Association for the Development of Education in Africa

MINISTRY OF EDUCATION
REPUBLIC OF KENYA

ADEA Inter-Country Quality Node on Mathematics and Science Education

The LEGO Foundation
www.learningthroughplay.com

# The Strategic Framework For The Inter-Country Quality Node on Mathematics and Science Education (ICQN-MSE) in Africa, 2024 - 2028

April, 2024

**Association for the Development of Education in Africa (ADEA)**
African Development Bank Group (AfDB),
Immeuble CCIA Plateau, Avenue Jean-Paul II
01 BP 1387, Abidjan 01 Côte d'Ivoire
Tel.: (+225) 272026 3964
Email: adea@afdb.org
Website: www.adeanet.org



Inter-Country Quality Node on Mathematics and Science Education (ICQN-MSE)
Secretariat Office, Host Institution
Centre for Mathematics, Science and Technology Education in Africa (CEMASTEA)
P. O. Box 24214 – 00502
Karen, Nairobi – Kenya
Tel.: 020 2044406 / 0706 722697 / 0780 797648
E-mail: ceo@cemastea.ac.ke
Website: www.cemastea.ac.ke

Developed with the support of the LEGO Foundation

……..

**Citation**

ADEA (2024). The Strategic Framework for the Inter-Country Quality Node on Mathematics and Science Education (ICQN-MSE) in Africa, 2024 - 2028

**TABLE OF CONTENTS**

## THE PROFILE OF THE ASSOCIATION FOR THE DEVELOPMENT OF EDUCATION IN AFRICA (ADEA)

The Association for the Development of Education in Africa (ADEA) is a Pan-African organization committed to promoting quality education and training in Africa through policy dialogue, advocacy, knowledge sharing, and partnership building. It focuses on helping ministries of education and funding agencies to coordinate their efforts to create successful education policies best on African leaderships. ADEA through the Inter-Country Quality Node on Mathematics and Science Education (ICQN-MSE) aspires to achieve the following vision, and mission:

### ADEA's Vision

The Association is committed to the transformation of education and training in African countries and achieving "high-quality education and training geared towards the promotion of critical knowledge and skills for accelerated and sustainable development in Africa".

In this framework, the ICQN-MSE is visioning to transform the quality of Science, Technology, Mathematics and Engineering (STEM) education in Africa as encapsulated in the vision. "***Empower African countries in STEM education for sustainable development***."

### ADEA's Mission

ADEA's mission is to "serve as an open and flexible Pan-African organization that informs and facilitates the transformation of education and training to drive Africa's accelerated and sustainable development". ADEA contributes to the revitalization and strengthening of education systems in Africa by facilitating dialogue, experience sharing, and cooperation among ministries of education, development partners, and key stakeholders. ADEA collaborates with governments, institutions, and stakeholders to develop innovative solutions, promote research, and capacity development programs, ultimately empowering African learners to excel in STEM fields, fostering innovation, and contributing to the continent's sustainable development.

The ICQN - MSE, as one of the nodes, that works to realize ADEA's mission of advancing STEM education in Africa as embodied in the mission, "***To catalyze and promote transformative policies, practices, and partnerships in STEM education in African countries through fostering innovation, capacity-building, and regional collaboration."***

### ADEA's Guiding Principles

ADEA is committed to the following guiding principles and values: African ownership, equal and multi-partnership, mutual trust, results-oriented, learning organization, innovation, commitment to change, integrity, gender-sensitivity, value-driven, and equitable opportunities and results.

## FOREWORD

This is a great milestone to introduce the Strategic Framework for the Inter-Country Quality Node on Mathematics and Science Education in Africa (ICQN-MSE) for the period 2024 – 2028. This framework represents a pivotal roadmap for advancing Science, Technology, Engineering, and Mathematics education (STEM) in African countries. The pursuit of excellence in STEM education is intrinsically connected to a broader canvas of global, continental, and regional aspirations. It is fitting to acknowledge the profound influence of key documents and initiatives that guide the collective journey of developing quality education on the continent of Africa.

The United Nations Sustainable Development Goals (SDGs) stand as a beacon, with Goal 4 underscoring the need for inclusive and equitable quality education, while Goal 9 highlights the crucial role of industry, innovation, and infrastructure. The Agenda 2063 and the Continental Education Strategy for Africa (CESA) 2016-2025 were referred to in the development of this strategic framework. The Science, Technology, and Innovation Strategy for Africa (STISA) 2024, acknowledges the pivotal role of STEM education in advancing Africa's sustainable development. In the spirit of these global, continental, and regional imperatives, ADEA's ICQN-MSE developed this comprehensive Strategic Framework. This Framework envisions an Africa where every learner has equitable access to high-quality STEM education. It aspires to nurture a new generation of innovators, problem solvers, and leaders to propel development in the continent to greater heights in the global arena.

I extend my gratitude to the dedicated individuals, organizations, and governments who contributed to the development of this strategic framework. Your dedication exemplifies the spirit of collaboration. I call upon all stakeholders to join hands with us in implementing this strategic framework. We recognize the value of partnerships and the collective strength in the development of STEM education. I extend my invitation to organizations already working with us, as well as those who share our vision of transforming STEM education in Africa. Let us remain steadfast in our resolve to make STEM education a cornerstone of Africa's development.

**Hon. Ezekiel Machogu Ombaki**
**Cabinet Secretary, Ministry of Education**
**Republic of Kenya**

## PREFACE

It is a honor to present to you the first ***Strategic Framework for the Inter-Country Quality Node on Mathematics and Science Education (ICQN-MSE) in Africa 2024 – 2028.*** The document represents a significant milestone in the collective efforts to advance quality STEM education in African countries. Gratitude to the Cabinet Secretary, Ministry of Education, Kenya as the leader of the ICQN-MSE for providing strategic leadership in the development of the Strategic Framework that will guide the Node for the next three years.

The Association is committed to the transformation of education and training in African countries and achieving "high-quality education and training for accelerated and sustainable development in Africa". ADEA's goal of empowering African countries to reform the educational systems sustainably guides the quest to deliver equitable, inclusive, relevant and quality education. The strategic framework for the ICQN-MSE aspires to transform the quality of Science, Technology, Mathematics and Engineering (STEM) education in Africa as captured in the vision to, ***"Empower African countries in STEM education for sustainable development."***

The Strategic Framework is informed by findings of two studies conducted by the ICQN-MSE to establish the status of STEM education in secondary school' level and the situational analysis on Play-Based STEM education in Africa. The SF is a roadmap for achieving the aspirations of the ICQN-MSE's Vision and Mission. The SF details strategic issues, objectives, strategies and resource requirement for implementation of planned activities in the three-year period. The drafting process considered the situational analysis reports on the strategic issues to realize the Strategic areas namely; in Africa from which …. Strategic objectives were derived.

**Albert Nsengiyumva**
**Executive Secretary**
**Association for the Development of Education in Africa**

**ACKNOWLEDGMENTS**

We are indebted to various stakeholders that made the Inter-Country Quality Node on Mathematics and Science Education (ICQN-MSE) Strategic Framework a reality. Gratitude to the Ministry of Education, Kenya led by the Cabinet Secretary for the strategic leadership support. Appreciation to the ministries of education in African countries that facilitated Country Focal Point (CFP) officers to participate in the validation of the Strategic Framework. To the outstanding leadership of the Board of Directors, management and staff of the Centre for Mathematics, Science and Technology Education in Africa (CEMASTEA), representatives from African countries and development partners that made valuable contributions to the Strategic Framework.

Appreciation to the ADEA ICQN-MSE coordinator Dr. Mary W. Sichangi who tirelesly worked to ensure a strategic framework that articulates the aspiration of the node in the next five years. Much regards to the ADEA resource person Dr. Marie-Christine Gasingirwa, for the commitment in ensuring successful development of the framework. Furthermore, this is to acknowledge and thank all stakeholders, including the ministries of education representatives from African countries, educators, researchers, and civil society organizations, who provided valuable insights, recommendations, and feedback during the development of this framework. Your perspectives and engagement have enriched the understanding of challenges and opportunities in STEM education in Africa.

Recognition and appreciation to the LEGO Foundation for funding support by way of strengthening Play-Based STEM education at the basic learning level in Africa grant. The collaboration and investment in the ICQN-MSE in Africa demonstrates a shared commitment to advancement of STEM education and empowerment of the youth of Africa. This is to affirm that the commitment of participating stakeholders in developing the strategic framework will become agents of change to lead transformative changes in STEM education in respective countries of Africa.

Together, we can equip our learners with knowledge and skills needed to excel in the modern world and contribute to sustainable development of African countries. The call to action is to request that we all work hand in hand to turn this vision into reality and make a lasting impact on the lives of young Africans.

**ADEA ICQN-MSE Secretariat**

## LIST OF TABLES

## CONCEPTS AND TERMINOLOGIES

*Table 1: Concepts and Terminologies*

| | |
|---|---|
| **Action plan** | The action plan lists the specific actions that must be taken, by whom and by when in order to achieve an overall goal or implement a strategy. |
| **External analysis** | This form of analysis includes examining the opportunities and threats that might affect the organization, often by using various assessment tools to assess, for example, various potential changes to driving forces, stakeholders, competitors and collaborators. External factors are those outside the control of the organization. |
| **Key Performance Indicator (KPI)** | Distinguished from other metrics, key performance indicators (KPIs) are those metrics most critical to gauging progress toward objectives. KPIs are metrics that are: tied to an objective; have at least one defined time-sensitive target value; and have explicit thresholds which grade the gap between the actual value and the target. |
| **Financial Plan** | Specifies the financial resources needed to operate the organization during one or more years of the span of the Strategic Plan, and should include financial resources necessary to address each of the strategic priorities in the Strategic Plan. Often referred to as the Annual Budget or Operating Budget. |
| **Goal (strategic)** | A goal is a specific accomplishment to be achieved at some point in the future. |
| **Governance** | This term refers to the nature of the activities conducted by the Board of Directors, including clarifying the overall purpose of the organization; optionally the vision and/or values of the organization; establishing broad policies and plans for how the organization operates to that purpose; and monitoring the implementation of those policies and plans. |
| **Implementation Plan** | The set of activities to increase the likelihood that a Strategic Plan will be implemented, and can include all of the action plans (they specify accountabilities for implementation). |
| **Internal analysis** | This includes examining the strengths and weaknesses of the organization, often by using various assessment tools to examine the quality of internal aspects of the organization. |

| | |
|---|---|
| **Issues (strategic)** | Strategic issues are very important challenges that the organization must face, often in the forms of weaknesses of the organization and pending threats to the organization. Identification of strategic issues often results from external and internal analyses, which, together, comprise the situational analysis. |
| **Mission (statement)** | The mission statement describes the overall purpose of the organization. |
| **Operational Plan** | The operating plan is usually focused on the action plans over a one-year period. |
| **Outcomes (results)** | The highest-level change that can be reasonably attributed to an organization or program. Outcomes can be short-term (usually changes in knowledge), intermediate (changes in skills) and long-term (changes in conditions). |
| **Situational analysis** | The situational analysis includes conducting analyses of the environments that are external and internal to the organization, in order to identify strategic issues or goals to be addressed during the strategic planning. |
| **Stakeholders** | Stakeholders are those people or groups of people who have a stake, or strong interest, in the operations, or effects of operations, of the organization. |
| **Strategy** | A strategy refers to an organization's long-term goals and how it plans to reach them. |
| **Strategic planning** | Process undertaken by an organization to clarify its overall organizational purpose, priorities to work toward that purpose and how each priority will be addressed. |
| **Values (statement)** | The values statement describes the overall, top-level priorities for how an organization chooses to conduct its activities and to be viewed by the public, for example, integrity, efficiency and reliability. |
| **Vision (statement)** | The vision is a vivid and compelling description of the organization and its customers/clients at some time in the future. |

## ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| **ADEA:** | Association for the Development of Education in Africa |
| **CEMASTEA:** | Centre for Mathematics, Science and Technology Education in Africa |
| **CESA**: | Continental Education Strategy for Africa |
| **CSTI:** | Centre for Science, Technology and Innovation |
| **EAC:** | East African Community |
| **EFA:** | Education for All |
| **4IR**: | Fourth Industrial Revolution |
| **ICQN-MSE:** | Inter-Country Quality Node on Mathematics and Science Education |
| **ICQN:** | Inter-Country Quality Node |
| **ICT:** | Information and Communications Technology |
| **KRA**: | Key Result Area |
| **LAN:** | Local Area Network |
| **M&E:** | Monitoring and Evaluation |
| **MDGs:** | Millennium Development Goals |
| **MINEDUC:** | Ministry of Education |
| **NGOs:** | Non-Governmental Organizations |
| **PESTEL:** | Political, Economic, Social, Technological, Ecological/ Environmental, Legal |
| **RECs**: | Regional Economic Communities |
| **SADC:** | South African Development Community |
| **SDGs:** | Sustainable Development Goals |
| **SF:** | Strategic Framework |
| **STEM:** | Science, Technology, Engineering and Mathematics |
| **STISA:** | Science, Technology and Innovation Strategy for Africa |
| **SWOT:** | Strength, Weaknesses, Opportunities and Threats |
| **TBD:** | To Be Determined |
| **ToTs:** | Trainer of Trainers |
| **UNDP:** | United Nations Development Programme |
| **UNESCO:** | United Nations Scientific and Cultural Organization |
| **UNICEF:** | United Nations Children's Fund |
| **VRIO:** | Value, Rarity, Imitability, and Organization |
| **WGMSE:** | Working Group on Mathematics and Science Education |

## EXECUTIVE SUMMARY

Quality STEM education is crucial for Africa's development. However, challenges persist in ensuring consistent excellence in these disciplines across the continent. To address these challenges, the Association for the Development of Education in Africa (ADEA), through the Inter-Country Quality Node on Mathematics and Science Education (ICQN-MSE) developed a strategic framework that provides a clear roadmap and direction for the ICQN-MSE activities and initiatives. This framework is closely aligned with global, continental and regional aspirations namely; SDGs, Agenda 2063 for Africa, CESA (2016-2025), STISA (2024), and regional commitments in order to reinforce the continent's commitment to fostering innovation, education, and sustainable development.

The development of the strategic framework was based on two studies conducted by the ICQN-MSE. The studies focused on assessing the status of STEM education in secondary school level in sample African countries, and a situational analysis on the status of play-based STEM education in primary schools in sample African countries. Strategic issues were identified from the two study reports as follows: Access, equity, inclusion and retention; Curriculum reform; Quality and relevance; Infrastructure, equipment and material resources; Collaborative partnerships and linkages; ICT integration in STEM education; Research and Development; and Cross-cutting issues.

ADEA identified a resource person to draft the strategic framework, which was subjected to a consultative in-person workshop. This workshop brought together stakeholders from fourteen African countries, fostering meaningful discussions and collaborations. As a result, four strategic objectives were identified, setting the course for ICQN-MSE's endeavours from 2024 to 2028:

**Strategic objective 1:** Support the development of policies that enhance access, equity, inclusion and retention in STEM education in African countries.
**Strategic objective 2:** Enhancing quality, relevance, efficiency and effectiveness in delivery of STEM education programs.
**Strategic Objective 3:** Strengthen collaborative partnerships and linkages that support STEM education at basic learning levels in Africa.
**Strategic Objective 4:** Strengthen a culture of research and development that seeks to encourage and support innovation, evidence-based policy and practices.

The strategic objectives above gave rise to strategies and activities to guide the implementation of the Strategic Framework. These have been defined with specific resource allocations and estimated budgets detailed in the result-based performance implementation matrix. A monitoring and evaluation tool is included to track the

implementation of activities and provides information to assess the value of investments over the strategic period. The final strategic framework was presented to stakeholders for validation. This strategic framework aims to enhance quality STEM education in African countries, serving as a guide in terms of policy discussions, development, and promotion of relevant programs in Africa.

CHAPTER 1 is the introduction and describes the rationale for the strategic framework, the context of the SF, the historical background of the ICQN-MSE, and the methodology of developing the Strategic Framework. This context describes how the ICQN-MSE aspires to implement programs that support attainment of the continental and international commitments. This includes the United Nations 2030 Agenda for Sustainable Development Goals (SDGs), African Union Agenda 2063 and ADEA's vision.

CHAPTER 2 describes the situational and stakeholder analysis. The external environment in terms of Political Economic, Social, Technological, Environmental and Legal (PESTEL) and internal environmental scan of Strengths, Weaknesses, Opportunities and Threats (SWOT) as well as Valuable, Rare, Inimitable and Organization-wide supported (VRIO) were analyzed and feedback applied to current needs. The chapter also details the stakeholders' analysis and related interest in STEM education.

CHAPTER 3 describes the strategic direction of the ICQN-MSE. The vision, mission and strategic objectives are contained here. The chapter lays out a comprehensive Strategic Framework for the advancement of STEM education in Africa. The framework encompasses strategic objectives, strategies and planned activities. The strategic objectives form the backbone of the framework, addressing challenges and opportunities within the African STEM education landscape.

CHAPTER 4 details the implementation and coordination plan for the strategic framework. The chapter also details the annual work plan and budget for the Plan period. Each objective details; specific activities, outputs, outcomes, and indicators, fostering a holistic approach to stakeholder involvement in the development of STEM education in Africa. The chapter concludes with a risk management matrix and mitigation measures. Furthermore, it emphasizes the critical role of funding in executing the framework. It underscores the need for diverse funding sources from public and private sectors, international organizations, and philanthropic foundations. The implementation budget for the strategic framework stands at ***USD 1,830,250***.

CHAPTER 5 details the monitoring, evaluation and learning techniques outlining the key performance indicators to be monitored. The chapter includes planned evolution, assumptions and risk matrix and a mitigation plan.

# CHAPTER ONE:
# INTRODUCTION

Chapter One provides a rationale for the Strategic Framework (SF), the context of the SF, the background of the Inter-Country Quality Node on Mathematics and Science Education (ICQN-MSE), principles of the ICQN-MSE SF and the methodology of developing the SF. The context describes how ADEA through the ICQN-MSE seeks to advance polices that support attainment of the global, continental and regional commitments namely; the United Nations 2030 Agenda for Sustainable Development Goals (SDGs), African Union Agenda 2063. The chapter also introduces the importance of STEM education in the context of the Fourth Industrial Revolution, the challenges faced in Africa, and the need for a strategic framework in order to collectively address these challenges.

## 1.1 The Strategic framework: Rationale and Purpose

The Inter-Country Quality Node on Mathematics and Science Education (ICQN-MSE) as an entity of ADEA requires a SF that enumerates strategies for achieving the core aspirations of the Pan Africa organization. The development of the SF is a demonstration of the commitment of the ADEA leadership, the minister of education, Kenya as the leader of the ICQN-MSE, the Secretariat and stakeholders from other Africa countries.

In order to address persistent obstacles of STEM education in Africa, the Association for the Development of Education in Africa (ADEA) undertook two studies on the subject. The first study focused on assessing the status of STEM education in secondary school level in nine sample African countries. The second study analysed the status of play-based STEM education in primary schools in sample African countries.

Based on insights from these studies, participating countries engaged in multi-stakeholder validation workshops to review evidence and priority issues. Arising from the stakeholder engagement forums it was observed that a coordinated strategic framework was needed to systematically tackle cross-border challenges through collaborative efforts. ADEA then spearheaded the development of the ICQN-MSE Strategic Framework (SF) 2024-2028 in collaboration with African ministries of education and STEM experts. The SF provides policy guidance and a structured approach towards achieving excellence in STEM education. It outlines shared goals and coordination mechanisms, and seeks to optimize interventions for maximum impact through regional synergies.

The SF development process ensured national ownership through country participation. Stakeholders collectively refined and endorsed the SF to promote uptake at institutional levels. Its flexibility allows for contextualization to diverse country circumstances while upholding common principles. This SF is envisioned to strengthen African STEM education systems, foster innovation and empower sustainable development through STEM education.

The SF aligns the efforts of multiple countries to ensure they are working towards common goals and objectives in STEM education. The alignment improves efficiency and effectiveness in resource allocation and program implementation. It provides a framework for monitoring and evaluating progress towards achieving the set objectives. The SF encourages collaboration

and knowledge sharing among participating countries and partners to facilitate the exchange of best practices, lessons learned, and research findings towards mutual learning and improvement.

The framework proposes policy recommendations or guidelines that participating countries can consider in the efforts to strengthen STEM education policies. The recommendations relate to issues such as curriculum development, teacher certification, and funding priorities.
Therefore, the specific purpose and content of the "ICQN MSE Framework" depends on the goals and priorities of the ICQN and the participating countries. This framework provides strategic thinking and planning by outlining the key focus areas for ICQN-MSE initiatives.

### 1.2 The Context of the ICQN-MSE Strategic framework

The ICQN-MSE plays a crucial role in advancing strategic policies that support development of STEM education in Africa. The node's developmental agenda is aligned with and influenced by various global, continental, and regional frameworks and initiatives aimed at enhancing education, fostering innovation, and driving sustainable development. The Strategic Framework for the ICQN-MSE was developed in reference to global, regional and continental development frameworks as discussed in the sections below.

#### 1.2.1 Global Frameworks

United Nations Sustainable Development Goals (SDGs) (UN, 2015): The ICQN-MSE's agenda on STEM education aligns with several SDGs namely; Goal 4 on quality, inclusive and equitable education that promotes lifelong learning opportunities; SDG number 5 on achieving gender equality and empowering women and girls; SDG goal number 9 on industry, innovation, and infrastructure; SDG number 17 on strengthening the means of implementation and revitalizing the global partnership for sustainable development. The ICQN-MSE contributes to achieving these global goals, particularly in the African context by promoting relevant policy and best practice to support development of STEM education.

The UNESCO's education 2030 framework: The ICQN-MSE agenda of promoting quality STEM education in Africa is in harmony with the UNESCO's education 2030 agenda specifically the emphasis on inclusive, equitable, and quality education. STEM education is recognized as a driver of socio-economic development and innovation, which aligns with the goals of Education 2030.

The global STEM education initiatives: ICQN-MSE collaborates with global STEM education initiatives, networks and industry partners to share best practices, research, innovation and resources. This international engagement helps Africa benefit from global expertise and trends in STEM education.

#### 1.2.2 Continental Frameworks

African Union's Agenda 2063: ICQN-MSE's agenda on STEM education resonates with the African Union's Agenda 2063, which envisions a prosperous and integrated Africa driven by its citizens that is focused on inclusive growth and sustainable development, good governance, respect for human rights, justice and the rule of law. STEM education is essential for achieving

this vision, as it underpins innovation, economic growth, and industrialization through advocating for favourable policy guidelines.

Continental Education Strategy for Africa (CESA 2016-2025): The initiatives of the ICQN-MSE align with CESA's strategic goal number seven (7) on revitalizing STEM education as a central driver of continental development. The focus on revitalizing the teaching profession, accelerate processes leading to gender parity and equity and strengthen science and mathematics curricula speak directly to the need for the provision of quality, relevant and inclusive STEM education.

Science, Technology, and Innovation Strategy for Africa (STISA 2024): ICQN-MSE contributes to the objectives of STISA 2024 by promoting STEM education to foster and accelerate Africa's transition to an innovation-led, knowledge-based economy in Africa.

### 1.2.3 Regional Frameworks

Regional Economic Communities (RECs): ICQN-MSE collaborates with RECs, such as the East African Community (EAC) and the Southern African Development Community (SADC), to align STEM education efforts with regional development goals and strategies. This cooperation ensures that the programs are tailored to regional needs.

### 1.2.4 ICQN-MSE's program-based context

All over the world, education has been credited for being an avenue not only to socio-economic transformation (Barbara, Alain & Ramahatra, 2003; Woodhall, 2004, UNESCO, 2014) but also for playing a pivotal role in character building and moral development of young children (Khanam, 2008). Kohlberg and Hersh (2009) described the school as a moral enterprise. Indeed, the benefits of education justify the governments' investments in education (Ndayambaje, Ampofo, Bizimana, Otieno, Ogeta, & Orodho, 2015).

In the same vein, Woodhall (2004) emphasizes that if a country spends more on educating its population, incomes will grow sufficiently in order to recover the investment. This reinforces Aristotle's thinking who claimed that education is the best provision for old age (University of Carolina, 2009). It also fulfils the World Bank's recognition of education as a strong baseline towards sustained economic growth (Gilead, 2012), the Education for All (EFA) goals, and the Millennium Development Goals (MDGs), goals in which education remains the cornerstone (UNDP, 2013).

STEM education in Africa is strategically poised to embrace the challenges and opportunities of the Fourth Industrial Revolution (4IR), driving innovation, digitalization, and technological advancement on the continent's educational and industrial landscape. Fostering the development of African youth as future leaders is not only aligned with the aspirations of the Continental Education Strategy for Africa (CESA), but also pivotal in achieving the Sustainable Development Goals (SDGs). A robust commitment to STEM education and empowerment, will result in equipping Africa's youth with skills and knowledge needed to lead in the 21st century, driving innovation, economic growth, and sustainable development in African countries. The foregoing discussion emphasizes the fact that STEM education is

perceived as an avenue to employability of approximately 11 million young people joining the labor market annually in Africa, but cannot access decent jobs.

STEM education creates critical thinkers, increases science literacy, and prepares the next generation of innovators (Engineering for Kids, 2020). There is now greater consensus that embedding mathematics, science, technology, and engineering concepts in the curriculum, will better prepare students for courses and careers in STEM fields leading to innovations of new products and services that will sustain future economies (Koketso, 2015).

Science, technology, engineering, and mathematics workers play a key role in the sustained growth and stability of a country's economy. Furthermore, the United States Department of Commerce estimates that STEM occupations are growing at 17% annually, almost double the rate for other occupations at 9.8%, and that STEM degree holders have comparably higher incomes (U.S. Department of Commerce, 2020).

Even though many countries understand the relevance of STEM education in the employability of basic education graduates, access and completion rates remain wanting (ADEA's ICQN-MSE, 2021). Enrolment and completion rates are not the only problems that have been observed, but also disproportionately poor performance in STEM subjects among girls and boys (ADEA ICQN-MSE, 2021).

Needless to say, several challenges leading to low enrolment, completion, and performance have been highlighted. They include inadequate teaching and learning resources and facilities, poor teacher pedagogical practices, student lack of interest in STEM subjects, relevance of STEM curriculum, and insufficient number of teachers of STEM subjects (ADEA's ICQN-MSE, 2021). Indeed, innovative solutions to ensure quality STEM education call for prompt action.

Given the challenges highlighted a paradigm shift in STEM education is deemed important. For instance, there is a globally growing trend toward the use of innovative approaches that place children at the center of learning to promote higher achievement (Briggs & Hansen, 2012; Darling-Hammond, Flook, Harvey, Baron, & Osher, 2020). Learning through play has emerged as an important strategy to promote student engagement, inclusion, and holistic skills development (Parker, Thomsen, & Berry, 2022). The importance of play in a young offspring for a healthy and adaptive development into adulthood is extensively documented and recognized by researchers from various disciplines and practitioners (Veiga, O'Connor, Neto, & Reiffe, 2020).

A natural, strong, and complementary nexus exists between play-based learning and STEM education given that both involve discovering, creating, experimenting, and building, a process that is creative, iterative, challenging, and playful (Hadani & Rood, 2018). Therefore, the integration of STEM education with learner-centered practices such as play-based learning connects important content areas in hands-on ways that allow students to apply what they are learning. Therefore, STEM education is well aligned with play-based learning approaches in terms of collaboration in designing solutions and getting feedback from one another, thinking creatively during problem solving activities.

### 1.2.5 Challenges of STEM Education in Africa

Science, technology, engineering and mathematics (STEM) education plays a crucial role in empowering individuals with relevant skills for the jobs of the future. As the world advances into the digital-era driven by the Fourth Industrial Revolution, STEM competencies have become increasingly important for socioeconomic transformation and sustainable development (UNESCO, 2017). Today's rapidly evolving economies require a skilled workforce adept in STEM disciplines to fill high-growth opportunities and drive innovation (U.S. Department of Commerce, 2020).

Research shows that STEM education and the competencies it fosters have far-reaching economic and social benefits. STEM skills are associated with higher earning potential and labor force participation (OECD, 2016). STEM-fluent populations contribute to economic growth, productivity gains and industrial competitiveness (World Bank, 2018). STEM also nurtures transversal abilities like problem-solving, critical thinking and teamwork that allow individuals and societies to overcome challenges (African Union Commission, 2014). Through advancing STEM learning, countries can realize inclusive development grounded in science for all.

Despite recognizing STEM's importance, challenges persist in providing quality STEM education at scale across Africa (ADEA's ICQN-MSE, 2021). Studies show that while enrolment is increasing, completion and performance especially in mathematics and physical sciences remain worryingly low (UNESCO, 2019). Gender disparities also influence participation, with fewer girls and women pursuing STEM pathways.

These problems stem from systemic issues. Limited funding and infrastructure deficits constrain the development of well-resourced STEM programmes (World Bank, 2020). Shortages of suitably trained STEM teachers further constrain delivery (Brock-Utne, 2017). Curricula are sometimes outdated or disconnected from workplace realities, jeopardizing student motivation and preparedness for STEM careers. Rural and impoverished communities face additional barriers due to inadequate facilities, outreach and resources (Nkomo, 2017).

The COVID-19 pandemic exacerbated pre-existing challenges through disruptions to learning. Lockdowns highlighted digital and socioeconomic divides in accessing online or remote learning alternatives (UNICEF, 2020). Collectively, these constraints undermine Africa's potential to harness STEM for sustainable development through innovation, industrialization and global competitiveness as envisioned in frameworks like Agenda 2063 and the Continental Education Strategy for Africa (CESA).

ICQN-MSE faces challenges inherent in the African education landscape, including inadequate resources, poor infrastructure, and disparities in teacher training. The COVID-19 pandemic further highlighted the digital and socioeconomic divides, posing additional challenges to STEM education. However, these challenges also present opportunities for innovation, collaboration, and targeted interventions. By addressing these challenges, ICQN-MSE has the potential to play a transformative role in shaping the future of STEM education in Africa, unlocking opportunities for sustainable development and inclusive growth.

### 1.3 Background of the ICQN-MSE

The establishment of the ICQN-MSE dates back to the 40th session of the ADEA steering committee held in May 16th – 17th 2014 in Tunisia, which approved a concept paper on the transformation of the Working Group on Mathematics and Science Education (WGMSE, 2004 - 2014) into an Inter-Country Quality Node on Mathematics and Science Education (ICQN-MSE). The leader of the ICQN-MSE is the Minister of Education, Kenya. The secretariat is hosted at the Centre for Mathematics, Science and Technology Education in Africa (CEMASTEA) in Nairobi-Kenya. The coordinator of the ICQN-MSE is a staff based at CEMASTEA and the centre provides staff and facilities to implement annual activities. Japan International Cooperation Agency was the main Development Partner of the ICQN-MSE from 2004 - 2017. The ICQN-MSE continues to seek for new partnerships to support and fund the regional activities. At its core, ICQN-MSE seeks to foster a collaborative community of practice among African countries to harness collective efforts in enhancing STEM education.

A conference organized under the auspices of the ICQN-MSE was held successfully on 15-17 March 2016 with 28 countries out of the invited 31 participating with over 120 participants. Kenya's Cabinet Secretary, Ministry of Education, Science and Technology of Kenya attended and launched ICQN-MSE and opened the offices of ICQN-MSE and ICQN-PE at CEMASTEA. The Cabinet Secretary emphasized the importance of STEM subjects and announced that Kenya would direct more educational resources towards increasing student enrolment at the university level in the STEM subject. The Director-General of Japan International Cooperation Agency (JICA) encouraged African countries to focus on what works to improve student learning within the realities of the African contexts. The ADEA Executive Secretary stressed the importance of promoting female participation in STEM subjects and related courses and careers. The keynote address by the Ghanaian Professor at the University of Sussex identified the way STEM teachers are being trained as the underlying cause of the challenges facing this area. It emphasised the need to rethink teacher training and to emphasis academic pursuit and focus on equipping STEM students with skills and knowledge for life. Four cases of exemplary practices to improve STEM education were presented from Ethiopia, Kenya, Senegal, Zambia. Key recommendations on holistic approaches to improving mathematics and science education made. Key ADEA partners also attended including World Bank, MasterCard Foundation, UNICEF, UNESCO among others. The 28 countries represented were officially requested by the ADEA Executive Secretary during the closing to be members of ICQN-MSE.

#### 1.3.1 The Role of ICQNS

ICQNs are platform for policy dialogue among African countries desiring to work together to address challenges facing respective education thematic areas. ICQNs serve as catalyst in the process of accumulation of information on innovative educational experiences in Africa. ICQNs functions in accordance to ADEA's ICQN Charter. The activities of the ICQNs include: human resource capacity development; advocacy and networking: conferences & technical workshops; analytical work through research; information dissemination through continental platforms.

### 1.3.2 The ICQN-MSE

The ICQN-MSE therefore focuses on developing and promoting African-led education dialogue platform to advance policies and practices for improved quality of mathematics, science and ICT integration in education for Africa's sustainable development. Since 2014, the ICQN-MSE has achieved a number of milestones guided by ADEA's strategic plans over the period, experienced a number of challenges and recorded strategic lessons.

In the dynamic education landscape, Science, Technology, Engineering, and Mathematics (STEM) education has emerged as a fundamental driver of innovation, economic development, and sustainable progress. As African countries transition to knowledge-based economies, the significance of STEM-based competencies become paramount in preparing individuals to navigate the challenges of the Fourth Industrial Revolution (4IR). Quality STEM education is not only academically enriching, but is a catalyst for socioeconomic transformation, contributing to technological advancements and ensuring future prosperity. The shift towards a digital era accentuates the need for critical thinking, problem-solving, and analytical skills that STEM education imparts, making it an indispensable component of the educational landscape.

However, African nations grapple with substantial challenges in implementing effective STEM education. While enrolment in STEM programs is on the rise, completion rates, especially in mathematics and physical sciences, remain alarmingly low. Gender disparities persist, and systemic issues, such as limited funding, infrastructure deficits, and shortages of trained STEM teachers, hinder the development of robust STEM programs. The COVID-19 pandemic further exposed disparities, emphasizing the digital and socioeconomic divides in STEM education across the continent. These challenges collectively jeopardize Africa's ability to harness STEM for sustainable development and global competitiveness, necessitating a strategic framework for concerted efforts.

Recognizing the persistent obstacles, the Association for the Development of Education in Africa (ADEA) conducted two pivotal studies on STEM education. The first assessed STEM education in secondary schools across nine African countries, while the second analysed Play-based STEM education in primary schools. These studies informed a multi-stakeholder validation process during workshops, where representatives from African ministries of education engaged in evidence review and issue prioritization. This participatory approach ensured national ownership, culminating in the development of the Inter-Country Quality Node on Mathematics and Science Education (ICQN-MSE) Strategic Framework. The framework's validation marked a significant milestone, promoting the adoption of STEM education at institutional levels, aligning with the strategic goals of participating countries.

STEM education is the core response to today's generation of young people facing a radically changing world in terms of socio-economic development. The shifts between industries and the changing nature of work, demand high-level skills which are expected to grow, and low-medium-skilled jobs will become obsolete. The emerging growth models require higher levels of skills than many economies are currently set to offer. One of the strategies to curb this shortage of graduates in scientific disciplines and address the job market specific demands, is to adopt the "Applied science education approach". On the other hand, the contemporary

education systems are increasingly dependent on Information and Communications Technology (ICT), as an enabler to access updated teaching and learning materials, to connect students and researchers to the global knowledge community. ICT systems, including a high-speed internet connection, are a major component in delivering quality education and implementation of the "applied sciences approach".

### 1.4 Principles of the ICQN-MSE Strategic Framework

The ICQN-MSE Strategic Framework was developed with regard to the principle of:

#### i. Ownership and Commitment

Ownership and commitment are crucial for quality improvement in education. In this context, the development of the ICQN-MSE strategic framework began with a situational analysis of the status of STEM education in African countries with the participation of the ministries of education officials. The study findings from the two studies at primary and secondary school level created strong engagement and buy-in from the participating countries in Africa. The countries took lead to discuss the study findings and drafted the SF that created a buy-in to define STEM education development goals and priorities. Stakeholder involvement in the development of the SF was a sign of commitment to the process of improving STEM education in Africa.

#### ii. Community of Practice

ADEA's ICQNs play a key role in facilitating a community of practice among participating countries. This involves creating a platform for countries to share experiences, best practices, challenges, and lessons learned in the field of STEM education. Regular meetings, workshops, and collaborative projects enhance peer learning and consensus building of a sense of comradeship or shared purpose.

#### iii. Support from Development Partners

Whereas the ownership and leadership of the ICQN-MSE strategic framework lie with the participating countries, agencies and development partners provide valuable support. The support come in form of technical expertise, funding, capacity-building programs, and access to resources. Development partners align assistance to the priorities identified by the countries to ensure delivery of demand-driven and responsive programmes.

#### iv. Strengthening Capacities at the Country Level

To ensure that ownership translates into effective action, countries need to focus on building capacities in STEM-based fields. This includes enhancing the capacity of curriculum implementers, improving curriculum and pedagogy, developing assessment tools, and investing in infrastructure and educational technology. Capacities should be developed at the national, regional and local levels of education to ensure a comprehensive and sustainable approach to STEM education.

#### v. National-Level Implementation

Quality improvement in STEM education is indeed a national affair. The ICQN-MSE strategic framework will be adapted and implemented at the national level, taking into account unique needs and contexts of each country. This may involve policy reforms, resource allocation, and the establishment of monitoring and evaluation mechanisms to track progress.

#### vi. Measuring Progress

A key aspect of the framework will be the establishment of a national monitoring and evaluation framework with clear metrics and indicators to measure progress in STEM

education. Countries need to regularly assess the impact of interventions and make data-driven decisions to refine their strategies.

### 1.5 Methodology of developing the ICQN-MSE Strategic framework

The development of the ICQN-MSE Strategic Framework 2024-2028 involved a desk review, and consultations with key stakeholders. The stakeholders included ADEA staff, partners, Ministries of Education from African countries, government institutions and non-state actors in relevant fields. The desk review focused on analyzing relevant documents, studies or reports related to the programs of the ICQN-MSE. Various policy and strategic documents were reviewed to ensure the ICQN-MSE Strategic Framework was informed and aligned with existing guidelines and best practices.

In order to develop a basis for key interventions in the next 5 years, the internal operating environment of the ICQN-MSE was analyzed using the Value, Rarity, Imitability, and Organization (VRIO) instrument. A SWOT analysis was conducted to identify the ICQN-MSE's Strengths, Weaknesses, Opportunities and Threats. The external environment scan was based on the Political, Economic, Social, Technological, Ecological and Legal (PESTEL) technique.

The strategic issues were formulated and the strategic objectives drawn through the design of specific strategies and detailed activities, which formed the action plans in the strategic framework. The implementation plan, key roles and responsibilities monitoring and evaluation frameworks were defined within set time frames to achieve the strategic objectives. The draft Strategic Framework was shared with key stakeholders for further inputs and comments to achieve a validated version. The validated Strategic Framework was thereafter launched and published.

# CHAPTER TWO:
# THE SITUATIONAL AND STAKEHOLDER ANALYSIS

The chapter presents the situational analysis in terms of internal and external environmental scan using the PESTEL, SWOT and VRIO techniques. The chapter concludes with stakeholder analysis and strategic issues.

## 2.1 Situational Analysis

Despite a number of challenges, STEM education as an important dimension of education has been given priority globally owing to the related socio-economic benefits. In line with Africa's Agenda 2063 and the Continental, Education Strategy for Africa's (CESA, 2016-2025) strategic objective number seven (7), a prosperous Africa is underpinned by Science, Technology, Engineering and Mathematics (STEM)-equipped workforce. The aim is to strengthen mathematics and science curriculum implementation as foundational subjects to STEM education. The STEM specific policies and initiatives have evolved over time. The foregoing is an overview of the STEM policy context in Africa.

***Recognition of the Importance of STEM Education*:** Many African countries have recognized the critical role of STEM education and innovation in driving economic development and addressing societal challenges. They acknowledge that a strong STEM workforce is essential for technological advancements, industrial growth, and global competitiveness (African Union Commission, 2014); Science, Technology and Innovation Strategy for Africa 2024 (STISA-2024). There is need to have a common definition of integrated STEM education in Africa.

***Education Reform:*** Several African nations have embarked on education reform efforts to improve STEM education from primary to tertiary levels. The reforms often include curriculum updates, teacher training, and the integration of technology into classrooms (African Development Bank, 2019; Education in Africa: A Strategy for Africa 2018-2022). The need for an adapted and contextualized pedagogy aligned to the real world and of importance to the learner's expectations.

***Gender Equity in STEM:*** Promoting gender equity in STEM fields is a priority in many African countries. Policies and initiatives aim to increase the participation of girls and women in STEM education and careers, challenging stereotypes and biases (UNESCO, 2017; Cracking the Code: Girls' and Women's Education in STEM). The is need to put more emphasis on gender-responsive STEM education initiatives.

***Research and Innovation:*** The focus on STEM education is not limited to education; many African governments are also investing in research and innovation. They establish research institutions, provide funding for research projects, and support technology hubs and incubators (African Union Commission, 2016). Despite these investments in research and innovation, there is inadequate collaboration among institutions and African countries. Efforts should be made to ensure the finding from the research are actually implemented by policy makers. There is need to support innovators to showcase and market inventions.

***Regional Initiatives:*** Regional organizations like the African Union (AU) play a significant role in shaping STEM policies in Africa. The AU's Science, Technology, and Innovation Strategy for Africa (STISA-2024) is a continental initiative aimed at promoting STEM and innovation (African Union Commission, 2014). Some countries in the regional blocks do not participate in the initiatives or there is no synergy among them.

***Partnerships:*** Collaboration with international organizations, foreign governments, and non-governmental organizations (NGOs) is common in the development and implementation of STEM policies. The partnerships provide funding, expertise, and resources to support STEM initiatives (African Development Bank, 2021). However, the interventions are occasionally at small scale and sometimes not well aligned with government priorities in respective geographies.

***Infrastructure Development:*** Improving infrastructure for STEM education and research is a key policy objective. This includes investments in laboratories, libraries, information and communications technology (ICT) infrastructure (World Bank, 2020).

***Entrepreneurship and Start-ups:*** Some policies and initiatives focus on supporting STEM-related entrepreneurship and start-ups. These efforts encourage young innovators to develop and commercialize technology-based solutions, contributing to economic growth (African Union Commission, 2018). In addition to broader insights into the state of STEM education in Africa, specific findings from two comprehensive reports contribute to a nuanced situational analysis. The reports, based on data collected from Ministry of Education officials and education stakeholders across African countries, shed light on the comparative status of STEM education.

***Study Findings: Comparative Status of STEM Education:*** Two in-depth studies conducted on the status of STEM education in Africa form a cornerstone of the situational analysis. These studies systematically gathered data from Ministry of Education officials and engaged education stakeholders, allowing for a comparative examination of STEM policies and initiatives across diverse African nations. The findings highlighted the common acknowledgment of STEM's pivotal role in driving economic development and addressing societal challenges.

***Cross-Country Disparities and Commonalities:*** The comparative analysis discerned both disparities and commonalities among African countries in recognizing and prioritizing STEM education. The reports emphasize that while many nations have initiated education reforms, including curriculum updates and teacher training, there exists a variance in the depth and scope of the efforts. The importance of a standardized definition for STEM across Africa is underscored, revealing a need for cohesive regional strategies.

***Gender Equity and Inclusion Insights:*** The studies specifically brought attention to gender equity in STEM, outlining varied policies and initiatives across African countries. Although promoting the participation of girls and women in STEM is a shared priority, the reports illuminate the need for intensified focus and tailored strategies to address existing stereotypes and biases hindering gender inclusivity.

***Research, Innovation, and Collaboration Dynamics:*** Findings underscore the multifaceted nature of STEM policies, extending beyond education to encompass research and innovation. While governments invest in research institutions and provide funding for projects, the reports highlight insufficient collaboration among institutions and countries. This suggests a crucial area for improvement, emphasizing the necessity of translating research findings into actionable policies and supporting innovators in showcasing and marketing the inventions.

***Regional Disparities and Lack of Synergy:*** The situational analysis, enriched by the reports, indicates that regional organizations like the African Union play a significant role in shaping STEM policies. However, challenges arise due to lack of synergy among countries with respective regional initiatives. The reports suggest the need for more coordinated efforts to harmonize STEM policies at the continental level.

***Challenges Reinforced by Study Findings:*** The challenges to effective STEM education, as identified in the reports, align with broader concerns expressed in the analysis. Limited resources, infrastructure deficits, and the imperative for sustained funding and political commitment are underscored as major obstacles. The studies reinforce the need for policymakers to adapt STEM policies to local contexts, considering cultural and socioeconomic factors, and striking a balance between global best practices and local needs.

***Inequality in STEM Education Access:*** Furthermore, the reports corroborate the analysis's emphasis on unequal access to quality STEM education. Rural and marginalized communities face significant hurdles, including limited infrastructure, resources, and trained teachers. Economic pressures, gender disparities, and cultural biases contribute to high dropout rates and low retention rates. While recent efforts have been made to improve education systems, the reports indicate that these interventions, including teacher training, curriculum reform, and technology access, have generally been on a small scale. A more expansive and scalable approach is warranted to address persistent challenges in STEM education across the continent.
However, there are still some lingering doubts emanating from several challenges to STEM education. African countries face challenges in implementing effective STEM policies, including limited resources, infrastructure deficits, and the need for sustained funding and political commitment. Addressing these challenges is essential for successful policy implementation (African Development Bank Group, 2014).

Adaptation to local contexts remains wanting as well. Effective STEM policies often require adaptation to local contexts and consideration of cultural and socioeconomic factors. Policymakers should seek to strike a balance between global best practices and local needs (World Bank, 2018).

Access to quality STEM education remains unequal, with rural and marginalized communities often facing limited infrastructure, resources, and trained teachers. Poverty, gender disparities, and cultural biases can further hinder access. High dropout rates and low retention rates are common due to economic pressures and inadequate learning environments (Nkomo, 2017; African Union Commission, 2016; Mgqwashu, 2020).

In recent years, African governments and international organizations have been working to improve education systems. Efforts have focused on enhancing teacher training, curriculum reform, and expanding access to technology. Partnerships with NGOs and international donors have facilitated funding for infrastructure development and educational materials (Nkomo, 2017; Brock-Utne, 2017; African Union Commission, 2016; Mgqwashu, 2020). However, these efforts have generally been on a small scale.

## 2.2 Internal and External Environmental Scan

### 2.2.1 SWOT ANALYSIS

The ICQN-MSE conducted a SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis to gain a clear understanding of its internal strengths and weaknesses, as well as external opportunities and threats. The table below presents a SWOT analysis of ICQN-MSE.

*Table 2: SWOT Analysis*

| **Internal** | | **External** | |
|---|---|---|---|
| **Strengths** | **Weaknesses** | **Opportunity** | **Threats** |
| Good will among the leaders in individual countries to STEM education | Limited source of funds (competing priorities in countries) | High level commitment of - Governments to STEM and ICT integration in education | Misunderstanding and limited knowledge of STEM concepts |
| Some countries have invested substantially in intervention programs at basic learning levels and support the aspirations of the ICQN-MSE. | High cost of implementing capacity development programs and resource provision with little or no sustainable source of funding. | There is potential for local and international development partnership with both public and the private sector as well as non-governmental organizations | Competing national and international programs that threaten investment programs. |
| Strong commitment of some countries to the activities of the ICQN-MSE especially the English speakers. | The percentage of countries actively engaged in the activities of the ICQN-MSE is below 50% | Potential exists to expand the activities of the ICQN-MSE to more African countries. | Inability to reach the large number of French and Portuguese speaking countries due to the cost of language barriers on the continent |
| The ICQN-MSE Secretariat host country has invested heavily in STEM education initiatives including a STEM policy, strategy and reformed curriculum | Inadequate funding for the regional secretariat activities. | Strengthening the regional secretariat in terms of staff and financial resources has potential to increase reach to more member countries. | Other competing programs for the regional secretariat staff and resources. |

### 2.2.2 PESTEL Analysis

There are a number of factors in the macro-environment that have potential effect on the performance of the ICQN-MSE programs. These are political, economic, social, technological, ecological and legal factors. The development of this SF considered different factors and analysed them to understand the ICQN-MSE's operating environment. The PESTEL analysis for the ICQN-MSE within ADEA's strategic plan, involved assessing various critical aspects as discussed below:

- **Political**: ADEA's ICQNs navigates political complexities in terms of securing support from African governments and international stakeholders. Political stability and alignment with education policies are crucial for successful implementation of the annual programs.
- **Economic**: Sustainable financing for the ICQN-MSE initiatives is vital. Economic factors such as; funding availability and cost-effectiveness were considered to ensure the plan's viability.
- **Social**: Recognizing diverse educational needs and cultural contexts is essential. Customizing ICQN-MSE programs to local societal expectations and values ensures acceptance and relevance. The implication is conducting awareness programs on the ICQN-MSE initiatives in the framework of community ownership for the development of the society.
- **Technological**: Leveraging digital tools and platforms can potentially enhance the ICQN-MSE activities by increasing accessibility and engagement and aligning with technological advancements.
- **Environmental/Ecological**: Promoting eco-conscious practices within the ICQN-MSE initiatives is increasingly important. Sustainable resource use and environmental awareness are integral to responsible program implementation.
- **Legal**: Adhering to education regulations, intellectual property rights, and other legal considerations is imperative in ensuring compliance with laws and regulations that are fundamental for a lawful and ethical ICQN-MSE strategic framework development.

### 2.2.3 The VRIO ANALYSIS

A VRIO analysis is a strategic framework used to assess the internal capabilities and resources of an organization or initiative. VRIO stands for Value, Rarity, Imitability, and Organization. This technique was used to analyse the ICQN-MSE as discussed below:

**Value**

**Yes**: The ICQN-MSE initiative provides value by fostering collaboration and knowledge sharing among African countries in the fields of STEM. It promotes the development of STEM education and research, which are critical for economic and social advancement.

**Rarity**

**Yes**: The ICQN-MSE initiative are relatively rare in its specific focus on quality improvement in STEM education within the African context. While there are other education initiatives, the ICQN- MSE's regional approach and focus on STEM education policy and strategy make it a unique platform especially in terms of peer learning.

**Imitability:**
**No**: The ICQN-MSE's activities, which involve coordinating and facilitating collaboration among multiple countries on evidence-based policy dialogue forums are not easily imitable. This is because, building the necessary networks, partnerships, and expertise at a regional level takes time and resources.

**Organizational**
**Yes**: The ADEA ICQN-MSE is well-organized and structured. It operates under the umbrella of ADEA. Thus, the policy dialogue form on STEM education benefits from a strong organizational foundation and collaborative partner support.

### 2.2.4 Lessons Learnt

Important lessons have been drawn since the ICQN-MSE was established as discussed below:

- Commitment from Ministries of Education in African governments and political goodwill is critical for successful development of the ICQN-MSE initiatives.
- Collaborative partnerships with development partners have potential to promote ICQN-MSE initiatives by addressing challenges of limited resources and expertise.
- Curriculum reforms that respond to emerging issues identified by the ICQN-MSE are important, but need to be adapted to local contexts of African countries.
- Gender disparities in STEM education need targeted interventions to promote more participation of girls and women.
- Efforts in programs that promote inclusion and representation of underrepresented groups like people living with disabilities have potential to enhance equity in ICQN-MSE member countries.
- Regional and continental frameworks that provide policy guidelines enhance synergy among ICQN-MSE member countries.
- Countries that have invested in STEM education Infrastructure materials and equipment have recorded improved quality of STEM Education.
- Harmonized performance indicators at continental and national levels guided by a monitoring and evaluation framework have potential to enhance development of STEM education in African countries.
- Adaptation of integrated STEM education to country contexts enhances effective implementation.

### 2.3 Stakeholder Analysis

The table below gives a detailed list of stakeholder's respective roles and mutual expectations.

*Table 3: Situation on stakeholder analysis*

| No | Stakeholder | Role | Stakeholder expectations from ADEA's ICQN-MSE | ADEA's ICQN-MSE expectations from the stakeholder |
|---|---|---|---|---|
| 1 | Funding agencies | Financial and technical support | Expecting data-driven insights to guide STEM education and skills development investments in Africa. Well-documented funding proposals and implementation reports. | Provide funds to support the implementation of ICQN-MSE initiatives and projects. |
| 2 | Government | Policy guidance, monitoring and implementation and resource allocation | Collaboration to implement projects. Providing expertise. establishing platform for knowledge sharing. | Strong and clear commitment and support for the ICQN-MSE initiatives. |
| 3 | Industry and private sector | Insights to enhance relevant policies and workforce development. | Facilitating the promotion and development of skills needed for the industries | Provide collaboration and networking frameworks and platform among African stakeholders,<br>Capacity building and continuous professional development |
| 4 | Teachers and educational body | Implementation of interventions, facilitate policy interpretation and strategies. | Supportive policies that enhance implementation of ICQN-MSE interventions at country level. | Implement knowledge and skills gained from the ICQN-MSE initiatives at country level. |
| 5 | Academic and technical institutions (universities, schools, technical colleges) | Provide Intervention programs and assess the impact. | Recommendations for curriculum improvement and resource allocation. | Collaboratively deliver the ICQN-MSE intervention programs in respective geographies. |
| 6 | Students and learners | Receiving STEM education and training | Skill development and preparation for the world of work | Committed, motivated inspired and dedicated |
| 7 | Parents and guardians | Supporting the children's education. | Informed decisions about STEM education for the children | Provide necessary support to the learners. Contribute to the development of the ICQN-MSE intervention programs through the resource provision. |

### 2.4 Strategic Issues

On the basis of the discussed achievements, challenges and lessons learnt, the following strategic issues were identified:

1. ***Access, equity and inclusion****:* Promote adoption of polices that enhance access, equity and inclusion in the ICQN-MSE initiatives. Advance equitable access to quality STEM

education, bridge educational disparities, promote inclusivity and reduce the gender gap while increasing retention and transition rates.

2. ***Curriculum reform***: Advance policies that support reform agenda in order to improve, restructure and update the curriculum for STEM subjects to align it to the changing global advancements. The curriculum should promote critical thinking, problem-solving, creativity and innovation. In addition, the review needs to cut across all levels of education from pre-primary to tertiary levels.

3. ***Quality and relevance:*** promote efficiency and effectiveness in the standards of delivering integrated STEM education programs through improved capacity of curriculum implementers and learning institutions in terms of instructional and pedagogical leadership and inviting institutional learning climate.

4. ***Infrastructure, equipment and material resources***: Advance policies that improve social and physical infrastructure including: libraries, working rooms /workshops, equipment and material resources to enhance access and improve quality of ICQN-MSE initiatives. Advance adequacy of modern STEM laboratories, facilities, technology, and learning materials, facilitating hands-on and experiential learning.

5. ***Collaborative partnerships and linkages***: Promote policies that enhance and build collaborative partnerships and linkages between governments, academia, industry, and civil society to support the ICQN-MSE initiatives, towards achieving access, quality and relevance, and workforce development. Encourage intergovernmental partnerships especially in the area of research, innovations and sharing of information. Create linkage to professional bodies to encourage mentorship, apprenticeship as well as curriculum reform.

6. ***ICT integration***: Support the establishment of policies that enhance the use of ICT in teaching and learning by developing competences in design of digital learning resources, digital content and institutional capacity to increase internet connectivity and digital literacy. Improve ICT infrastructure, equipment and resources through the provision of modern laboratories, targeted infrastructure including learning management platforms, Artificial Intelligence (AI) and coding software.

7. ***Research and Development***: Promote policies that strengthen research and encourage innovation with a view to generate evidence-based policy and practice. Establish mechanisms that support innovation, patenting and reward system at all levels of education. Increase resources to support research and innovation at all levels of education including longitudinal research.

8. ***Cross-cutting issues:*** Advance policies that promote ethical considerations in research and innovation, responsible technology development and use. Improve data privacy, protection measures and ethical guidelines for handling data in research.

## CHAPTER THREE:
## THE STRATEGIC FRAMEWORK

Chapter three lays out a comprehensive ICQN-MSE Strategic Framework for the advancement of STEM education in Africa. The framework encompasses strategic priorities, outcomes, and indicators, along with planned activities and the integration of cross-cutting issues. Six strategic priorities form the backbone of the framework, addressing challenges and opportunities within the African landscape.

### 3.1 The Mandate of the ICQN-MSE

The ADEA's ICQN-MSE serves as the catalyst in accumulation of information on innovative STEM education experiences in Africa and facilitates the implementation of lessons that a country or countries draw from respective experiences for peer learning.

### 3.2 The Vision Statement

The Vision of the ICQN-MSE is to, "***Empower African countries in STEM education for sustainable development***."

### 3.3 The Mission Statement

The Mission of the ICQN-MSE is to; ***"To catalyse and promote transformative policies, practices, and partnerships in STEM education in African countries through fostering innovation, capacity-building, and regional collaboration."***

### 3.4 Strategic Objectives, Strategies and Activities

Table 3.1 below details the strategic objectives, strategies, activities and related outputs that will ensure the ICQN-MSE achieves its vision and mission.

*Table 4:Strategic Objectives, Strategies and Activities*

| Strategic Objective | Strategies | Activities |
|---|---|---|
| **STRATEGIC OBJECTIVE 1:** Strengthen the development of policies that enhance access, equity and inclusion in STEM education in African countries. | 1.1 Promoting the development of guidelines on the basic resource requirements to enhance access and equity for STEM education<br>1.2 Promoting conducive learning environments for all learners in STEM education, including those | 1.1.1 Coordinate the development of a basic STEM resource strategy.<br>1.1.2 Coordinate an awareness workshop for peer learning and dissemination<br>1.2.1 Coordinate the development of a STEM education strategy for SNE<br>1.2.2. Coordinate the development of gender-responsive guidelines for STEM education<br>1.2.3. Promote awareness on gender stereotyping in STEM education<br>1.2.4 Promote policies that are gender responsive. |

| | | |
|---|---|---|
| | with special needs in education | |
| **STRATEGIC OBJECTIVE 2:** Enhance quality, relevance, efficiency and effectiveness in delivery of STEM education programs | 2.1: Improving the capacity of curriculum implementers for effective and efficient delivery of STEM education.<br>2.2. Promoting positive and inviting school environment for STEM education.<br>2.3 Promoting mentorship, coaching and psycho-social programs that support STEM education | 2.1.1 Coordinate the development of guidelines for ICT integration in teaching and learning.<br>2.1.2 Support development of guidelines for peer teaching and communities of practice.<br>2.1.3 Develop a framework for harnessing existing Continuous Professional Development initiatives to generate modules on STEM pedagogical content knowledge.<br>2.1.4 Coordinate development of guidelines for improvisation and innovation of teaching and learning resources.<br>2.1.5 Coordinate development of monitoring and reporting frameworks to track learners' performance.<br><br>2.2.1 Coordinate a workshop to develop instructional leadership training program for school leaders.<br>2.2.2 Promote mechanisms that mainstream gender responsive pedagogy<br>2.2.3 Spearhead forums to develop guidelines for meaningful parental engagement and empowerment.<br>2.2.4 Promote programs for recognition and reward.<br><br>2.3.1 Coordinate establishment of guidelines for school based mentoring and coaching programs.<br>2.3.2 Coordinate development of a framework for school-based psycho-social and resilience programs. |
| **STRATEGIC OBJECTIVE 3:** Strengthen collaborative partnerships and linkages that support STEM education at basic learning levels in Africa | 3.1 Enhancing collaborative partnerships and linkages between governments, academia, industry, and civil society to support delivery of STEM education.<br>3.2 Promoting public-private partnerships that supports innovation and creativity in STEM education<br><br>3.3 Strengthening linkages with professional bodies in STEM education. | 3.1.1 Develop a collaboration strategy for STEM education.<br>3.1.2 Establish partnerships with development partners with interest in STEM programs.<br>3.1.3 Initiate inter-governmental STEM-based joint programs<br>3.1.4 Coordinate the establishment of collaboration between government with academia, industry and civil society through sensitization activities.<br>3.1.5 Monitor, evaluate and document lessons learnt<br><br>3.2.1 Establish a STEM education public-private partnerships framework that guides on innovation and patenting<br>3.2.2 Conduct awareness campaigns and sensitization forums through STEM exhibitions, STEM Fairs, and competitions.<br>3.2.3 Initiate a reward system in collaboration with development partners intervening in STEM education<br>3.2.4 Coordinate the development of a STEM resource mobilization strategy.<br><br>3.3.1 Map relevant professional bodies interested in STEM programs.<br>3.3.2 Establish strategic linkages with the professional bodies. |

| | | |
|---|---|---|
| | | 3.3.3 Coordinate the implementation of mentorship and apprenticeship<br>3.3.4 Involve relevant professional bodies in the dialogue on curriculum reforms.<br>3.3.5 Monitor, evaluate and document lessons learnt. |
| **STRATEGIC OBJECTIVE 4:** Strengthen research and development culture that seeks to encourage and support innovation, evidence-based policy and practices | 4.1 Enhancing research and development to encourage innovation in STEM education<br><br>4.2 Fostering research, innovations and sharing of information on STEM education | 4.1.1 Conduct relevant and timely research to inform STEM education practices and policies<br>4.1.2 Disseminate research findings and share knowledge generated.<br>4.1.3 Present papers at international conferences.<br>4.1.4 Organize policy dialogues and webinars.<br><br>4.2.1 Initiate research that enhances innovation and creativity.<br>4.2.2 Organize dissemination forums for research findings.<br>4.2.3 Publish research reports and knowledge products.<br>4.2.4 Incubate, design, produce and upscale STEM-based innovations.<br>4.2.5 Monitor, evaluate and document lessons learnt. |

# CHAPTER FOUR:
# IMPLEMENTATION AND COORDINATION FRAMEWORK

Chapter four details a dynamic implementation plan for the **four** strategic objectives covering policy development, curriculum improvement, quality enhancement, infrastructure development, collaborative partnerships, and ICT resource provision. Each objective entails specific activities, outputs, outcomes, outcome indicators, annual targets and responsible entities to ensure effective implementation of the SF. The chapter concludes with assumptions and risk matrix, recognizing the dynamic nature of development changes and providing mitigation strategies.

## 4.1 Implementation

Furthermore, it emphasizes the critical role of funding in executing the framework. It underscores the need for diverse funding sources from public and private sectors, international organizations, and philanthropic foundations. The cost of implementing the SF is broken down by activities to ensure adequacy of resources for addressing teacher capacity, conducive learning environments, STEM curriculum, inclusivity, monitoring, evaluation, research, and stakeholder collaboration. Efficient resource allocation is highlighted as crucial for achieving the vision of transforming STEM education in Africa. The document serves as a comprehensive roadmap, outlining activities and budgets to guide policymakers and stakeholders in fostering a brighter future through STEM education on the continent.

## 4.2 Coordination

The ICQN-MSE will be responsible for coordinating the implementation of the Strategic Framework working closely with the ADEA secretariat which bears the final responsibility. The ICQN-MSE country focal points will support the implementation of the SF as members of the implementation committee. Each strategic objective will be implemented through a series of activity packages as detailed in Table 4.1. Therefore the implementation committee will include representatives of ADEA secretariat, ICQN-MSE and all the focal point persons from African countries.

*Table 5: Log Frame*

| Strategy | Activity | Output | Impact | | Baseline | Annual Targets | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Outcome | Outcome indicator | Base year: 2024 | Y 1 | Y 2 | Y 3 | Y 4 | Y 5 | Responsible |
| Strategic objective 1: Strengthen the development of policies that enhance access, equity and inclusion in STEM education in African countries. | | | | | | | | | | | |
| 1.1 Promoting the development of guidelines on the basic resources requirements to enhance access and equity for STEM education | 1. Coordinate the development of guidelines on basic resources requirements for STEM education.<br>2. Coordinate an awareness workshop for peer learning and dissemination | 1. Standardized guidelines on basic resource requirements for STEM education developed.<br>2. An awareness workshop for peer learning and dissemination conducted. | Improved access, equity and inclusion in STEM education in African countries. | % increase in the number of countries implementing the standardized guidelines on basic resource requirements for STEM education. | Conduct baseline | | | | | | ADEA Secretariat; ICQN MSE and Country Focal Persons |
| 1.2 Promoting conducive learning environments for all learners in STEM education, including those with special needs in education | 1. Coordinate the development of a STEM education strategy for SNE<br>2. Coordinate the development of gender-responsive guidelines for STEM education<br>3. Promote awareness on gender stereotyping in STEM education<br>4. Promote policies that are gender responsive. | 1. STEM education strategy for SNE developed<br>2. Gender-responsive guidelines on STEM Education developed<br>3. Sensitization fora on gender stereotyping in STEM education conducted<br>4. Gender responsive policies developed. | | % increase in the enrollment and participation of students with special needs and all gender in STEM education programs | Conduct baseline | | | | | | ADEA Secretariat; ICQN MSE and Country Focal Persons |
| Strategic Objective 2: Enhance quality, relevance, efficiency and effectiveness in delivery of STEM education programs. | | | | | | | | | | | |
| Strategy | Activity | Output | Outcome | Outcome indicator | Base year: 2024 | Y 1 | Y 2 | Y 3 | Y 4 | Y 5 | Responsible |
| 2.1 Improving the capacity of curriculum implementers for effective and efficient delivery of STEM education. | 1. Coordinate the development of guidelines for ICT integration in teaching and learning.<br>2. Support the development of guidelines for peer teaching and communities of practice.<br>3. Develop a framework to harness existing Continuous Professional Development initiatives to generate modules | 1. ICT leveraged in the teaching and learning.<br>2. Guidelines on peer and communities of practice developed.<br>3. A framework to harness existing Continuous Professional Development initiatives developed. | Improved capacity to effectively implement quality programs. performance in STEM subjects. | % increase in countries implementing capacity development programs for curriculum implementers.<br>% increase in countries reporting improved learner's performance. | Conduct baseline | | | | | | ADEA Secretariat; ICQN MSE and Country Focal Persons |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | on STEM pedagogical content knowledge.<br>4. Coordinate development of guidelines for improvisation and innovation of teaching and learning resources.<br>5. Coordinate development of monitoring and reporting frameworks to track learners' performance. | 4. Guidelines for development of teaching and learning resources established.<br>5. Country reports on learner's performance developed. | | | | | | | | | |
| 2.2. Promoting positive and inviting school environment that supports STEM education | 1. Coordinate workshops to develop instructional leadership training program for school leaders<br>2. Promote mechanisms that mainstream gender responsive pedagogy.<br>3. Spearhead forums to develop guidelines for meaningful parental engagement and empowerment.<br>4. Promote programs for recognition and reward | 1. Instructional leadership program in STEM education<br>2. Mechanism for mainstreaming gender responsive STEM pedagogy.<br>3. Parents' engagement and empowerment guidelines to support STEM education<br>4. Programmes for recognition and reward in place | Increased participation of students, teachers, and parents in STEM initiatives and activities. | % increase in countries implementing positive and inviting school environment programs. | Conduct baseline | | | | | | ADEA Secretariat; ICQN MSE and Country Focal Persons |
| 2.3 Promoting mentorship, coaching and psycho-social programs that support STEM education | 1. Coordinate the establishment of guidelines for school-based mentoring and coaching programs.<br>2. Coordinate development of a framework for school-based psycho-social and resilience programs. | 1. School based mentoring and coaching programs established.<br>2. School based psycho-social and resilience programs developed. | Improved students and educators engagement and well-being | Proportion of countries implementing mainstreamed mentorship, coaching and psycho-social programs. | Conduct baseline | | | | | | ADEA Secretariat; ICQN MSE and Country Focal Persons |
| Strategic objective 3: Strengthen collaborative partnerships and linkages that support STEM education at basic learning levels in Africa. | | | | | | | | | | | |
| Strategy | Activity | Output | Outcome | Outcome indicator | Base year: 2024 | Y 1 | Y 2 | Y 3 | Y 4 | Y 5 | Responsible |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3.1 Enhancing collaborative partnerships and linkages between governments, academia, industry, and civil society to support delivery of STEM education. | 1. Develop collaboration strategy for STEM education.<br>2. Establish partnerships with development partners with interest in STEM programs.<br>3. Initiate inter-governmental STEM-based joint programs<br>4. Coordinate establishment of collaboration between government with academia, industry and civil society.<br>5. Monitor, evaluate and document lessons learnt. | 1. Collaboration strategy<br>2. Partnership agreements signed<br>3. Inter-governmental STEM-based joint programs initiated<br>4. Collaboration between government, academia, industry and civil society established.<br>5. M&E reports documented. | Strengthened collaborative partnerships and linkages between governments, academia, industry, and civil society to support the delivery of STEM education | Proportion of countries implementing collaborative partnerships & linkages. | Conduct baseline | | | | | | ADEA Secretariat; ICQN MSE and Country Focal Persons |
| 3.2 Promoting public-private partnerships that supports innovation and creativity in STEM education | 1. Establish a STEM education public-private partnerships framework that guides on innovation and patenting<br>2. Conduct awareness campaigns and sensitization forums through STEM exhibitions, STEM Fairs, and competitions.<br>3. Initiate a reward system in collaboration with development partners intervening in STEM education<br>6. Coordinate the development of a STEM resource mobilization strategy. | 1. A STEM education Public-Private-Partnership framework to guide innovation and patenting established.<br>2. Awareness forums conducted.<br>3. A reward system in collaboration with development partners initiated.<br>4. A STEM resource mobilization strategy developed. | Increased public-private partnerships that support innovation and creativity in STEM education | % of countries implementing public-private partnership programs. | Conduct baseline | | | | | | ADEA Secretariat; ICQN MSE and Country Focal Persons |
| 3.3 Strengthening linkages with professional bodies in STEM education. | 1. Map relevant professional bodies interested in STEM programs.<br>2. Establish strategic linkages with the professional bodies.<br>3. Coordinate the implementation of mentorship and apprenticeship | 1. Repository of professional bodies.<br>2. Strategic linkages with professional bodies established.<br>3. Mentorship & apprenticeship programs implemented. | Mentorship and apprenticeship programs for learners in STEM strengthened. | 1. Increased proportion of countries with learners absorbed in the industry.<br>2. % of countries with increased number of apprentice and | Conduct baseline | | | | | | ADEA Secretariat; ICQN MSE and Country Focal Persons |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 4. Involve relevant professional bodies in the dialogue on curriculum reforms.<br>5. Monitor, evaluate and document lessons learnt. | 4. Reports on mentorship and apprenticeship programs.<br>5. Resolutions and recommendations on curriculum reforms.<br>6. Monitoring, evaluation and learning reports | | interns attached to industries | | | | | | | |
| Strategic Objective 4: Strengthen Research and Development culture that seeks to encourage and support innovation, evidence-based policy and practices | | | | | | | | | | | |
| Strategy | Activity | Output | Outcome | Outcome indicator | Base year: 2024 | Y 1 | Y 2 | Y 3 | Y 4 | Y 5 | Responsible |
| 4.1 Enhancing research and development to encourage innovation in STEM education | 1. Conduct relevant and timely research to inform STEM education practices and policies.<br>2. Disseminate research findings and share knowledge generated.<br>3. Present papers at international conferences.<br>4. Organize policy dialogues and webinars. | 1. Research to inform STEM education practices and policies conducted.<br>2. Research findings and knowledge generated disseminated.<br>3. Papers presented at international conferences.<br>4. Policy dialogues and webinars organized. | Increased evidence-based education research and development activities leading to innovation. | Proportion of countries implementing research projects or initiatives.<br>% of countries implementing policy decisions influenced by STEM education research products<br>Proportion of countries recording policy decisions influenced by policy options offered. | Conduct baseline | | | | | | ADEA Secretariat; ICQN MSE and Country Focal Persons |
| 4.2 Fostering research, innovations and sharing of information on STEM education. | 1. Initiate research that enhances innovation and creativity.<br>2. Organize dissemination forums for research findings.<br>3. Publish research reports and knowledge products.<br>4. Incubate, design, produce and upscale STEM-based innovations.<br>4. Monitor, evaluate and document lessons learnt. | 1. Research that enhances innovation and creativity initiated.<br>2. Dissemination forums for research findings organized.<br>3. Research reports and knowledge products published.<br>4. STEM-based innovations produced and up scaled.<br>5. M&E reports documented. | Evidence-based policy development and practice fostered. | % of countries in Africa with policies on STEM education | Conduct baseline | | | | | | ADEA Secretariat; ICQN MSE and Country Focal Persons |

## 4.3 Cost and financing of the Strategic Framework

### 4.3.1 Available Funds

Funds from ADEA secretariat will be applied to implement this framework for advancing STEM education in African countries as a critical component vital to its success. Adequate financial resources are essential to coordinate and execute the outlined strategies and activities. The funds will support initiatives such as the development and dissemination of guidelines or frameworks for STEM infrastructure, coordination of capacity-building programs for educators, implementation of innovative pedagogical approaches, and establishment of mentoring and coaching programmes.

### 4.3.2 Cost by programs

**Program 1: development of policies that enhance access, equity and inclusion in STEM education in African countries.**

The programme focuses on strengthening countries to develop policies that enhance access, equity and inclusion especially addressing gender disparities and promoting inclusivity in STEM education. Costs include conducting sensitization workshops, policy dialogue forums and peer learning activities. In addition, costs involve organizing awareness campaigns, providing scholarships to underrepresented groups, and implementing mentorship programs.

**Program 2: Enhancement of quality, relevance, efficiency, effectiveness and curriculum reforms in delivery of STEM education programs in Africa**

The programme aims at building capacity of policy makers, educators and relevant institutions to establish programs that ensure quality and relevance, efficiency and effectiveness in STEM education programs at country level. In order to enhance the STEM curriculum and teaching methodologies, funds are allocated to promote curriculum reviews, updates, and alignment with global standards and remain dynamic and relevant, reflecting the evolving landscape of STEM education. Costs encompass conduct of workshops and forums to build necessary capacity, development of guidelines and frameworks for implementation and peer learning. It also includes promoting curriculum reforms and collaborative learning, and enhancing institutional capacities to deliver quality STEM education.

**Program 3: Strengthening collaborative partnerships and linkages that support STEM education in Africa**

The programme seeks to increase collaborative partnerships and linkages between governments and development partners with interest in STEM education in Africa. Costs include conduct of workshops, forums and meetings with relevant partners to negotiate potential collaborations. In addition, costs encompass organizing collaborative events, fostering partnerships, and engaging with industry professionals. Investment is required to build sustainable relationships, leverage expertise, and mobilize collective efforts towards achieving the goals of advancing STEM education.

**Program 4: Strengthen research and development culture that supports innovation, evidence-based policy and practices**

The programme seeks to enhance evidence-based policy and practice by strengthening countries to monitor and evaluate progress and impact of STEM initiatives through strategic research. Costs in

this program include data collection, analysis, and the development of evaluation frameworks. Additionally, funds are allocated for research projects, surveys, and assessments to measure the effectiveness of STEM interventions and inform future strategies.

### 4.3.3 Funds to be mobilized, financing gaps, and strategies

Mobilizing funds and highlighting financing gaps to implement the Strategic Framework for ICQN MSE in Africa from 2024 to 2028, can be a complex, but an achievable task. Resource mobilization strategies are outline in Table 4.1 below.

*Table 6:Resource mobilization strategies*

| Strategy | Source of Funding framework Model | Approach to mobilize funds |
|---|---|---|
| 1. Diversify Funding Sources | Government Commitment | Engage with African governments to secure their commitment to STEM education and request budget allocations for STEM initiatives within their education departments. |
| | Development Partners | Collaborate with international development agencies, such as the World Bank, UNICEF, UNESCO, and bilateral donors, to secure grants, loans, and technical assistance for STEM programs. |
| | Private Sector Partnerships | Establish partnerships with private sector companies and industries that have a vested interest in STEM education. Encourage them to contribute financially to STEM initiatives. |
| | Philanthropic Organizations | Approach foundations and philanthropic organizations that support education, science, and technology causes. Develop grant proposals tailored to their interests. |
| | Public-Private Partnerships (PPPs) | Explore the possibility of forming PPPs with private companies for funding STEM projects. These partnerships can offer financial resources and expertise. |
| 2. Investment Promotion | Impact Investment | Attract impact investors who seek both financial returns and social impact. Showcase the potential long-term benefits of STEM education in Africa to these investors. |

| Strategy | Source of Funding framework Model | Approach to mobilize funds |
|---|---|---|
| | Venture Capital | Encourage venture capital firms to invest in startups and initiatives focused on STEM education, ed-tech solutions, and innovation hubs. |
| 3. Fundraising Campaigns | Crowd-funding | Launch crowdfunding campaigns, leveraging online platforms and social media to engage a broad audience in contributing to STEM initiatives. |
| | Alumni Engagement | Reach out to alumni of STEM programs and institutions for donations, mentorship, and support. They often have a personal connection to the cause. |
| 4. Grant Proposals and Competitions | Grant Applications | Regularly apply for grants from international organizations, government agencies, and foundations that specifically support STEM education and innovation. |
| | Participate in Competitions | Compete in global or regional innovation and education competitions to secure funding and recognition for STEM projects. |
| 5. Collaboration and Consortia | Partnerships with Other Organizations | Collaborate with other educational institutions, NGOs, and organizations to pool resources and jointly apply for grants and funding opportunities. |
| | Research Consortia | Join research consortia focusing on STEM-related topics. These consortia often receive funding for collaborative research and education initiatives. |
| 6. Impactful Advocacy | Awareness Campaigns | Raise awareness about the importance of STEM education among policymakers, business leaders, and the public. Use data and evidence to demonstrate the impact of STEM on economic development. |
| | Advocacy Groups | Partner with STEM advocacy organizations that can lobby for increased funding and support at the national and international levels. |
| 7. Monitoring and Reporting | Transparency | Maintain transparency in financial management and reporting. Show stakeholders that funds are being used efficiently and effectively. |

| Strategy | Source of Funding framework Model | Approach to mobilize funds |
|---|---|---|
| | Highlight Gaps | Regularly publish reports highlighting the funding gaps in STEM education. Use these reports to advocate for increased investment. |
| 8. Continuous Evaluation and Adaptation | Evaluate Impact | Continuously assess the impact of STEM programs and initiatives. Use data to demonstrate the value of investments and inform adjustments. |
| | Flexibility | Be adaptable and willing to adjust strategies based on changing circumstances and opportunities for funding. |
| 9. Capacity Building | Develop Grant Writing Skills | Invest in capacity building for your team to improve grant writing, proposal development, and fundraising skills. |
| | Financial Management | Ensure strong financial management practices within your organization to build trust with potential donors and partners. |
| | | Engage with organizations like the UN Agencies, Multilateral agencies, African Development Bank, African Union, and regional economic communities to tap into their funding mechanisms and partnerships for STEM projects. |

*Table 7:Strategic framework budget*

| STRATEGIC FRAMEWORK BUDGET | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Cost Item** | Strategy | Activities | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** | **NOTES** |
| KRA 1: Strengthened development of policies that enhance access, equity and inclusion in STEM education in African countries. | 1.1 Promoting the development of guidelines on the basic resources requirements to enhance access and equity for STEM education | 1. Coordinate the development of guidelines on basic resources requirements for STEM education. | $ 95,500.00 | | | | | **Consultancy:** Baseline study (USD. 600*20 days), development of guidelines on basic resources requirements for STEM education (USD. 600*10 days), **Physical validation workshop:** 20 PAX from 20 countries: Air ticket return USD. 1500, conference (USD.60*5 days), DSA (USD 200*6days), Local travel (USD. 50*5days), Communication and contingency (USD.200*once), **Scientific review** (USD.300*5 reviewers * 5 days), **Translation of document** (10,000 words* USD. 0.1). *A consultant will be selected to conduct a baseline survey and develop the guidelines on basic resources requirements for STEM education, stakeholders from 20 countries will convene for a physical workshop to validate the document, the document will thereafter be subjected to scientific review and translation to other languages.* |
| | | 2. Coordinate an awareness workshop for peer learning and dissemination. | $ 1,000.00 | | | | | Virtual workshop: Language interpretation (USD.1000*1day) |
| | 1.2 Promoting conducive learning environments for all learners in STEM education, including those with special needs in education | 1. Coordinate the development of a STEM education strategy for SNE. | | $ 95,500.00 | | | | **Consultancy:** Baseline study (USD. 600*20 days), development of a STEM education strategy for SNE (USD. 600*10 days), **Physical validation workshop:** 20 PAX from 20 countries: Air ticket return USD. 1500, conference (USD.60*5 days), DSA (USD 200*6days), Local travel (USD. 50*5days), Communication and contingency (USD.200*once), **Scientific review** (USD.300*5 reviewers * 5 days), **Translation of document** (10,000 words* USD. 0.1). *A consultant will be selected to conduct a baseline survey and develop the STEM education strategy for SNE, stakeholders from 20 countries will convene for a physical workshop to validate the document, the document will thereafter be subjected to scientific review and translation to other languages.* |

| STRATEGIC FRAMEWORK BUDGET | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Cost Item** | Strategy | Activities | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** | **NOTES** |
| | | 2. Coordinate the development of gender-responsive guidelines for STEM education. | | $ 95,500.00 | | | | **Consultancy:** Baseline study (USD. 600*20 days) development of gender-responsive guidelines for STEM education (USD. 600*10 days), **Physical validation workshop:** 20 PAX from 20 countries: Air ticket return USD. 1500, conference (USD.60*5 days), DSA (USD 200*6days), Local travel (USD. 50*5days), Communication and contingency (USD.200*once), **Scientific review** (USD.300*5 reviewers * 5 days), **Translation of document** (10,000 words* USD. 0.1). *A consultant will be selected to conduct a baseline survey and develop the gender responsive guidelines for STEM education, stakeholders from 20 countries will convene for a physical workshop to validate the document, the document will thereafter be subjected to scientific review and translation to other languages.* |
| | | 3. Promote awareness on gender stereotyping and policies that are gender responsiveness in STEM education. | | $ 1,000.00 | | | | Virtual workshop: Language interpretation (USD.1000*1day) |
| KRA 2: Enhanced quality, relevance, efficiency and effectiveness in delivery of STEM education programs. | 2.1: Improving the capacity of curriculum implementers for effective and efficient delivery of STEM education. | 1. Coordinate the development of guidelines for ICT integration in teaching and learning. | $ 95,500.00 | | | | | **Consultancy:** Baseline study (USD. 600*20 days), development of guidelines for ICT integration in teaching and learning (USD. 600*10 days), **Physical validation workshop:** 20 PAX from 20 countries: Air ticket return USD. 1500, conference (USD.60*5 days), DSA (USD 200*6days), Local travel (USD. 50*5days), Communication and contingency (USD.200*once), **Scientific review** (USD.300*5 reviewers * 5 days), **Translation of document** (10,000 words* USD. 0.1). *A consultant will be selected to conduct a baseline survey and develop the guidelines for ICT integration in T&L, stakeholders from 20 countries will convene for a physical workshop to validate the document, the document will thereafter be subjected to scientific review and translation to other languages.* |

| STRATEGIC FRAMEWORK BUDGET | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Cost Item** | Strategy | Activities | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** | **NOTES** |
| | | 2. Support the development of guidelines for peer teaching and communities of practice. | | $ 95,500.00 | | | | **Consultancy:** Baseline study (USD. 600*20 days), development of guidelines for peer teaching and communities of practice (USD. 600*10 days), **Physical validation workshop:** 20 PAX from 20 countries: Air ticket return USD. 1500, conference (USD.60*5 days), DSA (USD 200*6days), Local travel (USD. 50*5days), Communication and contingency (USD.200*once), **Scientific review** (USD.300*5 reviewers * 5 days), **Translation of document** (10,000 words* USD. 0.1). *A consultant will be selected to conduct a baseline survey and develop the guidelines for peer teaching and communities of practice, stakeholders from 20 countries will convene for a physical workshop to validate the document, the document will thereafter be subjected to scientific review and translation to other languages.* |
| | | 3. Develop a framework for harnessing existing Continuous Professional Development initiatives to generate modules on STEM pedagogical content knowledge. | | | $ 95,500.00 | | | **Consultancy:** Baseline study (USD. 600*20 days), Development of a framework for harnessing existing Continuous Professional Development initiatives (USD. 600*10 days), **Physical validation workshop:** 20 PAX from 20 countries: Air ticket return USD. 1500, conference (USD.60*5 days), DSA (USD 200*6days), Local travel (USD. 50*5days), Communication and contingency (USD.200*once), **Scientific review** (USD.300*5 reviewers * 5 days), **Translation of document** (10,000 words* USD. 0.1). *A consultant will be selected to conduct a baseline survey and develop a framework, stakeholders from 20 countries will convene for a physical workshop to validate the document, the document will thereafter be subjected to scientific review and translation to other languages.* |

| STRATEGIC FRAMEWORK BUDGET | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Cost Item** | Strategy | Activities | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** | **NOTES** |
| | | 4. Coordinate development of guidelines for improvisation and innovation of teaching and learning resources. | | $ 95,500.00 | | | | **Consultancy: Baseline** study (USD. 600*20 days)**, development** of guidelines for improvisation and innovation of teaching and learning resources (USD. 600*10 days), **Physical validation workshop:** 20 PAX from 20 countries: Air ticket return USD. 1500, conference (USD.60*5 days), DSA (USD 200*6days), Local travel (USD. 50*5days), Communication and contingency (USD.200*once), **Scientific review** (USD.300*5 reviewers * 5 days), **Translation of document** (10,000 words* USD. 0.1). *A consultant will be selected to conduct a baseline survey and develop the guidelines for improvisation and innovation of teaching and learning resources, stakeholders from 20 countries will convene for a physical workshop to validate the document, the document will thereafter be subjected to scientific review and translation to other languages.* |
| | | 5. Coordinate development of monitoring and report frameworks to track learners' performance. | | | $ 95,500.00 | | | **Consultancy:** Baseline study (USD. 600*20 days), Development of monitoring and report frameworks (USD. 600*10 days), **Physical validation workshop:** 20 PAX from 20 countries: Air ticket return USD. 1500, conference (USD.60*5 days), DSA (USD 200*6days), Local travel (USD. 50*5days), Communication and contingency (USD.200*once), **Scientific review** (USD.300*5 reviewers * 5 days), **Translation of document** (10,000 words* USD. 0.1). *A consultant will be selected to conduct a baseline survey and develop the monitoring and report frameworks, stakeholders from 20 countries will convene for a physical workshop to validate the document, the document will thereafter be subjected to scientific review and translation to other languages.* |

| STRATEGIC FRAMEWORK BUDGET | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Cost Item** | Strategy | Activities | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** | **NOTES** |
| | 2.2. Promoting positive and inviting school environment for STEM education. | 1. Coordinate workshops to develop instructional leadership training program for school leaders. | $ 95,500.00 | | | | | **Consultancy:** Baseline study (USD. 600*20 days), development of instructional leadership training program for school leaders (USD. 600*10 days), **Physical validation workshop:** 20 PAX from 20 countries: Air ticket return USD. 1500, conference (USD.60*5 days), DSA (USD 200*6days), Local travel (USD. 50*5days), Communication and contingency (USD.200*once), **Scientific review** (USD.300*5 reviewers * 5 days), **Translation of document** (10,000 words* USD. 0.1). *A consultant will be selected to conduct a baseline survey and develop the training program, stakeholders from 20 countries will convene for a physical workshop to validate the document, the document will thereafter be subjected to scientific review and translation to other languages.* |
| | | 2. Promote mechanisms that mainstream gender responsive pedagogy | $ 1,000.00 | | | | | Virtual workshop: Language interpretation (USD.1000*1day) |
| | | 3. Spearhead forums to develop guidelines for meaningful parental engagement and empowerment. | | | | $ 95,500.00 | | **Consultancy:** Baseline study (USD. 600*20 days). Develop guidelines for meaningful parental engagement (USD. 600*10 days), **Physical validation workshop:** 20 PAX from 20 countries: Air ticket return USD. 1500, conference (USD.60*5 days), DSA (USD 200*6days), Local travel (USD. 50*5days), Communication and contingency (USD.200*once), **Scientific review** (USD.300*5 reviewers * 5 days), **Translation of document** (10,000 words* USD. 0.1). A consultant will be selected to conduct a baseline survey and develop the guidelines, *stakeholders from 20 countries will convene for a physical workshop to validate the document, the document will thereafter be subjected to scientific review and translation to other languages.* |
| | | 4. Promote programs for recognition and reward | | | | $ 1,000.00 | | Virtual workshop: Language interpretation (USD.1000*1day) |

| STRATEGIC FRAMEWORK BUDGET | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Cost Item** | Strategy | Activities | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** | **NOTES** |
| | 2.3 Promoting mentorship, coaching and psycho-social programs in STEM education | 1. Coordinate establishment of guidelines for school based mentoring and coaching programs. | | | | $ 95,500.00 | | **Consultancy:** Baseline study (USD. 600*20 days), Development of guidelines for school based mentoring and coaching programs (USD. 600*10 days), **Physical validation workshop:** 20 PAX from 20 countries: Air ticket return USD. 1500, conference (USD.60*5 days), DSA (USD 200*6days), Local travel (USD. 50*5days), Communication and contingency (USD.200*once), **Scientific review** (USD.300*5 reviewers * 5 days), **Translation of document** (10,000 words* USD. 0.1). *A consultant will be selected to conduct a baseline survey and develop* the guidelines, *stakeholders from 20 countries will convene for a physical workshop to validate the document, the document will thereafter be subjected to scientific review and translation to other languages.* |
| | | 2. Coordinate development of a framework for school-based psycho-social and resilience programs. | | | | $ 95,500.00 | | **Consultancy:** Baseline study (USD. 600*20 days), **Development** of a framework for school-based psycho-social and resilience programs (USD. 600*10 days), **Physical validation workshop:** 20 PAX from 20 countries: Air ticket return USD. 1500, conference (USD.60*5 days), DSA (USD 200*6days), Local travel (USD. 50*5days), Communication and contingency (USD.200*once), **Scientific review** (USD.300*5 reviewers * 5 days), **Translation of document** (10,000 words* USD. 0.1). *A consultant will be selected to conduct a baseline survey and develop the framework, stakeholders from 20 countries will convene for a physical workshop to validate the document, the document will thereafter be subjected to scientific review and translation to other languages.* |
| KRA 3: Collaborative partnerships and linkages that support STEM education at basic learning levels in Africa strengthened. | 3.1 Enhancing collaborative partnerships and linkages between governments, academia, industry, and civil society to support delivery of STEM education. | 1. Develop a collaboration strategy for STEM education. | $ 83,500.00 | | | | | **Consultancy:** Development of a collaboration strategy for STEM education (USD. 600*10 days), **Physical validation workshop:** 20 PAX from 20 countries: Air ticket return USD. 1500, conference (USD.60*5 days), DSA (USD 200*6days), Local travel (USD. 50*5days), Communication and contingency (USD.200*once), **Scientific review** (USD.300*5 reviewers * 5 days), **Translation of document** (10,000 words* USD. 0.1). *A consultant will be selected to develop collaboration strategy for STEM, stakeholders from 20 countries will convene for a physical workshop to validate the document, the document will thereafter be subjected to scientific review and translation to other languages.* |

| STRATEGIC FRAMEWORK BUDGET | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Cost Item** | Strategy | Activities | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** | **NOTES** |
| | | 2. Establish partnerships with development partners with interest in STEM programs. | | | | | | No cost |
| | | 3. Initiate inter-governmental STEM-based joint programs | | | | | | No cost |
| | | 4. Coordinate establishment of collaboration between government with academia, industry and civil society. | | | | | | No cost |
| | | 5. Monitor, evaluate and document lessons learnt. | | | | | | No cost |
| | 3.2 Promoting public-private partnerships that supports innovation and creativity in STEM education | 1. Establish a STEM education public-private partnerships framework that guides on innovation and patenting | | $ 83,500.00 | | | | **Consultancy:** (USD. 600*10 days), **Physical validation workshop:** 20 PAX from 20 countries: Air ticket return USD. 1500, conference (USD.60*5 days), DSA (USD 200*6days), Local travel (USD. 50*5days), Communication and contingency (USD.200*once), **Scientific review** (USD.300*5 reviewers * 5 days), **Translation of document** (10,000 words* USD. 0.1). *A consultant will be selected to prepare a draft framework, stakeholders from 20 countries will convene for a physical workshop to validate the document, the document will thereafter be subjected to scientific review and translation to other languages.* |
| | | 2. Conduct awareness campaigns and sensitization forums through STEM exhibitions, STEM Fairs, and competitions. | | | | | | No cost: Will leverage the workshops forums that have already been budgeted |
| | | 3. Initiate a reward system in collaboration with development partners intervening in STEM education | | | $ 83,500.00 | | | **Consultancy:** (USD. 600*10 days), **Physical validation workshop:** 20 PAX from 20 countries: Air ticket return USD. 1500, conference (USD.60*5 days), DSA (USD 200*6days), Local travel (USD. 50*5days), Communication and contingency (USD.200*once), **Scientific review** (USD.300*5 reviewers * 5 days), **Translation of document** (10,000 words* USD. 0.1). *A consultant will be selected to prepare a reward system document, stakeholders from 20 countries will convene for a physical workshop to validate the document, the document will thereafter be subjected to scientific review and translation to other languages.* |

| STRATEGIC FRAMEWORK BUDGET | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Cost Item** | Strategy | Activities | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** | **NOTES** |
| | | 4. Coordinate the development of a STEM resource mobilization strategy | | $ 95,500.00 | | | | **Consultancy:** Baseline study (USD. 600*20 days), Development of a STEM resource mobilization strategy (USD. 600*10 days), **Physical validation workshop:** 20 PAX from 20 countries: Air ticket return USD. 1500, conference (USD.60*5 days), DSA (USD 200*6days), Local travel (USD. 50*5days), Communication and contingency (USD.200*once), **Scientific review** (USD.300*5 reviewers * 5 days), **Translation of document** (10,000 words* USD. 0.1). *A consultant will be selected to conduct a baseline survey and develop the resource mobilization strategy, stakeholders from 20 countries will convene for a physical workshop to validate the document, the document will thereafter be subjected to scientific review and translation to other languages.* |
| | 3.3 Strengthening linkages with professional bodies in STEM education. | 1. Map relevant professional bodies interested in STEM programs. | | | | | | No cost |
| | | 2. Establish strategic linkages with the professional bodies. | | | | | | No cost |
| | | 3. Coordinate the implementation of mentorship and apprenticeship | | | $ 1,000.00 | | | Conduct virtual meetings, Language interpretation (USD.1000*1day) |
| | | 4. Involve relevant professional bodies in the dialogue on curriculum reforms. | | | | | | No cost. Invite them to relevant forums |
| | | 5. Monitor, evaluate and document lessons learnt. | | | | | | No cost |
| **KRA4:** Strengthened Research and Development culture that seeks to encourage and support | 4.1 Enhancing research and development to encourage innovation in STEM education | 1. Conduct relevant and timely research to inform STEM education practices and policies. | $ 30,500.00 | $ 30,500.00 | $ 30,500.00 | $ 30,500.00 | $ 30,500.00 | **Consultancy:** Baseline study (USD. 600*20 days), Conduct research (USD. 600*10 days), Scientific **review** (USD.300*5 reviewers * 5 days), **Translation of document** (50,000 words* USD. 0.1). *A consultant will conduct research based on identified areas* |

| STRATEGIC FRAMEWORK BUDGET | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Cost Item** | Strategy | Activities | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** | **NOTES** |
| innovation, evidence-based policy and practices | | 2. Disseminate research findings and share knowledge generated. | | $ 1,000.00 | $ 1,000.00 | $ 1,000.00 | $ 1,000.00 | Virtual workshop: Language interpretation (USD.1000*1day) |
| | | 3. Present papers at international conferences. | $ 2,850.00 | $ 2,850.00 | $ 2,850.00 | $ 2,850.00 | $ 2,850.00 | Attendance 1 pox: Air ticket return (USD. 1500), DSA (USD 200*4days), Local travel (USD. 50*3days), Communication and contingency (USD.200*once), Conference registration fees USD.200 |
| | | 4. Organize policy dialogues and webinars | $ 1,000.00 | $ 1,000.00 | $ 1,000.00 | $ 1,000.00 | $ 1,000.00 | Virtual workshop: Language interpretation (USD.1000*1day) |
| | 4.2 Fostering research, innovations and sharing of information on STEM education. | 1. Initiate research that enhances innovation and creativity. | $ 30,500.00 | $ 30,500.00 | $ 30,500.00 | $ 30,500.00 | $ 30,500.00 | **Consultancy:** Baseline study (USD. 600*20 days), Conduct research (USD. 600*10 days), **Scientific review** (USD.300*5 reviewers * 5 days), **Translation of document** (50,000 words* USD. 0.1). *A consultant will conduct research based on identified areas* |
| | | 2. Organize dissemination forums for research findings. | $ 1,000.00 | $ 1,000.00 | $ 1,000.00 | $ 1,000.00 | $ 1,000.00 | Virtual workshop: Language interpretation (USD.1000*1day) |
| | | 3. Publish research reports and knowledge products. | | | | | | |
| | | 4. Incubate, design, produce and upscale STEM-based innovations. | | | | | | Will depend on the nature of innovation |
| | | 5. Monitor, evaluate and document lessons learnt. | | | | | | No cost |
| | | **TOTAL** | **$ 437,850.00** | **$ 628,850.00** | **$ 342,350.00** | **$ 354,350.00** | **$ 66,850.00** | **$ 1,830,250.00** |

# CHAPTER FIVE:
# MONITORING, EVALUATION AND LEARNING

## 5.1 Monitoring and evaluation arrangements

The ICQN-MSE Strategic Framework has different indicators namely; baseline, mid-line and end-line. The indicators will be monitored and evaluated to asses performance implementation tracked to enhance attainment of the overall objectives. The implementation of these indicators will be monitored and evaluated by the ADEA steering committee on a regular basis. The roles of the committee members shall ensure effective and efficient utilization of resources to implement that SF.

*Table 8: Monitoring of the Key Performance Indicators*

| INDICATOR | Baseline | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Responsibilities |
|---|---|---|---|---|---|---|---|
| **STRATEGIC OBJECTIVE 1:** Strengthen the development of policies that enhance access, equity, inclusion and retention in STEM education in African countries | | | | | | | |
| **INDICATOR 1.1:** % increase in the number of countries implementing the standardized guidelines on basic resource requirements for STEM education. | Conduct the baseline | | | | | | ADEA Secretariat, ICQN-MSE and Ministry of Education or relevant educational authorities |
| **INDICATOR 1.2:** % increase in the enrollment and participation of students with special needs and all gender in STEM education programs | Conduct the baseline | | | | | | ADEA Secretariat, ICQN-MSE and Ministry of Education or relevant educational authorities |
| **STRATEGIC OBJECTIVE 2:** Enhancing quality, relevance, efficiency and effectiveness in delivery of STEM education programs | | | | | | | |
| **INDICATOR 2.1.1:** % increase in countries implementing capacity development programs for curriculum implementers.<br>**INDICATOR 2.1.2:** % increase in countries reporting improved learner's performance. | Conduct the baseline | | | | | | ADEA Secretariat, ICQN-MSE and Ministry of Education or relevant educational authorities |
| **INDICATOR 2.2** % increase in countries implementing positive and inviting school environment programs. | Conduct the baseline | | | | | | ADEA Secretariat, ICQN-MSE and Ministry of Education or relevant educational authorities |
| **INDICATOR 2.3:** Proportion of countries implementing mainstreamed mentorship, coaching and psycho-social programs. | | | | | | | |
| **STRATEGIC OBJECTIVE 3:** Strengthen collaborative partnerships and linkages that support STEM education at basic learning levels in Africa | | | | | | | |
| **INDICATOR 3.1**<br>Proportion of countries implementing collaborative partnerships & linkages. | Conduct the baseline | | | | | | ADEA Secretariat, ICQN-MSE and Ministry of Education or relevant educational authorities |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **INDICATOR 3.2** % of countries implementing public-private partnership programs. | Conduct the baseline | | | | | | ADEA Secretariat, ICQN-MSE and Ministry of Education or relevant educational authorities |
| **INDICATOR 3.3.1:** Proportion of countries with learners absorbed in the industry.<br><br>**INDICATOR 3.3.2:** % of countries with increased number of apprentice and interns attached to industries | Conduct the baseline | | | | | | ADEA Secretariat, ICQN-MSE and Ministry of Education or relevant educational authorities |
| S**TRATEGIC OBJECTIVE 4:** Strengthen research and development culture that seeks to encourage and support innovation, evidence-based policy and practices | | | | | | | |
| **INDICATOR 4.1.1**: Proportion of countries implementing research projects or initiatives.<br><br>**INDICATOR 4.1.2:** % of countries implementing policy decisions influenced by STEM education research products<br><br>**INDICATOR 4.1.3:** Proportion of countries recording policy decisions influenced by policy options offered. | Conduct the baseline | | | | | | ADEA Secretariat, ICQN-MSE and Ministry of Education or relevant educational authorities |
| **INDICATOR 4.2** % of countries in Africa with policies on STEM education | Conduct the baseline | | | | | | ADEA Secretariat, ICQN-MSE and Ministry of Education or relevant educational authorities |

## 5.2 Planned evaluations

In order to ensure regular M&E of this SF, partner countries will establish in-country steering committees in charge of M&E process under the guidance of ICQN-MSE and ADEA Executive Committee. The committee will meet on quarterly basis and report to the ICQN-MSE on M&E progress reports to enable the ICQN to track implementation of planned activities. A mid-term evaluation of the SF will be carried out in 2025/2026 to consider relevant changes and opportunities and make required adjustments to ensure achievements and performance of the set vision and strategic objectives. An end line evaluation of the SF will be carried out in 2028.

## 5.3 Risk management framework

Table 5.2 details the risk management framework. The framework describes and categorizes the risks that may hinder the realisation of each of the key result areas in the strategic framework prioritized based on the likelihood of occurrence and expected impact. Suggested actions for mitigation, monitoring and reporting of the risks are included.

*Table 9: Identified risks and mitigation strategies*

| No | KRA | Strategic Objective | Risk | Description of the risk | Likelihood on a scale of 1-5 | Severity on a scale of 1-5 | Overall risk Level (L/M/H) | Mitigation strategies |
|---|---|---|---|---|---|---|---|---|
| 1. | Policies that enhance access, equity and inclusion in STEM education in African countries strengthened | rengthen the velopment of licies that enhance cess, equity and clusion in STEM ucation in African untries. | Risks of policy developme nt<br><br>Risk of the under-represented groups. | Risk associated with countries accepting to develop relevant policies.<br><br>Risks associated with attracting and retaining the under-represented groups to STEM education. | 4 | 4 | High | • Sensitize countries on the importance of establishing the policy in order to enhance access, equity and inclusion.<br>• Advance policy interventions that successfully attracted and retained under-represented groups |
| 2. | Quality, relevance, efficiency and effectiveness in delivery of STEM education programs enhanced. | hance quality, relevance, efficiency and effectiveness in delivery of EM education programs. | Risks of policy developme nt<br><br>Inadequate and qualified human resources.<br><br>Relevant Curriculum risk<br><br>Inadequate material resources | Risk associated with countries accepting to develop relevant policies.<br><br>Risks associated with countries assigning adequate human resources to implement the ICQN-MSE activities<br><br>Risks associated with countries accepting to reform outdated or irrelevant curriculum.<br><br>Risks associated with countries accepting to | 4 | 4 | High | • Sensitize countries on the importance of establishing the policy in order to enhance quality and relevance.<br>• Advance best practice using policy interventions that successfully attracted improved quality and relevance. |

| No | KRA | Strategic Objective | Risk | Description of the risk | Likelihood on a scale of 1-5 | Severity on a scale of 1-5 | Overall risk Level (L/M/H) | Mitigation strategies |
|---|---|---|---|---|---|---|---|---|
| | | | and equipment | provide adequate material resources and equipment. | | | | |
| 3. | Collaborative partnerships and linkages that support STEM education in Africa strengthened. | Strengthen collaborative partnerships and linkages that support STEM education at basic learning levels in Africa. | Liquidity risk<br><br>Limited funding and resources | Risks associated with inadequate funds and liquidity to implement the ICQN-MSE activities<br><br>Risks associated with identification, selection and implementation of partner funded programs. | 3 | 4 | High | • Advance best practice in creating collaborative partnerships with local international organizations to secure additional funding.<br>• Leverage open-source and low-cost educational resources and software.<br>• Create networking platforms with relevant organizations with interest in STEM education |
| 4. | Research and Development culture that supports innovation, evidence-based policy and practices strengthened. | Strengthen Research and Development culture that seeks to encourage and support innovation, evidence-based policy and practices | Research conceptualization<br><br>Data and information loss<br><br>Analysis and dissemination of research findings. | Risk associated with poor research conceptualization<br><br>Risk associated with loss of data and information.<br><br>Risks associated with inability for data analyses and failure to disseminate findings to the intended stakeholders | 3 | 3 | Medium | • Build necessary capacity through intervention programs.<br>• Advance best practice in data protection policy<br>• |

# REFERENCES


African Union Commission. (2016). Continental Education Strategy for Africa 2016-2025.

Agboola, B. M., & Ofoegbu, F. I. (2010). *Access to university education in Nigeria: A review*.

Babalola, J.B. (2003). Basic text in educational planning (1st ed.). Ibadan: University of Ibadan.

Barbara, B., Alain, M., & Ramahatra, R. (2003). *Achieving Universal Primary Education by 2015: A Chance for Every Child.* Washington D.C.: World Bank.

Brock-Utne, B. (2017). Education for all and multicultural education in Africa: The unforeseen challenges. Compare: A Journal of Comparative and International Education, 47(4), 528-545.

Burney, S. (2012). An integrated conceptual model of performance appraisals and succession planning using multi valued evaluation. *Pakistan journal of engineering, technology and science*, *2*(2), 144-159.

Chowdhury, M. (2016). Emphasizing morals, values, ethics, and character education in science education and science teaching. The Malaysian online journal of educational science, *4*(2), 1-16.

Coleman, & James, S. (1990). Foundations of social theory. Cambridge: Harvard University Press.

Cunningham, A. (2013). The broader societal benefits of higher education, in Solutions for Our Future Project. Washington: Institute for Higher Education Policy.

*Damtew Teferra and Heinz Greijn. (2010). Higher Education and Globalization. Boston College, USA.*

Eymann, A, & Schweri, J (2015). *Horizontal skills mismatch and vocational education: Discussion paper*, 43p.

Gilead, T. (2012). Education and the logic of economic progress. Journal of philosophy of education, *46*(1).

http://adeanet.org/sites/default/files/concept_paper_for_icqn-mse-moest.pdf

https://adeanet.org/sites/default/files/adea_icqn_mse_about_us.pdf

https://adeanet.org/sites/default/files/icqn-mse_program_and_budget_2015-refined.pdf

Khanam, A. (2008). Effect of religious education on the moral development of children. Available from: http://prr.hec.gov.pk/jspui/bitstream/123456789/1127/1/740S.pdf.

Kohlberg, L, & Hersh, H. L. (1977). Moral development: A review of the theory. Theory into practice, *16*(2), 53-59. DOI: 10.1080/00405847709542675

Literate (n.). Factors and drivers of dropout and repetition in Rwandan schools. Towards evidence-based policies to improve the quality of education.

Mgqwashu, E. M. (2020). A review of factors contributing to poor academic performance in mathematics in South African rural secondary schools. African Journal of Research in Mathematics, Science and Technology Education, 24(1), 44-53.

National Rehabilitation service (n.d). Statement by NRS Director General. From:

https://www.nrs.gov.rw/index.php?id=101

Ndayambaje,I., Ampofo, S. Y.; Bizimana B., Otieno, M. A., Ogeta, N.O, & Orodho, J. A. (2015). Challenges

of Social and Spill-Over Benefits as Motivating Factors to Investment in Formal Education in selected countries of Ghana, Kenya and Rwanda. *Journal Of humanities and social science*, *20*(4), 29-38.

Nkomo, M. (2017). African higher education: An international reference handbook. Springer.

Retrieved from https://au.int/en/documents/20170202/continental-education-strategy-africa-cesa-2016-2025

Schwamberger, B., Wahl-Alexander, Z., & Ressler, J. (2017). Ensuring moral development in physical

education. *Strategies*, *30*(2), 33-37. http://dx.doi.org/10.1080/08924562.2016.1273808.

Shields, D., & Bredemeier, B. (1995). *Character development and physical activity*. Champaign, IL:

Human Kinetics.

State of Africa in Education Report, 2015

UNDP. (2013). TST issues brief: Human rights including the right to development. Retrieved from:

http://www.ohchr.org/Documents/Publications/Human_rights_indicators_en.pdf. On October 3, 2014.

UNESCO (2014). *Teaching and Learning: Achieving Quality for All. EFA Global Monitoring Report*

*2013/2014.* Paris:UNESCO. Retrieved on www.UNESCO.org

UNESCO. (2019). Education in Africa: Overview. Retrieved from

http://uis.unesco.org/en/topic/education-africa-overview

University of Carolina (2009). The economic return on investment in South Carolina‟s higher

education. Carolina: The Darla Moore School of Business, http://www.che.sc.gov/CHE_Docs/InfoCntr/HESC_Files/EconReturnHigherEdAugust09.pdf

Woodhall M. (2004). *Cost-Benefit Analysis in Educational Planning.* 4th Edition, Paris: UNESCO, IIEP.

World Health Organization (2014). Major causes of delinquency. From: https://www.nrs.gov.rw/index.php?id=36

Zaidi, S. M. A, Saif, M. I., & Zaheer, A. (2010). The effect of workgroup heterogeneity on decision

making: An empirical investigation. *African journal of business and management*, *4*(10), 2132-2139.


Ushirika wa Maendeleo ya Elimu Barani Afrika
الرابطة لأجل تطوير التربية في إفريقيا
Association for the Development of Education in Africa
Association pour le développement de l'éducation en Afrique
Associação para o Desenvolvimento da Educação em África

Association for the Development of Education in Africa (ADEA)
African Development Bank Group (AfDB)
Immeuble CCIA Plateau, Avenue Jean-Paul II, 01 BP 1387
Abidjan 01, Côte d'Ivoire
Tel: (+225) 27 20 26 39 64
Email: adea@afdb.org - Website: www.adeanet.org