

Simone Esau-Bailey

Centre for Research on Science and Technology, Stellenbosch University

## Introduction

This report looks at the science, technology and innovation system of the Republic of Kenya and is structured in three main parts. Section 1 briefly deals with the national political environment; Section 2 looks at the key country characteristics including the economic, demographic and health, education and information and communication technology infrastructure. Finally, Section 3, which forms the main part of the report, gives an overview and analysis of the science and technology system. This section is subdivided into seven thematic subsections covering the governance of the science and technology, science and technology landscape, S&T human resources, funding, research outputs, technological innovation and lastly international co-operation and networks activities.



## Section 1: The political environment

Kenya is in Eastern Africa, bordering the Indian Ocean, between Somalia and Tanzania, neighbouring Uganda, Sudan and Ethiopia to the west. The country is divided into seven topographical regions. The principal rivers are the Tana and Athi. The arable areas cover nearly 20% of the country and provide the main livelihood for most of the population.<sup>1</sup>

Since independence in 1963, the Kenya African National Union (KANU) dominated politics in Kenya. In 1992, political pluralism was legalised in the country leading to the emergence of several political parties and multi-party elections in 1992 and 1997, which were won by KANU. During the third multi-party elections in December 2002, the main opposition parties together with key KANU politicians combined forces to form National Rainbow Coalition (NARC), which won the elections. (GoK, 2005)<sup>2</sup>

Founding president and liberation struggle icon Jomo Kenyatta led Kenya from independence in 1963 until his death in 1978, when President Daniel Toroitich arap Moi took power in a constitutional succession. The country was a de facto one-party state from 1969 until 1982 when the ruling Kenya African National Union (KANU) made itself the sole legal party in Kenya. Moi acceded to internal and external pressure for political liberalization in late 1991. President MOI stepped down in December 2002 following fair and peaceful elections. Mwai Kibaki, running as the candidate of the multiethnic, united opposition group, the National

---

<sup>1</sup> [www.health.go.ke](http://www.health.go.ke)

<sup>2</sup> Kenya Country Corporate Strategy 2005-2007

Rainbow Coalition, defeated KANU candidate Uhuru Kenyatta and assumed the presidency following a campaign centred on an anticorruption platform.<sup>3</sup>

## Section 2: Country characteristics

### 2.1 *Basic economic outlook*

The regional hub for trade and finance in East Africa and yet Kenya has been hampered by corruption and by reliance upon several primary goods whose prices have remained low. A severe drought from 1999 to 2000 compounded Kenya's problems, causing water and energy rationing and reducing agricultural output. As a result, GDP contracted by 0.2% in 2000. Despite the return of strong rains in 2001, weak commodity prices, endemic corruption, and low investment limited Kenya's economic growth to 1.2%. Growth lagged at 1.1% in 2002 because of erratic rains, low investor confidence, meagre donor support, and political infighting up to the elections. In the key December 2002 elections, Daniel Arap Moi's 24-year-old reign ended, and a new opposition government took on the formidable economic problems facing the nation. In 2003, progress was made in rooting out corruption and encouraging donor support. (The World Fact book, CIA)

The moderate rebound in economic activity that began in 2003 continued in 2004 as real GDP growth increased from 1.8 percent to 2.6 percent in 2004 as tourism and construction activities gained momentum. This performance remained modest due to the economy's stagnation in the years prior to 2002. The stagnant growth was due to three main factors. Firstly, unfavourable weather conditions in the past years adversely affected the productive sectors, particularly agriculture. Secondly, deteriorating physical infrastructure and high energy costs raised the cost of doing business. Thirdly, poor governance and the security situation reduced investor confidence and deterred external resource flows from bilateral and multilateral donors. (GoK, 2005)

The inflation rate (overall inflation excluding food, fuel, and energy), which declined from 11.2 percent in 1997 to 2 percent in 2002, rose sharply from 3 percent in 2003 to 7 percent in 2004. Annual overall inflation, as measured by the twelve-month percent change in the consumer price index (CPI), rose from 8 percent in September 2003 to 19 percent in September 2004, before dropping to 16 percent in December 2004. These rates have exceeded the Central Bank of Kenya (CBK)'s target of 5 percent for underlying inflation due to poor harvest, and subsequent high food prices, and high energy prices. The overall fiscal deficit (excluding grants) of 1.8 percent in 2003/04 (compared to 2.3 percent of GDP in 2002/2003) was much lower than the earlier projection of 4.8 percent, owing to the Government's strong revenue collection efforts and tight management of recurrent expenditure. Expenditures amounted to 24.3 percent in 2003/2004 compared to 25.7 percent a year earlier. However, recurrent expenditures have remained high (21.1 percent in 2003/04) relative to capital expenditures, calling for measures to speed up the expenditure switching. (GoK, 2005)

---

<sup>3</sup> (The World Fact book, CIA)

**Table 1: Selected Basic Economic Data**

<b>Gross Domestic Product at current market prices (US \$ million)</b>										
<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>
9046.74	12045.86	13115.76	14094.00	12896.02	12705.37	13058.51	13190.81	15036.17	19130.90	19040.65
<b>Gross Domestic Product at factor cost (constant 2000 prices)</b>										
10080.56	10547.94	10575.37	10946.98	11242.50	11275.53	11833.58	11893.17	12243.97	12713.78	13265.36

The value of exports grew by an average of 9.9 percent amounting to US\$ 2,411 million in 2003 and US\$ 2,650 million in 2004. This improvement in export growth is attributed to increased exports of horticulture to the EU, tea and manufactured exports to COMESA, as well as garment exports to USA under AGOA arrangements. Imports increased at an annual average of 26 percent in the same period with the import value reaching US\$ 3564 million in 2003 and US\$ 4500 million in 2004. Surpluses on the invisible accounts have partially offset the trade deficits, which stood at US\$ 1,850 million in 2004. The deficits on the current account (excluding official transfers) increased to 3.3 percent from a surplus of 0.3 percent of GDP in 2003. The Government continues to implement a flexible exchange rate system, which has served the economy well in absorbing fluctuations in external conditions. (GoK, 2005)

Progress in public enterprise reform has been extremely slow. The adoption of the new Privatisation Bill and strategy must have priority in order to speed up the pace of transactions. The Kenya Railways Corporation is to be privatised through a joint concession with the Uganda Railways. For the Kenya Electricity Generating Company, the Government has not met its intention to offload 30 percent of its equity to the private sector by December 2005. In Telkom Kenya, mobile private operators have led reform, and the situation of the third mobile operator remains unresolved. In the financial sector, the slow progress on the restructuring of state-influenced banks leaves the sector weighed down with large non-performing loans, requiring continuous fiscal injections in order to prevent a banking crisis from developing. Such injections constitute major leakages in the Government's financial resources. (GoK, 2005)<sup>4</sup>

It is estimated that Kenyan working-age population (age 15 to 64) consisted of about 18 million in 2003 (56 % of the total population). Unemployment is very high; nearly 23 percent of the working age population were inactive due to economic stagnation, and low investments in various sectors. Growth in formal sector employment has been insufficient to meet the demand for jobs created by a growing population. Significant growth in the informal sector has filled the gap. (GoK, 2005)

In terms of general economic competitiveness, there was little comparative data for most African economies because the early issues of the Global Competitiveness Report covered few countries in Africa until the publication of The Africa Competitiveness Report by the World Economic Forum in 1998.<sup>5</sup> The early edition of The Africa Competitiveness Report became the "first systematic benchmarking exercise for combining broad macroeconomic and political analysis of firm and country" (WEF, 2000) for 24 African countries.<sup>6</sup> The second report was published in 2000 and the authors collected three times as many questionnaires, making the sample more representative than the first Africa Competitiveness Report. The third Africa Competitiveness Report, which covered 25, selected African economies. The report uses the *Global Competitiveness Index* (GCI), which has three sub-indices including the public institutions index, macroeconomic environment index and technology index.

---

<sup>4</sup> Kenya Country Corporate Strategy 2005-2007

<sup>5</sup> It was in the 2003-2004 Global Competitiveness Report that the number of African countries increased from 8 to 25. In this report 22 new countries of which 17 are African were added in the coverage, while the total number of countries increased from 80-102.

<sup>6</sup> Note that until the World Competitiveness Report in 2004, there were few countries in Africa covered by the previous issues.

**Table 2: Kenya Competitiveness Ranking in Africa, 2004**

Country	2004 Rank (Out of 25)	2004 Score
Botswana	1	4.56
Tunisia	2	4.49
South Africa	3	4.37
Mauritius	4	4.12
Namibia	5	3.99
Gambia	6	3.93
Egypt	7	3.84
Morocco	8	3.77
Tanzania	9	3.49
Ghana	10	3.46
Algeria	11	3.39
Malawi	12	3.36
Senegal	13	3.34
Uganda	14	3.25
<b>Kenya</b>	<b>15</b>	<b>3.21</b>
Nigeria	16	3.10

Source: WEF Africa Competitiveness Report 2004

Overall Kenya is ranked fifteenth out of 25 African countries, with its neighbours Tanzania (9<sup>th</sup>) and Uganda (14<sup>th</sup>) fairing better on the ranking.

## 2.2 Demographic and health characteristics

**Table 3: Summary of various demographic statistics for Kenya**

Indicator	Statistic	Year	Source
<i>General demographical</i>			
Total population	34.256	2005	African Development Bank <sup>7</sup>
Population annual growth	2.3	2005	World Health Organisation <sup>8</sup>
<i>Health</i>			
Crude birth rate (per 1000 population)	39.2	2005	African Development Bank
Life expectancy at birth (years)	49.0	2005	African Development Bank
Total fertility rate	5.0	2005	African Development Bank
Infant mortality rate (per 1000)	64.8	2005	African Development Bank
Under-5 mortality (per 1,000 live births)	116	2000	Government of Kenya, 2005
Maternal mortality rate (per 100,000 live births)	414	2003	Government of Kenya, 2005
Adults aged 15-49 with HIV/AIDS (%)	9.3	2003	Ministry of Health (Kenya)
Deaths due to HIV/AIDS (per 100 000 population per year)	409	2005	World Health Organisation
Physicians (number)	4,506	2002	World Health Organisation
Physicians (density per 1 000 population)	0.14	2002	World Health Organisation
Nurses (number)	37,113	2002	World Health Organisation
Nurses (density per 1 000 population)	1.18	2002	World Health Organisation
Dentists (number)	1,340	2002	World Health Organisation
Dentists (density per 1 000 population)	0.04	2002	World Health Organisation
Pharmacists (number)	3,094	2004	World Health Organisation
Pharmacists (density per 1 000 population)	0.10	2004	World Health Organisation

<sup>7</sup>

[www.afdb.org](http://www.afdb.org)

<sup>8</sup>

[http://www.who.int/whosis/database/core/core\\_select\\_process.cfm](http://www.who.int/whosis/database/core/core_select_process.cfm)

Table 3 Continued

Indicator	Statistic	Year	Source
<i>Education</i>			
Primary enrolment in public primary schools	7.2 million	2004	Session Paper No._ of 2004
Secondary enrolment in public primary schools	862.908	2003	Session Paper No._ of 2004
Illiteracy rates	15%	2003	Government of Kenya, 2005
<i>Information &amp; Communication Technology (ICT)</i>			
Fixed telephone line subscribers	260 000	2004	Ministry of Information and Communications, 2006
Cellular mobile subscribers	3 million	2004	Ministry of Information and Communications, 2006
Fixed Teledensity	0.75 per hundred (19)	2004	Ministry of Information and Communications, 2006
Mobile Teledensity	9.75 per hundred inhabitants (21)	2004	Ministry of Information and Communications, 2006
Internet users	1 030 000	2005	Ministry of Information and Communications, 2006
ISP's	73 registered 16 of which were active	2005	Ministry of Information and Communications, 2006
Cyber cafes and telephone bureaus	> 1000	2005	Ministry of Information and Communications, 2006

Based on the World Economic Forum's Global Information Technology report Kenya is ranked 91<sup>st</sup> in the 2005-2006 report out of 115 countries examined. Tanzania and Uganda were both ranked higher, 84<sup>th</sup> and 79<sup>th</sup> respectively. The table below shows the technology profile relating to ICTs:

**Table 4: Kenyan selected ICT indicator ranking**

<b>Growth Competitiveness Index (Technology)</b>	<b>Rank out of 25 African countries</b>	<b>Rank out of 102 countries</b>
Quality of competition in the ISP sector	11	73
Internet access in schools	14	86
Laws relating to ICT	9	67
Internet users, 2002	9	80
Internet hosts, 2002	8	77
Personal computers, 2002	14	86
Cellular phones, 2002	10	82
Telephone lines, 2002	13	89
Government prioritisation of ICT	20	81

Source: WEF: Global Information Technology Report

### **Section 3: Science and technology system<sup>9</sup>**

Following the enactment of the Science and Technology Act (Cap 250), in 1977, the Government created a framework for Science & Technology (S&T) thus providing the country with a legal basis and the machinery for obtaining advice on matters of science and technology. The act signified government's resolution to have S&T play a central role in the development of the Kenyan economy. The importance of S&T has increasingly been emphasized with the subsequent creation of two new science and technology orientated universities, namely Moi University and Jomo Kenyatta University of Agriculture and Technology. (Wandiga, S.O.; Awuor, V.; Wanyama, B. & Abuodha, N.L, 2004)

Despite the recognized importance of S&T, mechanisms for achieving stakeholder involvement in policy development, identification of priorities and mobilization of resources for S&T appear to be lacking. These mechanisms are required to ensure the long-term contribution of S&T to the country's well being through strategic research and development (R&D) as well as through the diffusion of products. (Wandiga, S.O.; Awuor, V.; Wanyama, B. & Abuodha, N.L, 2004)

In the current situation where the country's S&T goals are pursued through the operation plans of the various ministries and agencies, a national science and technology plan is required within which all the various sectoral activities would conform. The S&T plan should be prepared by the National Council for Science and Technology (NCST) in consultation with various stakeholders and should spell out, among other things, specific sectoral programs for R&D, human resource development and the building S&T capacity. Compliance to the plan from all parties involved would improve the efficiency of Government R&D activities and remove duplication and overlaps on matters of S&T. (Wandiga, S.O.; Awuor, V.; Wanyama, B. & Abuodha, N.L, 2004)

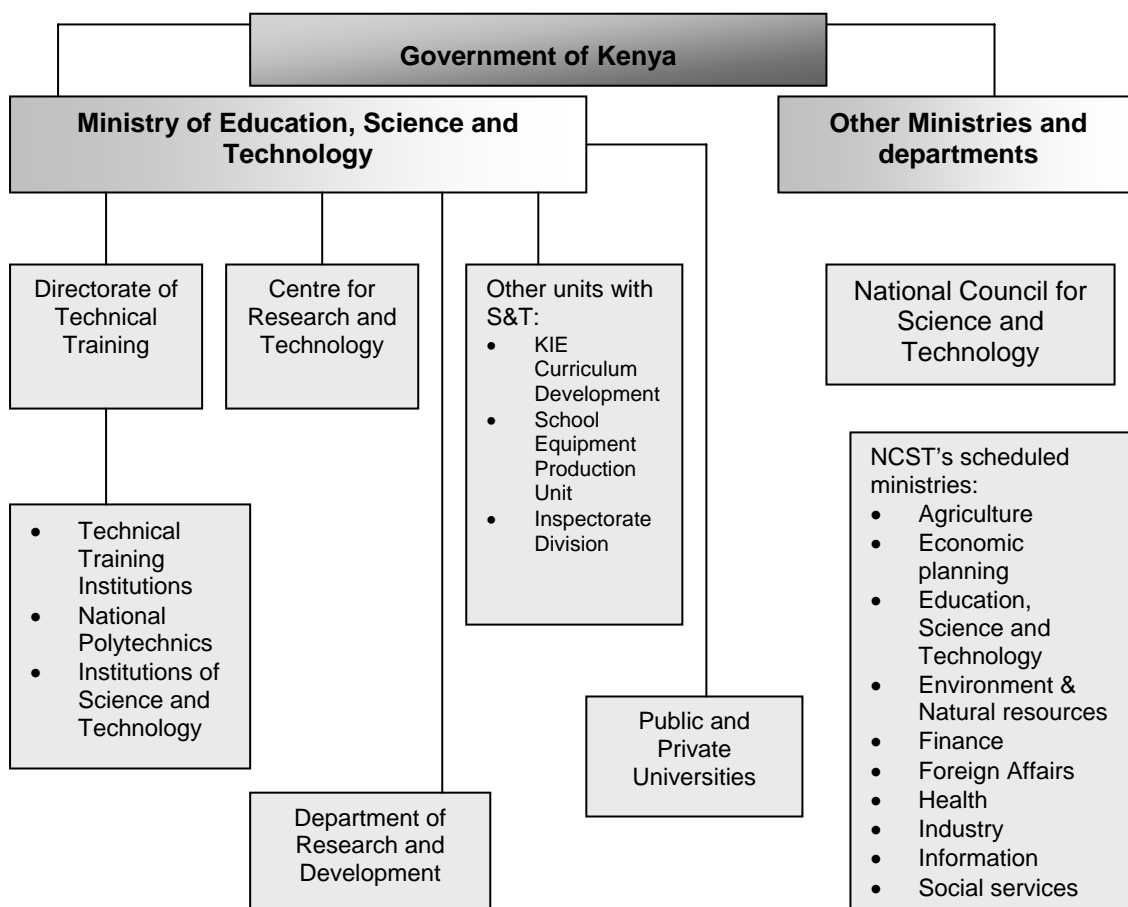
#### **3.1 Governance of science and technology**

<sup>9</sup> Introduction from SCOPE Project

The institutional origins of S&T in Kenya can be traced back to early science and technology programmes of the colonial government, which focused on the agricultural sector, supporting cash crops like coffee, tea, sisal, wheat and livestock. The first research institutions set up were: the Forest Department in 1902, Agricultural Laboratories in 1903, Coffee Research Services in 1910, the Njoro Plant Breeding Station in 1927 and the Tea Research Foundation in 1951. (Wandiga, S.O.; Awuor, V.; Wanyama, B. & Abuodha, N.L, 2004)

An overview of the main institutional developments in the Kenyan Science and Technology landscape, as well as of the major policy initiatives that have taken place, is provided in the appendices attached. Below is a diagrammatic representation of the structure of the research and development in Kenya.

**Figure 1: Structure of the Research and Technology Development (RTD) in Kenya**



Technology policy-making in Kenya is dispersed across four ministries and their various departments as follows:

### 3.1.1 Ministry of Education, Science & Technology

The Ministry of Regional Development, Science and Technology was first 1982, which later became the Ministry of Research, Science and Technology in 1987 and then changed to its current name the Ministry of Education, Science and Technology (MOEST). The MOEST is charged with the overall responsibility of managing science and technology in Kenya. The ministry formulates the national policy on S&T while the NCST undertakes advisory and coordination functions. At a sector level,

however, the management of respective research and technology development (RTD) lies with parent ministries. (Malo, SCOPE)

There is an evident lack of proper coordination and direction of the various components of RTD portfolios in the country. NCST has neither budget control nor authority to direct and coordinate activities of the institutions. The country is largely a consumer of foreign technology due to this and the lack of strategies to promote research in the private sector. (Malo, SCOPE)

There are structural problems with the current organizational management of RTD in Kenya owing to the spread of the S&T activities in many ministries yet the NCST is housed within MOEST. The lack of clear policy on S&T and inadequate provision of resources to the NCST and other S&T institutions spread across many ministries further complicates the steady realization of the country's RTD goals. The specific facets of S&T that are not clearly catered for in the current policy framework and institutional arrangement include:

- Management of Science and Technology
- Computing services
- Social science and humanities research
- Physical sciences
- Biological sciences
- Engineering and Architectural Sciences
- Energy sciences and Technology
- Space sciences (Malo, SCOPE)

Concerning skills training, the country has 4 national polytechnics, 17 institutes of technology, 1 technical teacher's training college and 21 technical training institutes. In addition to the institutions mentioned above, that fall under the auspices of Ministry of Education, Science & Technology, other Government Ministries operate institutions that provide specialized technical training. This makes coordination of their activities and maintenance of training standards difficult as the supervision of most of these institutions is left to individual ministries and private sector that often lack the capacity to assure quality and high standards of training. (Sessional Paper No.\_ of 2004)

### 3.1.2 *Ministry of Tourism, Trade and Industry*

The department's strategic objectives are to provide linkages between the Government and private sector, stakeholders and multi-lateral organizations. These linkages are maintained through 13 consultative committees, which meet at least four times a year.

The Ministry of Tourism, Trade and Industry also aims to facilitate the development of competitive local industries in the following key industrial sectors where Kenya has a comparative advantage:

- Textile and clothing
- Leather and leather products
- Electronics
- Iron and steel
- Pesticide
- Pharmaceutical
- Motor vehicles and spare parts

- Glass, ceramics and other building materials

The department is also required to regularly identify and prepare studies and potential projects for investments in the lead sectors to achieve industrial growth of at least 10% per year. It is also required to increase the participation of indigenous entrepreneurs by organizing sensitisation workshops for at least 3,000 entrepreneurs per year. While promoting 50 local and 20 foreign investments in the industrial sectors per year.

### 3.1.3 *Ministry of Labour and Human Resources Development*

The following are the core functions of the Ministry of Labour and Human Resource Development.

- Promoting harmonious industrial relations in the country.
- Ensuring compliance with national and international labour standards, laws, and codes of practice as well as review labour standards and domestication of international standards.
- Promotion of Occupational Safety and Health Services.
- Human Resource Planning Development, Management and Employment.
- Judicial Determination of Industrial Disputes and Registration of Collective Bargaining Agreements.
- Development of the Micro and Small Enterprises.
- Provision of Labour market information
- Provision of Industrial training

### 3.1.4 *Ministry of Agriculture*

The mission of the Ministry is "To promote sustainable and competitive agriculture through creation of enabling environment and provision of support services, to enhance food security, incomes and employment." The Strategic Plan (2006–2010) sets the goals and strategies that the Ministry will pursue over the next five years. It is a commitment by the Ministry to improve service delivery in line with national aspirations. The Strategy for Revitalising Agriculture (SRA; 2004–2014) presents strategic interventions, which will transform agriculture into a competitive and commercially oriented enterprise. ([www.kilim.go.ke](http://www.kilim.go.ke).)

The Ministry's core functions include:

- Formulation, implementation and monitoring of agricultural legislation, regulation and policies.
- Provision of agricultural extension services
- Supporting agricultural research and promoting technology delivery
- Facilitating and representing agricultural state corporations in the Government
- Development, implementation and coordination of programmes in the agriculture sector
- Regulating and quality control of inputs, produce and products from the agriculture sector
- Management and control of pests and diseases in crops
- Promoting management and conservation of the natural resource base for agriculture
- Collecting, maintaining and managing information on the agriculture sector

The overlapping jurisdictions lend to territorial conflicts. They tend to limit interdepartmental communication and stifle coherence and coordination in decision-making. Such a lack of coherence

and coordination in technology policies inhibits dynamic decision-making, especially in mounting timely strategic response to changing market conditions, such as liberalization and globalization. A body capable of analyzing technology needs at the broad economic level; designing strategies that cut across many ministerial and departmental lines; and, finally, implementing those strategies, is essential for improving Governments strategy-making capabilities. (UNCTAD/ITE/IPC/Misc.13, 2003)

### 3.1.5 *Science and technology priorities*

Since the enactment of the Science and Technology Act, Cap 255 in 1997, many changes have occurred in the national and international fronts that have had an influence on the national pursuit of science and technology. New technologies with pervasive influence on economies and geopolitical systems have emerged. Liberalization of economies is taking place and so is the complex and uncertain process of globalisation. In view of these occurrences, countries that wish to integrate into the liberalized global knowledge-based economic system and effectively manage the process of globalisation require to put in place new or revised science and technology policies. (Wandiga, S.O.; Awuor, V.; Wanyama, B. & Abuodha, N.L. (2004))

Despite the changes that clearly pose national welfare concerns and having significant implication for science and technology, Kenya is yet to strengthen her S&T policy framework and put adequate response mechanisms that place a premium on science and technology. In an address to a policy forum to mark the 2002 Science Revival Day, the then Minister of Science and Technology observed that although science and technology have important contribution to make in addressing the priority government efforts in poverty reduction and economic recovery, the Kenyan science and technology have realized limited development and therefore is of poor status in comparison with those of the new industrialized countries of Asia. The observation implies that in its status, S&T cannot be effectively deployed in such priority pursuits unless improved and re-invigorated. (Wandiga, S.O.; Awuor, V.; Wanyama, B. & Abuodha, N.L. (2004))

The national research priority areas that have been formulated by the National Council for Science and Technology are as follows:

- Agricultural Sciences
- Health Sciences
- Industrial Sciences
- Natural and Physical Sciences
- Social Sciences

These priority areas were established in 1989, and are therefore rather outdated. The National Council for Science and Technology has not produced updated priority areas since then.

### 3.1.5.1 Information and Communication Technologies (ICTs)

The Government recognizes the role of ICTS in the social and economic development of the nation and has promulgated a national ICT Policy based on the Economic Recovery Strategy for Wealth and Employment Creation (2003-2007).

This policy seeks 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. The policy is based on four guiding principles: infrastructure development, human resource development, stakeholder participation and appropriate policy and regulatory framework.

Kenya has witnessed significant growth in the ICT sector as demonstrated by the number of telephone lines, Internet Service Providers (ISPs), the number of internet users, broadcasting stations, and market share of each of them. The Government has liberalized the mobile cellular market and currently, there are two mobile cellular operators.

## 3.2 Science and technology landscape

### 3.2.1 S&T agencies

The institutional landscape defining the RTD set-up of the country is comprised of research funding, training, performing and utilizing organizations.

**Table 5: Summary of Key S&T Agencies and Functions**

Agency	Established	Function
National Council for Science & Technology	1977	Advisory body to the Government on matters of Science & Technology
Commission for Higher Education		Co-ordination and regulation of the university education

#### 3.2.1.1 National Council for Science and Technology

The need to have a mechanism through which scientific activities could be co-ordinated and promoted culminated in the enactment of the Science and Technology Act in 1977. The Act established the National Council for Science and Technology (NCST) to serve as an advisory body to the Government on matters of science and technology. (Wandiga, S.O.; Awuor, V.; Wanyama, B. & Abuodha, N.L., 2004)

The main consumers of the research and technology general by the country's RTD system include government ministries through their extension and public service activities, industry for manufacture and promotion of their goods and services, legislature for informing debate and law as well as policy reforms. (Malo, SCOPE)

#### 3.2.1.2 Commission for Higher Education

The Commission regulates and coordinates university and post-secondary education and training. The Commission is responsible for the accreditation of private universities and post-secondary institutions.

### 3.2.2 R&D performing institutes

The R&D performing institutions in Kenya may be categorized in the higher education sector institutions, public sector research and technology institutes as well as private sector research institutes. The institutions currently engaged in active research and technology development are Universities; specialized (sector based) government or donor sponsored institutions (KEMRI etc); international research and technology development institutes (ICRAF, ITDG, ICIPE, ILRI). Individual companies also have research units that engage in research by employees or external consultants. Individuals, and professional bodies like the Kenya National Academy of Sciences (KNAS) as well as regional bodies like ACTS, IGAD, EAC and other professional and academic networks also carry out specialized research. (Malo, SCOPE)

#### 3.2.2.1 Higher Education Sector

Enrolment and growth of universities have been increasing since the establishment of the first Kenyan university, the University of Nairobi, in 1970. There are six public universities and 13 recognized private universities. The Kenyan post-secondary educational institutions are largely orientated towards general arts and sciences, with technical and engineering enrolments constituting a small part of the total. (Wignaraja & Ikiara, 1999). The three premier institutions for training technical work force are Kenya Polytechnic and the Departments of Engineering of the University of Nairobi and the Jomo Kenyatta University of Agriculture and Technology. All three universities have a small number of engineering graduates. Kenya Polytechnic is the leader for middle-level technical work force, producing diploma holders in the mechanical, electrical, automotive, aeronautical, telecommunications, building and civil engineering fields. (UNCTAD/ITE/IPC/Misc.13, 2003)

Apart from training, most of these technical institutes provide little or no research or technical service to industry. A recent survey revealed that the proportion of research and development to total university budgets had declined from an average of 1% in the 1980s to around 0.5% in the 1990s. The institutions directly involved with technology development are poorly funded. Staff members have few incentives to work on industrial technological problems or interact with firms. Their administrative structures and facilities do not encourage them to do such work, and laboratory facilities are poor. Low salaries make it difficult to recruit or retain good staffers. Furthermore, there are no funds available for commercializing research findings. (UNCTAD/ITE/IPC/Misc.13, 2003)

##### 3.2.2.1.1 Public Universities

Egerton University, the oldest institution of higher learning in Kenya, has a long tradition of scholarship and academic excellence. Founded in 1939, the institution traces its roots to the generosity of Lord Maurice Egerton of Tatton who donated 300 hectares (740 acres) of his estate. Lord Egerton had bought the land from Lord Delamere. Originally, it was a school for training white European youth for careers in agriculture. It was known as Egerton Farm School. The Lord Egerton name has been bequeathed to the University, in addition to the family coat of arms, *Sic Donec* (Thus Until), which has continued as the University motto. In 1979, the Government of Kenya and USAID funded the expansion of College. The Agricultural College was gazetted as a constituent college of the University of Nairobi in 1986 and 1987; the University was established as a full-fledged University by an Act of Parliament. Today, the University has expanded to include Laikipia, Kisii, Kenyatta and Nakuru Town Campuses. ([www.egerton.ac.ke](http://www.egerton.ac.ke).)

Egerton University in Mombasa organized a planning workshop in 1990 that was attended by stakeholders in agriculture and the university sector. Among the important recommendations made were that Egerton should embark as soon as possible on:

- Establishing a strong research programme to complement teaching. The research programme was to be accompanied by an outreach and dissemination programme for research results to be implemented by the beneficiaries.
- Establishing strong linkages with relevant institutions in education and research for collaborative purposes and exchange of information.
- Establishing a strong relationship with agricultural and other industries in the economy for purposes of practical training of students, providing opportunities for research, outreach, and exchange of information.) ([www.egerton.ac.ke](http://www.egerton.ac.ke).)

In pursuit of these recommendations, the Research Division of the University recommended the establishment of Tegemeo Institute. Tegemeo's mandate was to address the problems of management of agriculture and natural resources with specific reference to policy. The institute was expected to be a self-financing referral centre for the most comprehensive and authoritative data and information on agricultural policy. This explains the descriptive name, 'Tegemeo', meaning self reliant and dependable. With the institute established, a vehicle was created to transform the Policy Analysis Matrix (PAM) project into the Tegemeo Institute of Agricultural Policy and Development. Today Tegemeo is widely recognized as the centre of excellence in agricultural policy research and analysis in Kenya. ([www.egerton.ac.ke](http://www.egerton.ac.ke).)

Over the last 11 years, the institute has been funded consistently by the United States Agency for International Development (USAID), but seeks to diversify sources of funding. Recent partnerships have been with the World Bank, Rockefeller Foundation, Ford Foundation, DFID, KARI, FAO, IEA, Michigan State University, the State University of New York, Clark University, the University of Georgia and Makerere University. ([www.egerton.ac.ke](http://www.egerton.ac.ke).)

Jomo Kenyatta University of Agriculture and Technology (JKUAT) is situated in Juja, 36Kms Northeast of Nairobi. The institution was started in 1981, as a middle level college, awarding diploma certificates in Agricultural Engineering, Food Technology, Horticulture, Civil, Mechanical and Electrical Engineering. In 1988, the then Jomo Kenyatta College became a constituent college of Kenyatta University and in 1994; it was transformed into a University through an Act of Parliament. ([www.jkuat.ac.ke](http://www.jkuat.ac.ke).)

JKUAT's Mission is to be a leading University in Training, Research and Innovation in the fields of Agriculture, Engineering, Applied Sciences, Technology, and Enterprise Development to suit the needs of a dynamic World". The University's Vision is to become a "World-class institution for Development". ([www.jkuat.ac.ke](http://www.jkuat.ac.ke).)

Currently, the University has three faculties and a school. The faculties' are Agriculture, Engineering, Science and the School of Architecture and Building Sciences. It also has various institutes and centres, which offer market-driven courses. In response to changing market demands, new undergraduate programmes were developed in various faculties to meet the challenges. The new curriculum includes programmes such as Geomatic, Mechatronic and Electronics and Computer Engineering. Others are, Food Science and Nutrition, Biomechanical and Processing Engineering; Soil, Water and Environmental Engineering and Ornamental Science and Landscaping. ([www.jkuat.ac.ke](http://www.jkuat.ac.ke).)

In coming decades, teaching, learning and research facilities will be expanded to create a more enabling environment. All stakeholders will be involved and consulted in the planning and implementation of the projected programmes. However, JKUAT like any other universities in the world

is faced with pressure to expand its students' enrolment due to its popularity, location, countrywide service and indeed the entire region. This has led to lack of space in the accommodation of students. On the teaching front, resources are an issue. Most courses are under-funded by over 60 percent in unit cost. Engineering, Architecture and Agriculture courses require intensive input in terms of resources and cannot be compared to humanities-related programmes in other universities. Currently the government gives Kshs. 120,000 per student per year to all universities and yet Kshs. 500,000 is required per student per year. ([www.jkuat.ac.ke](http://www.jkuat.ac.ke).)

**Kenyatta University** is situated about 23 kilometres from the city of Nairobi on the Nairobi-Thika dual carriageway on 1,100 acres of land. The long journey to University status started in 1965 when the British Government handed over the Templer Barracks to the Kenya Government. These were converted into an institution of higher learning known as Kenyatta College. Initially, Kenyatta College was divided into two sections, the Secondary Education Division (SED) and the Teacher Education Division (TED). The Secondary Education Division had classes from Form I to Form VI. Forms I and IV and the Advanced level Arts classes were phased out in 1969 to give way to seven Advanced level Science classes, which earned the institution high reputation for its excellent performance in the Advanced level examinations. It became the main supplier of undergraduates in Science oriented courses at the University of Nairobi where they performed extremely well. The Secondary Education Division was phased out in 1973. ([www.ku.ac.ke](http://www.ku.ac.ke).)

Following an Act of Parliament of 1970, Kenyatta College became a constituent College of the University of Nairobi. Consequently, the name changed from Kenyatta College to Kenyatta University College. It admitted its first batch of 200 students in 1972 to pursue studies leading to the award of the Bachelor of Education degree of the University of Nairobi. Certificate courses were phased out by 1975 to give way to the Bachelor of Education degree programme and a two-year undergraduate Diploma in Education programme. The Diploma programme was implemented to alleviate an acute shortage of Science and special subjects (Kiswahili, Music, Fine Art etc.) teachers in the Secondary Schools. There were insufficient number of students with degree entry qualifications and no degree programmes existed then in some of those areas. In July 1978, the Government transferred the Faculty of Education of the University of Nairobi to Kenyatta University College Campus. As a result, the College became the only institution-training teachers at both undergraduate and postgraduate levels. ([www.ku.ac.ke](http://www.ku.ac.ke).)

The University status was achieved on August 23, 1985, when the Kenyatta University Act received Presidential assent making the Institution a full - fledged University. The Act became operational on September 1, 1985 and the new University was inaugurated on December 17, 1985. Kenyatta University immediately started establishing new Faculties and constituent colleges. In this pursuit, Jomo Kenyatta College of Agriculture and Technology (JKUAT) became a constituent College of Kenyatta University in 1988 before becoming a full-fledged university. ([www.ku.ac.ke](http://www.ku.ac.ke).)

The inception of the **University of Nairobi** is traced back to 1956, with the establishment of the Royal Technical College that admitted its first lot of A-level graduates for technical courses in April the same year. The Royal Technical College was transformed into the second University College in East Africa on 25th June 1961 under the name Royal College Nairobi and was admitted into a special relation with the University of London whereupon it immediately began preparing students in the faculties of Arts, Science and Engineering for award degrees of the University of London. Meanwhile, students in other faculties such as the Faculty of Special Professional Studies (later renamed Faculty of Commerce) and Faculty of Architecture continued to offer diplomas for qualifications of professional bodies/ institutions. ([www.uon.ac.ke](http://www.uon.ac.ke).)

On 20 May 1964, the Royal College Nairobi was renamed University College Nairobi as a constituent college of inter-territorial, Federal University of East Africa, and henceforth the enrolled students were to study for degrees of the University of East Africa and not London as was the case before. In 1970, the University College Nairobi transformed into the first national university in Kenya and was renamed the University of Nairobi. ([www.uon.ac.ke](http://www.uon.ac.ke).)

In view of the rapid expansion and complexities in administration, the University underwent a major restructuring in 1983 resulting in decentralization of the administration, by creation of six (6) campus colleges headed by principals. The following are the names and respective locations of the colleges:

- College of Agriculture & Veterinary Sciences situated at Upper Kabete Campus
- College of Architecture & Engineering situated at the Main Campus
- College of Biological & Physical Sciences situated at Chiromo Campus
- College of Education & External Studies situated at Kikuyu Campus
- College of Health Sciences situated at the Kenyatta National Hospital
- College of Humanities and Social sciences situated at the Main Campus -Faculty of Arts; Parklands-Faculty of Law; Lower Kabete Campus -Faculty of Commerce. ([www.uon.ac.ke](http://www.uon.ac.ke))

Moi University is located in Eldoret, a distance of 310 Kilometres Northwest of Nairobi, the capital city of Kenya. It was established as the second Public University in Kenya by an Act of Parliament, the Moi University Act of 1984. Moi University was established as an institution of Science and Technology with relatively small component of arts based programmes. The first group of 83 students was admitted in 1984 through a transfer from the Department of Forestry, University of Nairobi. It was the first department in the pioneer Faculty of Forest Resources and Wildlife Management. ([www.mu.ac.ke](http://www.mu.ac.ke))

Since then, the University has experienced phenomenal growth from the initial one faculty in 1984 to 13 Schools in 2006 spread across the campuses of Moi University. Moi University has three campuses (Main Campus, Chepkoilel Campus, Town Campus), two satellite campuses in Nairobi and Kitale and a constituent college (Western University of Science & Technology (WUST)). ([www.mu.ac.ke](http://www.mu.ac.ke).)

The University has modern teaching facilities that support academic programmes: Margaret Thatcher Library, the Moi Teaching and Referral Hospital, Seed Testing Laboratory and Water Resource Engineering Laboratory and the Fish Farm. ([www.mu.ac.ke](http://www.mu.ac.ke).)

Maseno University is a monument in Western Kenya that crowns the Education enterprise at Maseno for 100 years. Currently Mr. William Wamalwa is the Chancellor. Maseno became a full-fledged university in January 2001 through Maseno University Act. The University boasts as the only institution located along the equator and 15km off the shores of Lake Victoria. ([www.maseno.ac.ke](http://www.maseno.ac.ke).)

The actual location of Maseno is at Maseno Township along Kisumu Busia road, some 25km from Kisumu and 400km from Nairobi. The university offers various courses in undergraduate and postgraduate programmes. ([www.maseno.ac.ke](http://www.maseno.ac.ke).)

### 3.2.2.1.2 Private Universities

- Africa Nazarene University
- Daystar University
- Catholic University of Eastern Africa
- Kabarak University
- Kenya Methodist University
- Kiriri Women University of Science and Technology
- St Paul's United Theological College
- Scott Theological College
- Strathmore University
- University of Eastern Africa Baraton
- United States International University- Kenya
- The Aga Khan University
- The East Africa School of Theology
- The Kenya Highlands Bible College
- The Nairobi Evangelical Graduate Scholl of Theology
- The Nairobi International School of Theology
- The Pan Africa Christian College

Roughly, 80% of the student population are enrolled in public universities, while 20% of the total university student population attends private universities.

Mombasa Polytechnic has passed through three distinct phases to become what it is now. The institution has been offering technical education to students pursuing professional courses in the various fields of Engineering, Applied Sciences, Commerce and now Entrepreneurship. ([www.mombasapoly.ac.ke](http://www.mombasapoly.ac.ke).)

The origin of the Mombasa Polytechnic can be traced back to the late 1940's as a consequence of the consultations pioneered by Sir Philip Mitchell in 1948 between The Aga Khan, the sultan of Zanzibar, The Secretary of State for the colonies, Sir Bernard Reilly and H.M. Treasury, Mombasa Institute of Muslim Education (M.I.O.M.E) was founded from capital raised by means of gifts of £100,000 from Sultan of Zanzibar. A further £50,000 was raised by the Bohora Community of East Africa at the insistence of Doctor Sayedna Taher Saifuddin, the high priest of the community. ([www.mombasapoly.ac.ke](http://www.mombasapoly.ac.ke).)

In 1966, M.I.O.M.E became Mombasa Technical Institute (M.T.I.) and started to admit any qualified Kenyan regardless of their religious backgrounds. In order to comply with the newly set educational policies of the independent Kenya, the curriculum of the institute was restructured and more courses introduced. In addition to Civil engineering, Electrical and Mechanical engineering, M.T.I. introduced higher calibre courses in Business Studies as well as Mathematics and Applied Sciences. Indeed this set up provided the necessary academic foundation from which The Mombasa Polytechnic has grown. M.T.I. became The Mombasa Polytechnic in 1972, this being the second National Polytechnic. Since then, the Polytechnic has expanded its operations in all directions and dimensions. ([www.mombasapoly.ac.ke](http://www.mombasapoly.ac.ke).)

By 1985, The Polytechnic had five fully-fledged departments namely; Business Studies, Electrical and Electronics Engineering, Building and Civil Engineering, Mechanical Engineering and Applied Sciences. During the period 1986 to-date, six more academic departments have been formed namely; Medical Engineering, Computing and Information Technology, Enterprise and Development Centre, Media and Graphic Design, Management Information System (M.I.S.) and Library. Currently the Mombasa Polytechnic is offering over ninety academic programmes in different trade areas. ([www.mombasapoly.ac.ke](http://www.mombasapoly.ac.ke).)

The expected status and role of National Polytechnics in the technological growth and development of this country is clearly spelt out in the Report on Education and work force Training for the next Decade and Beyond whose recommendations were accepted by the Government through the sessional paper No. 6 of 1988. As per these recommendations, the facilities in the National Polytechnics are therefore required to expand their training programmes to Bachelor of Technology (BTech.) degree level. ([www.mombasapoly.ac.ke](http://www.mombasapoly.ac.ke).)

### 3.2.2.2 *Public Research Institutes*

Kenya Agricultural Research Institute (KARI) was established in 1979 as a semi-autonomous government institution through the amendment of the Science and Technology Act Cap 250, following the collapse of the East African Community (EAC) in 1977. The new institute took over research activities from the East African Agricultural and Forestry Research Organisation (EAAFRO), East African Veterinary Research Organisation (EAAVRO) and later the Ministries of Agriculture and Livestock Development. Further, in 1986 the Kenyan government recognized the challenge to meet long-term food production constraints in the country as recognized in Sessional Paper No. 1 of 1986 entitled "Economic management for renewed growth." More recently, the Kenya Veterinary Vaccines Production Institute (KEVEVAPI) and the Kenya Trypanosomiasis Research Institute (KETRI) have been integrated into KARI. The government has recognized the need to further strengthen its agricultural research system by placing these research centres under KARI to create an institutional framework to effectively manage, reorganise and consolidate agricultural research within the country. (<http://www.kari.org/Default.htm>)

The Kenya Agricultural Research Institute (KARI) is a premier national institution bringing together research programmes in food crops, horticultural and industrial crops, livestock and range management, land and water management, and socio-economics. KARI promotes sound agricultural research, technology generation and dissemination, food security through improved productivity and environmental conservation. (<http://www.kari.org/Default.htm>)

The Kenya Forestry Research Institute (KEFRI) was established in June 1986 by an Act of Parliament to undertake forestry research and development (R&D). The mandate of KEFRI is to:

- Conduct research in forestry
- Disseminate research findings
- Co-operate with other research bodies within and outside Kenya carrying out similar research
- Liaise with other organizations and institutions of higher learning in training and on matters of forestry research.

KEFRI implements its research through four research programmes: Farm Forestry, Natural Forests, Dryland Forests, Plantation Forests and one Service Programme mainly dealing with information documentation and dissemination. KEFRI has six research Centres namely: Muguga, Karura, Kitui, Gede, Londiani and Maseno. The headquarters is located in Kikuyu Division, Kiambu District, Central Province about 25km northwest of Nairobi city and two kilometres off the Nairobi-Naivasha Nakuru highway. ([www.kefri.org](http://www.kefri.org).)

The Kenya Industrial Research and Development Institute (KIRDI) is a technology development and management agency of the Government, which operates under the ambit of the Ministry of Trade and Industry. The Kenya Industrial Research and Development Institute (KIRDI) was established and incorporated under the Science & Technology Act Cap. 250 in 1979. ([www.kirdi.gov.ke](http://www.kirdi.gov.ke))

The Institute's history however dates back to 1942, when the then Colonial Government set up a central laboratory at Kabete, Nairobi. The laboratory's aim was to initiate and develop industries to relieve the industrial goods shortages that caused by the Second World War. At that time, the Kenya Industrial Management Board (KIMBO) administered the laboratory. Later, as the laboratory expanded its management was taken over by the East African Community (EAC), and was renamed East African Industrial Research Organization (EAIRO). EAIRO, the predecessor of the present day KIRDI, had Centres in Kenya, Uganda and Tanzania, ceased operations in 1977 following the collapse of the then East African Community. The National Industrial Research Complex under the Ministry of Commerce and Industry subsequently took up its operations. In 1979, the Act of Parliament establishing the National Council for Science & Technology (NCST) was amended to establish five Research Institutes, KIRDI being one of them. ([www.kirdi.gov.ke](http://www.kirdi.gov.ke))

As a national research body, KIRDI's mandate is to undertake multidisciplinary research and development in industrial and allied technologies.

This financial year (2005/2006), the Institute is undertaking the following projects:

- An Integrated Approach to Prevent Ota Contamination during Post Harvest Processing of Coffee in East Africa.
- Dissemination of Beekeeping and Honey Processing Technologies.
- Baseline Study and Market Survey of the Status of the Energy Efficiency Standards in Kenya.
- Distribution and Bioavailability Assessment of Heavy Metals in Sediments from Lake Naivasha, Kenya.
- Improvement of ICT- Based Information Systems for KIRDI Phase IV.
- Eastern Province Horticulture and Traditional Food Crops (EPHTFCP -IFAD Project).
- Commercial Utilization of Kirdi Food Pilot Plant.
- Utilization of Rice Straw in Mushroom Production Technology.
- Distribution and Partitioning Of Nutrients from the Lake Naivasha Basin.
- Quality Management and Control Using Nuclear and Related Technologies
- Dissemination of the Rice Thresher Prototype Developed at EDSC in Mwea Irrigation Scheme. ([www.kirdi.gov.ke](http://www.kirdi.gov.ke))

The Kenya Bureau of Standards (KEBS) was established by an Act of parliament, The Standard Act, and chapter 496 of the Laws of Kenya. It started its operations in July 1974. The KEBS Board of Directors is known as the National Standards Council (NSC). It is the policy-making body for supervising and controlling the administration and financial management of the Bureau. The Managing Director is the Chief Executive responsible for the day-to-day administration of the Bureau within the broad guidelines formulated by the NSC. The aims and objectives of KEBS include preparation of standards relating to products, measurements, materials, processes, etc. and their promotion at national, regional and international levels; certification of industrial products; assistance in the production of quality goods; quality inspection of imports at ports of entry; improvement of measurement accuracies and dissemination of information relating to standards. ([www.kebs.org](http://www.kebs.org))

To keep close liaison with and render efficient service to industry, trade and commerce in different parts of the country, KEBS has opened Regional Offices in Mombasa, Kisumu and Eldoret. The Bureau has plans to open more Regional Offices in other parts of the country. ([www.kebs.org](http://www.kebs.org))

Kenya Institute for Public Policy Research and Analysis (KIPPRA) is a Semi-Autonomous Government Agency (SAGA) set up to provide quality public policy advice to the Government of Kenya and the public generally, by conducting objective research and analysis as well as contributing to Capacity Building through internship. ([www.kippira.org](http://www.kippira.org))

The Institute contributes to improved public policy making and implementation by:

- Conducting objective public policy research and analysis; Informing and providing advice during policy-making process; Building capacity of the Government of Kenya to absorb, undertake and analyse public policy; Strengthening working modalities with the Government of Kenya and other stakeholders; and
- Enhancing KIPPRA's institutional capacity to effectively support the policy process.

KIPPRA is therefore a central source of information and advice on a wide range of policy issues. The Institute's primary activity is research. There are five broad primary research Divisions: Macroeconomics, Productive Sector, Social Sector, Infrastructure and Economic Services and the Private Sector Development Divisions. ([www.kippira.org](http://www.kippira.org))

The Kenya Medical Research Institute (KEMRI) was established in 1979 under the Science and Technology (Amendment) Act of that year to represent the national body responsible for carrying out health science research in Kenya. Prior to the establishment of KEMRI, health research in Kenya was conducted under the auspices of the East African Medical Research Council, which had been established in 1957 to serve the countries of the East African Community. ([www.kemri.org](http://www.kemri.org))

KEMRI has consolidated its research activities into the following main programmes:

<p><b>Infectious Diseases</b></p> <p>This programme aims at the reduction of the disease burden due to infectious agents and in particular due to HIV/AIDS and related infections. It also emphasizes on research on opportunistic infections; tuberculosis, sexually transmitted infections, viral hepatitis, acute respiratory infections, drug development and management. The programme mainly focuses on the epidemiology, immunology, molecular biology, virology, microbiology, prevention and control of infectious diseases</p>	<p><b>Biotechnology and Non-Communicable Diseases</b></p> <p>The focus of this programme is the development and promotion of modern biotechnological techniques in molecular biology for production of pharmaceuticals, biologicals and for other applications for use in the promotion of health.</p>
<p><b>Parasitic Diseases</b></p> <p>The programme aims at the reduction of disease burden due to parasitic infections and particularly due to malaria, schistosomiasis, leishmaniasis, filariasis and intestinal parasites.</p>	<p><b>Epidemiology, Public Health and Health Systems Research</b></p> <p>The programme is mandated to define and investigate the incidences and prevalence of diseases and health issues of major public health importance and develop strategies for promotion of better health.</p>

### 3.2.2.3 Private Research Institutes

Kenya's recognition of the importance of S&T has attracted the establishment of international research facilities to augment the S&T capacity of the country. The most conspicuous of these international institutions are the International Livestock Research Institute (ILRI), the International Centre for Research in Agro Forestry (ICRAF), the International Centre for Insect Physiology and Ecology (ICIPE) and the African Centre for Science and Technology Studies (ACTS).

The International Livestock Research Institute (ILRI) works at the crossroads of livestock and poverty, bringing high-quality science and capacity building to bear on poverty reduction and sustainable development. ILRI works in Africa, Asia and Latin America and the Caribbean, with offices in East and West Africa, South and Southeast Asia, China and Central America, and projects in Southern Africa, North Africa and the Near East. ([www.ilri.org](http://www.ilri.org))

ILRI is a non-profit-making and non-governmental organization with headquarters in Nairobi, Kenya, and a second principal campus in Addis Ababa, Ethiopia. They employ over 700 staff from about 40 countries. About 80 staff are recruited through international competitions and represent some 30 disciplines. Around 600 staff is recruited nationally, largely from Kenya and Ethiopia. ([www.ilri.org](http://www.ilri.org)) ILRI is funded by more than 60 private, public and government organizations of the North and South. The institute's expenditure for 2004 was US\$34.9 million. Some donors support ILRI with core and program funds whereas others finance individual research projects. In-kind support from national partners such as Kenya and Ethiopia, as well as that from international collaborators, is substantial and vital. This mix of generic, specific and in-kind resources is essential for the partnership research we conduct. ([www.ilri.org](http://www.ilri.org))

The International Council for Research in Agroforestry (ICRAF) was created in response to a visionary study in the mid-1970s led by forester John Bene of Canada's International Development Research Centre (IDRC). The study coined the term 'agroforestry' and called for global recognition of the key role trees play on farms. This led to the establishment of ICRAF in 1978 to promote agroforestry research in developing countries. ([www.worldagroforestry.org/](http://www.worldagroforestry.org/))

During the 1980s, ICRAF operated as an information council focused on Africa. It joined the Consultative Group on International Agricultural Research (CGIAR) in 1991 to conduct strategic research on agroforestry at a global scale, changing its name from Council to Centre. After joining the CGIAR, the Centre explicitly linked its work to the goals of the CGIAR - reducing poverty, increasing food security and improving the environment - through two means: overcoming land depletion in smallholder farms of sub humid and semi-arid Africa, and searching for alternatives to slash-and-burn agriculture at the margins of the humid tropical forests. In implementing this strategy, the Centre expanded into South America and Southeast Asia while strengthening its activities in Africa. ([www.worldagroforestry.org/](http://www.worldagroforestry.org/))

ICRAF continued the process of institutional transformation by developing a science culture, building excellent research facilities and doubling its financial and human resources by 1996.

In 2002, the Centre acquired the brand name the 'World Agroforestry Centre'. The 'International Centre for Research in Agroforestry' remains their legal name and they continue to use the acronym 'ICRAF'. The new name reflects the fact that the Centre is now recognized as the international leader in agroforestry research and development. ([www.worldagroforestry.org/](http://www.worldagroforestry.org/))

International Centre for Insect Physiology and Ecology (ICIPE) is an organisation with a tropical agenda. Established in Kenya in 1970, ICIPE's founders recognised that the mainly developing countries in the tropics had special problems that were not adequately addressed by scientists and organisations in the North. Furthermore, there was a serious lack of indigenous expertise to resolve these problems. It should come as no surprise therefore that ICIPE's objectives for this millennium are essentially the same as they were three decades ago:

- To help ensure food security and better health for humankind and its livestock;
- To protect the environment;
- To conserve and make better use of natural resources ([www.icipe.org/](http://www.icipe.org/))

ICIPE is engaged in 'tropical insect science for development'. Together with partners, ICIPE searches for 'effective prevention and smart cures' to help bring about food security, sustainable livelihoods, good health and sustainable use of natural resources for peoples of the tropics. ICIPE develops solutions to the problems of the peoples of the tropics that are appropriate, affordable, accessible and acceptable. ICIPE searches for and develops environmentally safe integrated pest and vector management options that eschew the use of pesticides and synthetic chemicals wherever possible. ICIPE builds capacity of individuals and institutions in the tropics to solve their own problems. ([www.icipe.org/](http://www.icipe.org/))

Much of the basic strategic research is conducted at ICIPE's international headquarters on the Duduville campus in Kasarani, Nairobi, with fieldwork being conducted at the major research and training field station at Mbita Point on the shores of Lake Victoria. Four other field sites in Kenya and at Port Sudan on the Red Sea coast ensure that the Centre's research and development work spans every type of ecosystem and habitat found in the tropics. ([www.icipe.org/](http://www.icipe.org/))

In southern Ethiopia, the BioVillage Initiative brings together many of ICIPE's innovative 4-H concepts for improved living into a holistic package that includes components for the control of crop pests, mosquitoes and tsetse, as well as energy conservation and poverty alleviation through insect-based income generating activities. ([www.icipe.org/](http://www.icipe.org/))

The African Centre for Technology Studies (ACTS) is a Nairobi-based international intergovernmental science, technology and environment policy think-tank that generates and disseminates new

knowledge through policy analysis, advocacy and outreach. The Centre's mission is to *strengthen the capacity of African countries and institutions to harness science and technology for sustainable development*. They strive to rationalize scientific and technological information to enable African countries make effective policy choices for improved living standards. ACTS works with partners and networks including academic and research institutions, national governments, UN bodies, regional and international processes and NGOs. ACTS' research and capacity building activities are organized in five programmatic areas: Biodiversity and Environmental Governance; Energy and Water Security; Agriculture and Food Security; Human Health; and Science and Technology Literacy. Its member states are Kenya, Malawi, Malta, Uganda and Ghana. The International Centre for Research in Agroforestry (ICRAF) and the Third World Academy of Sciences (TWAS) are also founding members of ACTS. ([www.acts.or.ke](http://www.acts.or.ke).)

### 3.3 Human capital for S&T

The availability of science and engineers as well as other relevant professionals in any research and innovation system cannot be overemphasized. Generating a critical mass of scientists and technicians is integral to any development strategy. In this regard, Kenya's higher education sector has contributed to the nurturing of the scientific workforce in the country. For instance, the total enrolment in public universities has increased from 3,443 students in 1970 to 58,017 students (18,317 females and 39,700 males) in 2003/4. In private universities the total enrolment for 2003/4 was 9,540 students (5,128 females and 4,412 males), while the officially known number of Kenyans attending foreign universities is 5,123 students. In the 2003-4 academic year, the total number of those enrolled in public and private universities rose to 67,556. However, despite the rise in enrolments, the transition rate from secondary level to university remains low, at 12%. Regarding gender parity, female students constitute 32% of the total enrolment in public universities and 54% in private universities. (Sessional Paper No.\_ of 2004)

**Table 6: Student Enrolment by Gender in Universities, 1999/2000 - 2003/2004**

Institutions	1999/2000		2000/2001		2001/2002		2002/2003		2003/2004*	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Nairobi	8,419	3,523	8,383	3,341	10,638	4,345	10,737	4,623	9,603	4,406
Kenyatta	4,188	3,008	4,510	3,019	10,638	4,314	10,737	4,998	10,753	5,023
Moi	3,483	2,312	4,753	1,960	5,469	2,310	6,275	2,638	5,804	2,812
Egerton	7,131	2,842	5,998	1,968	6,816	2,284	6,975	2,387	6,908	2,444
Jomo Kenyatta (JKUAT)	2,511	626	2,992	1,288	2,565	1,115	3,184	1,404	3,203	1,454
Maseno	2,338	1,385	2,596	1,538	2,531	1,518	3,505	2,130	3,429	2,178
Public Total	28,070	13,696	29,232	13,114	38,656	15,887	41,412	18,181	39,699	18,317

Table 6 Continued

Institutions	1999/2000		2000/2001		2001/2002		2002/2003		2003/2004*	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Private										
Private Accredited	3,186	3,816	3,093	4,050	3,122	4,089	3,476	4,163	3,650	4,371
Private Unaccredited	777	346	876	472	949	511	748	742	763	757
Private Total	3,963	4,162	3,968	4,521	4,071	4,600	4,224	4,905	4,412	5,128
TOTAL	32,033	17,858	33,200	17,636	42,727	20,486	45,635	23,086	44,111	23,445
Grand Total	49,891		50,836		63,214		68,721		67,556	

\*Provisional

Source: Ministry of Ministry of Education, Science and Technology

### 3.3.1 Size and structure of the R&D workforce

According to the UNESCO Science Report (2005), Kenya had 1800 staff in higher education, and 600 full-time researchers in the public sector. There are 35 researchers per one million inhabitants in Kenya.

**Table 7: Scientific Indicators for Kenya: Researchers**

Country	Staff in Higher Education	Researchers full time in the public sector	Researchers per million inhabitants
Kenya	1800	600	35

Source: UNESCO Science Report, 2005

### 3.3.2 Human and institutional capacity development strategies

The Government of Kenya acknowledges the crucial role University education plays in national development. The Government's long-term policy is to provide a framework for a sustainable, competitive and autonomous national university system. University education and training will, therefore, need to be demand-driven, of high quality, gender sensitive, technologically informed, research supported, democratically managed and globally marketable. (Sessional Paper No.\_ of 2004)

To address the challenges that constrain access, equity and quality in university education, the Government will, through the respective University Councils and CHE:

- Promote private sector investment in the development of university education and training;
- Strengthen quality assurance mechanisms in all university education institutions;

- Provide scholarships based on the needs of the economy; targeted bursaries and loans to the needy, taking into account gender parity;
- Ensure relevant training in all professional courses to address the current skills mismatch;
- Promote academic programmes among universities with the aim of creating centre's of excellence and make each university have a comparative advantage;
- Develop a mechanism for universities to undergo regular peer reviews and evaluation of their programmes;
- Work with public universities to develop a performance based system of appointments and promotions;
- Review all professional programmes to ensure incorporation of internships into the academic programmes; and
- Expand the financial base of HELB to enable it mobilize more resources for loans to needy students. (Sessional Paper No.\_ of 2004)

### 3.3.3 *Scientific mobility*

The African Capacity Building Foundation has estimated that Africa is losing an average of 20,000 skilled personnel a year to developed countries. About 128,000 Africans have immigrated to the USA alone over the last two decades. World Bank estimates indicate that Africa is presently employing about 100,000 expatriates from industrialized countries. Their cost is equal to US \$4 billion equivalent, about 35 percent of the total official development assistance flowing into the SSA countries. Several factors have been attributed to the migration of highly educated individuals. There appears to be two forces at work, the push-out and pull-in factors. (Khalil-Timamy, 2002)

The push factors include: low wages and salaries, political instability, over-production and under utilization of qualified manpower, lack of research and other facilities, discrimination in appointment and promotion, lack of freedom, lack satisfactory working conditions, lack scientific tradition, desire for higher qualifications and recognition, better career expectations and public apathy. (Khalil-Timamy, 2002)

The pull factors include: higher wages and income, higher standard of living and better way of life, allocation of substantial funds for research, modern educational system and better career opportunities, prestige of foreign training, better working conditions and employment opportunities, intellectual freedom, relative political stability, presence of a rich scientific and cultural tradition, availability of experienced support staff, motivational factors and recognition. (Khalil-Timamy, 2002)

**Table 8: Number of Kenyan Professionals Admitted into the USA, 1982-1989**

Country	1982	1983	1984	1985	1986	1987	1988	1989
Kenya	162	192	212	196	201	203	207	261
Total Africa	2855	2569	2737	2864	3161	3331	3530	4783
Kenya as % of Africa*	5.7	7.5	7.7	6.8	6.4	6.1	5.9	5.5

Source: Adapted by Aredo, D (2000) "Human Capital Flight from Africa: An Assessment of Brain Drain in Ethiopia". Paper presented at the Regional Conference on Brain Drain and Capacity Building in Africa, Addis Ababa, Ethiopia.

### 3.4 *Financial resources (funding)*

In general, Africa's investments in R&D activities remain very low in comparison to other regions and at the individual country level, although there has been encouraging signs of increasing investments, or some governments' interests to expand their spending on science, technology and innovation activities on the continent through various policy developments and project initiatives. These efforts are local and external as well as private and public.

#### 3.4.1 *National financial resources*

The major research funders include Ministries especially those with direct link to RTD operations: Ministry of Finance, Ministry of Agriculture, Ministry of Health, Ministry of Education Science and Technology. No current figures on Kenyan Science and Technology expenditure were available to establish and track whether government has increased its expenditure in this sector over the past couple of years.

#### 3.4.2 *International donor funding*

USAID is the leading bilateral donor in Kenya and chairs several donor meetings that meet once a month. Overall development assistance to Kenya total about \$ 700 million per year. The United States and United Kingdom (UK) are Kenya's first and second largest bilateral donors respectively.

The United States is the leading donor in the democracy and governance sector. Other donors are the UK's Department for International Development (DFID), European Union (EU), Netherlands, Denmark, Sweden, Germany, and Canada. The World Bank, EU, DFID and USAID work together to support the GOK in developing appropriate policies and macroeconomic and fiscal expenditure frameworks. USAID, the EU, and the World Bank have been instrumental in encouraging the development of an enabling policy environment for agriculture and natural resources management.

The World Bank works closely with USAID to provide support to Kenya's agricultural research institutes, while the EU, World Bank, African Development Bank, and USAID support livestock development. In the natural resources management sector, the major donors are the United States, the Netherlands, the UK, Japan, Sweden, Belgium, Finland, Germany, Denmark, the EU, the World Bank, and the United Nations Environment Program.

The United States is the leading bilateral donor to Kenya's population and health sector. USAID and DFID both support work in HIV/AIDS, family planning, and malaria. Finally, USAID is a member of the Sector Working Group on Education, which includes DFID, the World Bank, Canada, Japan, and the United Nations organizations.

##### 3.4.2.1 *World Bank*

The World Bank Group's assistance to Kenya is guided by the Country Assistance Strategy (CAS), which spells out the direction for IDA and IFC assistance to Kenya over the medium-term. The current Country Assistance Strategy (CAS) for Kenya was discussed by the Board on June 2004 and covers fiscal years 2004-2007. Preparation of new lending operations and ESW as laid forth in the CAS is largely on track and the Bank has begun to work on a CAS Progress Update. Actual timing of Board delivery of the CAS Progress Update will depend largely on the evolution of events on the ground. ([www.worldbank.org](http://www.worldbank.org))

As of February 2006, the Bank's portfolio in Kenya consisted of 14 active projects, with a total commitment of US\$719.4 million, including a US\$4.1 million grant from the Global Environment Facility. These projects support initiatives across a number of areas including:

- Governance and Anti-corruption
- Infrastructure
- Health and Education
- Private sector development
- Agriculture and the Environment. ([www.worldbank.org](http://www.worldbank.org))

#### 3.4.2.2 *UK Department for International Development (DFID)*

DFID's primary aim in Kenya is to support the further development and implementation for the Economic Recovery Strategy, so that it is at the centre of Government policy and of the partnership with the international community. DFID further aims to help the Government of Kenya to end corruption, improve the economy and deliver essential services to the poor people. In 2005/06 DFID spent over £60 million. Over 80% of that was on health, education, and humanitarian assistance following the droughts. There is evidence that the HIV rate may be stabilising in Kenya. DFID has provided £43million towards the fight against HIV and AIDS. We also support the joint UK/US Taskforce on AIDS, for which Kenya is one of five African countries. ([www.dfid.gov.uk](http://www.dfid.gov.uk))

DFID supports the Government to develop the Kenya Education Sector Support Programme launched in June 2005 – their road map to universal primary education by 2015 which is making good progress. DFID's contribution will support the construction of 11,880 new, rehabilitated, or refurbished classrooms in Kenya. In addition, it is estimated that the doubling of DFID's support to £47 million towards malaria control will deliver 11 million insecticide treated bed nets, saving 167,000 children's lives, and reducing under-5 mortality in Kenya by at least 15 %. ([www.dfid.gov.uk](http://www.dfid.gov.uk))

Corruption remains a significant problem in Kenya. The Transparency International Corruption Index ranks Kenya 144th out of 158 countries. DFID has worked with the Government of Kenya to help them produce a credible anti-corruption action plan. Against this, they have already passed Procurement and Privatisation Acts, fully staffed the Kenya Anti-Corruption Commission, and have established a new code of ethics for ministers.

DFID funding for Kenya is £50 million for 2006/07 focused on health, education and governance. ([www.dfid.gov.uk](http://www.dfid.gov.uk))

#### 3.4.2.3 *USAID*

The USAID/Kenya program is one of the most mature development programs in Africa. The U.S.-Kenya economic cooperation goes as far back as Kenya's pre-independence in the late 1950s and early 1960s. During this period, the U.S. assistance came in the form of the Kennedy-Mboya airlift of young Kenyans. The support provided training opportunity in the United States for the challenging tasks of self-government and leadership. Over 600 Kenyans benefited from the cooperation. The United States also assisted Kenya in building the University of East Africa which later developed into the University of Nairobi. (<http://www.usaid.gov/ke/index.html>)

The U.S. Army Medical Research Unit (MRU) supports research programs focused on developing vaccines against work on other infectious diseases. The Centres for Disease Control Prevention (CDC) works with USAID in malaria research and HIV/AIDS including support for HIV/AIDS and tuberculosis surveillance, prevention of mother-to-child transmission, integration of TB and HIV services, support for voluntary counselling and testing and prevention programs that target young and the uniformed services.

### 3.5 Research output

It is standard practice to measure research output in country studies in terms of peer-reviewed article output. Information on other forms of research outputs (books, conference proceedings, chapter in books and so on) is usually not available in standard form neither is it always readily available at country level. In cross-country comparisons, it has also become standard practice to use output in one of the ISI-indexes (SCI, SSCI, or AHI) as sole source. This inevitably introduces various kinds of biases into such comparisons, as the ISI-indexes do not cover all countries, languages and disciplines equally well. It is a well-established fact that the coverage of those countries on the margin of world science-, which is true for most if not all of Africa-, is particularly poor.

While different databases provide different perspectives on trends in scientific publication output among African countries over the past decade, they agree at least on one point: in five years (1991-96), compared with Europe or with the rest of the world, Africa has lost 20-25% of its relative capacity to contribute to world science. (Gaillard, Hassan, Waast & Schaffer, 2005)

**Table 9: Scientific Articles for Kenya, 1998**

Country	Number of Scientific Articles	Articles per million inhabitants
Kenya	506	17

Source: UNESCO Science Report 2005 (Science Citation Index)

Kenya produced 506 scientific publications within the Science Citation Index in the year 1998. The ISI-data for Kenya was analyzed to produce institution level data (see diagram in Appendix B), as well as a profile of scientific collaboration both within and outside of the country. The profile presented on the next page reveals some interesting trends:

- There is a clear distinction between higher education institutional article production and other research institutions.
- The University of Nairobi dominates the number of scientific articles amongst the universities with Moi and Egerton universities, lagging way behind. Interestingly only four of the six public universities are visible in the diagram, Maseno University and Jomo Kenyatta University of Agriculture and Technology do not feature. One private university, Daystar University, produced scientific articles.
- There is no evidence of collaborations between the universities and the research institutes that exist within Kenya. Moi University is the only university that collaborates internationally. The research institutes do have small international collaborations with the rest of the world (USA & Netherlands) as well as Africa (Nigeria)

### 3.6 Technological innovation

Business expenditure on R&D (BERD) and patent data are often used as a measure of a country's technological performance. This implies that indicators for technological innovation are useful for both input and output measurements. (UNDP, 2001:46).

Intellectual Property Rights (IPRs) are property rights in something intangible, protect innovation, and reward innovative activity. IPRs comprise a bundle of rights focusing on the physical manifestations of intellectual activity in any field of human endeavour. IPRs are concerned with the expression of an idea for an invention, the details of which have been worked out and which takes the form of a product

or process that can be applied industrially. Development over a century has given rise to various IPR's, which have become well known. These include patents, trade and service marks, copyright, rights in performances, designs, plant breeder's rights, utility models, and appellations of origins, layout designs and topography (Kameri-Mbote, 2005).

### *3.6.1 Technology balance of payments*

The technology balance of payments measures international transfer of technology including licensing contracts, purchases of patents, expertise and research, and technical assistance. Unlike R&D expenditure, these are payments for production-ready technologies. Although the technology balance of payments reflects a country's ability to sell its technology abroad and its uses of foreign technologies, a deficit does not necessarily indicate low competitiveness.

Kenyan industry has been slowly increasing technology content of its products, especially its exports. Between 1985 and 1998, the share of medium and high tech products making up Kenya's exports, approximately doubled from 3.2% to 7.6%. At the same time, the proportion of low-tech products increased from 4.3% to 11.8%, and the resource-based export share declined from 28.1% in 1985 to 23.8% in 1998. These figures suggest a gradual movement away from resource-based and low-tech manufactured exports towards a more technologically sophisticated range of products. Nevertheless, it is important to note that progress has been very slow, and overall, Kenya is still far from being a high-tech exporter. The country ranks number 62 out of 87 countries based on its share of medium and high-tech products in its total manufactured exports. (National Development Report for Kenya, 2005)

### *3.6.2 Patents*

Besides the EU and US patent databases, there are two Regional Organizations, which deal with issues of intellectual property rights (IPRs) in Africa these are the African Regional Industrial Organization (ARIPO) and the African Intellectual Property Organization (OAPI) based in Harare and Yaoundé respectively. Kenya is a member of ARIPO, an inter-governmental industrial property organization created in 1976 at the Diplomatic Conference in Lusaka, Zambia. At present, there are 15 member states of ARIPO.

The industrial property regime in Kenya is embodied in a 1989 Act is administered by the Kenyan Industrial Property Office (KIPO), set up in 1990. The Kenyan law on patents is based on British law, with some features for the European and US systems. Patents are granted for 17 years but can be extended to 20 years in conformance with the TRIPS agreement. The main aims of the Act were to promote indigenous technology, protect foreign patents and encourage the acquisition and diffusion of technology. (UNCTAD/ITE/IPC/Misc.13, 2003)

**Table 10: Number of patents registered**

Year	KIPO	ARIPO
1990	10	-
1991	28	-
1992	34	-
1993	50	-
1994	35	-
1995	15	4
1996	27	24
1997	32	30
1998	31	28
1999	24	13
Total	286	99

KIPO = Kenyan Industrial Property Office ARIPO = African Regional Industrial Property Office

Source: UNCTAD/ITE/IPC/Misc.13, 2003

In general, the KIPO is a relatively passive organization and lacks the necessary technical skills to play the role expected of a functional intellectual property office under the new World Trade Organization. Furthermore, there is a need for a stronger competition policy regime to offset the stronger intellectual property rights granted to transnational corporations. (UNCTAD/ITE/IPC/Misc.13, 2003)

The most recent comparisons of foreign direct investment performance, produced by the United Nations Conference on Trade and Development (UNCTAD), Kenya ranked in position 118 among 140 countries, slipping from 90th place at the end of the 1980s. During the period of 1997-2001, FDI was about 0.6% of GDP, which was below the Sub-Saharan African average of 1.9% per annum. Kenya's relatively poor performance in attracting increased rates of foreign direct investment reflects the continued cautious attitude of foreign investors. Investors seem to have adopted a 'wait and see' attitude, which nonetheless holds promise for the future, if the NARC government policies and implementation record continues to be positive and reforms can be institutionalized and solidified in the coming years. (USAid/Kenya, 2005)

The policy framework for technology imports is relatively liberal. There are no controls on capital goods imports or licensing. Tariffs on machinery are low ranging from 5- 10%. Earlier controls on foreign exchange remittances are virtually gone. (UNCTAD/ITE/IPC/Misc.13, 2003)

### 3.6.3 *Manufacturing sector*

The overall contribution of industry to GDP declined from 21.4% in 1973 to 17.3% in 1993, but by 2003 had risen again to 19.3% (see table). Manufacturing, the largest single industrial activity, followed a similar pattern, dropping from 14.3% of GDP in 1973 to 10.5% in 1993, and then rebounding to 13.6% by 2003. The contribution of manufacturing in the last 30 years has therefore been erratic. Construction and electricity/water, on the other hand, both rose between 1973 and 1983, but then declined steadily. Mining/quarrying declined from 1973 to 1983, rose slightly, and then declined again. (National Development Report for Kenya, 2005)

Table 11: Contribution of Industry to GDP, selected years (%)

Sub-sector	1973	1983	1993	2003
<b>Manufacturing</b>	14.33	12.33	10.51	13.59
<b>Construction</b>	5.42	5.95	5.61	4.53
<b>Electricity/Water</b>	1.25	1.42	0.94	1.05
<b>Mining/Quarrying</b>	0.41	0.22	0.26	0.17
<b>Total</b>	21.41	19.92	17.32	19.34

Source: National Development Report for Kenya, 2005

The majority of manufacturing enterprises are locally owned and the rest are either under joint local/foreign ownership, foreign owned, or government owned. Most of the Kenyan Asian-owned enterprises are local, though local and foreign investors own some jointly. The few European firms are also local, though there is some foreign multinational presence in Kenya. New entrants into the Export Processing Zones tend to be foreign, but from South and East Asia rather than from Europe or North America. (National Development Report for Kenya, 2005)

The processes of structural adjustment within Kenya, combined with overall changes in the world economy have brought about a number of developments in Kenyan industry, some of which are: growth of the MSE sector, export promotion, growth of regional markets and human resource development.

Micro and small-scale enterprises (MSEs) are everywhere in Kenya. Many of the 1.3 million MSEs recorded in 1999 were in trade and services, but a substantial minority fell into the manufacturing and construction sectors. Approximately 173,000 enterprises engaged in manufacturing and 22,000 in construction. These employed 385,000 workers. Just over one quarter of the manufacturing enterprises (27%) and 30% of the construction enterprises are in the urban centres, with the rest found in rural areas. (National Development Report for Kenya, 2005)

In 2001 and 2002, Kenya's exports leapt up, recording increases of 12% and 8%. This was largely an outcome of the African Growth and Opportunity Act (AGOA), an initiative of the United States government that allows duty-free imports into the US by qualifying sub-Saharan African countries. Kenya was the first country to qualify under the Act, and has used the opportunity both to bolster its existing export-oriented clothing industry and to attract foreign investment. (National Development Report for Kenya, 2005)

The main benefit of AGOA has been job creation. As already mentioned, clothing production is labour intensive. Sources within the Ministry of Trade and Industry estimate that 36,000 jobs have been created in the three years that Kenya has been participating in AGOA. Most AGOA-related employment consists of machine operators, helpers, and other low-skilled staff. The clothing industry worldwide is highly competitive. The low-priced market, which most of Kenya's contract producers' target, competes on price. (National Development Report for Kenya, 2005)

### 3.7 International co-operation and networks

Kenya is a member of the Common Market for Eastern and Southern Africa (COMESA) and the East African Community (EAC). The country hosts the headquarters of the United Nations Environmental Programme (UNEP) and UN-habitat, as well as many other regional headquarters, both intergovernmental and corporate. (United Nations, 2005) Other institutions within the Kenyan S&T landscape's co-operation and networks are shown in table 12.

**Table 12: Institutional international co-operation and networks:**

ACTS	The Regional Approach to Biotechnology and Biosafety Policy in Eastern and Southern Africa (the RABESA initiative) originated from the Common Market for Eastern and Central Africa (COMESA) community in 1997. This project aims to generate and analyse technical information needed to inform COMESA and the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA) countries on regional biotechnology and biosafety policy choices. National and Regional workshops have been held in Egypt, Ethiopia, Kenya, Tanzania, and Uganda.
ATPS & AERC	Some of the best-known examples of partnerships concerning S&T policy research in African are the African Technology Policy Studies (ATPS) and the African Economic Research consortium (AERC), that are based in Nairobi, Kenya. Another IDRC activity that has considerable success in promoting local design and a focus on local needs is Research on Knowledge Systems (RoKs).
Egerton University	Tegemeo Institute is widely recognized as the centre of excellence in agricultural policy research and analysis in Kenya. Recent partnerships have been with the World Bank, Rockefeller Foundation, Ford Foundation, DFID, KARI, FAO, IEA, Michigan State University, the State University of New York, Clark University, the University of Georgia and Makerere University.
University of Nairobi	<p>The university has and currently is working in partnerships with different institutions across the world, and signed a variety of different memorandums of understanding with some of the following institutions:</p> <ul style="list-style-type: none"> <li>• Emory University, USA</li> <li>• University of Nairobi College of Health Sciences and the University of Washington School of Medicine and Public Health and Community Medicine.</li> <li>• Small Enterprise Promotion and Training" [SEPT] programme of the University of Leipzig, Italy and the University of Nairobi</li> <li>• Trocaire East Africa Regional Office (EARO) and University of Nairobi</li> <li>• Implementing Aids Prevention and Care (IMPACT) Project Amendment between Family Health International (FHI) and University of Nairobi</li> <li>• The United Nations Environment Programme (UNEP) and University of Nairobi (UON) with the support of the Government of Kenya FOR implementation of Nairobi River Basin Programme</li> <li>• The African Economic Research Consortium (AERC) and the University of Nairobi</li> </ul>

### 3.8 Conclusion

The increasing recognition that Science and Technology is gaining in Kenya underscores its importance in the country's sustainable development quest. Sustainability concerns have occupied a place on the global agenda since at least the Brundtland Commission's 1987 report "Our Common Future" (WCED, 1987). Sustainability has become a "high table" issue in national and international affairs and the role of RTD is instrumental in attaining projected sustainable development goals in the next 2 decades. The transition towards sustainable development is inconceivable without science, research and technology. (Malo, J.O., SCOPE)

The lack of clear policy on S&T and inadequate provision of resources to the NCST and other S&T institutions have further compounded the problems of advancing S&T in Kenya. Consequently, the coordination and implementation of national S&T objectives outlined by the government have continued to face difficulties. Additional problems of the national S&T arise from the biased focus of public research institutions, with the exception of universities, on economic and social returns from research as opposed to contributions to the advancement of scientific knowledge in general. (Wandiga, S.O.; Awuor, V.; Wanyama, B. & Abuodha, N.L, 2004)

The Kenyan government acknowledges the importance that science and technology will make to the country as a whole and for that reason is in the process of developing their National Science and Technology Policy. The implementation of the National Science and Technology Policy should be based on, among other priority programs, the following:

- *Sectoral Policy development, coordination and promotion*

The S&T sectoral areas such as space science, water, food and agriculture, environmental issues, biotechnology and biosafety, new and emerging areas of science and technology, education, nuclear science, socio-cultural issues, nanotechnology, biodiversity, natural resources, energy and health, are important contributors to socio-economic development. (Wandiga, S.O.; Awuor, V.; Wanyama, B. & Abuodha, N.L. (2004))

- *Public awareness and popularisation of Science and Technology*

Kenya should, as a matter of national priority; position herself to capture benefits arising out of opportunities that may accrue through knowledge based economic changes. Awareness concerning S&T is the key to national acceptance and confidence in S&T pursuits. Thus, the country should strive to embed science and technology in her people's culture to enable them to make informed decisions about S&T issues in their daily lives. Kenyans should also be able to appreciate science, access and technology, and engage in debates about the implications of scientific pursuits and technological change. (Wandiga, S.O.; Awuor, V.; Wanyama, B. & Abuodha, N.L. (2004))

- *Developing national system for Innovation, Technology development, acquisition and diffusion*

As Kenya develops its science and technology capacity it is essential to recognize that knowledge alone does not transform economies, nor is there any guarantee of positive returns to investment in research and development or in other products of higher education. The greatest benefits of scientific and technological knowledge are reaped when such knowledge is used within a complex system of institutions and practices known as a National Innovation System. Innovation, involving research, development, technology transfer and intellectual property management, need become a core competency for the survival of Kenyan companies into the future. (Wandiga, S.O.; Awuor, V.; Wanyama, B. & Abuodha, N.L. (2004))

- *International Cooperation in Science and Technology*

The limited resources require targeted science and technology efforts in Kenya, effective international linkages and transfer of foreign technology. International linkages and collaborations are potential avenues for enhancing national science and technology efforts. (Wandiga, S.O.; Awuor, V.; Wanyama, B. & Abuodha, N.L. (2004))

- *Harnessing indigenous and traditional knowledge*

Owing to the domination of the modern scientific knowledge in development, indigenous knowledge has been undervalued in terms of its potential practical applications. Whenever it has been absorbed into scientific solutions, it has not merited sufficient legal protection given to modern scientific knowledge. Consequently, benefits arising from its application have not adequately been passed on to the knowledge holding communities. Therefore, a systematic documentation, study and validation of indigenous knowledge, especially in areas of environment and health would greatly improve Kenya's scientific and technological heritage. (Wandiga, S.O.; Awuor, V.; Wanyama, B. & Abuodha, N.L. (2004))

- *Measurement of the progress and impact of S&T*

There is a need for appropriate indicators for use in the assessment and measurement of the impact of science and technology development. (Wandiga, S.O.; Awuor, V.; Wanyama, B. & Abuodha, N.L. (2004))

#### 4. References

- African Development Bank. (2004). *African Development Report 2004*.
- Gaillard, J.; Hassan, M.H.A.; Waast, R. & Schaffer, D. (2005) *UNESCO Science Report 2005: Africa*. UNESCO Publishers. <http://www.unesco.org/science/psd/publications/africa.pdf>
- Government Printer Law of Kenya: The Science and Technology Act: Chapter 250(1980). Nairobi
- Kameri-Mbote, P.(2005). *Intellectual Property Protection in Africa: An assessment of the Status of Laws, Research and Policy Analysis on Intellectual Property Rights in Kenya*. International Environmental Law Research Centre (IELRC): Working Paper
- Kenya Country Corporate Strategy 2005-2007
- Malo, J.O. "Scenarios for Research on Technological Development (RTD) Cooperation with Europe (SCOPE): Kenya country Report" in *Foresight: Scenarios for Research & Technology Development Cooperation with Europe*. SCOPE 2015
- Ministry of Information and Communications (2006) *National Information & Communications Technology (ICT) Policy*. Republic of Kenya
- Ministry of Planning & Development website, 2005
- National Development Report for Kenya, 2005
- Oyelaran-Oyeyinka, B. (2005). *Partnerships for building Science and Technology Capacity in Africa*. Paper prepared for the Africa-Canada-UK Exploration: Building Science and Technology Capacity with African Partners. Canada House, London, UK.
- Sessional Paper No.\_ of 2004. *A Policy Framework for Education, Training and Research. Meeting the challenges of the Education, Training and Research in Kenya in the 21<sup>st</sup> Century*. October 2004
- UNCTAD/ITE/IPC/Misc.13 (2003). *Chapter Two: The Case of Kenya" Africa's Technology Gap- Case Studies on Kenya, Ghana, Uganda and Tanzania*. United Nations Publications
- Wandiga, S.O.; Awuor, V.; Wanyama, B. & Abuodha, N.L. (2004). *National Science and Technology Policy Development in Kenya*. A Report to the Ministry of Education, Science and Technology of the Government of Kenya.
- University of Nairobi: [www.uon.ke](http://www.uon.ke)
- The CIA World Fact book: <https://www.cia.gov/redirects/factbookredirect.html>
- Kenyan Ministry of Health: [www.health.go.ke](http://www.health.go.ke)
- Kenyan Ministry of Planning and National Development: [www.planning.gov.ke](http://www.planning.gov.ke)
-

## Appendix A: highlights of institutions development

1903	Scott Agricultural Laboratories
1908	Coffee Research Services
1910	Veterinary Research Laboratories
1950	Kenya Meat Commission
1958	Medical Research Laboratory
1970	International Centre for Research in Insect Physiology and Ecology (ICIPE) is created
1977	National Research and Scientific Council was set up as the umbrella organization of the semi-autonomous National research Institutes and Advisory Research Committees. These included: the Kenya Agricultural Research Institute, the Kenya Trypanosomiasis Research Institute, the Kenya Forestry Research Institute, the Kenya Industrial Research and Development Institute, and the Kenya Marine and Fisheries Research Institutes.
1979	Creation of research institutes namely: KARI, KIRDI, KEMFRI, KEMRI and KETRI.
1979	<p>Kenyan Agricultural Research Institute was established in 1979 as a semi-autonomous government institution through the amendment of the Science and Technology Act Cap 250, following the collapse of the East African Community (EAC) in 1977. The new institute took over research activities from the East African Agricultural and Forestry Research Organisation (EAAFRO), East African Veterinary Research Organisation (EAAVRO) and later the Ministries of Agriculture and Livestock Development.</p> <p>The Kenya Industrial Research and Development Institute (KIRDI) is a technology development and management agency of the Government, which operates under the ambit of the Ministry of Trade and Industry. The Kenya Industrial Research and Development Institute (KIRDI) was established and incorporated under the Science &amp; Technology Act Cap.250 in 1979.</p> <p>The Institute's history however dates back to 1942, when the then Colonial Government set up a central laboratory at Kabete, Nairobi. The laboratory's aim was to initiate and develop industries so as to relieve the industrial goods shortages that had been caused by the Second World War. At that time, the Kenya Industrial Management Board (KIMBO) administered the laboratory. Later, as the laboratory expanded its management was taken over by the East African Community (EAC), and was renamed East African Industrial Research Organization (EAIRO).</p> <p>EAIRO, the predecessor of the present day KIRDI, had Centres in Kenya, Uganda and Tanzania, ceased operations in 1977 following the collapse of the then East African Community. The National Industrial Research Complex under the Ministry of Commerce and Industry subsequently took up its operations. In 1979, the Act of Parliament establishing the National Council for Science &amp; Technology (NCST) was amended to establish five Research Institutes, KIRDI being one of them.</p> <p>As a national research body, KIRDI is mandated to undertake multidisciplinary research and development in industrial and allied technologies.</p> <p>In 1979, in Vienna, Austria an international conference was convened to review the state of science and technology in Africa and the convention articulated the need for technology policy research capacity in Africa. Two networks, the Eastern Africa and Southern Africa Policy Studies Network (EATPS) and the West African Technology Policy Studies Network (WATPS), emerged in the 1980s to strengthen research skills of indigenous researchers, to stimulate interest in technology policy research and to help disseminate research results. EATPS and WATPS became the precursors of the <b>African Technology Policy Studies Network</b>, the organization poised to fill the void in science and technology policies in Africa.</p>
1982	The Ministry of Regional Development, Science and Technology was created
1983	The Kenya National Academy of Sciences is a learned, non-political, non-sectarian organization that includes all branches of knowledge. It seeks to foster the transformation of the Kenyan economy through: synthesizing and disseminating knowledge; promoting the advancement of science and technology; facilitating coordination among the different groups of scientists and potential users of science and technology; improving resource utilization through research; enhancing cooperation through international agreements and programmes; providing the government with scientific and technological information for policy formulation and execution. The Academy, founded in 1983, has a current membership of 117. Members are elected from among citizens of the Republic of Kenya of a certain academic standing.
1987	Ministry of Research, Science and Technology, which followed the Ministry of Regional Development, Science and Technology, was created to oversee all science and technology activities in Kenya.
1988	African Economic Research Consortium (AERC): the objective of AERC is to strengthen local capacity for conducting independent, rigorous inquiry into problems pertinent to the management of economies in sub-Saharan African
1992	<p>Set up in 1950, the Kenya Meat Commission collapsed in 1992 after efforts to revive it failed. It began to go under in the mid 1970s due to poor management, dwindling international markets and the use of old machinery and equipment.</p> <p>The first ominous signs of its imminent collapse were in 1987 when, under the weight of debts, it was first closed. It reopened two years later but the final nail in the coffin came in 1992 when KMC was placed under receivership.</p>

1994	<p>ATPS started as a secretariat of the International Development Research Centre (IDRC)</p> <p>African Centre for Technology Studies mission is to strengthen the capacity of African countries and institutions to harness science and technology for sustainable development. Their vision is better living standards for all in Africa through harnessing science and technology for sustainable development</p> <p>The Kenya Institute for Public Policy Research and Analysis (KIPPRA) is an autonomous Public Institute created under the provisions of the State Corporations Act. The primary mission of the Institute is to conduct research and analysis leading to policy advice to government and the private sector. KIPPRA aims to produce consistently high quality analysis of key policy issues and contribute to the achievement of national long-term development objectives by providing sound information, based on objective analysis, to policy makers. KIPPRA is therefore a source of information and advice on a wide range of policy issues for government, government agencies, and the private sector.</p> <p>International Centre for Research in Agroforestry (ICRAF)</p> <p>International Livestock Research Institute</p>
2003	African Technology Policy Studies Network (ATPS) institution was declared a full-fledged international organization.
2006	President Kibaki yesterday led the nation in marking the re-opening of the Kenya Meat Commission

### Summary of major policies driving research and institutional programmes

Policy/Act	Date
National Information and Communications Technology Policy	2006
National Science and Technology Policy Development in Kenya A Report to the Ministry of Education, Science and Technology of the Government of Kenya.	2004
Sessional Paper No. 2 of 2004 on a Policy Framework for Education, Training and Research. Meeting the challenges of the Education, Training and Research in Kenya in the 21 <sup>st</sup> Century.	2004
Economic Recovery Strategy (ERS) for Wealth and Employment Creation	2003
National Development Plan	2002-2008
The Industrial Property Act, Cap 509 of the Laws of Kenya	2001
Science and Technology Act, Cap 255	1997
The Higher Education Loans Board Act	1995
The Universities Act (Chapters 210B)	1985
The Science and Technology Act	1977