination and strengthening STEM at national & regional levels
- promoting common STEM initiatives, projects, programs and STEM promotion by sparking new ideas and develop new opportunities collaboratively
- undertaking coordination role in provision of STEM Career related information, labour market and offer guidance by developing action plans for achievement of the objectives of this Strategy
- supporting data collection at national and regional levels to inform the strategic actions towards promotion & strengthening of STEM practices, projects, initiatives and programs

5.4 MONITORING AND EVALUATION

Monitoring progress on the implementation of the strategy is crucial to ensure that the objectives are being met. Mechanisms for reporting shall be agreed upon and followed. These will include:

- Annual reports on the status of STEM from the national coordinating institutions that will be designated by the Partner States. These could be the national science and technology councils or the relevant ministries.
- The regional committee through EASTECO produces a bi-annual report about the status of STEM in the region.
- A mid-term review of the policy will be undertaken in the 5th year of implementation
- A final evaluation to take place at the end of the 10-year period.

EASTECO will be responsible for liaising with national institutions to prepare and provide annual reports as well as being responsible for preparing the regional reports.

Monitoring and Evaluation Matrix

Pillar one: Identify and simulate STEM needs in the EAC to achieve Vision 2050														
				Year of intervention/activity										Means of verification
Key outcomes	Key intervention	Baseline	Target by 2030	1	2	3	4	5	6	7	8	9	10	
Two scoping studies	Undertake a scoping study to document existing STEM resources in the region						x				x			Scoping study reports
Two mapping studies undertaken	Undertake a detailed mapping study to document all STEM stakeholders and the programs they run at regional level, national and local levels					x			x			x		Mapping reports
STEM IMS designed STEM IMS implemented	Design and implement a regional STEM information management system that captures information about STEM interventions, initiatives, programs and activities at all levels and share this information periodically through publications					x			x			x		Annual reports
6 labour studies conducted twice in 10 years	Undertake national level labour studies to simulate the STEM skills requirements to achieve vision 2050						x				x			4-year interval labour studies reports

Pillar Two: Enhance the teaching and learning environment for STEM at all levels (pre-school, primary, secondary, universities, colleges and TVET) levels.														
				Year of intervention/activity										Regional /National/ local implementing/ reporting institution(s)
Key outcomes	Key intervention	Baseline	Target by 2030	1	2	3	4	5	6	7	8	9	10	
Develop and review guidelines for use in the region and review after 5 years	Develop/review teaching guidelines for STEM for use in pre-primary, primary and secondary schools, universities and TVET colleges emphasizing contextual relevance and practicality				x		X		x		X		x	EASTECO, National Science and Technology Commissions, National Curriculum Development Centres
Materials available in 3 years	Develop and make readily available STEM teaching and learning resources that are understood by learners and teachers from various backgrounds (STEM learning resources available in different languages)			x	x	x								
This takes time	Support the development and adoption of a core STEM curriculum for use at all levels of education at national levels			x	x	x	X	x						
Special programs to attract more students to STEM	Design and introduce programs that attract sufficient numbers of students to STEM programs.			x	x	x	X	x						
Selected schools to be well equipped ensuring equitable selection	Equip schools with proper STEM facilities to inspire and arouse interest as well as enhancing completion rates for girls			x	x	x	X	x	x	x	X	x	x	
Funding STEM must be justified and sustained	Develop and sustain a campaign for the allocation of sufficient funds at national level to STEM education and research through sustained public and private investment			x	x	x	X	x	x	x	X	x	x	
Special programs and innovations to support rural schools, teachers and learners	Develop and implement interventions and innovations that bridge rural-urban disparities in terms of access to STEM resources			x	x	x	X	x	x	x	X	x	x	
Special programs/ interventions to attract and retain female learners on STEM	Design and introduce innovative programs encouraging more female students to enroll in STEM programs at secondary school, universities and TVET levels through internships, fellowships, scholarships, and other training opportunities			x	x	x	X	x	x	x	X	x	x	

3 surveys after every two years	Periodically undertake surveys to measure attitudes and career interests of learners to identify teaching and learning experiences that positively shape perceptions about STEM					x			x			x		
STEM model schools as in Kenya	Identify and provide technical support to more STEM model schools in each Partner State for demonstrating best practices and effective STEM teaching and learning			x	x	x	x	x	x	x	x	x	x	
Undertake reviews every two years	Undertake regular reviews of teacher experience with STEM materials and learning environment				x		x		x		x		x	
Pillar Three: Strengthen the linkages between institutions of higher learning (universities, colleges, TVETs and research institutions) and industry (employers) players														
				Year of intervention/activity										Regional /National/ local implementing/ reporting institution(s)
Key outcomes	Key intervention	Baseline	Target by 2030	1	2	3	4	5	6	7	8	9	10	
Compile data on these opportunities at country and regional level	Provide regular periodic information to students of STEM on industrial attachment opportunities				x		x		x		x		x	
Organise annual engagement meetings between industry and academia and professionals	Organise periodic engagements with industry players to gain insights on the changing demands of industry with regard to STEM skills			x	x	x	x	x	x	x	x	x	x	
Identify industries that work with STEM institutions directly supporting the programme peg through sponsorship and tailored programs	Identify and establish twinning partnerships between specific industry players with specific STEM needs through jointly developed programs and sponsorships			x	x	x	x	x	x	x	x	x	x	
Develop special partnership systems	Design and operationalize good partnership models between schools and employers that demonstrate champions of STEM			x	x	x	x	x	x	x	x	x	x	
Develop collaborative research programs between academia and industry	Strengthen partnerships with other key stakeholders to foster collaborative research and professional development opportunities and to attract extramural funding in STEM field			x	x	x	x	x	x	x	x	x	x	

Develop and fund STEM inter-disciplinary research programs	Support research, development, and dissemination of effective inter-disciplinary STEM education practices, programs, and policies			x	x	x	x	x	x	x	x	x	x	
Organise employer recognition/ award programs annually	Develop and implement an employer recognition system that awards employers for engaging with institutions of learning, providing feedback and supporting STEM professionals with on the job skilling and related assistance			x	x	x	x	x	x	x	x	x	x	
Pillar Four: Raise general awareness of STEM and coordinate the efforts to implement the STEM strategy														
				Year of intervention/activity										Regional /National/ local implementing/ reporting institution(s)
Key outcomes	Key intervention	Baseline	Target by 2030	1	2	3	4	5	6	7	8	9	10	
A regional committee focusing on STEM strategy implementation	Put in place STEM Coordination Steering Committee that brings together all the actors identified in the strategy for coordination of STEM at regional levels and organize regular meetings				x		x		x		x		x	
Hire staff where necessary at regional level	Create the administrative infrastructure necessary to support planning, coordination, assessment, and undertake continuous improvement of STEM initiatives				x		x		x		x		x	
Support national institutions to develop their own STEM strategies	Undertake coordination of STEM, related information and offer guidance by developing action plans for achievement of the objectives of this Strategy			x	x	x	x	x	x	x	x	x	x	
Joint annual action planning	Develop Annual Action Plan for implementation of STEM Strategy activities			x	x	x	x	x	x	x	x	x	x	
Document best practices at different levels and share with stakeholders	Disseminate examples, best practices, and lessons learned and outcomes with stakeholders as well as through media outlets			x	x	x	x	x	x	x	x	x	x	

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