



REPUBLIC OF KENYA

**SECTOR PLAN  
FOR  
SCIENCE TECHNOLOGY AND INNOVATION  
2013 – 2017**

*Revitalizing and Harnessing Science, Technology and Innovation for Kenya's Prosperity and Global Competitiveness*

The Principal Secretary  
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## **STATEMENT BY THE CABINET SECRETARY MINISTRY OF DEVOLUTION AND PLANNING**

In keeping with the decision that Kenya Vision 2030 be implemented through five year Medium Terms the Government successfully launched the Second Medium Term Plan (MTP 2013-2017) in October 2013. The Ministry of Devolution and Planning then embarked on the process of preparing the second round of Kenya Vision 2030 Sector Plans detailing policies, programmes and projects to be implemented in each sector. A total of twenty one Sector Plans have therefore been produced based on the work of nineteen medium term plan sector working groups and three thematic working groups formed to prepare detailed plans as background documents for the Second MTP).

The Sector Plans outline in greater detail specific plans for implementation in each sector during the 2013-17 period. The Plans have been prepared through a participatory and inclusive process involving representatives from the government, development partners, private sector, NGOs, civil society, faith based organizations, professional associations, research institutions, and organizations representing women and youths, among others. Apart from the technical inputs, the Sector Plan priorities have been aligned and taken into account the priorities and inputs from nationwide Second MTP county consultation forums which captured views and priorities of Kenyans at the grass root and local level. Additionally, the Sector Plans have taken on board the key issues and priorities outlined in the Manifesto of the Jubilee Government in line with Second MTP.

The Sector Plans implementation matrices outline the broad goals and strategic objectives, the specific objective of each programme and project, the expected output and outcomes, the indicators for monitoring progress, the entity responsible for implementation, the implementation timelines, the source and mode of funding for each planned programme and activity starting financial year 2013/14 to 2017/18.

In accordance with the Constitution of Kenya, it is expected that the programmes and projects outlined in the Sector Plans will be implemented in close consultation and collaboration with county governments, keeping in mind, the distribution of functions between the national and county governments as outlined in the fourth schedule; and the capacity of county governments. Involvement of the private sector, including through Public Private Partnerships (PPPs), in implementing the sector plans will also be crucial to deliver the expected outputs and outcomes of various prioritized programmes and projects.

To ensure successful implementation of the Sector Plans, and the activities outlined in the implementation matrices, my ministry will put in place the necessary monitoring and evaluation framework and systems including the reporting formats and templates for production of quarterly progress reports by implementing entities.

In conclusion, let me take this opportunity to thank the respective Cabinet and Principal Secretaries involved in various sectors and all those involved in preparation of the Sector Plans.



**Anne Waiguru, O.G.W.**

**Cabinet Secretary, Ministry of Devolution and Planning**

## FOREWORD

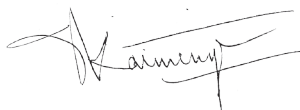
The government recognizes the key role played by Science, Technology and Innovation (ST&I) in wealth creation and building human capital required for the transition to a knowledge driven economy. Vision 2030 proposes to intensify the application of ST&I to raise productivity and efficiency levels across the three pillars of national development. As a result, the Government is implementing the ST&I policy framework through the identification, acquisition, transfer, diffusion and application of relevant ST&I knowledge in all sectors of the economy.

The first Medium Term Plan (MTP) 2008-2012 was developed based on the challenges identified in vision 2030 and other policy documents. It was implemented through a coordinated action plan within the context of economic, social and political pillars of the economy. The development of capacities of the national innovation system has been fast tracked to ensure the competitiveness in the international technology market, based on the targeted programmes from the identified sectoral areas. However, more need to be done and as a result, the Ministry of Education, Science and Technology and its stakeholders have developed the Second MTP for 2013-2017 for the Science, Technology and Innovation sector. This Second MTP (2013-2017) proposes more strategic and bold programmes to address the persisting macroeconomic and social-economic challenges, facing the country.

The objective of the Second MTP is to achieve the transformation to a knowledge based economy that integrates ST&I in national production processes and create technology platforms essential for the development of products, processes and services in a wide range of sectors. The Second MTP provides for prioritization of ST&I programmes based on their potential impact and the existing gaps identified within the framework of Vision 2030, the ST&I policy and the First MTP 2008-2012.

I wish to appreciate and commend all stakeholders who participated in the compilation of this Second MTP. I further wish to reiterate the government's commitment to provide an enabling environment for the successful implementation of this plan and call upon all partners to support the actualization of the programmes therein. The future can only get brighter.

God bless Kenya.



**Prof. Jacob T. Kaimenyi, PhD, FICD, EBS**

**Cabinet Secretary, Ministry of Education, Science and Technology**

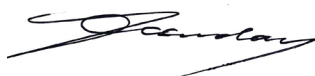
## PREFACE

Science, Technology and Innovation (ST&I) play a pivotal role in the industrialization, sustainable development and growth of nations. Investments and integration of ST&I into social, economic and governance policies will increase Kenya's global competitiveness, create employment and increase productivity. Intensified application of Science, Technology and Innovation is essential in raising productivity and efficiency levels across the economic, social and political pillars. All these are key attributes to achieving the overarching Kenya Vision 2030 goals.

The Kenya Vision 2030 is implemented through five-year Medium Term Plans (MTP) under the various sectors. To achieve the goals of Vision 2030, the Science, Technology and Innovation sector has identified Flagship Programmes for the Second MTP. This approach calls for adoption of various initiatives including: Public Private Partnerships (PPPs); linking industry with academia; value chain analysis; synergy as opposed to individual competition and initiatives for closed-cycle cluster approach for enhanced cooperation. The Second MTP integrates science, technology and innovation into the identified sectors by ensuring that the sector players have access to the necessary technologies that will be relevant for the production of a diverse range of products, processes and services.

The achievements realized and lessons learnt in the implementation of the First MTP have informed and shaped the preparation of the Second MTP. The ST&I sector prioritizes areas which reflect the most important fields of knowledge and technology for which research excellence is important to improve Kenya's ability to address social and economic challenges. This plan prioritizes the following areas for implementation: Space Science Technologies, Materials, Nanosciences and Nanotechnologies; New Production Technologies; Energy Technologies; Biotechnology and Biosciences; Telecommunications, Electronics and Computers Technologies; Natural products and Indigenous Knowledge technologies; Science, Technology, Engineering, and Mathematics Education; and Coordination of Technology, Innovation and Commercialization.

The resultant re-organization of institutional management and attendant legal frameworks has provided a favourable environment and a great opportunity for a multi-sectoral approach to solving Kenya's pressing challenges. This plan provides a bold, multi-disciplinary, transformative and creative approach to spur economic growth, sustainable job creation and improve the quality of life for all Kenyans.



**PROF. COLLETTE A. SUDA, PhD, FKNAS, EBS**

**Principal Secretary, State Department of Science and Technology, Ministry of Education, Science and Technology**

## **ACKNOWLEDGEMENT**

The Second MTP Sector Plan is a product of the collective efforts of partners and stakeholders. It seeks to prioritize policies, programmes and projects that endeavour to capitalize on ST&I to reduce poverty and inequality. The sector recognizes a multi-sector and multi-disciplinary approach as being pivotal in the effective implementation of the plan. Consequently, the Sector Working Group on ST&I would like to acknowledge the following individuals and institutions for their invaluable contribution:

- The Minister for Higher Education, Science and Technology for the policy guidance and motivation to the Sector Working Group and ST&I stakeholders during the preparation of the Second MTP
- The Permanent Secretary, Ministry of Higher Education, Science and Technology for the vision, leadership and guidance in the development of the MTP.
- The stakeholders represented by the private sector, industry, and government ministries, for participating in the consultations and providing field level perspectives on ST&I.
- Universities and research institutions, for valuable inputs in identification of the key development issues, sector priorities, strategies and programmes to be implemented in the Second MTP.
- Scientists and researchers, for whom the application of ST&I is a reality that they deal with every day. Their inputs, gained from life experiences, are most valuable.
- Individual ST&I experts, for providing quick responses and feedback on the programs, priorities and activities in their fields of specialization.
- The MTPSWG Secretariat, for providing logistics to the TWG and the SWG and over-seeing the development of the Second MTP
- The Central Planning and Project Monitoring Unit for the information support and coordination.
- Ministry of State for Planning, National Development and Vision 2030, for the overall advice, coordination and the financial facilitation of some activities of the SWG.



**MR. MICHAEL KAHITI, CHIEF ECONOMIST**  
**SECRETARY MTPSWG, CHAIR TECHNICAL WORKING GROUP**

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## LIST OF ACRONYMS /ABBREVIATIONS

|          |   |
|----------|---|
| AG       | Attorney General  |
| ASAL     | Arid and Semi-Arid Lands  |
| CBOs     | Community Based Organizations                                     |
| CPF      | Country Programme Framework                                       |
| ERS      | Economic Recovery Strategy  |
| ERSWEC   | Economic Recovery Strategy for Wealth and Employment Creation     |
| FDI      | Foreign Direct Investment   |
| GIS      | Geographic Information System                                     |
| GCI      | Global Competitiveness Index                                      |
| HES      | Higher Education Sector   |
| HIV/AIDS | Human Immune-Deficiency Virus/Acquired Immune Deficiency Syndrome |
| HR       | Human Resources   |
| HRM      | Human Resources Management  |
| IAEA     | International Atomic Energy Agency.                               |
| ICT      | Information and Communication Technology                          |
| IEC      | Information, Education and Communication                          |
| IPR      | Intellectual Property Rights                                      |
| IRTK     | Indigenous ST&I Resources and Traditional knowledge               |
| KAM      | Kenya Association of Manufacturers                                |
| KARI     | Kenya Agricultural Research Institute                             |
| KEMRI    | Kenya Medical Research Institute                                  |
| KEPSA    | Kenya Private Sector Alliance                                     |
| KEPHIS   | Kenya Plant Health Inspectorate Services                          |
| KIPI     | Kenya Industrial Property Institutes                              |
| KIPO     | Kenya Industrial Property Organization                            |
| KIRDI    | Kenya Industrial Research and Development Institute               |
| KSH/Ksh. | Kenya Shillings   |
| KIPPRA   | Kenya Institute of Public Policy and Research Analysis            |
| LA       | Lead Agency   |
| M&E      | Monitoring and Evaluation   |
| MDG      | Millennium Development Goals                                      |
| MIC      | Middle- Income-Country  |
| MoF      | Ministry of Finance   |
| Moi      | Ministry of Industrialization                                     |
| MoIC     | Ministry of Information and Communication                         |
| TSC      | Teacher Service Commission  |
| KNEC     | Kenya National Examination Council                                |
| MoHEST   | Ministry of Higher Education, Science and Technology              |
| NACSTI   | National Commission for Science, Technology and Innovation        |
| NCST     | National Council for Science and Technology                       |
| NMK      | National Museums of Kenya   |
| NMK-IPR  | National Museums of Kenya – Institute of Primate Research         |
| NESC     | National Economic and Social Council                              |
| NGO      | Non-Governmental Organization                                     |
| ODL      | Open Distance Learning  |
| PAC-ST&I | Presidential Advisory Committee on ST&I                           |
| PPP      | Public – Private Sector Partnership                               |



|      |  |
|------|--|
| RSEs | Researchers, Scientists and Engineers            |
| R&D  | Research and Development                         |
| SMEs | Small and Medium Enterprises                     |
| S&T  | Science and Technology                           |
| STEM | Science, Technology, Engineering and Mathematics |
| ST&I | Science, Technology and Innovation               |
| SAGA | Semi-Autonomous Governmental Agency              |
| ST&I | Science, Technology and Innovation               |

## EXECUTIVE SUMMARY

Sustainable economic development requires that a country does not remain, primarily, a provider of raw materials with external dependency for hi-tech services. Thus, the ST&I sector seeks to identify national programmes that are aligned to the national goals and market needs, in order to identify sector priorities and determine the strategic technology platforms required to address those priorities. This requires the identification and development of projects aligned to the Vision 2030 which will help the country attain global competitiveness and a knowledge based economy.

This calls for the rationalization, re-structuring and establishment of ST&I institutions to make them more effective in addressing national priority needs in order to build a robust national innovation system that uses product oriented multi-disciplinary approaches to become globally competitive. Concerted efforts will be made to strengthen governance and management of the ST&I sector and institutions to make them more efficient, effective and accountable for performance. This document outlines the second phase of implementation of activities to be pursued towards achieving the long term goals of Vision 2030. The Second MTP on ST&I is a vehicle through which the situational analysis of the sector is made, sector priorities and programmes are identified and an implementation matrix is postulated for a period of five years, (2013-2017) with a view to responding effectively to the global changes in Science, Technology and Innovation. The Second MTP lays the roadmap for implementing Kenya's development objectives for ST&I for the next five years.

The development of this Second MTP takes into consideration the ST&I sector mandate, the TVET Act, the University Education Act, the ST&I Act; ST&I policy; the Report of the Task Force on alignment of the Higher Education Science and Technology (TAHEST) sector to the Constitution of Kenya 2010 and the results of consultations with the MTP ST&I Sector stakeholders. The plan therefore reviews the successes attained and the challenges encountered in the implementation of the First MTP. The implementation of the First MTP recorded significant achievements in the growth and development of ST&I in Kenya.

To further bolster the ST&I sector, the Government has developed policy and legal reforms that has led to the development of the ST&I policy and the enactment of the ST&I Act that streamlines the institutions needed to ensure effective coordination of ST&I in the country. Based on the lessons learnt, the plan sets out sector priorities, programmes and projects, analyses the policy and legal environment using an elaborate performance management framework. The Second MTP on ST&I comprises six chapters that outline the situational analysis, sector priorities, programmes and projects, policy and legal framework, implementation matrix and monitoring and evaluation.

**Chapter 1** presents the situational analysis with a focus on rationale and current status of the ST&I sector; overview, and strategic thrusts of the First MTP; and policy and institutional reforms that have been undertaken over the past five years. The chapter also gives a summary of achievements, challenges and lessons learnt.

**Chapter 2** presents the ST&I sector priorities and provides a brief description, criteria and rationale for identification and selection of the sector priorities. Prioritization is based on a bold, multi-disciplinary, transformative and creative approach in order to spur economic growth, sustainable job creation and improve the quality of life. Further, the priorities seek to advance the generation and creation of new knowledge with value to Kenya, while securing it through Intellectual Property Rights (IPR) and capacity building. The areas identified as priority are: Material Science and Nano science; Engineering and new production technologies; Biotechnology and Biosciences; Space Science and Technology; Energy Technologies; Science, Technology, Engineering and Mathematics Education; Nanotechnology; Telecommunications Electronics and computing technologies; Natural products and indigenous knowledge technologies; and Coordination of Technology, Innovation and Commercialization.

**Chapter 3** describes the programmes and projects that relate to the identified priority areas. The

programmes seek to actualize the benefits outlined in Chapter 2 in order to address the macroeconomic and social challenges and achieve the transformation to knowledge based economy. The key flagship projects identified under each priority area are: Kenya Nanotechnology Institute for advancing Nano-Sciences, Materials and New Production Technologies Programme; The National Physical Science Research Laboratory for Engineering and new production technologies; Space Science and Technology-Kenspace Programme ; Establishment of an Institute for Nuclear Science and Technology Research for Peaceful Purposes under the Nuclear Energy Programme; Kenya Bioscience Institute and Kenya National Biological Resource Centre for advancement of Biotechnology and Biosciences Programme. Other priority programmes include: Kenya Electronics Telecommunications, and Computing Research Institute to develop Electronics, Telecommunications and Computing equipment and devices; The Natural Products Programme; Establishment of Kenya Advanced Institute of Science and Technology; and Kenya National Innovation System Programme.

**Chapter 4** provides the policy and legal reforms required to actualize the implementation of the Second MTP programmes. The MTP proposes policy and legal reforms which are at different stages of development. These include the Draft National Biotechnology Development Policy and Bill; the draft Natural Products Policy and Bill; draft Atomic Energy Policy and Bill; draft Space Science Policy and Bill; and the draft Kenya Institute of Nanotechnology (KION) Policy and Bill;. These policies and bills if adopted and enacted into law will provide the required policy and legal environment for further development of the ST&I sector.

**Chapter 5** provides the performance evaluation framework that will be used to track the implementation of the Second MTP and provide the required feedback.

# 1 SITUATIONAL ANALYSIS

## 1.0 Introduction

The effective management of Science, Technology and Innovation (ST&I) is now widely regarded as the determinant of competitiveness both for corporate entities and countries. The Kenya Vision 2030 and the Constitution explicitly place a premium on the generation and management of a knowledge-based economy and the need to raise productivity and efficiency.

The Vision 2030 is implemented through five-year Medium Term Plans (MTP) under the different sectors identified in the vision. The first ST&I MTP Sector Plan covered the period of 2008-2012. The Second MTP (2013-2017) builds on the success and lessons learnt in the First MTP while acknowledging the opportunities in the dynamic environment. It identifies priority Flagship Programmes with clear outcomes to contribute to the long term achievements of the ST&I goals in support of Vision 2030. To achieve the identified Flagship Programmes during this MTP, various initiatives including the Public Private Partnerships (PPPs); linking industry with academia; value chain analysis; initiatives for closed-cycle cluster approach for enhanced cooperation and synergy as opposed to individual competition will be adopted.

The Second MTP falls in a transitional phase of rapid technological advancement, globalization, social-demographic transition and increased demand and flow of information and services. This is supported by the highest political commitment, economic growth, legal and institutional reforms as well as increased regional drive for integration.

## 1.1 Rationale for STI

Science, Technology and Innovation are essential ingredients in the industrialization and sustainable development of nations as a component of growth and development. In a knowledge-based economy, the capacity to compete in the global market is highly dependent on the ability to innovate and apply the relevant technology to industries and productive sectors. Investments in ST&I and the integration of ST&I into social, economic and governance policies can increase global market competitiveness, create employment and increase productivity. All these attributes are key to achieving the overarching Vision 2030 goal. Through ST&I, Kenya is positioning itself as a major regional and international hub for emerging technologies to support quality of life and overall socio-economic development. These efforts complement initiatives in peace building and addressing environmental threats as well as climate change. This calls for a critical re-evaluation and application of Science, Technology and Innovation as an engine and driver of knowledge economies in general and knowledge-based economy in particular.

### 1.1.1 Guiding Principles

The effective implementation of the Science Technology and Innovation Medium Term Plan will be guided by the following principles:

1. **Relevance:** ST&I policy shall be aimed at helping to achieve the country's Vision 2030.
2. **Cost-effectiveness:** There shall be use of the most cost-effective means to achieve the desired results.
3. **Realism:** Whereas Kenya desires to reach the international frontiers of ST&I application and development, this policy will be implemented within the Country's capacities and aspirations.
4. **Multi-disciplinary and synergy:** ST&I development and application must be holistic. There thus shall be a multi-disciplinary and cross-sectoral approach to problem-solving for synergy.
5. **Partnerships:** There shall be conscious efforts for collaboration and interaction with all local and foreign stakeholders in the national innovation system.
6. **Environmental protection and conservation:** All ST&I institutions shall make efforts to protect and conserve the environment.

7. **Empowerment and participation:** Promote the empowerment as well as full participation of women, youth, marginalized communities and disadvantaged persons in all ST&I activities.
8. **Equity and non-discrimination:** Ensure there is equity and non-discrimination in appointing the leadership team and in recruitment, promotions and human resource management of public ST&I institutions; and ensure the principle that not more than two-thirds of the members of elective or appointive bodies shall be of the same gender is observed.
9. **Ethical leadership:** Ensure that the leadership team of public ST&I institutions complies with the ethical leadership principles as specified in Article. 73(2) of the Constitution.
10. **Reward and recognition:** Develop and implement a robust system for identifying, evaluating, recognising, protecting intellectual property rights and rewarding excellence in ST&I activities
11. **Good governance:** Ensure that the leadership team of public ST&I institutions complies with the values and principles in the management and administration of public institutions as provided in Article 232(1) of the Constitution as well as the principles governing the management of public finances as specified in Article 201 of the Constitution.

## 1.2 Current Status of Science, Technology and Innovation Sector

### 1.2.1 Sector Analysis

The ST&I sector has undergone various changes attributed to globalization and socio-demographic changes. A systematic review of the sector points to a promising future. The following are the key conclusions of the analysis:

- The importance of the highest level Political & Legal statement on science policy and strategy endorsed by Government;
- Rapid growth of the University sector providing opportunities for linkages among Government, Industry and Academia;
- Increased number of specialized Public Research Institutions; The critical importance of the Science and Education system at all levels (primary, secondary, Technical, Vocational Education and Training (TVET) and University levels) has been encouraged through Science, Engineering and Technology related training programmes;
- Policy emphasis on building research capacity, quality and coherence, particularly with regard to the growth required in order to achieve the National, Regional & International R&D targets;
- The need to achieve balance and connectivity between discovery research, development and commercialization;
- Complement existing priority research areas (ICT and Life Sciences) with more emphasis on certain strategic research areas (e.g. Sustainable Food and Agriculture and Health) and key disciplines (e.g. mathematics);
- Participation in international research, collaborative agreements and networks.

### 1.2.2 Kenya's Performance in Science, Technology and Innovation

The ST&I indicators provide a management tool to monitor the national investments in the field of science and technology. They can also assess and forecast future investments needed for stabilizing knowledge based systems. Such indicators are also a valuable tool for identifying and monitoring the progress towards achievements in the priority areas for further investment.

Table 1.1 shows the World Economic Forum's Global Competitiveness Index (overall and innovation ranks) ranking of the top countries in South Asia, BRICS countries and Kenya. It shows that Kenya is very close to the BRICS countries from an innovation perspective but very far off from an overall ranking perspective. The country's strengths continue to be found in the more complex areas measured by the GCI. Kenya's innovative capacity is ranked an impressive 52<sup>nd</sup>, with high company spending on R&D and

good scientific research institutions that collaborate well with the business sector in research activities.

**Table 1:1 Global Competitiveness Ranking of Selected Countries**

| Countries    | GCI – 2009/2010 |                 | GCI – 2010/2011 |                 | GCI – 2011/2012 |                 |
|--------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
|              | Overall rank    | Innovation rank | Overall rank    | Innovation rank | Overall rank    | Innovation rank |
| Japan        | 4               | 4               | 6               | 4               | 9               | 4               |
| Singapore    | 8               | 8               | 3               | 9               | 2               | 8               |
| Korea        | 19              | 11              | 22              | 12              | 24              | 14              |
| Malaysia     | 24              | 24              | 26              | 24              | 21              | 24              |
| China        | 29              | 26              | 27              | 26              | 26              | 29              |
| South Africa | 45              | 41              | 54              | 44              | 50              | 41              |
| India        | 49              | 30              | 51              | 39              | 56              | 38              |
| Brazil       | 56              | 43              | 58              | 42              | 53              | 44              |
| Russia       | 63              | 51              | 63              | 57              | 66              | 71              |
| Kenya        | 98              | 48              | 106             | 56              | 102             | 52              |

Source: WDR, 2011

Table 1.2 compares the expenditure on R&D as a percentage of GDP for a number of countries, including Kenya. The data in this table shows that the BRICS countries spend about 1% of their GDP on research and development, while Kenya is at less than 0.5%. One of the challenges noted is that Kenya does not routinely collect data on the R&D indicator.

**Table1:2 Comparative Research and Development Expenditure (% of GDP)**

| Country Name | Research and Development expenditure (% of GDP) |      |      |      |      |      |      |
|--------------|---|------|------|------|------|------|------|
|              | 1997  | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
| Australia    |   | 1.7  |      | 1.8  |      | 2.1  |      |
| Brazil       |   | 1.0  | 1.0  | 0.9  | 1.0  | 1.0  | 1.1  |
| China        | 0.6   | 1.1  | 1.1  | 1.2  | 1.3  | 1.4  | 1.4  |
| Finland      | 2.7   | 3.4  | 3.4  | 3.5  | 3.5  | 3.4  | 3.5  |
| Germany      | 2.2   | 2.5  | 2.5  | 2.5  | 2.5  | 2.5  | 2.5  |
| India        | 0.7   | 0.7  | 0.7  | 0.8  | 0.8  | 0.8  | 0.8  |
| Israel       | 3.0   | 4.6  | 4.3  | 4.3  | 4.4  | 4.4  | 4.8  |
| Japan        | 2.9   | 3.2  | 3.2  | 3.2  | 3.3  | 3.4  | 3.4  |
| Kenya        |   |      |      |      |      |      | 0.48 |
| Korea, Rep.  | 2.5   | 2.4  | 2.5  | 2.7  | 2.8  | 3.0  | 3.2  |
| Malaysia     |   | 0.7  |      | 0.6  |      | 0.6  |      |
| Mauritius    | 0.3   | 0.4  | 0.3  | 0.4  | 0.4  |      |      |
| Mexico       | 0.3   | 0.4  | 0.4  | 0.4  | 0.4  | 0.4  | 0.4  |

| Country Name   | Research and Development expenditure (% of GDP) |      |      |      |      |      |      |
|----------------|---|------|------|------|------|------|------|
|                | 1997  | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
| Singapore      | 1.5   | 2.2  | 2.1  | 2.2  | 2.3  | 2.3  | 2.5  |
| South Africa   | 0.6   |      | 0.8  | 0.9  | 0.9  | 0.9  | 0.9  |
| Uganda         |   | 0.4  | 0.3  | 0.3  | 0.2  | 0.3  | 0.4  |
| United Kingdom | 1.8   | 1.8  | 1.7  | 1.7  | 1.7  | 1.8  | 1.8  |
| United States  | 2.6   | 2.7  | 2.7  | 2.6  | 2.6  | 2.7  | 2.7  |

Source: WDR, 2011

### 1.2.3 International Science ,Technology and Innovation Partnerships

Kenya has a plentiful and rich variety of bilateral, multilateral and regional partnerships and networks around ST&I, R&D and Innovation – both formal and informal. The partnerships and collaborations have been developed through diplomatic relations with specific countries, regional economic blocs and scientific organizations. Kenya participates in global challenges such the global millennium project and global and regional scientific projects such as the consolidated plan of action for Africa’s ST&I.

Recent Initiatives in Science ,Technology and Innovation

### 1.2.4 Recent Initiatives in Science ,Technology and Innovation

Some of the recent ST&I initiatives which Kenya has taken part for development include the following:

1. Kenya has been a key leader and participant in the implementation of the African ST&I Plan of Action. In 2009-2010 Kenya was the Chair of the African Ministers’ Conference on Science and Technology (AMCOST), the Committee of Ministers of Africa in charge of development of Science and Technology.
2. The planning and hosting of the 1<sup>st</sup> African Science and Technology and Innovation for Youth, Employment, Human Capital Development and Inclusive Growth forum marked a paradigm shift and a new beginning for the ST&I sector in Kenya and in Africa. The Forum presided over by His Excellency the President of Kenya, H.E. Mwai Kibaki, brought together more than 30 African Ministers of Education and Science who unanimously pledged to put ST&I policies, strategies, programmes and plans into action over the next five years. The president noted that “We need policies and infrastructure for research and development that will attract and retain top-notch scientists.”
3. The Sector has, in collaboration with the NEPAD office of Science and Technology initiated African Science, Technology and Innovation Indicators (ASTII) Programme to enable Kenya measure the development of ST&I Sector using an agreed African ST&I Indicators Manual.
4. The Taskforce on Harmonizing and Alignment of Higher Education, Science and Technology (TAHEST) clearly points the direction, the position and the role of ST&I in national development in the Constitution.
5. The development of Konza Technopolis promises to further put Kenya on a global map as a leading centre of excellence in ST&I and knowledge-based economy.
6. The liberalization of higher education that has led to increased opportunities for increasing capacity in human resource for ST&I.
7. The advancement in ICT and laying of the fibre-optic as well as the establishment of dedicated government agencies for improved communication of information storage and sharing, presents unlimited opportunities under the MTP.

## 1.3 Overview of the First Medium Term Plan and MTEF Process

The implementation of the First MTP was structured within the Research, Innovation and Technology (RIT) MTEF Sector Working Group. During the 1st Medium Term Plan, the RIT Sector was composed of seventeen (17) subsectors led by the Ministry of Higher Education, Science and Technology (MOHEST), Ministry of Information and Communication (MOIC) and all Public Research Institutions.

In the interim period 2010/11-2012/13 the Sector Goals and Achievements for the RIT were realized as summarized in Table 1.3. Key highlights include advances in disease prevention, the establishment and operationalization of the national research fund, ICT improvements as well as legal and institutional reforms.

**Table 1.3 RIT Sector Programmes and Achievements 2008-2012**

| No | Sector Programme                                       | Goals  | Achievements  |
|----|--|--|---|
| 1. | Research and Innovations                               | To create new knowledge and technologies   | <ul style="list-style-type: none"> <li>National Research Fund</li> <li>Use of ARV's for Prevention of HIV</li> <li>Malaria Vaccine development</li> </ul>   |
| 2. | ICT infrastructure development                         | To develop modern ICT infrastructure   | <ul style="list-style-type: none"> <li>Government Common Core Network (GCCN)</li> <li>Development of TEAMS</li> </ul>   |
| 3. | Human Resource development                             | To build and strengthen human capacity   | <ul style="list-style-type: none"> <li>Increased University enrolment</li> <li>Increased TVET enrolment</li> </ul>  |
| 4. | Information & Communication Services                   | To provide quality, equitable and affordable information and communication services countrywide.           | <ul style="list-style-type: none"> <li>Fiber Optics Cable</li> </ul>  |
| 5. | Data Management  | To develop a comprehensive and reliable national database  | <ul style="list-style-type: none"> <li>Kenya Atlas on changing environment</li> <li>Population and Housing Census</li> <li>Kenya Demographic and Health Survey, 2008</li> <li>National Innovation Survey</li> </ul> |
| 6. | Development of Policy, legal & Institutional framework | To formulate, review and implement appropriate policies, legal and institutional frameworks for the Sector | <ul style="list-style-type: none"> <li>ST&amp;I Sessional Paper; National Biosafety Act; ICT Bill, Freedom of Information Bill; Kenya Communication Amendment Bill 2008; Media Bill etc.</li> </ul>                 |

The RIT sector functioned as an entity up to FY 2008/2009-2010/2011 in accordance to the MTEF Cycle. The MTEF Sectors were reconstituted in FY 2011/2012 to-date and membership changed while other members of the former RIT went to different sectors. This scenario has presented challenges in situation analysis.

### 1.3 The Strategic Thrust Areas for 2008 – 2012

The Government of Kenya recognizes the vital role played by university education and training, the importance of ST&I and the challenges facing the sector and proposed to undertake a number of measures to leverage it for the benefit of the Kenyan people. These measures covering the period, were articulated under the following key strategic thrust areas:

#### 1.3.1 Strengthening Technical Capacities and Capabilities:

The government committed to focus on the creation of better production processes, placing a strong emphasis on technological learning. The focus was on technologies and processes that enhance national competitiveness and facilitate the creation of quality jobs. In addition, the capacities of ST&I institutions were to be enhanced through advanced training of personnel, improved infrastructure, equipment, and by strengthening linkages with actors in the productive sectors. A programme targeting provision of ST&I infrastructure was also to be implemented over a period of three years.



### **1.3.2 Developing a Highly Skilled Human Resource Base:**

Under this programme a National Skills Inventory and Audit Survey was to be implemented to form a basis for targeted long-term development of a human resource base to support the ST&I sector in accordance to UNESCO's ST&I standards. On the basis of this, a National Critical Skills Development Strategy was to be formulated for implementation by 2009. The number of researchers, scientists and engineers was to be increased to focus on national priority sectors. Furthermore, the current transition rate from secondary level education to university was to be increased and the postgraduate training strengthened, particularly in the fields of Science and Technology.

### **1.3.3 Intensification of Innovation in Priority Sectors:**

Biannual National Innovation Survey was to be conducted to determine the incidence of innovation in the national priority areas as well as determining the impediments to increased innovation in those sectors. Additionally, to intensify innovation, the funding for basic and applied research at higher institutions of learning, as well as for research and development was to be increased to Kshs. 37 billion by 2012.

### **1.3.4 Enhancing Science, Technology and Innovation Awareness:**

Under this plan the sector was to put in place measures to create and deepen STI awareness amongst policy makers and implementers, through professional associations and community science networks; non-profit Organizations and large businesses; Early Childhood Development (ECD), primary and secondary schools, universities and technical institutes. This programme was aimed at creating and nurturing a passion for learning, creativity, technology and innovation.

### **1.3.5 Strengthening the ST&I Performance Management Framework:**

This programme targeted putting in place a framework to collect and disseminate information on the resources employed by the sector and their effectiveness. The proposed framework was to focus on timely tracking of the implementation of various programmes/initiatives under the plan.

## **1.4 Policy, Legal and Institutional Reforms**

The ST&I sector developed various policies, strategies, legislative and administrative measures that must be put into operation for successful revamping of the Higher Education Science and Technology Sector as a foundation of the Kenya Vision 2030 and in line with the Constitution of Kenya.

### **1.4.1 Policy Framework**

Kenya's ST&I interventions for 2008-2012 were to be implemented through an enabling legal and policy framework. To this end the national strategy and bill for science and technology was developed in 2009 in alignment with the Kenya Vision 2030. When the Constitution of Kenya 2010 came into effect in 2010, the strategy and bill were realigned to conform to the provisions of the new constitution. This led to the development of the ST&I policy and ST&I bill 2012.

### **Kenya Vision 2030**

Vision 2030 proposes intensified application of Science, Technology and Innovation to raise productivity and efficiency levels across the three pillars. It recognizes the critical role played by Research and Development in accelerating economic development in all the newly industrializing countries of the world. The vision envisages that the Government will create the ST&I policy framework to support Vision 2030. The Vision therefore lays the basis for policy and strategy in ST&I.

### **Science Technology & Innovation Policy**

The ST&I bill is guided by the ST&I policy of 2012. The policy provides a platform to leverage ST&I to transform the economy through the national priority areas, create an effective and efficient Kenya

National Innovation System, operationalize the triple helix and commercialize research outputs through the Innovation Agency (KENIA), mobilize at least the equivalent of 2% of GDP annually from the Government, Private Sector and other sources to fund the entire ST&I value chain.

### **National Agricultural Research System Policy**

The National Agricultural Research System Policy Lays the policy for the National Agricultural Research System (NARS). This is in response to the need to reform the agricultural sector as articulated in various government policies and strategies, more specifically the Economic Recovery Strategy (ERS), the Strategy for Revitalizing Agriculture (SRA) and Vision 2030. The policy calls for the creation of an agricultural innovation system made up of research institutes, universities, research foundations, private sector and non-governmental organizations (NGOs) as a means of establishing an efficient agricultural research system that consistently provides appropriate technologies, knowledge and information to the agricultural sector.

#### **1.4.2 Legal Reforms**

Legal reforms in the Science Technology and Innovation range from constitutional provisions to enabling acts of parliament. Before the promulgation of the constitution 2010, the ST&I sector was governed by the Sessional Paper No 1 of 2005 on education training and research, Science Technology Act Cap 250 and the National Bio-safety Act, 2009. The legal provision for delivery in ST&I is now guided by the ST&I Act of 2013 which provides for the promotion, coordination and regulation of the progress of Science, Technology and Innovation in the country, assignment of priority to the development of Science, Technology and Innovation and entrenchment of Science, Technology and Innovation into national production system.

#### **1.4.3 Institutional Reforms**

The Department responsible for ST&I will be lean at the policy making level with delegated functions to state corporations and regulatory bodies: The department will house the National Commission for Science, Technology and Innovation (NCSTI) whose mandate is to regulate and assure quality in the ST&I sector and advise Government on matters of science, technology and innovation; the Kenya National Innovation Agency (KENIA) mandated to develop and manage the Kenya National Innovation System; the National Biosafety Authority (NBA) whose mandate is to exercise control over development, transfer, handling and use of genetically modified organisms and the National Research Fund (NRF) mandated to mobilize and manage financial resources for the advancement of the National Innovation System in order to create knowledge, innovation and development in all fields of science and technology, including indigenous knowledge.

Research institutes will be hosted by the respective sector ministries. The National Commission for ST&I will work with sector ministries to restructure and rationalize the research institutes to promote product-oriented multi-disciplinary research. The policy, planning and budgeting of the sector-based research institutes will be harmonized under their respective ministries. However, these institutes will only access funds from the National Research Fund to carry out projects that have been prioritized by the National Commission for Science, Technology and Innovation. A County Government may establish specialized research institutes or innovation centres of excellence to carry out mandates that have been prioritized by this level of Government.

#### **1.4.4 International and Regional Treaties**

Kenya is party to international treaties on implementation of ST&I programmes. The following are the international treaties that affect the programmes to be implemented under the Second MTP.

## **Biotechnology**

The Cartagena Protocol on Biosafety is an international agreement on biosafety, as a supplement to the Convention on Biological Diversity. The Biosafety Protocol seeks to protect biological diversity from the potential risks posed by genetically modified organisms resulting from modern biotechnology. The Biosafety Protocol makes clear that products from new technologies must be based on the precautionary principle and allow developing nations to balance public health against economic benefits. It will for example let countries ban imports of a genetically modified organisms if they feel there is not enough scientific evidence that the product is safe and requires exporters to label shipments containing genetically altered commodities such as corn or cotton.

## **Nuclear Energy**

The Country Programme Framework (CPF) developed and jointly implemented by the Government and the International Atomic Energy Agency (IAEA), identifies the national priorities for social economic development where nuclear science and technology can make a significant contribution to the country. CPF also provides the basis for the design and formulation of sound Technical Cooperation projects with IAEA. Kenya has ratified the following treaties and convention that related to peaceful application of nuclear science and technology: Comprehensive Nuclear Test Ban Treaty (CTBT); Convention on Physical Protection of Nuclear Materials; African Nuclear –Weapon- Free Zone Treaty (Pelindaba); The Safeguard Agreement in connection with the Treaty on the Nuclear Non Proliferation (NTP) Nuclear Weapons; The Additional Protocol under the Nuclear Non-Proliferation Treaty; Small Quantities Protocol; Comprehensive Safeguards; and African Cooperative Agreement for Research, Development and Training Related to Nuclear Science and Technology (AFRA).

## **Space Science**

Kenya is a signatory to the Outer Space Treaty which represents the basic legal framework of international space law. Among its principles, it bars States Party to the Treaty from placing nuclear weapons or any other weapons of mass destruction in orbit of Earth, installing them on the Moon or any other celestial body, or to otherwise station them in outer space. It exclusively limits the use of the Moon and other celestial bodies to peaceful purposes and expressly prohibits their use for testing weapons of any kind, conducting military manoeuvres, or establishing military bases, installations, and fortifications. The treaty also states that the exploration of outer space shall be done to benefit all countries and shall be free for exploration and use by all the States.

### **1.5 Achievements Of Sector Priorities Firstmtp 2008-2012**

The achievements of the sector during the implementation of the First MTP have been outlined in terms of the programmes, goals intended and the actual achievement by programme. This is tabulated the following table.

**Table 1.4 ST&I Flagship Programmes 2008:2012 Achievements**

| No. | Programme   | Goals   | Achievements  |
|-----|---|---|---|
|     | Strengthening the Technical Capacities and Capabilities | <ul style="list-style-type: none"> <li>• Provide a Policy, Legal and Institutional Framework for the promotion and integration of ST&amp;I in the national production processes</li> <li>• Improve STEM</li> <li>• Implement a programme supporting cutting edge training and research in agro-processing, biotechnology, ICT, laser and material sciences</li> </ul> | <ul style="list-style-type: none"> <li>• ST&amp;I Sessional Paper and Bill; UE Sessional Paper and Bill; and TVET Sessional Paper and Bill finalized.</li> <li>• Developing Academic Programmes in Petroleum, Mining and Renewable energy to build capacity in these areas</li> <li>• An Atomic Energy Policy was developed</li> <li>• The Bio-safety Act and regulations was developed and gazetted.</li> <li>• The National Biosafety Authority was established in 2009</li> <li>• Development of National Agricultural Research Systems (NARS) and National Agricultural Sector Extension Programme (NASEP) policies</li> <li>• Establishment of the land use system.</li> <li>• Establishment of Disease-free zones; Fertilizer cost-reduction Investment; high yielding and quality tea varieties.</li> <li>• Initiation of Pilot Surveys under the African Science, Technology and Innovation Indicators Initiative (ASTII).</li> <li>• The Science and Technology Parks (STP) Policy was completed during 2011/2012</li> <li>• Establishment of Level 3 laboratory</li> <li>• Establishment of state of the art laboratory for paediatric HIV diagnosis to support National HIV&amp;AIDS prevention, treatment and Care Program</li> <li>• Development of capacity for HIV-Drug resistance testing</li> <li>• The development of national disease surveillance and rapid response capacity for major disease outbreaks.</li> </ul> |
|     | Developing Highly Skilled Human Resources               | Improved and increase the national pool of skills and talent and integrate it to the job market.  | <ul style="list-style-type: none"> <li>• Conducted the National Manpower Survey in collaboration with the Ministry of Labour.</li> <li>• Establishment of a Graduate School (the Institute of Tropical Medicine and Infectious Diseases – ITROMID) for Masters and PhD training in health sciences in liaison with the Jomo Kenyatta University of Agriculture and Technology (JKUAT),</li> <li>• Establishment of two global centres for training in the control of parasitic and infectious diseases respectively, under the Government of Japan Hashimoto and Okinawa initiatives.</li> <li>• Developed a critical mass of health research scientists; 80 PhD degrees, 140 master's and bachelor's degrees and 250 highly trained and skilled technical staff</li> <li>• Initiated and completed the training needs for Business Process Outsourcing (BPO) and Knowledge Process Outsourcing.</li> <li>• Capacity building in IPR and opening of IPR offices/desks in institutions of higher learning and research institutions in order to support commercialization of innovations was undertaken</li> </ul>   |

| No. | Programme  | Goals   | Achievements  |
|-----|--|---|---|
|     | Intensification of Innovation in Priority Sectors                  | Intensify innovation in national priority sectors   | <ul style="list-style-type: none"> <li>• A National Science, Technology and Innovation Fund was established and operationalized</li> <li>• Strategic international research collaborations and partnerships were established with other countries, world regional blocks such as the European Union and several other existing collaborations reviewed.</li> <li>• Establishment and review of bilateral collaborations and linkages in areas of Science, Technology &amp; Innovation</li> <li>• Established an Award Scheme for recognition of outstanding scientists in Kenya.</li> <li>• Finalized the curriculum development and review framework with a view of modularizing the TVET curriculum to make it more relevant to the market needs</li> </ul> |
|     | Enhancing ST&I Awareness   | Create and promote a national culture on ST&I   | <ul style="list-style-type: none"> <li>• Annual National Technology Exhibition</li> <li>• Regional Technology Exhibitions organized in four different regions.</li> <li>• Four round tables have been held (2010, 2011 and 2012) on various issues under Science, Technology and Innovation.</li> </ul>   |
|     | Strengthening the ST&I Performance Management Framework            | Develop quantifiable targets and tools to measure the implementation and performance of this plan in achieving the Vision 2030 goals  | <ul style="list-style-type: none"> <li>• Quarterly Progress reports</li> <li>• Annual Progress Reports</li> <li>• E-Promis</li> </ul>   |
|     | Expanding access and equity to tertiary education and training     | Increasing access and varying the routes for progression to higher education to cater for the increasing number of students completing secondary schooling, diploma courses and others who desire to pursue university education. | <ul style="list-style-type: none"> <li>• Construction of thirteen (13) new public TVET institutions across the country.</li> <li>• Construction of new laboratories and workshops in all TVET Institutions</li> <li>• The number of private universities has increased from 13 to 26 from 2003 to 2012</li> <li>• Accelerated intake in public universities.</li> </ul>   |
|     | Improving Quality and Relevance of tertiary education and training | Development, implementation, review, enforcement and monitoring of higher education and training quality standards  | <ul style="list-style-type: none"> <li>• Centre of Excellence Programme where Technical Training Institutions were provided with modern equipment.</li> <li>• Human resource development for the teaching staff...</li> <li>• .Developed a TVET Curriculum Development Standard to make TVET curricular relevant to the market</li> </ul>   |

## 1.6 Challenges in Implementation of the First Medium Term Plan

During the implementation of the First MTP the sector registered key successes. However the sector also experienced some challenges that impacted negatively on the achievement of objectives of the First MTP. Some of the challenges include:

1. Uncoordinated and fragmented Innovation System where synergies and networking among Government, Research and Training Institutions, Industry, Financial Sector and Professional Groups is weak;
2. Lack of harmony between MTP, MTEF, PPP and Performance Contracting processes;
3. Lack of a harmonized national Research Policy, agenda and priorities;
4. Inadequate funding of research. Funding for research is mainly donor-driven, fragmented, and uncoordinated, as a result, priority setting at both the national and international level remains blurred;
5. Absence of a skills inventory and inadequate alignment of the planning of human resource to development needs mainly due to lack of reliable and timely data on the demands of the labour market;
6. Mismatch between the skills possessed by the job seekers and those required by industry, which leads to underutilization of the existing human resources capacity;
7. Poor state of infrastructure and equipment for research and higher education and training;
8. Most industries are engaged in retailing of products from other companies hence the demand for RDI has been minimal;
9. Inadequate scientific expertise in the country. Lack of advocacy for ST&I at high political and policy levels;
10. Weak ST&I culture among the population;
11. Over reliance on the use of foreign expertise to the neglect of the use and development of local expertise;
12. Weak mechanisms for implementation, evaluation and review.

## 1.7 Lessons Learnt

A review of the implementation of the First MTP does provide useful lessons on what the sector should do in order to realize and exploit the full potential of ST&I. The main lessons learnt are:

1. The need to establish sector specific institutions of advanced training and research dedicated to developing key industries that will see the country attain NIC status.;
2. The critical role of a multi-sectoral approach to funding to facilitate full implementation of the proposed policies and legal framework by strengthening the role of PPPs in provision of University and Technical Education & Training and research activities.
3. The need for harmonization in the development of work plans, institutional and legal framework in order to avoid duplication and overlaps in the Second MTP. This will be achieved by establishing clear M&E framework, database and dissemination policy.
4. The need for an objective criterion to guide the selection and prioritization of projects.
5. The necessity of a highly skilled human capital to facilitate carrying out of the planned policies, strategies and programmes within the sector from a multi-sectoral and multi-institutional collaboration.
6. The role of entrenching product oriented multi-disciplinary approach to R&D
7. Careful attention needs to be paid to ensuring that the preparation of the MTP is aligned to the preparation of the MTEF for synergy and harmony in the prioritization and funding of programmes.

## 2 SECTOR PRIORITIES

### 2.0 Introduction

To address the macroeconomic and social challenges and achieve the transformation to knowledge based economy, there is need to integrate the ST&I priority sectors to create technology platforms for enhanced productivity growth. The strategic technology platforms are essential to support the development of products, processes and services in a wide range of sectors. Prioritization in this MTP is considered pertinent and is based mainly on the potential impact and the existing gaps within the framework of Vision 2030 and the National ST&I policy. Some of the important factors guiding identification of ST&I priorities identified for emphasis in Second MTP are as follows:

1. Increasing investment in basic research and improving opportunities for researchers;
2. Promotion of education and training in Science, Technology, Engineering, and Mathematics (STEM) disciplines;
3. Affirmative action programmes to increase the number of female researchers in scientific and technical disciplines;
4. Development of core technologies and innovations that drive growth;
5. Technology transfer, diffusion and commercialization of new technologies;
6. Promotion of national and international cooperation in research between universities, research institutes, business incubators and new technology start-ups;
7. Promotion of ST&I commercialization by firms;
8. Activation of private ST&I organizations;
9. Promoting a culture ST&I in the society.

### CRITERIA FOR SELECTION OF SCIENCE, TECHNOLOGY AND INNOVATION PRIORITIES

The ST&I sector takes an Integrated Innovation approach, defined as “the coordinated application of scientific, technological, social and business innovation to develop solutions to complex challenges”. This approach does not discount the singular benefits of each of these types of innovation alone, but rather highlights the powerful synergies that can be realized by aligning all three. Integrated Innovation recognizes that scientific/technological innovations have a greater chance of going to scale and achieving global impact and sustainability if they are developed from the outset with appropriate social and business innovations. The proposed priorities in the sector will:

1. Be bold, multi-disciplinary, transformative and creative in nature and have potential to spur economic growth, sustainable job creation and improve the quality of life;
2. Advance the generation and creation of new knowledge with value to Kenya, while securing it through intellectual property rights and capacity building;
3. Continue to pursue excellence in Kenyan research by strengthening the research capacity of universities, research institutions, individuals and private sector;
4. Accelerate Kenya’s ability to commercialize research innovations, by maximizing delivery, uptake, acceptability, sustainability and impact of new or value added products, processes and services;
5. Pursue a global strategy for STI supported by collaborative national and international research at the frontiers of knowledge;
6. Be resource efficient, environmentally sensitive and can be monitored and evaluated with potential of application to many sectors.

### 2.1 SCIENCE, TECHNOLOGY AND INNOVATION SECTOR PRIORITIES

The Second MTP integrates science, technology and innovation into specified sectors by ensuring that the key players within the sector have access to the necessary technologies that will be relevant to the

improvement of a diverse range of products, processes and services. In setting the sector priorities, strategic thrusts will focus on strengthening technical capacities and capabilities of individuals and institutions involved in research, in order to develop a highly skilled human resource base that can trigger intensification of technologies and innovations in the priority fields. More efforts will be focused on enhancing awareness in emerging technologies and strengthening the monitoring and evaluation component with the aid of acceptable performance management metrics.

The priority sectors will require a multi-sectoral approach involving various government departments and agencies responsible for facilitation, coordination, research funding, capacity building, policy formulation, manufacturing and commercialization, as well as Institutes of Higher Learning in teaching, research and technology development. Further, development partners and the private sector will supplement government efforts in financing as well as provide partnerships in international collaboration. The prioritized sector components which reflect the most important fields of knowledge and technology where research excellence is particularly important to improve Kenya's ability to address its social, economic, public health, environmental and industrial challenges of the future are:

### **Nanosciences, Material science, and New Product Technologies**

Nanotechnology is defined as the science and technology where the component parts of a can be measured in a billionth of a meter (nanometer). The building block for this new technology wave is Nanoscience. Nanoscience allows the manipulation of properties of materials at the molecular or atomic level, giving rise to products with enhanced properties, faster production processes, lower production costs, much smaller manufacturing equipment, cleaner environment or new manufacturing systems. As a result nanotechnology has been defined as a small science with a huge and immense potential.

Nanotechnology is revolutionizing various sectors of many economies including agriculture, medicine, energy, electronics and defence. Nanotechnology has become a new industrial revolution and many countries are investing heavily in this technology to maintain their market competitiveness. Developed countries have heavily invested in nanotechnology with well spelt out policies and strategic plans. The competitive edge of any developing nation lies heavily in its investment in this technology. This is particularly true for new economic power houses including China, India, North Korea and Brazil.

Materials science plays a significant role in the economic progress of a country and contributes directly towards the growth of the industrial sector, particularly; ceramics, plastics, metallurgy, aerospace, telecommunications, transportation, electronics, micro and optoelectronics, energy, healthcare, computing, consumer goods, and construction. The Major areas of application of nanosciences include nanoelectronics where electronics have been reduced in size and performance; nanosensors and diagnostic kits for detection and disease diagnosis; Nanomaterials for structured applications such as aerospace, engineering; smart delivery systems for agriculture, cosmetic among others.

Kenya is lagging behind in the uptake of nanotechnology since the technology is still new. There are efforts in the development of policies, initiatives and strategic plans for nanotechnology. Nanotechnology promises more for less - smaller, cheaper, lighter and faster devices with greater functionality, using fewer raw materials and consuming less energy. Nanotech applications are most likely to benefit: energy storage, production and conversion; enhancement of agricultural productivity; water treatment and remediation; and the diagnosis and treatment of disease.

Nanomaterials and nanomedical devices will play increasingly critical and beneficial roles in safer drug delivery and improving the diagnosis, treatment, and ultimately prevention of infectious and non-infectious diseases. Nanomachines have the potential to perform delicate surgery, cure previously unstoppable diseases, convert toxic waste into harmless and useful materials, and build nearly anything imaginable from basic materials.

Kenya must make a deliberate effort to institute basic science research at the highest level. Several



basic and technological research laboratories exist in government departments, universities and research institutions. The research equipment and financial support to these laboratories is inadequate to meet and sustain the needs of rapidly changing technology. Moreover some of the equipment required for physical sciences research are too expensive and beyond the budgetary allocation of the small laboratories. There is therefore need for a centralized approach to instrument acquisition and hence the need for a national physical science laboratory.

### **Space Science and Technology**

Space Science and Technology will develop the key core technologies of satellite telecommunications and broadcasting regarding space/ground segments, transmission, advanced services, Global Navigation Satellite System and its application technologies, integration with wireless networks, and applications to other industry sectors. Through this development, Kenya will contribute to the realization of universal, ubiquitous broadband telecommunications and broadcasting services for the promotion of public security and enriched national life.

The developed technology will also promote the domestic satellite business and, thus, provide the industries with the opportunities of market creation and penetration domestically as well as internationally. Further, it will enhance satellite broadcasting and communications transmission technology, Global Navigation Satellite System (GNSS) technology, environment-friendly infra technology such as satellite and high altitude platform technology including On Board Processing(OBP), gigabit class transmission, large antennas, beam forming, and satellite control systems.

Space enterprise provides an opportunity for the country move up the value chain, to diversify exports, attract and retain highly skilled engineers and other professionals. Kenya's geographic location is a natural resource for equatorial launches of rockets and supports for space vehicles especially those in low inclined trajectories. This resource has attracted the attention of space faring nations starting with the Italian Government way back in 1964, leading to the establishment of the San Marco Project Space Centre (Broglia Space Centre) in Malindi, Kenya.

The objective of this programme will be to enhance the teaching, research and development of space science and subsequent use of space technology for peaceful purposes in general, to improve the use of space science and technology and to achieve sustainable provision and utilization of space-derived services for economic, social and scientific development and enhanced quality of life for all mankind. Space Science technology will be used to accomplish the following:

1. Remote sensing for natural resource monitoring and management;
2. Climate change and drought monitoring;
3. timely natural disaster prediction and mitigation;
4. Rural and urban planning;
5. Land, sea and air navigation positioning applications and safety;
6. communications; telemedicine;
7. E-learning;
8. Space weather monitoring and mitigation of potential threats to technological systems,
9. National surveillance.

The strategy is to use space technology to provide improved product and service delivery to the people in almost all fronts and especially in monitoring and Protection of the natural resource management and environment; land administration; management and control; national defence and security services; communications and navigation; disaster monitoring and relief; hazards forecasting and early warning systems; transport monitoring; food security; mineral exploration and prospecting. Potential benefits of space science technology include:

1. Direct capital inflow arising from satellite launches (billions of shillings for a single launch), telemetry, command and remote sensing services;

2. Promotion of Kenya as an investment destination and centre for high end research and training in space sciences;
3. Provision of space related services to other clientele worldwide;
4. Improved planning of urban and rural areas, monitoring, exploitation and management of natural resources;
5. Improved mitigation of space weather effects that could impact negatively on technological systems for communications, surveying, navigation and surveillance;
6. Timely and effective delivery of relief supplies and execution of evacuation procedures during disaster.

### **Energy Technologies:**

The level and the intensity of energy use in a country is a key indicator of economic growth and development. The main challenges that have been identified in the energy sector include: over reliance on hydro-power; inadequate specialized skills and tools required for planning and forecasting energy needs; the high cost of rural electrification through grid extension due to the scattered nature of settlements; insecurity of energy supply due to frequent power outages and high system losses, adverse environmental and health impacts, depletion of energy sources, limited technical capacities and high and ever rising prices of imported fossil fuels. Based on this observation, the Kenya Vision 2030 identified energy as one of the infrastructure enablers of its social and economic pillars and targeted to make significant demands for relatively affordable, reliable, sustainable and clean energy for all citizens.

The ST&I priority intervention will be on the improvement of energy sources for electricity generation, improved energy use efficiency and, alternative and renewable energy with special emphasis on development of clean energy sources. The priorities of the ST&I sector will be to develop capacities for players in fossil fuel, geothermal, biomass and renewable energy subsectors to develop technologies that ensure production of clean energy and ensure energy conservation. The sector will also invest in the acquisition and deployment of peaceful, safe and appropriate nuclear technologies and other emerging energy sources, including developing the necessary institutional and human capacities to manage its safe exploitation in order to diversify Kenya's fragile non-renewable and renewable energy mix and meet the energy demands for industrialization and development.

The recent discovery of oil, coal and other minerals in the country calls for the development of human capacity and infrastructure. The energy technologies programme will include a project for the establishment of dedicated institutes to develop capacities for the exploitation of these mineral resources.

The potential benefits will include the facilitation of the provision of clean, sustainable, affordable, reliable and secure energy services at low cost while protecting the environment and providing the economic and social energy solutions. The application of ST&I will therefore ensure that the use of clean energy offers alternatives for the country's energy needs and address the manufacturing challenges of clean-energy technologies and increase energy efficiency in industry, buildings, and manufacturing sectors.

### **Biotechnology and Biosciences**

Biological sciences (Biosciences) and related advances in biotechnology are opening up new opportunities to increase food production, stem environmental degradation, fight such diseases as malaria, HIV/AIDS and tuberculosis, and add value to natural resources as well as promote industrialization in Kenya. Biosciences and Biotechnology research can contribute to the reduction of poverty and improvement of the country's economic competitiveness.

The development of a new generation of safer and more affordable vaccines for human diseases such as meningitis, and animal diseases such as rabies is set to enlarge prospects of human development. Already the application of biotechnology in agriculture has resulted in new crop varieties with improved tolerance to pests and diseases, resistance to environmental stresses, and higher nutritional value.

Biosciences and Biotechnology research have advanced the development of drugs and disease diagnosis in very profound ways. Combined with advances in imaging technology and sensors, medical practitioners are able to use genomic approaches to diagnose many diseases and offer early treatment, development of therapeutic and related biopharmaceuticals. The completion of mapping the genomes of many organisms provides a unique opportunity for the development and application of new knowledge in the area of bioinformatics, biomedical research, genomics and proteomics research.

To harness the enormous potential of Biotechnology and Biosciences for the economic development and improved competitiveness, the country will implement this programme that seeks to address the two main constraints namely: (a) limited scientific and technical capacity (b) limited capacity in human, infrastructure, policy, public awareness and funding. The programme's overall objective is to build Kenya's capacities to develop and safely apply Biotechnology and Biosciences in agriculture, health, mining, industry and environmental conservation.

The Biotechnology and Biosciences programme and its projects will focus on mobilizing and integrating at the national level a critical mass of physical and financial resources and expertise needed to enable Kenya effectively harness and apply Biotechnology and Biosciences. Institutions and expertise will be networked around joint project activities targeting specific developmental problems as well as enabling the country to contribute to advancing knowledge in the area of Biosciences.

The Biotechnology and Biosciences programme will review the national policy, legal, regulatory and institutional framework to encompass the governance of all areas of Bio- and life sciences. Further, the programme will develop a new Biosciences policy, legal, regulatory and institutional framework that is sufficiently robust for the effective governance of the general area of Biosciences sub-sector.

### **Telecommunications, Electronics and Computers Technologies**

Priority thrusts in Telecommunications, Electronics and Computers (TEC) seek to provide the country with technologies and innovations that will develop high-tech vibrant, affordable and globally competitive ICT infrastructure and technology. In addition a lot of effort will be devoted to providing cutting edge technologies and innovations to service other sectors.

In the recent past, Kenya has emerged as a highly innovative country. This is evidenced by key innovations like mobile money transfer (M-Pesa) by Safaricom, model banking developed by Equity Bank and Ushahidi by i-Hub. In addition, several technology multinational firms, including IBM and Google, have set up regional offices in Kenya to take advantage of the innovative potential. Although Kenya seems to perform fairly well on innovation, especially in Global Competitiveness Index (GCI) innovation indicators, the innovation system is linear and does not effectively serve critical national needs.

The TEC component of ST&I sector seeks to support research in niche and emerging areas. The TEC multi-sectoral projects will involve government agencies and the private sector in capacity building, legal framework, training, research and technology development, intellectual property issues, research funding and coordination. Further, coordinated efforts in international collaborations, partnerships & financing as well as infrastructure development will leverage the expected benefits of ST&I in the TEC sector.

The emergence of Information and Communication Technology (ICT) as the principal motor of national growth and competitiveness has placed it as a driver of efficiency and effectiveness in all sectors of the national economy. ICT is an essential enabler in many aspects of life today and as such is strategic to almost all businesses. Its products and services are constantly evolving and improving. In order for derive benefits from global ICT trends, there is need to constantly develop and maintain an adequate base of infrastructure and competent people with a deep understanding of the technology and who can provide leadership in ICT integration in various sectors of the economy.

Following the formulation of the national ICT policy in 2006, Kenya's approach to ICT has been guided by four principles, namely: infrastructure development; human resource development; stakeholder

participation; and appropriate policy and regulatory framework. On the basis of these principles, the nation hopes to facilitate sustained economic growth and poverty reduction; promote social justice and equity; mainstream gender in national development; empower the youth and disadvantaged groups; stimulate investment and innovation in ICT; and achieve universal access.

Clearly, ICT related projects have potential to provide economic and social benefits to the Kenyan society. That potential can be maximally exploited depending on the ICT capacity established in terms of human resources and infrastructure. Investments in ICT affect economic activities which in turn affects ICT investments. Kenya is emerging as a preferred investment destination and this has the potential of attracting and providing high end research and training services to other clientele worldwide.

In the medium term, the TEC sector is envisaged to provide direct capital inflow arising from products and services generated as well as job creation at county, national and global levels. TEC projects will improve planning, monitoring, exploitation and management to satisfy the information needs of industry, commerce and agriculture as well as transforming information circulation. In light of the foregoing, it is imperative that adequate infrastructure and sufficient and competent human resource base is available to sustain the Kenyan TEC sectoral growth and oversee the integration of information technology into the various areas of national endeavour.

While ICT keeps evolving rapidly, there has not been a concurrent effort in the country to track the extent to which the country has kept pace in producing and deploying skilled ICT workforce. Consequently, it is not possible currently, to say with certainty the kinds of information and communication technologists and their competency in the technology areas. In view of this and the fact that the extent of adequacy of ICT infrastructure and skills in the country is not yet comprehensively established, it will be necessary to make an assessment of the available infrastructure and its capabilities in serving technology integration in various sectors. Also, a survey to establish knowledge/skills gap will be required as a basis for reviewing of curriculum in the formal education institutions to orient them to market needs. This is of essence if the country is to attract and sustain international investments and effectively address market needs in the sector.

The projects will improve planning, monitoring, exploitation and management to satisfy the information needs of industry, commerce and agriculture as well as transforming information circulation.

### **Natural products and Indigenous Knowledge technologies**

Indigenous knowledge is the cumulative body of knowledge and beliefs handed down through generations by cultural transmissions about the relationship of living beings with one another and with their environment. It is the local knowledge that is unique to a culture or society and has been the basis for agriculture, food preparation, health care, education, conservation, naming and explanation of natural phenomena. Formal education systems have disrupted the practical everyday life aspects of indigenous knowledge and ways of learning, replacing them with abstract knowledge and academic ways of learning.

Today, there is a grave risk that much indigenous knowledge is being lost and, along with it, valuable knowledge about ways of living sustainably. There is need to tap into the indigenous scientific and technological viability and create awareness of the value of indigenous knowledge particularly its potential contribution to sustainable development at a time when such knowledge is being threatened as never before.

The Natural Products Initiative is aimed at creating an interface between indigenous knowledge and Science, Technology, Innovation and business expertise; spurring home-grown innovation culture and promote quality production and growth while developing Kenyan unique products that meet national and international standards. The Key factors for success of the natural products initiative are the creation of enabling policy, legal, regulatory and institutional framework to ensure formal recognition and anchoring

of natural products in the mainstream economy; harnessing of indigenous knowledge and related genetic resources; creation of a comprehensive inventory of ethno-botanical resources and building capacity for product discovery, improvement, development and commercialization capability with Government support and participation of private sector and individuals.

The ST&I sector will support the development, acquisition, deployment and uptake of appropriate technologies to ensure optimal use and enhancement of available natural resources (water, soil, forests, minerals and bio-diversity) and indigenous knowledge in a sustainable manner. The ST&I sector further, seeks to support and facilitate research that advances understanding of vulnerabilities in human and bio-geophysical systems and their relationships to climate extremes, thresholds, and tipping points as a way of climate change remediation.

### **Science, Technology, Engineering and Mathematics Education:**

The Science, Technology, Engineering, and Mathematics (STEM) is the foundation upon which rests a country's leadership in innovation and its economic prominence. Expertise in this area is required to build and sustain economic and scientific leadership in a world whose focus is evolving from agricultural to industrializing and information technology. The demand for scientific expertise is on the rise, the number of students enrolling in STEM is declining and failure in completing degrees is also getting higher. Therefore, there is need to support STEM to address the gap of scientists and engineers and other professionals in the scientific fields by developing their technological, pedagogical and content knowledge.

These areas involve engaging multi-sectorial activities and people, such as introducing and repackaging STEM university programmes, preparing effective STEM teachers, setting affirmative gender actions for STEM programmes and investing in modern infrastructure for STEM with an aim of realizing the Kenya Vision 2030 and prosperity of the country.

### **Coordination of Technology, Innovation and Commercialization**

Kenya requires accelerated efforts to enhance and generate new ideas through advances in technologies, innovativeness and commercialization of the outcomes as a fundamental component of ST&I. The enhanced outcomes will be realized through the research innovations, capacity building and education as articulated in the vision 2030. Maximizing delivery, uptake, acceptability, sustainability and value addition to the products, process and services will be an overarching outcome. Ultimately, technology and innovation products will be branded and commercialized locally, regionally and internationally through focused competitive marketing strategies.

In prioritizing the technological innovations and commercialization, strategic thrusts will focus on strengthening technical, individual and institutional capabilities in the areas of: appropriate incentive support, recognition of early-stage technology development, university-industry partnerships and linkages, research innovations, diversification of language programmes in education and training institutions, capacity building and patenting of products and ideas. Further, it will require linkages with diaspora researchers and public and private sector workforce. This will aim at imparting a culture of creativity, innovativeness and continuous learning that supports the goals of ST&I in Kenya.

### **County Technology and Innovations Delivery Services**

The Promulgation of the Kenya Constitution 2010 ushered in a complete paradigm shift in the organization of Government from a Central system to a Devolved system of Government with regional Counties forming a second level of governance. Effectively, the country was divided into 47 counties, which have become the center of focus for socio-economic development. The National Government retains certain core functions while a whole range of socio-economic, political and governance roles have been devolved to the County governments. The main developmental objective in this arrangement is to recognize the

right of the local communities to manage their own local affairs in order to promote social and economic development through provision of proximate, easily accessed services throughout the country.

In compliance with the letter and spirit of the Kenya Constitution 2010, and to ensure service delivery at the grass roots, the ST&I sector will need to design programmes that target to harness technology and innovations at the County level. In the run-up to the preparation of this Second MTP, the Ministry of State for Planning and Vision 2030 conducted public hearings in all the 47 counties to solicit views on the specific needs of communities living in each of the counties and the specific intervention they deem fitting in addressing them through this planning process.

Reports of the public hearings have clearly identified a whole range of unique and specific needs of communities living in each of the 47 counties. A close examination of these reports by the ST&I sector technical working group reveal that the key need areas for all the counties related to the following:

1. Health;
2. Agricultural production;
3. Value addition;
4. Infrastructure;
5. Communication;
6. Water scarcity;
7. Environmental degradation;
8. Fuel energy;
9. Climate change;
10. Youth unemployment;
11. Security;
12. Education and training;
13. Entrepreneurship and market opportunities;
14. Social integration;
15. Socio-cultural limitations;

It is generally agreed that the ST&I sector is capable of harnessing and delivering innovative scientific and technological interventions to address these needs in a specific and unique approach. Further, the sector can facilitate the identification and prospecting of already existing indigenous technological innovations including indigenous knowledge, and coordinate their application in addressing the specific and unique needs identified as by each county.

The County specific needs identified are cross-cutting in nature ranging from health to agriculture to socio-economic. The ST&I sector therefore, has a crucial role to play as a point of articulation for the cross-cutting interventions geared towards addressing the identified needs. As an example, fuel energy needs can be addressed through appropriate technologies that harness wind, solar, bio-gas, green sources, micro-hydro generation and energy saving appliances. These can be tailored along the specific context of the counties.

The Science, Technology and Innovation Act 2013 provide for the establishment of three autonomous bodies to facilitate a better coordination and governance of the ST&I sector. These are; the National Commission for Science, Technology and Innovation (NCSTI); the National Research Fund (NRF); and the Kenya National Innovations Agency (KENIA). KENIA has an express mandate to devolve its service delivery to the County level. This presents a unique opportunity to establish technological innovation advisory and prospecting centers in each of the 47 counties to serve as the point of articulation for technology and innovations services delivery at the county level.

## **3 PROJECTS AND PROGRAMMES FOR 2013-2017**

### **3.0 Introduction**

The global economy, including Kenya, is undergoing rapid development with a shift to a knowledge-based economy, where technology, driven by skills and innovation, will be key determinants to enhance efficiency, productivity and competitiveness. In this respect Science, Technology And Innovation have become important enabling tools, leading to changes in the comparative advantage and competitiveness of economies worldwide. This Chapter outlines the programmes and projects that will implement the proposed interventions recommended under the Sector priority areas to achieve the ST&I goals as given in the Vision 2030. The programmes will be implemented in the five year period of this Medium Term Plan. The programmes will also implement the Science, Technology and Innovation Policy developed by the stakeholders in the ST&I sector.

### **Programmes and Projects For The Second Medium Plan**

#### **3.1.1 Nano-Sciences, Material Science and New Production Technologies**

The priority areas of application of Nanotechnology in Kenya include the ICT sector especially in nanoelectronics, National Security and Safety, Water and Sanitation, Energy Sector (Clean energy: Solar, wind), Nanomaterials and Manufacturing, Nanoagriculture, Nanomedicine and Health, Public awareness through education on nanotechnology, Infrastructure development, Mining and chemical technology.

Nano-sciences and science entails the development appropriate high strength materials which are low cost, effective and efficient and find wide application in numerous technological developments. Because of this wide application, Nano sciences have been identified as a priority area to be implemented in the 2nd medium term plan of the vision 2030. The development of nanosciences places demand for infrastructure, equipment and skilled manpower's and researchers that will develop and domesticated this technologies to the demands of the Kenyan economy.

Key priority areas for implementation on nanotechnology will include: Capacity building on nanotechnology (Education) through scholarships; Investment in Instruments and techniques supporting Nanoscience and Nanotechnology research; Implementation of the policy on Nanotechnology; Public engagement and awareness on nanotechnology; Research in Medicine (nanomedicine), Water and sanitation; Nanomaterials for infrastructure development and manufacturing.

#### **Project 1: The Kenya Institute of Nanotechnology**

The Kenya Institute of Nanotechnology (KIoN) will be established as a multidisciplinary institution focused on specialized training in nanoscale science and technology. The institute will foster, develop and promote all aspects of responsible nanoscience and nanotechnology that have the potential to benefit society and the environment. The centre will be mandated to solve global problems in information processing, healthcare, energy and environment through the application of nanoscience and nanotechnology.

The KIoN will occupy a purpose-built facility within the Kenya Advanced Institute of Science and Technology (KAIST). The Institute will work with government departments, universities, researchers, companies and the general public to educate and inform on all aspects of nanotechnology across a wide variety of themes and sectors.

The Centre will focus on the combined skills of universities and industry in the fields of; Chemistry, Physics, Materials, Medicine, Electrical and Electronic Engineering, Mechanical Engineering, Chemical Engineering, Biochemical Engineering and Earth Sciences. The KIoN will benefit from collaborations with the broader nanotechnology and commercial communities as well as provide access to corporate, investment and industrial partners.

## **Project 2: The National Physical Science Research Laboratory for Engineering and new production technologies**

The objective of the National Physical Science Research Laboratory (NPSRL) will be to provide infrastructure and equipment for research that will deliver cutting edge physical science solutions from small equipment and research tools to large projects in need of complex design and fabrication. The formation of research units of NPSRL will provide consulting, engineering, fabrication and calibration services for both public institutions and private businesses worldwide. The laboratory will be managed by highly trained staff in the fields of electrical engineering, mechanical engineering, machine operations, and physics for global competitiveness.

National Physical Science Research Laboratory will be accessed by all research institutions, universities, government agencies and private entities. From small equipment and research tools to large projects in need of complex design and fabrication, NPSRL provides consulting, engineering, fabrication, and calibration services for both public institutions and private businesses in the region.

### **Key activities of the project will be**

1. Identification and acquisition of land for location and construction. The National Physical Science Research Laboratory will be housed in the Konza Technopolis if land is available
2. Equipping the laboratory
3. Staffing and engaging researchers

### **3.1.2 Space Science and Technology- Kenspace Programme**

The KENSPACE programme will entail manufacturing of satellites; establishment of a National Space Agency; building a rocket ground launch station base site; building a Telemetry Command Control Centre and a remote sensing station and establishment of space science and technology Institutional and Infrastructural facilities.

**Project 1: Manufacturing of satellite:** Manufacturing of satellite in domestic space industry and launch it in Space for remote sensing of geo-resources and other applications.

**Project 2: Kenya National Space Agency:** Establish a Kenya National Space Agency to oversee Space Science and Technology development in the country.

**Project 3: Build an equatorial rocket ground launch station base:** Build a base on land to serve the international community on commercial basis in order to boost Kenya's economic development.

**Project 4: Build a Telemetry Command and Control Centre and a Remote sensing station:** Intended to serve international clientele on commercial basis.

### **3.1.3 Energy Technologies**

Nuclear Science and Technology (NST) will significantly contribute to addressing some of the developmental challenges facing Kenya including energy, food security and agriculture, livestock production, human health (cancer treatment), environmental protection, water resource management and industry application. In order to meet the energy needs, as articulated in Vision 2030, the government has proposed power generation mix which includes the nuclear energy. Nuclear power will result in, reliable, stable and cost effective electricity supply to support the country to achieve its economic and social needs.

However, while some experience exists in nuclear technology applications, the generation of electricity using nuclear power requires a high investment in capacity building to meet the nuclear reactor needs such as research, radiation protection, nuclear waste management and security which are currently lacking. There will therefore be added scope and responsibilities in harnessing and governing of Nuclear Science and Technology thus requiring a professional and independent institution to shoulder the envisaged responsibilities.



### **Project 1: Establishment of a Centre for Nuclear Research for Peaceful Applications**

In view of the envisaged nuclear power production by 2022, and the need to strengthen nuclear application in the other sectors of the economy, the Government will establish a premier nuclear research facility which will be a multi-disciplinary research centre with extensive infrastructure for advanced research and development. The core mandate of the research Centre will be to sustain peaceful applications of nuclear energy for power generation, for isotopes in industries, groundwater resource management, medicine for cancer treatment and agriculture. The Centre will also conduct research in spent fuel processing, and safe disposal of nuclear waste.

#### **Key activities for the project include**

1. Setting up of a Secretariat to oversee activities towards the establishment of the facility; (Approximately 15 hectares of land will be required for the research laboratory)
2. Identification of appropriate personnel;
3. Construction of the research laboratory;
4. Procurement of a nuclear research reactor and other equipment;
5. Commissioning of the nuclear research reactor;
6. Capacity building; the personnel for the facility will receive enhanced training in key areas of nuclear reactor.

### **Project 2: Establishment of the Kenya Institute of Oil and Gas (KIOG) and the Kenya Institute of Mining and Geology**

The goal of the project is to provide competent skills for petroleum and mining industry to enable workers and enterprises to move from declining or low-productivity activities and sectors into growing and higher-productivity activities and sectors, and to capitalize on new technologies. This will impact the economy positively and stimulate the generation of knowledge, products and innovation to drive Kenya's Vision 2030.

#### **3.1.4 Biotechnology and Biosciences**

The Biotechnology and Biosciences programme will focus on the enhancement of the national capacity and capabilities for harnessing Biotechnology/Bio resources to produce goods and services. This will involve the development of institutional, human and infrastructural capacity for Biotechnology development and application. The programme will further review the existing Biotechnology policy, legal, regulatory and institutional framework and develop a new more robust framework that will encompass all areas of the Biosciences discipline. The programme will be implemented through the following 5 projects:

##### **Project 1: Biotechnology Policy and Legal Framework**

The goal of this project will be to review the existing Biotechnology policy, legal and regulatory framework (National Biotechnology development policy and Biosafety Law), and develop a new policy, legal, regulatory and institutional framework for the governance of Biological/life Sciences. Key activities of the project will be:

1. Reviewing the existing policy, legal, regulatory and institutional frame work for governing Biotechnology;
2. Formulation of an all-encompassing policy, legal and regulatory framework for the beneficial utilization and development of the biosciences/life-sciences area (Biosciences Policy and Law);
3. Establishment of the Kenya National Biosciences Institute;
4. Establishment of the Kenya National Biological Resources Centre.

##### **Project 2: Establish Centres of Excellence in Biotechnology Research in Research and Higher Learning Institutions.**

The goal of this project will be to identify and equip Biotechnology Research laboratories in research

and higher learning institutions. The key activities of the project will be:

1. Development of a criteria for identification of institutions to host the centres of excellence;
2. Selection of institutions to host the Biotechnology research centres of excellence;
3. Conducting equipment needs assessment for the Biotechnology research centres of excellence;
4. Procurement, delivery and commissioning of the laboratory equipment in the Biotechnology research centres of excellence;
5. Training personnel on the handling and maintenance of the laboratory equipment in the Biotechnology research centres of excellence;

### **Project 3: Development of Human Capacity for Biotechnology Research and Product Development.**

The goal of this project will be to develop a critical mass of a competent human resource for the development and application of Biotechnology. The key activities of the project will be:

1. Reviewing the Biotechnology training programmes at the institutions of higher learning;
2. Conducting training programme at undergraduate and post-graduate levels for a critical number of experts in various fields of Biotechnology;
3. Developing Biotechnology training programmes for technicians and mid-level experts;
4. Conducting Biotechnology training for technicians and mid-level experts;
5. Review and incorporate Biotechnology in Primary and Secondary school education curriculum;

### **Project 4: Public Education and Awareness on Biotechnology and Biosciences.**

The goal of this project will be to educate the public and create awareness on the whole subject of Biotechnology and Biosciences. The key activities of the project will be:

1. Development of educational and publicity materials for public education and awareness on Biotechnology and Biosciences;
2. Rolling out Biotechnology and Biosciences public education and awareness campaigns;
3. Institutionalizing the Bio-Aware initiative.

### **Project 5: Delivery of genetically modified (GM) crop varieties for commercial production by Kenyan farmers**

The goal of this project will be to facilitate the commercialization genetically modified crop varieties as products of modern Biotechnology. Key activities of the project will be:

1. Establishment of a task force for the commercialization of genetically modified crop varieties;
2. Facilitation of approval for commercial planting of genetically modified crop varieties by Kenya farmers;
3. Procurement and distribution of seeds of genetically modified crop varieties to farmers;
4. Conducting farmer education and technology stewardship;
5. Evaluation of GM crops performance and reporting;

## **3.1.5 Telecommunications, Electronics and Computers Technologies Programme**

Under this programme, the following projects will be pursued:

### **Project 1: The Kenya Electronics Telecommunications and Computing Research Institute (KETCRI)**

This programme involves establishment of a national Electronics Telecommunications and Computing Research Institute that will advance the formulation of innovative ideas; develop new techniques; and training professional individuals in the area of Electronics, Telecommunications and Computing to ultimately enhance social and economic aspects of the modern society.

The institute will be housed in the Science Park of the Konza City Metropolis. It will consist of research laboratories, divisions, centres, and affiliated research institutes to provide cutting edge national research in: IT Convergence Technology Research, Software Research, Convergence Components &

Materials Research, Broadcasting & Telecommunications Convergence Research, Internet Research, Contents Research, Creative and Challenging Research, Technology Strategy Research and Technology Commercialization.

The Kenya Electronics Telecommunications and Computing Research Institute (KETCRI) will provide a confluence of telecommunications, mobile communications, radio & broadcasting, software computing, telematics, intelligent robot, RFID and wireless sensor networks. The institute will be expected to develop Electronics, Telecommunications and Computing equipment and devices thus creating engines for national growth by successfully commercializing the research outcomes produced by KETCRI, developing new markets, and nurturing the industry. The key activities within the project will include:

1. Development of the legal and regulatory framework
2. Establish KETCRI
3. Develop organisational structure and strategy
4. Procurement of the equipments

### **Project 2: Software Development and Commercialization**

The project on soft ware development and commercialization will ensure that Kenya develops its software application locally in order to ensure that the software available in the market are transaction based for easier and more effective use.

### **Project 3: Manufacture of Electronic devices**

The project aims to increase the use of Kenyan manufactured electronic devices in order to make them cheaper and more available to the local users. The institute will be expected to develop Electronics, Telecommunications and Computing equipment and devices thus creating engines for national growth by successfully commercializing the research outcomes and developing new markets, and nurturing the industry

### **Project 4: Baseline Survey and assessment of National ICT Capacity**

The nature and extent of adequacy of ICT capacity, in terms of infrastructure and skills in the country has not been comprehensively established. This is a limitation to the country's effort to attract international investments in the national ICT sector. To address current and future market needs in ICT, there is need to comprehensively identify existing knowledge/skills, supportive infrastructure as well as other related gaps. The assessment of infrastructure and knowledge/skills adequacy take account of practices and benchmark with competitive countries in regard to the intensity and reach of infrastructure, and the product and service levels that Kenya should be able to attain and maintain.

Key activities under the project will include:

1. Production of a national profile of current and projected ICT market needs in various sectors of the national economy;
2. Identification of ICT skills available and associated gaps;
3. Undertaking an assessment of ICT capacity utilization with a view to proposing a strategy for maximization of the existing capacity;
4. Identifying areas for capacity review including ICT curriculum changes to ensure effective ICT response to current and future market needs.

#### **3.1.6 The Natural Products**

The programme aims at building a vibrant natural products industry in Kenya through the development and exploitation of an interface between indigenous knowledge and modern science, technology innovation. The programme will aim to contribute to the harnessing of a vibrant natural products industry by generating intellectual property and prototype products borne out of the interplay between indigenous knowledge

/ technologies, on the one hand, and modern science, research and technological innovation, on the other. It will involve the development, acquisition, deployment and uptake of appropriate technologies to ensure optimal use and enhancement of available natural resources (water, soil, forests, minerals, bio-diversity, etc.) and indigenous technologies in a sustainable manner. This will promote home-grown innovations and lead to development and manufacture of niche products that meet national and international standards for local and global markets. To achieve this, an effective functional synergy between this programme and the manufacturing sector will be created.

Two key programmatic themes will be pursued. One is harnessing through documentation, profiling and securing of indigenous knowledge, technologies and associated biological resources as a national resource and as part of the knowledge capital. Two, is research, scientific testing and validation to provide proof-of-concept and generate prototype products for registration and up-scaling. All these project activities will rely on fostering appropriate partnerships and networks at local, county, national, regional and international levels to enable access to requisite natural resources; building and enhancing transfer of technology; patenting, protection of IP rights and equitable sharing of benefits.

### **3.1.7 Science, Technology, Engineering and Mathematics Programme**

The Science, Technology, Engineering, and Mathematics (STEM) education and training applies interdisciplinary research in learning and cognition, STEM integration, instructor development, and evaluation and assessment to STEM teaching from early childhood through graduate education. Improving STEM education in Kenya has been identified as a critical concern that will embed ST&I in the country's education and production systems. This calls for enhancing the capacity of education institutions to provide STEM education by providing modern equipment and qualified staff. To deliver on the on the STEM the following projects will be implemented in the 2nd Medium Term Plan:

#### **Project I: Kenya Advanced Institute of Science and Technology**

In effort to achieve the long-term goal of economic and social growth, the demand for highly trained scientists and engineers with post-graduate level education would inevitably increase very rapidly, as many developed nations, including Korea, has experienced. This implies that the development of graduate programmes in science and technology is essential and urgently needed for the realization of the Kenya's Vision 2030. The establishment of an advanced research institute in Kenya will provide for specialized training in various engineering fields.

#### **Project 2: Repackage STEM in Education and Training**

Kenya's investment in high-level technical human resource is low while education and training does not adequately meet the needs of industry. The project is expected to promote experiential learning, innovation creativity and attraction to STEM related disciplines through well-coordinated programmes in education, R&D and Training in all aspects of ST&I at all levels starting from Early Childhood to Primary and Secondary Education levels up to University.

To end the inadequate facilities, teaching and training staff challenge this project will enable technology-driven delivery of curriculum at all levels of education and training.

To promote the generation of knowledge and its application in ST&I, the strategies will involve rebranding the Education Institutions by introducing innovation and creativity as a major function of ST&I and promote research to improve the manpower quality Education and Training Institutions at all levels. Focus on technological learning within industry will be emphasized for the exploitation of technologies to enhance competitiveness.

#### **Project 3: Integration of Science, Technology and Innovation in Education Management**

Information is key to efficient management of the education system. The education system in Kenya

suffers the lack of a harmonized and shared Education Management Information System by all key education and training stakeholders in Government and Private Sector. Each Government Agency dealing with education and training has established its own MIS which in many instances is not shared with other Agencies and is also limited in scope. The project will establish a Sector Wide Education and Training Management Information System linking all education related Agencies in the public and private sectors.

#### **Project 4: Conduct a National Skills Inventory and Audit for ST&I**

Quality human resource is an important determinant of sustainable growth and development raising the need to progressively increase the rate of generation of a high quality skilled human resource with a special focus on developing and upgrading innovation competencies within employment to cater for the market needs. The project will be used to establish the status of the national ST&I human resource capacity and skills in science, engineering and technology in comparison with the job market needs

On the basis of the survey report, a National Critical Skills Development Strategy will be formulated and implemented in order to increase the number of researchers, scientists and engineers for the industry. This project will assess the existing SET skills, determine the requirements of SET skills for the country and draw up a strategy for closing the gap. It will include an assessment of new and emerging industries in advanced manufacturing, nanotechnology and bioinformatics. Strengthening of linkage between industry and institutions of higher learning in areas of curriculum review, industries labour requirements, including incentives for attracting and keeping SET skills in industry.

#### **3.1.8 Coordination of the Technology, Innovation and Commercialization**

An effective innovation system is required for a country to harness the potential offered by modern science and technology to its social and economic advantage. Innovations in a country drive growth but this has to be commercialized in order to reap the full benefits of the innovations. On the other hand, information on the performance of the entire innovation system is a useful tool for target setting and benchmarking. This programme underscores the importance of innovation, commercialization and performance metrics. The projects under the innovation system are:

##### **Project 1: Knowledge Management Information System (KMIS)**

To be able to measure the flow of knowledge into the society, there is need to develop an effective knowledge management system. This will ensure that the right knowledge related information is available to the key Science, Technology and innovation Institutions / Organizations at the right time and in the right form.

Benchmarking is an important tool for assisting an economy to target specific areas that enhance the ability to draw benefits from ST&I. In this regard, the use of indicators show the status of inputs, processes, outputs and outcomes and provide a basis to assess ST&I efforts within and between countries. The indicators broadly measure the dynamism of the innovation process of the economy.

The sector will develop the Knowledge Management Information System which will be a comprehensive performance management framework, including clear measurement metrics, linking programme outcomes to long term impacts of the ST&I in the economy. KMIS will have a knowledge sharing platform and deductive database with capabilities to define rules which can infer additional information from the facts that are stored in the database through artificial intelligence and data mining. The Knowledge Management Information System is expected to break down the information access barrier within the sector and allow for global comparisons.

##### **Project 2: Innovative technology transfer system**

Innovation is widely recognized as a major source of improved productivity, competitiveness, and economic growth. Innovation also plays an important role in creating jobs, generating income, alleviating poverty,

and driving social development. It also contributes to learning and development of capability, which in turn contribute to competitiveness in domestic and international markets.

Technology transfer is a transaction or a process through which technological know-how is transferred normally between businesses or agencies representing businesses. The transaction or collaboration takes place because both the parties (the supplier and the acquirer) perceive gains. The focus of the business model is not simply on technology transfer but also on its integration with the other dimensions of the business to ensure that it makes a contribution to improving the competitiveness and performance of the business. Without such motivation and effectiveness in implementing it, development of technological capability will either not take place or will be inappropriate.

Technology transfer can be one of the ingredients for the development of technological capabilities but it cannot by itself develop them. The advantages technology transfer offers could be:

1. A production process or part of a process which improves production efficiency, reduces costs, improves quality control and/or reduces environmental pollution;
2. A product which is of better quality, has greater functionality, better appearance, less damaging to the environment in its use; or
3. A combination of process and product as production of a better product often requires changes in processes
4. Development of an Innovative Technology Transfer System enables people to adapt rapidly to challenges that they face and those that occur and to respond readily when opportunities arise, because physical, social, and economic environment changes continually.

### **Project 3: Science, Technology and Innovation Indicators Surveys**

ST&I indicators are crucial for monitoring Kenya's scientific and technological development. They are useful for formulating, adjusting and implementing ST&I policies. Indicators can be used to monitor global technological trends, conduct foresight exercises, and determine specific areas of investment. The main activities in the project will include: Development and Adoption of Kenyan Common Science, Technology and Innovation Indicators and Establishing an African STI Observatory.

The Kenya Science, Technology and Innovation (ST&I) Indicators Project intends to measure, monitor and understand the dynamics of ST&I in terms of human resources, expenditure and focus areas in relation to economic growth. It is set to conduct the official national research and experimental development (R&D) and innovation surveys that will lead to the establishment of a baseline set of ST&I indicators for monitoring, reporting on and providing evidence for policy-making and fine-tuning of the National System of Innovation (NSI). The aim is to build a national database of R&D and innovation data compliant with international practice for preparation of ST&I indicators reports. Regular and reliable survey-based data on R&D and innovation will be used to report on the development of the NSI using a set of internationally comparable data and indicators. ST&I indicators, which are crucial for monitoring Kenya's scientific and technological development, will also be used for regional and international comparisons.

The overall objective of the project is to build Kenya's capacity to develop and use STI indicators. Its specific objectives are to:

1. Develop and cause the adoption of internationally compatible STI indicators;
2. Build human and institutional capacities for STI indicators and related surveys;
3. Enable Kenya to participate in international programmes for STI indicators; and
4. Inform Government on the state of STI in Kenya.

#### **3.1.9 County Technology and Innovations Delivery Services**

This programme aims at delivering science, technology and innovations services to the grass roots by focusing on the County units in line with the provisions of the Kenya Constitution 2010. The programme will see the establishment and empowerment of County Technology and Innovations advisory and

prospecting centers to coordinate technology transfer and adoption at the county level. This will be implemented through the mandate given to KENIA vide the Science, Technology and Innovation Act 2013.

### **Project 1: Establishment of the Kenya National Innovation Agency (KENIA)**

This project will seek to operationalize KENIA as provided for in the Science, Technology and Innovation Act 2013. Key activities of the project include:

1. Setting up a secretariat for the Agency;
2. Appointment of Board for the Agency;
3. Recruitment of staff of the Agency;
4. Development of the organization structure of the Agency;

### **Project 2: Establishment of County Technology and Innovations Advisory and Prospecting Centers**

This project will involve the establishment of centers in the Counties to coordinate innovations and technology transfer and adoption at the county level. Key activities of the project include:

1. Surveillance of the 47 counties to establish readiness for the centers;
2. Acquisition of premises and operational equipment;
3. Setting up the centers;
4. Recruitment and deployment of staff;

### **Project 3: Develop and Transfer County Specific Technologies**

The project will ensue that the Technology and Innovations delivery services are available at the County level and will entail the determination of specific technological needs for each of the 47 counties in line with the mandate of KENIA as provided for by the Science, Technology and Innovation Act 2013. The centers will perform the following functions;

1. Harness existing indigenous knowledge and technological innovations for the socio-economic development of the respective counties;
2. Scout for technological innovations from the national and global research communities;
3. Negotiate for the proprietary rights of the acquired technologies and facilitate their adoption through appropriate technology transfer approaches.

# 4 POLICY LEGAL AND INSTITUTIONAL REFORMS

## 4.0 Introduction

This chapter provides the policy and legal reforms required to actualize the implementation of the Second MTP programmes. The MTP proposes policy and legal reforms which are at different stages of development. These include the Draft National Biotechnology Development Policy and the draft Natural Products Policy and Bill. The proposed policies and Bills include: Nuclear Policy and Bill; Kenya Institute of Nanotechnology (KION) Policy and Bill; and Kenya Space Science and Technology Policy and Bill. These laws will provide the required policy and legal environment for the optimal development of the ST&I sector.

## 4.1 Proposed Legal Frameworks and Policies

There are programmes and projects proposed in this MTP that require legal backing and direction if they are to be implemented successfully. Some of the identified legal frameworks and policies are explained as follows:

### **National Biotechnology Development draft Policy and the Biosciences Policy and Bill**

The current National Biotechnology Development draft Policy was specifically developed to domesticate the Cartagena Protocol on Biosafety to the Convention on Biological Diversity (CBD). It outlines the government's commitment to the development and application of biotechnology in agriculture, health, environment and other areas of application. However, the policy is inadequate for purposes of governing the entire Biosciences sub-sector including Biosecurity, Bio-economy, Biomedical, Bioinformatics and other related life sciences. In this essence the sector proposes to develop a biosciences policy and bill.

### **Atomic Energy Policy and Bill**

The proposed Atomic Energy Policy and Bill aims to address statutory and operational issues of nuclear electricity power generation, peaceful application of nuclear science in all sectors of the economy and services, nuclear waste management and security, radiation protection, and adherence to international and regional treaties and agreements.

### **Kenya Institute of Nanotechnology legal framework**

The proposed Kenya Institute of Nanotechnology (KION) legal framework will be developed to provide a legal framework for the establishment of the National Nanotechnology Centre. The policy will provide for broad strategic areas in line with vision 2030 for investing in nanotechnology, governance of nanotechnology, Nanotechnology capacity building, Ethics and public awareness on nanotechnology, financial support for nanotechnology, legal framework for application of nanotechnology.

### **Kenya Space Science and Technology policy and bill**

The Kenya Space Science and Technology policy and bill will position the country as a leader in space science and technology in Africa and the world. The essence of the national space policy is to set the platform for the mounting of a national space programme. The country will not be seeking to delve into everything in space science but will identify niche areas of space science and technology to invest in.

### **Natural Products Policy and Bill**

A policy and bill on natural products has been proposed to provide guidelines on the utilization of natural products for commercial purposes while ensuring environmental sustainability. The Natural Products Industry (NPI) Policy, 2012, and the Bill will lay ground for developing and integrating the sub-sector into the mainstream economy. In addition it will seek to contribute to the objectives of the Kenya Vision 2030, and is firmly premised on the strength of the letter and spirit of the The Kenya Constitution, 2010 which recognizes the role of culture, indigenous knowledge, science, and protection and utilization of



biodiversity in national development. The NPI policy and legal framework intends to create an institutional set-up that will serve as the primary custodian of the natural products industry by strategically promoting, directing and coordinating all the activities of the multiple and diverse players in the knowledge and product value chain.

# 5 PERFORMANCE EVALUATION FRAMEWORK

## 5.0 Introduction

The successful implementation of the Medium Term Plan will depend on how effectively the planned activities and outputs are monitored and evaluated with a view to ensuring that the plan implementation remains on course. Under the Medium Term Plan, a comprehensive monitoring and evaluation system has been proposed in this chapter to ensure that the planned implementation is executed expeditiously. Indeed, one of the lessons learnt from the previous Medium Term Plan, 2008-2012 is that the poor performance of some of the targets in the Plan could be partly attributed to lack of an effective monitoring and evaluation framework.

### 5.1 The Performance Management Framework

Effective, expeditious and transparent performance management mechanisms are necessary in securing the success of ST&I initiatives. To this end, the Government will:

- Ensure the development of a comprehensive performance management framework linking programme outcomes to long-term impacts of this Medium Term Plan.
- Develop, implement and strengthen science-based monitoring and reviewing mechanisms
- Under the implementation of the programmes and projects set out in chapter three of this plan, all agencies and organs will have specific performance targets to ensure coordination of efforts. It is also expected that results of such effort will result in positive outcomes for the Kenyan people.

### 5.2 Monitoring

Monitoring is an important management tool that will help management teams to make decisions aimed at improving performance, achievement of intended objectives, ensuring accountability to all parties involved in the implementation, to assess the use and delivery of the resources in accordance with the implementation plan and to monitor the timely achievement of the intended deliverables. The main purpose is to facilitate evidence-based decisions by managers of the implementing Agencies on any corrections and mitigation needed in implementation.

In this regard, the Monitoring and Evaluation team composed of the implementing Agencies will monitor and evaluate the inputs, activities and outputs to ensure that the Medium Term Plan objectives are delivered in accordance with the implementation plan. An effective M&E framework for the Plan will be designed and applied.

The evaluation of the Medium Term Plan will be useful in several ways; first, to avoid the possibility of wasting money by aiding the selection of the most effective options. Second, it will help the implementation teams to operate through an informed network of information and performance system across the sectors and other implementing agencies.

In developing the monitoring methodologies, it is recognized that numerous interrelationships exist between the Medium Term Plan with other sectoral policies and programmes at national and institutional levels with each of them having been developed independently, the monitoring methodology will cross-reference between them, with the MTP providing the harmonizing framework.

#### 5.2.1 Monitoring Methodologies

Monitoring will involve routine data collection and analysis on the success of the implementation of this Medium Term Plan by the key sectors as identified. The results from the analysis will then be used to inform decision making at all levels through the national coordination mechanism.

The methodologies used will have as their foundation a baseline survey of all existing, upcoming and

future policies in all the sectors and cross referencing to identify the degree to which they address and are in harmony with the Medium Term Plan, propose areas of enhancement and review the implementation frameworks continuously.

To realize the objectives, the following activities will be undertaken.

1. Development of monitoring and evaluation indicators at all levels of implementation;
2. Carrying out continuous data collection, analysis and periodic reporting to the Ministerial Management Steering Committee;
3. Carrying out random inspections and making objective observations;
4. Conducting specially designed surveys and rapid assessments to assess progress
5. Carrying out participatory M&E;
6. Establishing Work Improvement Teams in the respective implementing agencies;
7. Facilitating independent assessment and reviews of the programmes under implementation in the implementing agencies.

The implementing agencies will submit periodic review reports to the Inter-Agency M&E steering committee, the Monitoring and Evaluation Directorate of the Ministry of Planning, National Development and Vision 2030 and the Vision Delivery Secretariat. These reports will be reviewed regularly against the indicators to ensure that there is positive progress.

### 5.2.3 Evaluation

The Medium Term Plan will be evaluated during and after implementation to ensure that it produces the intended results. The plan will be subjected to independent evaluation to remove any element of bias. The evaluation will be carried out using relevance, efficiency, effectiveness, sustainability and impact measures.

A logical framework will be designed for each strategic objective showing the expected outputs, activities, M&E tasks, means of verification, the action centres, timeframe and resource requirements to help track and monitor progress in the implementation of the Medium Term Plan.

Performance of this Medium Term Plan will be reviewed along the following dimensions:

1. Speed and extent of implementation of programmes and projects identified;
2. Increased proportion of technology based growth in Kenya's wealth creation efforts;
3. Performance of businesses in terms of their utilization of science, technology and innovation;
4. Extent of creation of new technology based growth sectors;
5. Creation of new business start-ups;
6. Number of techno-jobs created;
7. Increase in the number and value of local patents as well as their contribution to world patents;
8. Increased innovative efforts of the Kenyan ST&I sector;
9. Enhancement of Kenya's ST&I potential;
10. Increased ST&I human capital as per established sector requirements; and
11. Increased contribution of ST&I to improvements in the quality of life of Kenyans.

Deliberate efforts will be made to objectively assess Kenya's performance along these dimensions using internationally acceptable, but locally relevant indicators. This is expected to provide insights into the performance of this Medium Term Plan. It will also provide an objective basis for measures to improve future interventions aimed at applying ST&I to enhance the welfare of the Kenyan people.

### 5.2.4 Monitoring and Evaluation Reporting

Monitoring and Evaluation will be carried out quarterly, annually and at the end of the Plan period leading to the preparation of the following reports:-

**Quarterly Progress Reports:** Quarterly progress reports will include information on key process and output indicators against set targets for the quarter. The quarterly progress report shall be used for

reviewing progress and forward planning by project implementers. It will also inform the M&E Directorate and the Vision Delivery Secretariat on progress of implementation during the quarter

**Annual Progress Reports:** At the end of every financial year, an annual progress report will be prepared that objectively highlights key achievements against set targets (both physical progress and financial status), constraining factors, lessons learnt and recommendations on the way forward.

**Mid-Term Review Report:** Given the dynamic nature of the Science, Technology and Innovation the Plan will require a comprehensive review to capture the emerging changes in the ST&I sector. A mid-term review of the Plan will be carried out in the 2015/16 financial year. The Mid-Term Review report will inform any requisite changes required in the Programmes and Projects for the remaining plan period.

**End of Plan Period Report:** At the end of the Plan period, there will be a Terminal Review (TR). The TR will identify achievements against each set target and make an overall assessment of performance of the ST&I Sector in implementing the Plan. The review will also identify challenges encountered and make recommendations to inform formulation of the next MTP.

## **6.0 Summary**

The proposed institutional structure for the Kenya National Innovation System (KNIS) aims at ensuring that there is greater harmony in ST&I policy prioritization coupled with a coherent implementation of identified priority ST&I programmes and projects. Key institutional reforms will revolve around policy, regulatory and implementing institutions.

Policy institutions will be focused around a reorganized National Government Agency responsible for science, technology and innovation. Similarly regulatory agencies and mechanisms will be set up under the Agency while Sectoral policies and implementing institutions will be reviewed to focus on key growth areas as identified while operating within a national system. A variety of funding measures proposed within KNIS will operate within a National Commission for Science, Technology and Innovation, National Research Fund and Kenya National Innovation Agency.

Effective, expeditious, transparent and performance management mechanisms will be established to facilitate linking programme outcomes to long-term impacts of this Medium Term Plan and strengthen science-based monitoring and reviewing mechanisms. Deliberate efforts will be made to objectively assess Kenya's performance along these dimensions using internationally acceptable, but locally relevant indicators.

## IMPLEMENTATION MATRIX

| Goal 1 : to leverage application of nanoscience and nanotechnology in all sectors of the economy  |   |   |  |   |               |                       |                         |         |         |         |         |       |
|---|---|---|--|---|---------------|-----------------------|-------------------------|---------|---------|---------|---------|-------|
| Sector priority: nanosciences, material science, and new product technologies   |   |   |  |   |               |                       |                         |         |         |         |         |       |
| Strategic objectives : to establish endogenous capabilities for nanoscience and nanotechnology interfacing among applied physics, chemistry and life sciences |   |   |  |   |               |                       |                         |         |         |         |         |       |
| Programme/<br>Project   | Objective   | Outcome/<br>Output                              | Performance<br>Indicator                 | Lead Implementing<br>Agency                       | Time<br>Frame | Source<br>of<br>funds | Budget estimated (Kshs) |         |         |         |         | TOTAL |
|   |   |   |  |   |               |                       | 2013/14                 | 2014/15 | 2015/16 | 2016/17 | 2017/18 |       |
| Establishment of Kenya Institute of Nanotechnology (KIoN)   | To establish endogenous capabilities for nanoscience and nanotechnology | Functional interdisciplinary KIoN in place      | Functional KIoN                          | GoK, NCST, Universities and Research Institutions | By 2017       | GoK Donors PPPs       | 200M                    | 200M    | 200M    | 200M    | 200M    | 1B    |
| Development of the Nanoscale Sciences and Technologies legal framework  | To provide a legal framework for the centre                             | Nanoscale Sciences and Technologies Act enacted | The percentage development of the act    | MOEST, State Law Office                           | 2013-2014     | GoK Donors PPPs       | 2M                      | 3M      | 3M      | 2M      | 10M     |       |
| Identification, acquisition of space and construction of the facility within KAIST land   | To establish the Kenya Institute of Nanotechnology                      | Kenya Institute of Nanotechnology lab           | The land acreage assigned within KAIST   | MOEST, MOTI, MOLHUD                               | 2013-2015     | GoK Donors PPPs       | 1.0B                    | 1.0B    | 1.0B    | 1.0B    | 5B      |       |
| Capacity building   | To get a critical mass of specialists in nanoscale technologies         | The critical mass of specialists                | The no. of Nanoscale specialists trained | MOEST, Universities, and Research institutions    | 2013-2017     | GoK Donors PPPs       | 20M                     | 20M     | 20M     | 20M     | 100M    |       |
| Purchase and installation of equipment and other laboratory facilities  | To equip the facility (lab)   | Equipment purchased and installed               | no. of equipment,                        | MOEST, and Research Institutions                  | 2016-2017     | GoK Donors PPPs       | -                       | -       | -       | 100M    | 1.22B   | 6.11B |
| National Physical Science Research Laboratory   |   |   |  |   |               | TOTAL                 | 1.222B                  | 1.223B  | 1.223B  | 1.222B  | 1.22B   | 200M  |
| Acquisition of land and construction of the Research Laboratory   | Provide land and buildings  | Institution                                     | 20 acres of land, laboratory buildings   | NCST, MOLHUD, MOTI, MOEST                         | 2013-2016     | GoK Donors PPPs       | 150M                    | 250M    | 300M    | 3000M   | -       | 3.7B  |
| Equipping laboratory  | Provide equipment for physical science research                         | Installed equipment                             | Number of equipment installed            | NCST:MOEST  | 2016-17       | GoK Donors PPPs       | -                       | -       | -       | 1.0B    | 500 M   | 1.5B  |
| Staffing  | Recruit staff   | Employment of staff                             | No of staff employed                     | MOEST   | 2017-2017     | GoK                   | -                       | -       | -       | 200M    | 200M    | 200B  |
|   |   |   |  |   |               | TOTAL                 | 150M                    | 250M    | 300M    | 4.1B    | 800M    | 5.6B  |

**Goal 2 : to fulfill the energy demands of the growing economy . sector priority: energy technologies strategic objectives :to ensure energy security through the generation and application of scientific knowledge and technological innovations.**

| Programme/<br>Project   | Objective   | Outcome/<br>Output                       | Performance<br>Indicator                                  | Lead Implementing<br>Agency   | Time<br>Frame | Source of<br>funds              | Budget              |                     |                     |                     |                   | TOTAL             |
|---|---|--|---|---|---------------|---------------------------------|---------------------|---------------------|---------------------|---------------------|-------------------|-------------------|
|   |   |  |   |   |               |                                 | 2013/14             | 2014/15             | 2015/16             | 2016/17             | 2017/18           |                   |
| <b>NUCLEAR ENERGY PROGRAMME</b>   |   |  |   |   |               |                                 |                     |                     |                     |                     |                   |                   |
| Acquiring approximately 15 hectares of land for research laboratory                       | Acquire adequate land                               | Centre established                       | 15 hectares of land purchased                             | MOEP, MOLHUD, MOTI, MOEST   | 2012-2013     | GoK Donors PPPs                 | 50M                 | -                   | -                   | -                   | -                 | 50M               |
| Recruitment of qualified personnel  | To acquire skilled manpower in nuclear science      | Qualified staff recruited                | Number of staff with requisite skills (PhD, Masters etc.) | Public Service Commission, MOEST, Universities, Research Institutions | 2012-2015     | GoK Donors PPPs                 | 20M                 | 30M                 | 50M                 | 50M                 | 50M               | 200M              |
| Construction of the research laboratory   | To construct the nuclear research laboratory        | Nuclear research laboratory constructed  | 1 lab constructed   | MOEP, NOLHUD, MOEST   | 2013-2015     | GoK Donors PPPs                 | 100M                | 300M                | 300M                | 300M                | -                 | 1B                |
| Establish Kenya Institute of Oil and Gas (KIOG) and Kenya Institute of Mining and Geology |   |  |   |   |               |                                 |                     |                     |                     |                     |                   |                   |
| Acquire land  | To improve research capacity in oil and gas         | Centre established                       | 15 hectares of land purchased                             | MOEP, MOLHUD, MOTI, MOEST   | 2012-2014     | GoK Donors PPPs                 | 50M                 | -                   | --                  | -                   | -                 | 50M               |
| Recruitment of qualified personnel  | To acquire skilled manpower in oil and gas research | Qualified staff recruited                | Number of staff with requisite skills (PhD, Masters etc.) | Public Service Commission, MOEST, Universities, Research Institutions | 2012-2017     | GoK Donors PPPs                 | 50M                 | 100M                | 20M                 | 15M                 | 15M               | 200M              |
| Construction of the research laboratory   | To construct the research laboratory                | Research laboratory constructed          | 1 lab constructed   | MOEP, MOTI, MOEST   | 2013-2015     | <b>TOTAL</b><br>GoK Donors PPPs | <b>270M</b><br>100M | <b>430M</b><br>300M | <b>370M</b><br>300M | <b>365M</b><br>250M | <b>65M</b><br>50M | <b>1.5B</b><br>1B |
| Procure research equipment  | To enhance the capacity for research in oil and gas | Research centre established and equipped | Percentage of implementation                              | MOEP, MOEST, Universities, Research Institutions                      | 2013-2017     | GoK Donors PPPs                 | 100M                | 100M                | 200M                | 400M                | 200M              | 1B                |
| <b>TOTAL</b>  |   |  |   |   |               |                                 | <b>200M</b>         | <b>400M</b>         | <b>500M</b>         | <b>650M</b>         | <b>250M</b>       | <b>2.0B</b>       |

**Goal 3 :to harness biotechnology for the country's development  
sector priority: biotechnology and biosciences . strategic objectives :to enhance institutional and human capacity and develop an enabling policy and legal environment for harnessing  
biotechnology and other bio resources to produce goods and services by 2017**

| Programme/<br>Project   | Objective   | Outcome/<br>Output                                 | Performance<br>Indicator  | Lead Implementing<br>Agency                         | Time<br>Frame | Source<br>of funds                    | Budget           |                  |                   |                  |                  | TOTAL              |
|---|---|--|---|---|---------------|---------------------------------------|------------------|------------------|-------------------|------------------|------------------|--------------------|
|   |   |  |   |   |               |                                       | 2013/<br>14      | 2014/<br>15      | 2015/<br>16       | 2016/<br>17      | 2017/<br>18      |                    |
| Develop a comprehensive<br>National Biosciences<br>Policy, Legal, Regulatory<br>and Institutional<br>Framework            | To restructure the<br>current Biotechnology<br>governance<br>framework  | Report   | Recommendations<br>for policy<br>intervention                   | MOEST, NCST, State Law<br>office                    | 2013-<br>2014 | GoK<br>Donors<br>PPPs<br><b>TOTAL</b> | 5M               | 10M              | -                 | -                | -                | 15M                |
|   |   |  |   |   |               |                                       | <b>5M</b>        | <b>10M</b>       | -                 | -                | -                | <b>15M</b>         |
| Formulate a National<br>Biosciences Policy  | To develop a National<br>Biosciences Policy   | Draft<br>Biosciences<br>Policy                     | Draft Biosciences<br>policy formulated                          | MOEST, NCST, State Law<br>office                    | 2014-<br>2015 | GoK<br>Donors<br>PPPs                 | 1M               | 5M               | 3M                | -                | -                | 9M                 |
| Draft and enact a<br>Biosciences Law  | Establish legal<br>framework for<br>biosciences   | Draft<br>Biosciences<br>Bill<br>Biosciences<br>Act | Draft Biosciences<br>Bill drafted<br>Biosciences Act<br>enacted | MOEST, NCST, State Law<br>office                    | 2014-<br>2015 | GoK<br>Donors<br>PPPs                 | 10M              | 20M              | 20M               | -                | -                | 50M                |
| Implementation of the<br>National Biosciences<br>Policy and Act   | To implement the<br>National Biosciences<br>policy and enforce the<br>Biosciences Act.                                  | Compliance<br>report                               | Number of<br>compliance<br>reports                              | MOEST, NCST, State Law<br>office                    | 2015-<br>2017 | GoK<br>Donors<br>PPPs                 | -                | 20M              | 70M               | 60M              | 50M              | 200M               |
| Establishment of the Kenya<br>Biosciences Institute (KBI),  | To establish the KBI  | KBI  | KBI operational   | MOEST, NCST, State Law Office                       | 2015-<br>2017 | GoK<br>Donors<br>PPPs                 | -                | 20M              | 70M               | 60M              | 50M              | 200M               |
| Establishment of the Kenya<br>National Biological<br>Resources Centre<br>(KNBRC)  | To establish the<br>KNBRC   | KNBRC  | KNBRC<br>operational  | MOEST, NCST,<br>State Law Office                    | 2015-<br>2017 | GoK<br>Donors<br>PPPs                 | -                | 20M              | 70M               | 60M              | 50M              | 200M               |
| Establishment of centres of<br>excellence in<br>Biotechnology Research in<br>research and higher<br>learning institutions | To identify and select<br>institutions to host the<br>Biotechnology<br>research centres of<br>excellence                | Institution<br>identified and<br>selected          | Selected<br>institutions  | MOEST<br>NCST,<br>Research Institutions             | 2013-<br>2014 | <b>TOTAL</b><br>GoK<br>Donors<br>PPPs | <b>11M</b><br>1M | <b>85M</b><br>5M | <b>233M</b><br>4M | <b>180M</b><br>- | <b>150M</b><br>- | <b>659M</b><br>10M |
| Conduct equipment needs<br>assessment for the<br>Biotechnology research<br>centres of excellence                          | To identify the specific<br>laboratory equipment<br>needs for the<br>Biotechnology<br>research centres of<br>excellence | Report   | Equipment needs<br>identified                                   | MOEST, Universities, NCST,<br>Research Institutions | 2014-<br>2017 | GoK<br>Donors<br>PPPs                 | 5M               | 15M              | 30M               | 30M              | 20M              | 100M               |



| Goal 3 :to harness biotechnology for the country's development<br>sector priority: biotechnology and biosciences . strategic objectives :to enhance institutional and human capacity and develop an enabling policy and legal environment for harnessing<br>biotechnology and other bio resources to produce goods and services by 2017 |   |  |   |  |           |                 |     |      |      |     |     |      |
|---|---|--|---|--|-----------|-----------------|-----|------|------|-----|-----|------|
| Procure, deliver and commission laboratory equipment to the Biotechnology research centres of excellence  | To deliver and commission top of the range Biotechnology research laboratory equipment to the centres of excellence | Adequately Equipped Biotechnology research laboratories            | Functional Biotechnology research centres of excellence | MOEST, NCST, Research institutions, Universities | 2014-2017 | GoK Donors PPPs | 10M | 30M  | 60M  | 60M | 40M | 200M |
| Train personnel on the handling and maintenance of the laboratory equipment   | To train personnel to handle and maintain the specialist Biotechnology laboratory equipment                         | Highly specialized and technical personnel.                        | No of trained technical staff                           | MOEST, Universities, NCST, Research institutions | 2014-2017 | GoK Donors PPPs | 2M  | 8M   | 15M  | 15M | 10M | 50M  |
|   |   |  |   |  |           |                 | 18M | 58M  | 109M |     | 70M | 360M |
| <b>Human Capacity Development for Biotechnology Research and product development</b>  |   |  |   |  |           |                 |     |      |      |     |     |      |
| Review Biotechnology training programmes at the institutions of higher learning   | To enhance the current Biotechnology training programmes in universities  | Report   | Recommendations for programmes update                   | MOEST Universities                               | 2013-2015 | GOK             | 1M  | 2M   | 2M   | 3M  | 2M  | 10M  |
| Develop Biotechnology training programmes for technicians and mid-level experts   | To develop training programmes for mid-level technicians  | Critical number of experts trained                                 | Number of Biotechnology experts trained                 | MOEST Universities                               | 2014-2017 | GOK             | 1M  | 2M   | 2M   | 3M  | 2M  | 10M  |
| Conduct Biotechnology training for technicians and mid-level experts  | To train mid-level technicians in Biotechnology   | Trained mid-level technicians                                      | Number of trained mid-level technicians                 | MOEST Universities                               | 2014-     | TOTAL           | 2M  | 4M   | 4M   | 6M  | 4M  | 20M  |
| Review and incorporate Biotechnology in Primary and Secondary school curriculum   | To Review and incorporate Biotechnology in Primary and Secondary school curriculum                                  | Report   | Recommendations for new content                         | MOEST KICD KNEC                                  | 2015-2017 | GOK Donors PPPs | 5M  | 20M  | 20M  | -   | -   | 45M  |
|   |   |  |   |  |           |                 | 5M  | 30M  | 30M  | 20M | 15M | 100M |
|   |   |  |   |  |           |                 | 10M | 60M  | 60M  | 40M | 30M | 200M |
| <b>Public Education and Awareness</b>   |   |  |   |  |           |                 |     |      |      |     |     |      |
| Institutionalize the BioAware initiative  | To convert the BioAware initiative into a directly funded project   | Institutional provisions for operations of the BioAware initiative | Operational provisions for the BioAware initiative      | MOEST, NCST Universities                         | 2013-2015 | GoK Donors PPPs | 2M  | 3M   | 5M   | -   | -   | 10M  |
|   |   |  |   |  |           | TOTAL           | 22M | 113M | 115M | 60M | 45M | 355M |

| Goal 3: to harness biotechnology for the country's development<br>sector priority: biotechnology and biosciences . strategic objectives :to enhance institutional and human capacity and develop an enabling policy and legal environment for harnessing biotechnology and otherbio resources to produce goods and services by 2017 |  |   |  |   |            |                 |         |         |         |         |         |       |     |     |     |     |
|---|--|---|--|---|------------|-----------------|---------|---------|---------|---------|---------|-------|-----|-----|-----|-----|
| Biotechnology public education and awareness campaign   | To conduct public education and awareness campaigns  | Public education and awareness campaigns              | Number of awareness campaigns held                                   | MOEST, Universities, Partners                             | 2014-2015  | GoK Donors PPPs | 10M     | 20M     | 20M     | 20M     | -       | -     | 50M |     |     |     |
| Establish Biotechnology Information and Resource Centres  | To establish Biotechnology information and resource centres at the County level                              | Information and resource centres                      | Number of operational information and resource centres               | MOEST, Research Institutions, Partners, Universities      | 2013-2017  | GoK Donors PPPs | 5M      | 10M     | 15M     | 10M     | 5M      | 45M   |     |     |     |     |
| Establishment of a task force for the commercialization of genetically modified crop varieties  | To formalize the establishment a task force for the commercialization of genetically modified crop varieties | Task force established and gazetted                   | Operationalization of the task force                                 | MOEST,NCST NBA,KARI , Partners, CODA                      | 2013-2014  | GOK             | 3M      | 7M      | -       | -       | -       | 10M   |     |     |     |     |
| Approval of commercial planting of genetically modified crop varieties  | To facilitate the expeditious approval of commercial planting of GM crop varieties                           | Approval for Commercial planting of GM crop varieties | Time taken for approval to be granted                                | MOEST,KARI,NBA, Partners CODA                             | 2013-2014  | GOK             | 3M      | 7M      | -       | -       | -       | 10M   |     |     |     |     |
| Procurement and distribution of GM seed varieties to farmers  | To avail seeds of GM crop varieties to farmers for planting  | Commercial planting of GM varieties                   | Number of farmers planting GM varieties                              | MOEST,Universities,Partners CODA                          | 2014-2015  | GOK             | 10M     | 20M     | 20M     | -       | -       | 50M   |     |     |     |     |
| Farmer education and technology stewardship   | To conduct Farmer education on genetically modified crops and technology stewardship                         | Farmer education educated                             | Level of farmers appreciation of the genetic modification technology | MOEST, Research Institutions, Partners, Universities CODA | 2013-2017  | GOK             | 2M      | 8M      | 10M     | 10M     | 10M     | 40M   |     |     |     |     |
| TOTAL   |  |   |  |   |            |                 |         |         |         |         | 12M     | 28M   | 30M | 10M | 10M | 90M |
| <b>Goal:4to enhance research capacity in telecommunication electronic and computer</b>  |  |   |  |   |            |                 |         |         |         |         |         |       |     |     |     |     |
| <b>Programme 5: telecommunications, electronics and computers (tec)</b>   |  |   |  |   |            |                 |         |         |         |         |         |       |     |     |     |     |
| <b>Strategic objectives :to develop the capacity to produce electronics, telecommunications and computing equipment and devices locally indicators</b>  |  |   |  |   |            |                 |         |         |         |         |         |       |     |     |     |     |
| Programme/Project   | Objective  | Outcome/Output  | Performance Indicator  | Lead Agency   | Time Frame | Source of funds | Budget  |         |         |         |         | TOTAL |     |     |     |     |
| Develop the TEC Technologies policy   | To provide a legal framework for running TEC   | Policy and Bill                                       | Legal Framework availability   | MOIEDCT, MOLHUD, MCTI, MOEST, ICT Board                   | 2013-2014  | GOK             | 2013/14 | 2014/15 | 2015/16 | 2016/17 | 2017/18 | TOTAL |     |     |     |     |
|   |  |   |  |   |            |                 | 10M     | 40M     | 50M     | -       | -       | 100M  |     |     |     |     |

| Goal 3 to harness biotechnology for the country's development<br>sector priority: biotechnology and biosciences. strategic objectives: to enhance institutional and human capacity and develop an enabling policy and legal environment for harnessing biotechnology and other bio resources to produce goods and services by 2017 |   |   |  |  |             |         |     |      |      |      |      |      |
|--|---|---|--|--|-------------|---------|-----|------|------|------|------|------|
| and Bill   | programmes in Kenya   | Centre established  | 15 hectares of land purchased  | MOIEDCT, MOLHUD, MOTI, MOEST, ICT Board                          | 2012-2013   | GOK     | 10M | 90M  | -    | -    | -    | 100M |
| Acquiring approximately 15 hectares of land for research institution   | To establish a Centre for TEC Research  | Centre established  | 15 hectares of land purchased  | MOIEDCT, MOLHUD, MOTI, MOEST, ICT Board                          | 2012-2013   | GOK     | 10M | 90M  | -    | -    | -    | 100M |
| Recruitment of qualified personnel   | To acquire skilled manpower in TEC  | Qualified staff recruited   | Number of staff with requisite skills (PhD, Masters etc.)                                  | Public Service Commission, MOEST, Universities, Research Institt | 2012-2015   | GOK     | 10M | 30M  | 60M  | -    | -    | 100M |
| Construction of the research institution   | To enhance capacity in TEC  | Institution constructed   | 1 lab constructed  | MOEP, MOTI, MOEST  | 2013-2015   | GOK PPP | 10M | 400M | 250M | 200M | 140M | 1B   |
| Procure research and other equipment   | To enhance capacity in TEC  | Institution established and equipped  | Percentage of implementation   | MOIEDCT, MOEST, Universities, Research Institt, ICT Board        | 2013-2017   | GOK PPP | 50M | 200M | 250M | 250M | 250M | 1B   |
| Support software design and development  | To develop transaction based software applications  | Software applications for different transactions  | Number of software applications developed  | KETCRI Individual Software developers                            | 2014 - 2017 | GOK PPP | 5M  | 20M  | 25M  | 25M  | 25M  | 100M |
| Promote local manufacturing of electronic devices  | Increase use of Kenyan manufactured electronic devices  | Locally made electronic equipment   | No of readily available Kenyan brands  | KETCRI NCST KENYA  | 2014 - 2017 | TOTAL   | 95M | 780M | 635M | 475M | 415M | 2.4B |
| Undertake a national ICT infrastructure and skills survey and assessment.  | To profile national ICT market needs and inventory of ICT infrastructure, skills requirements and related gaps by sector. | A profile of the national market needs in terms of ICT infrastructure and skills. availability/gaps | Documented ICT market needs and availability of skills and infrastructure and related gaps | MOEST, NCST, MOIED, and Development Partners                     | 2014 - 2017 | GOK PPP | 10M | 40M  | 50M  | 50M  | 50M  | 200M |
|  |   |   |  |  |             | TOTAL   | 60M | 240M | 300M | 300M | 300M | 1.2B |

| Goals 5. utilize indigeneous knowledge and modern st&i to exploit kenya's natural resources to prduce goods and services<br>Sector priority: natural resource utilization technologies<br>Strategic objectives :to create an interface between indigenus knowledge and associated practices with st i and business expertise for economic development while ensuring environmental sustainability |  |   |   |  |               |                     |             |             |             |             |             |             |
|---|--|---|---|--|---------------|---------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Programme/<br>Project   | Objective  | Outcome/<br>Output  | Performance<br>Indicator  | Lead Implementing<br>Agency  | Time<br>Frame | Source<br>of funds  | Budget      |             |             |             | TOTAL       |             |
|   |  |   |   |  |               |                     | 2013/<br>14 | 2014/<br>15 | 2015/<br>16 | 2016/<br>17 |             | 2017/<br>18 |
| i) Formulate the (NPi) Policy<br>ii) Enact accompanying Bill  | To establish policy & legal framework  | A National Coordination Agency  | Gazetted Policy, and an Act of Parliament   | Attorney General; Kenya; SCAC  | 2013/14       | GOK                 | 10M         | 40M         | 50M         | -           | -           | 100M        |
| i) Sensitize indigenus knowledge (IK) and technologies-holders<br>ii) Conduct baseline survey, gather and analyze data on IK and associated biological resources countrywide<br>iii) Inventorize the data into a secure national database<br>iv) Develop school and college curricula for induction and training in IK and attendant technologies   | To document indigenous and secure indigenous knowledge, technologies and associated biological resources as part of national knowledge capital | A comprehensive indigenous knowledge digital library; IK and attendant technologies mainstreamed into formal educational curricula                                      | i) Mutually consented and signed contractual Agreements<br>ii) Data collection protocols and personnel put in place<br>iii) Infrastructure for digital library installed<br>iv) Data collected, analyzed and stored | Natural Products Industry (NPI) Coordination Board; NNMK; NEMA; KWS; KEMRI; KIPi   | 2013-17       | GOK<br>PPP<br>DONOR | 20M         | 40M         | 80M         | 100M        | 60M         | 300M        |
| i) Upgrade innovation and R&D infrastructure<br>ii) Enhance technical skills and know-how<br>iii) Prepare and implement fundable flagship project proposals<br>iv) Mobilize financial resources through establishment of a revolving fund   | To build and utilize capacity for natural product research, innovation and development   | i) Custom-built innovation and R&D infrastructure relevant technical skill base<br>ii) Sufficient and relevant technical skill base<br>iii) A functional revolving fund | i) Specialist R&D facilities and equipment installed<br>ii) A pool of personnel from participating institutions<br>iii) prototype products generated and patented   | NPI Coordination Board; KEMRI; NNMK; IPR; KIRDI; KARI; KEFRI; Universities; NCST; KEBS; KIPi; PPB; NEMA; KWS; KFS; DVS; Private sector, NGOs | 2013-17       | GOK<br>PPP<br>DONOR | 20M         | 80M         | 120M        | 150M        | 130M        | 500M        |
| i) Document and profile all relevant players in the sub-sector involved in innovation and R&D; technology transfer; patenting; product registration<br>ii) Initiate contact and prepare modalities of engagement  | To foster local, national, regional and international linkages among various actors in the knowledge   | i) A database of all relevant actors including researchers, innovators, investors, venture  | i) MoUs; collaborative and technology transfer agreements<br>ii) Product patents and licenses<br>iv) Membership to  | NPI Coordination Board; KEMRI; KEMFRI, NNMK; IPR; KIRDI; KARI; KEFRI; Universities; NCST;  | 2013-17       | GOK<br>PPP<br>DONOR | 3M          | 7M          | 8M          | 12M         | 20M         | 50M         |
|   |  |   |   | <b>TOTAL</b>   |               | <b>TOTAL</b>        | <b>20M</b>  | <b>80M</b>  | <b>120M</b> | <b>150M</b> | <b>130M</b> | <b>500M</b> |

| <b>Goal5 .utilize indigeneous knowledge and modern st&amp;i to exploit kenya's natural resources to prduce goods and services</b><br><b>Sector priority: natural resource utilization technologies</b><br><b>Strategic objectives :to create an interface between indigenous knowledge and associated practices with st i and business expertise for economic development while ensuring environmental sustainability</b> |                                 |  |  |  |               |             |             |             |             |       |     |
|---|---------------------------------|--|--|--|---------------|-------------|-------------|-------------|-------------|-------|-----|
| Programme/<br>Project   | Objective                       | Outcome/<br>Output   | Performance<br>Indicator                           | Lead Implementing<br>Agency                                | Time<br>Frame | Budget      |             |             |             | TOTAL |     |
|   |                                 |  |  |  |               | 2013/<br>14 | 2014/<br>15 | 2015/<br>16 | 2016/<br>17 |       |     |
| iii) Identify and initiate specific programmes as a basis for networking  | and natural product value chain | capitalists, indigenous knowledge-holders, technology-holders and policy-makers<br>ii) Instruments of engagement<br>iii) Well-defined joint programmes | professional bodies in the natural products sector | KEBS; KIPi; PPB; NEMA; KWS; KFS; DVS; Private sector, NGOs |               | 3M          | 7M          | 8M          | 12M         | 20M   | 50M |
|   |                                 |  |  |  |               | TOTAL       |             |             |             |       |     |

| <b>Goal 6 :to intergrate st&amp;i in education management and curriculum delivery</b><br><b>Sector priority: science,technology engineering and mathematics (stem)</b><br><b>Strategic objectives to enhance stem capabilities in the education institutions in kenya</b>  |   |   |  |  |               |                     |            |             |             |             |             |             |
|--|---|---|--|--|---------------|---------------------|------------|-------------|-------------|-------------|-------------|-------------|
| Programme/<br>Project  | Objective   | Outcome/<br>Output  | Performance<br>Indicator                     | Lead Implementing<br>Agency  | Time<br>Frame | Source<br>of funds  | Budget     |             |             |             |             | TOTAL       |
|  |   |   |  |  |               |                     | 2013/14    | 2014/15     | 2015/16     | 2016/17     | 2017/18     |             |
| Construction of<br>KAIST   | Establish Kenya<br>Institute of Science<br>and Technology   | Kenya Institute of<br>Science and<br>Technology           | Building                                     | MOEST, NT, Research<br>Institutions<br>KENIA   | 2013-<br>2016 | GOK<br>PPP<br>DONOR | -          | 20M         | 20M         | 60M         | -           | 100M        |
| Repacage STEM in<br>universities   | Re- engineer the<br>delivery of STEM  | Skilled graduates   | Number of<br>Ph.D. and<br>M.Sc.<br>graduates | Universities<br>NGST   | 2013-<br>2017 | GOK<br>PPP<br>DONOR | 50M        | 225M        | 225M        | 250M        | 250M        | 1B          |
| Conduct a National<br>Survey on manpower<br>needs for ST&I   | To assess the<br>manpower<br>requirements for the<br>country  | Manpower needs<br>determined                              | Report                                       | MOEST, NGST, KENIA,<br>KAM, KEPSA, LIWA,<br>KNEC, FKE, MOIED,<br>MOTI, NT, MOLHUD  | 2013-<br>2015 | GOK<br>PPP<br>DONOR | 10M        | 45M         | 45M         | -           | -           | 100M        |
| Develop a National<br>Critical Skills<br>Development<br>Strategy   | To obtain a<br>guideline on how to<br>close the gap<br>between training<br>and job market<br>needs  | Strategy<br>Developed                                     | Strategy                                     | MOEST, NGST, KENIA,<br>Research Institutions<br>KNBS, Universities<br>KAM, KEPSA, LIWA,<br>KNEC, FKE, MOIED,<br>MOTI, NT, MOLHUD | 2013-<br>2015 | GOK<br>PPP<br>DONOR | 10M        | 45M         | 45M         | -           | -           | 100M        |
|  |   |   |  |  |               | <b>TOTAL</b>        | <b>70M</b> | <b>335M</b> | <b>335M</b> | <b>310M</b> | <b>250M</b> | <b>1.3B</b> |
| <b>Goal7: to establish an effective and efficient systen innovation connecting all actors in the st&amp;i chain</b><br><b>Sector priority: technology co-ordination, innovation and commercialization</b><br><b>Strategic objectives to harness the potential offered by modern science and technology to national social and economic advantage</b> |   |   |  |  |               |                     |            |             |             |             |             |             |
| Programme/<br>Project  | Objective   | Outcome/<br>Output  | Performance<br>Indicator                     | Lead Implementing<br>Agency  | Time<br>Frame | Source<br>of funds  | Budget     |             |             |             |             | TOTAL       |
|  |   |   |  |  |               |                     | 2013/14    | 2014/15     | 2015/16     | 2016/17     | 2017/18     |             |
| Knowledge<br>Information<br>Management<br>System   | To provide the right<br>knowledge related<br>information to the key<br>ST&I institutions  | Quality and<br>availability of<br>information             | Knowledge<br>management<br>system            | MOEST, NGST,<br>Research Institutions,<br>ICT Board, MOIEDCT,<br>KNBS, Universities  | 2013-<br>2017 | GOK<br>PPP<br>DONOR | 10M        | 20M         | 20M         | 25M         | 25M         | 100M        |
| Innovative<br>Technology<br>Transfer   | to enhance and<br>generate new ideas<br>through advances in<br>technologies and<br>innovativeness of the<br>fundamental<br>component of ST&I. | Technologies<br>identified,<br>transferred and<br>adopted | No of<br>technologies<br>transferred         | MOEST, KENIA,<br>Research Institutions<br>Collaboration Partners   | 2013-<br>2017 | GOK<br>PPP          | 50M        | 225M        | 225M        | 250M        | 250M        | 1B          |

|  |   |   |   |                            |           |               |            |             |             |             |             |             |
|--|---|---|---|----------------------------|-----------|---------------|------------|-------------|-------------|-------------|-------------|-------------|
| Capacity development   | To build capacity in ST&I statistics, surveys and policy-making at the national level                                   | Staff equipped with skills for ST&I surveys, statistical analysis and policy briefing | No. of trainings, certification, reports and policy briefs                        | MOEST, KNBS, AOSTI         | 2013-2015 | GOK DONOR     | 200M       | 400M        | 400M        | -           | -           | 1B          |
| Establishment of a national ST&I data collection and survey unit     | To establish and equip a national ST&I data collection and survey   | Avail data and information to policy makers   | Questionnaires Reports<br>A functional unit to support R&D and innovation surveys | MOEST, KNBS, KEPPP         | 2013-2017 | GOK DONOR     | 100M       | 400M        | 400M        | 300M        | 300M        | 1.5B        |
| Data platforms   | To develop an information system for ST&I statistics  | Accessible depository database for use by policy makers and stakeholders              | Software development, agreements with collaborating partners                      | MOEST, e-Govt Office, KNBS | 2014-2016 | GOK DONOR     | -          | 200M        | 400M        | 400M        | -           | 1B          |
| Publications and awareness   | To publish and present to stakeholders and policy makers the survey reports and policy briefs                           | Reference information available on ST&I to policy makers and stakeholders             | Publications, Public forums for presentation and briefs                           | MOEST, KNBS                | 2013-2017 | GOK PPP       | 50M        | 150M        | 200M        | 300M        | 300M        | 1B          |
| Linkages with national, regional and international databases on ST&I | To establish collaborative linkages with national, regional and international institutions responsible ST&I information | National ST&I data platform linked with regional and international depositories       | MeMO/Tanda of agreements, Generated reports                                       | MOEST, ASTII, UJS          | 2014-2017 | GOK PPP       | 5M         | 5M          | 40M         | 200M        | 200M        | 450M        |
| Regulatory reforms   | To cause ST&I statistics to be included in the Statistics Act   | Prepare an ST&I Statistics policy paper   | Amendment of the Statistics Act to include ST&I statistics                        | MOEST, MODIP, KNBS         | 2015-2017 | GOK PPP DONOR | 5M         | 5M          | 40M         | 200M        | 200M        | 450M        |
|  |   |   |   |                            |           | <b>TOTAL</b>  | <b>60M</b> | <b>160M</b> | <b>280M</b> | <b>700M</b> | <b>700M</b> | <b>1.9B</b> |

| Sector priority: technology co-ordination, innovation and commercialization<br>Programme kenya national innovation system programme<br>Programme goal: to harness the potential offered by modern science and technology to national social and economic advantage |  |  |  |  |              |                     |
|--|--|--|--|--|--------------|---------------------|
| Strategies/Project(s)  | Objectives   | Output   | Indicators   | Implementing Agencies  | Time Frame   | Cost (ksh millions) |
| Knowledge Information Management System  | To provide the right knowledge related information to the key ST&I Institutions and Organizations  | Quality and availability of information  | Knowledge management system  | MOEST, NCST, Research Institutions, ICT Board, MOIEDCT, KNBS, Universities | 2013-2017    | 100                 |
| Innovative Technology Transfer   | to enhance and generate new ideas through advances in technologies and innovativeness of the fundamental component of ST&I.  | Technologies identified, transferred and adopted   | No of technologies transferred   | MOEST, KENIA, Research Institutions<br>Collaboration Partners              | 2013-2017    | 500                 |
| Capacity development   | To build capacity in ST&I statistics, surveys and policy-making at the national level  | Staff equipped with skills for ST&I surveys, statistical analysis and policy briefing  | No. of trainings, certification, reports and policy briefs                           | MOEST, KNBS, AOSTI   | 2013-2015    | 200                 |
| Establishment of a national ST&I data collection and survey unit   | To establish and equip a national ST&I data collection and survey unit so as to have a basis from which to:<br>i) Develop globally benchmarked data collection instruments<br>ii) Undertake regular surveys for R&D and innovation | Avail data and information to policy makers<br>Equipment and office facilities for the ST&I data collection and survey unit                  | Questionnaires<br>Reports<br>A functional unit to support R&D and innovation surveys | MOEST, KNBS, KEPPP   | 2013-2017    | 200                 |
| Data platforms   | To develop an information system (MOTI) platform for ST&I statistics   | Accessible depository database for use by policy makers and stakeholders   | Software development, agreements with collaborating partners                         | MOEST, e-Govt Office, KNBS   | 2014-2016    | 200                 |
| Publications and awareness   | To publish and present to stakeholders and policy makers the survey reports and policy briefs  | Reference information available on ST&I to policy makers and stakeholders  | Publications,<br>Public forums for presentation and briefs                           | MOEST, KNBS  | 2013-2017    | 1,00                |
| Linkages with national, regional and international databases on ST&I   | To establish collaborative linkages with national, regional and international institutions responsible for ST&I information  | National ST&I data platform linked with regional and international depositories e.g. the African Innovation Outlook and the UIS S&T Database | MeMO/Tianda of agreements, Generated reports   | MOEST, ASTII, UIS  | 2014-2017    | 150                 |
| Regulatory reforms   | To cause ST&I statistics to be included in the Statistics Act  | Prepare an ST&I Statistics policy paper  | Amendment of the Statistics Act to include ST&I statistics                           | MOEST, MODP, KNBS  | 2015-2017    | 100                 |
|  |  |  |  |  | <b>TOTAL</b> | <b>1,55B</b>        |

**SECTOR PRIORITY: County Technology and Innovations Delivery Services  
PROGRAMME: County Technology and Innovations Delivery Programme  
Programme Goal: To Promote social and economic development through provision of proximate, easily accessible Technology and Innovations services at the country level.**



| <b>SECTOR PRIORITY: County Technology and Innovations Delivery Services</b><br><b>PROGRAMME: County Technology and Innovations Delivery Programme</b><br><b>Programme Goal: To Promote social and economic development through provision of proximate, easily accessible Technology and Innovations services at the country level.</b> |  |  |                                |   |             |                     |
|--|--|--|--------------------------------|---|-------------|---------------------|
| Strategies/Project(s)  | Objectives   | Output   | Indicators                     | Implementing Agencies   | Time Frame  | Cost (Ksh millions) |
| Establishment of the Kenya National Innovation Agency (KENIA)  | To develop and manage the Kenya National Innovation System   | KENIA established                                | KENIA                          | MOEST, KENIA, Research Institutions Universities Collaboration Partners | 2013-2015   | 100                 |
| Establishment of County Technology and Innovations (CTI) Advisory and Prospecting Centers  | To scout and nurture innovative ideas from individuals, training institutions, the private sector and globally for transfer to the counties  | CTI Advisory centres established                 | CTI Advisory centres           | MOEST, KENIA, Research Institutions Universities Collaboration Partners | 2013-2017   | 500                 |
| Innovative County Specific Technology Development and Transfer   | To enhance and generate new ideas through advances in technologies and innovativeness at the county level<br>To create synergies among different technological innovations, incubations initiatives for diffusion of technology in at the County level | Technologies identified, transferred and adopted | No of technologies transferred | MOEST, KENIA, Research Institutions Universities Collaboration Partners | 2013-2017   | 500                 |
| <b>TOTAL</b>   |  |  |                                |   | <b>1.1B</b> |                     |

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6. The Draft National Biotechnology Development Policy 2006
7. The university Education Act 2012
8. The Science, Technology and Innovation Act 2013
9. The Comprehensive Plan of Action for Africa's Development

# **ANNEX 1: MEMBERSHIP OF THE SCIENCE, TECHNOLOGY AND INNOVATION SECTOR**

**Chairman: Permanent Secretary, Ministry of Higher Education, Science and Technology**

1. Ministry of Higher Education Science and Technology (MOHEST)
2. Ministry of Information and Communications (MOIC)
3. Ministry of Education
4. Ministry of State for Planning, National Development and Vision 2030
5. Ministry of Finance
6. Ministry of Home Affairs
7. National Economic and Social Council (NESC)
8. ICT Board
9. Linking Industry with Academia
10. Kenya National Academy of Science
11. Public and Private Universities
12. Kenya Intellectual Property Institute (KIPI)
13. Kenya Private Sector Alliance (KEPSA)
14. Department of Resource Surveys and Remote Sensing (DRSRS)
15. Directorate of E-Government
16. Government Information Technology Services (GITS)
17. Integrated Population Registration System -IPRS
18. Kenya National Bureau of Statistics (KNBS)
19. Coffee Research Foundation (CRF)
20. Kenya Agricultural Research Institute (KARI)
21. Kenya Forestry Research Institute (KEFRI)
22. Kenya Institute for Public Policy Research and Analysis (KIPPRA)
23. Kenya Industrial Research and Development Institute (KIRDI)
24. Kenya Marine and Fisheries Research Institute (KMFRI)
25. Kenya Medical Research Institute (KEMRI)
26. Kenya Sugar Research Foundations (KESREF)
27. National Crime Research Centre (NCRC)
28. Tea Research Foundation (TRF)
29. United Nations Educational, Scientific, and Cultural Organization (UNESCO)
30. United Nations International Development Organization (UNIDO)
31. Kenya Association of Manufacturers (KAM)
32. Numerical Machines
33. Vision 2030 Delivery Secretariat

