

The political economy of the Kenyan science granting councils

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May 2017

National case study report

For the

Research Project: 'Case studies of the political economy of science granting councils'

Funded by IDRC, DFID and the South African NRF

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Introduction

Kenya's science system is well developed with several research active universities, a number of well-established and internationally regarded public research institutes, some level of government funding for research activities as well as a small but increasing level of private investment in formal research and development (R&D)¹. In addition, there is increasing recognition of the role of R&D in the informal sector and its impacts on economic growth. The result is that Kenya has some of the highest rates of R&D investment in sub-Saharan Africa with a rate of 0.79% of gross domestic product (GDP) for R&D intensity (UNESCO, 2016). Several technologies developed in Kenya are now spreading across the world – mobile money being the most well-known example – and Kenyan scientists and researchers have world renown from Prof. Thomas Odhiambo, the founder of the Kenyan International Centre for Insect Physiology and Ecology (Icipe) to young female scientists such as Prof. Faith Osier and Dr. Amina Abubakar Ali who have both won the prestigious Royal Society Pfizer Award (now the Royal Society Africa Prize).

At the same time however, Kenya is struggling to meet its commitment to 2% of GDP being spent on R&D and relies for 40% of its R&D funding on external sources (i.e. international development partners). The quality of university education is known to be weak with many graduates failing to get jobs. Universities struggle to maintain labs and equipment and many lecturers pursue consultancy work to earn additional income. In addition, there is very little connection between university and industry meaning that many innovations, new technologies or ideas are rarely demand driven and/or taken up.

Kenya's science system is supported at a national level by the Science Technology and Innovation Act of 2013 and an ongoing discussion of Kenya's Science Technology and Innovation Policy frameworks. The 2013 Act created a National Commission for Science Technology and Innovation (NACOSTI) in charge of the policy and regulation of science, technology and innovation (STI) activities in Kenya, the National Research Fund (NRF) to disburse researching funding and the Kenyan Innovation Agency (KENIA) which is tasked with promoting innovative activity in the country. While the NRF could perhaps be defined as the only agency with research fund granting powers, the Canadian International Development Research Cooperation (IDRC) the UK's Department for International Development (DFID) and the South African NRF funded 'Science Granting Councils initiative' sees all three of these organisations falling under the category of science granting council or SGC.

This study explores the political and economic factors that influence this context and particularly the work of the science granting council organisations in Kenya to support research activities and the promotion of STI activity in the country. It is based on the result of a review of grey and published literature on STI and research activities in Kenya as well as eight key informant interviews (see Table 1). The study was conducted between January and April 2017.

This report has the following sections: Section 1 introduces the Kenyan STI and research funding field in the context of wider political and economic influences. Section 2 provides an overview of the historical and current situation of STI activities in Kenya. Section 3 narrows down into the research funding landscape under the SGCs and their predecessors. Section 4 provides details of data from the key informant interviews to highlight emerging themes in the area of economic and political enablers and challenges facing the SGCs. Section 5 concludes with a few recommendations.

¹ This report uses R&D to refer to "basic research, applied research and experimental development, both formal R&D in R&D units and informal or occasional R&D" (UNESCO, 2016: 741) but also refers to 'science, technology and innovation' (STI) which is R&D as per the UNESCO definition as well as process by which it takes place and a recognition that R&D can occur in both the human and natural sciences as well as in the technology and engineering fields. Finally, the report also utilises the term 'research' in relation to 'research funding' this term should be considered as interchangeable with R&D and STI.

Table 1: Key informant interviews conducted

Key informant type	Interview medium	Interview date
Science granting council representatives x 3	Face-to-face	16 February 2017
	Face-to-face	10 March 2017
	Phone	27 January 2017
Ministry of Education Science and Technology (MEST) employee	Face-to-face	7 February 2017
Private sector representative	Face-to-face	7 February 2017
Education sector representative 1	Face-to-Face	17 February 2017
Education sector representative 2	Phone	8 February 2017
International development research funder representative 4	Face-to-face	16 February 2017

1. Setting the context

Kenya is one of the African ‘power-house’ countries. It has sustained high levels of growth over the past 10 years and has a vibrant political system with multi-party elections and in 2013 devolved some activities and political power to newly formed county governments. However at the same time, while overall poverty indices are reducing, the level of inequality in the country is rising sharply. Inflation rates have also been rising and the country has suffered from food insecurity due to drought and ethnic violence in recent years.

The country has an established education system and a strong private sector. Not surprisingly therefore its rankings on key science and technology indicators with regards numbers of trained scientists, R&D funding etc. are relatively high for the region.

STI has received a significant boost in attention by government since the 2000s (a trend that has been witnessed in many African countries; Mouten et al, 2014). The country’s strategic development plan, Vision 2030, places STI as a required foundation for success. At the same time, the introduction of free public education at primary schools (2003) and day-secondary schools (2008) have significantly increased the number of students entering Kenyan universities since 2012 creating a large increase in the number of university graduates. Finally, since the 2013 STI Act was enforced the government has introduced a new organisational format for the promotion and support of STI in Kenya through the creation of three organisations instead of one to manage and promote STI activities including research in Kenya.

1.1 Political overview

Kenya gained independence in 1963 and its political system since then has been shaped by ethnic clashes as well as the legacy of colonial rule and external pressure (Hornsby, 2012). Kenya has predominately had a multi-party political system since independence with varying levels of democracy. In 2010 the country enacted a new constitution which has changed the shape of politics and its actors in Kenya by introducing devolved government to county level and codified rules with regards the structure and make-up of the executive, legislature and judiciary. The constitution acknowledges the role of science and indigenous technology in shaping Kenya’s development (clause 11(2)b). This together with various development plans of the current and previous Presidents of Kenya have influenced the way STI policy and implementation of the promotion of STI has been conducted in Kenya over the past 20 years. In addition, there are a number of other actors who have been involved in discussions of Kenya’s STI policy and implementation of the promotion of STI in Kenya. These will now be introduced.

1.1.1. The organisation of government ministries

Different governments had organised the civil service in different ways with science and technology falling either within the remit of a Ministry of education, science and technology or giving it a ministry of its own. The STI Act of 2013 recognises this by talking about the Cabinet Secretary and Principal Secretary “in the Ministry *for the time being responsible* for science, technology and innovation” (authors’ emphasis). For example from 2005 to 2013 the country had a specific Ministry of Science and Technology. The Permanent Secretary within the Ministry of Science and Technology in February 2007 reported that this move was due to an increasing importance placed by various organs of government on STI for the country’s economic development.² During this time significant work went into developing a new STI policy for the country and the development of a draft STI Act. Following the inauguration of a new government under H.E. Uhuru Kenyatta in early 2013 the Ministry of Science

² See siteresources.worldbank.org/INTSTIGLOFOR/Resources/WB_STI_Kiamba_Kenya.ppt (accessed 28/04/17)

and Technology was dissolved and merged with the Ministry of Education to become the Ministry of Education, Science and Technology.

1.1.2. Devolution

The Kenyan Constitution enacted in 2010 introduced devolution of certain government roles and responsibilities to new county governments. Specifically, county governments now have mandates over pre-primary education, village polytechnics, homecraft centres and childcare facilities. As a result many county governments have focused on the promotion of, and increased access to, vocational training as part of their mandate. For example, Nairobi county government supports eleven vocational training centres.

In addition, some national responsibilities in relation to the health and agricultural sectors have been devolved to county governments. In the agricultural sector for example, national government retains “policy formulation and coordination while county governments are expressly mandated to be responsible for crop and animal husbandry, livestock sale yards, county abattoirs, plant and animal disease control and fisheries” (Njagi et al, 2014: 2). In an analysis of county government budgets in the first year after devolution, Njagi et al (2014) found that there were some counties that didn’t allocate any money to agriculture development. That said, the Kenya Livestock and Livestock Research Institute (KALRO) still receives its funding from the national government – through the National Research Fund from 2017 (see below).

1.1.3. Actors in Kenya’s STI space and its national system of innovation

A background report from the Kenyan government for the 2002-2005 UN Millennium Project outlines the sub-sectors and actors in the national science and technology system at the time as being:

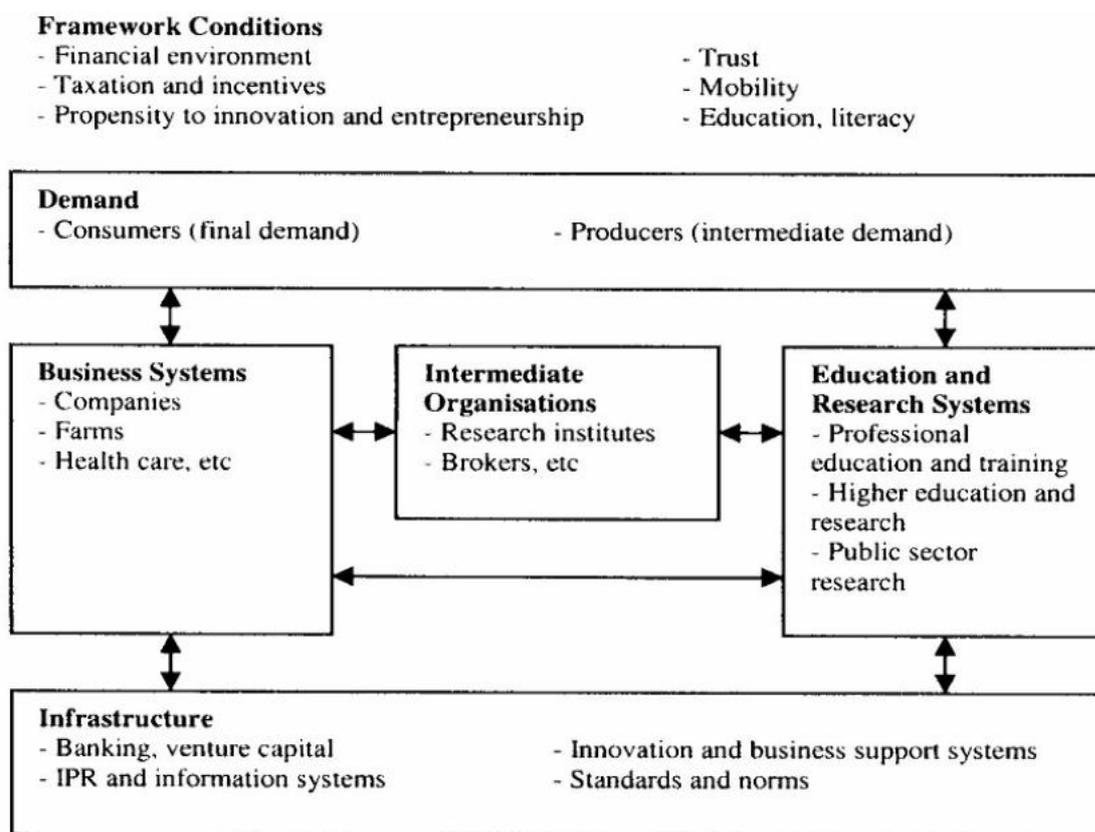
- “coordination of science and technology activities (mainly undertaken by the NCST),³
- research and experimental development (national research institutes, commodity based research foundations, private local and international research bodies),
- scientific testing and standardization services (Kenya Bureau of Standards, Materials Branch of the Ministry of public Works and Housing, Government Chemist, etc.),
- scientific and technical education and training (national public and private universities, national polytechnics, technical institutions etc.),
- general purposes social and economic data collection (Central Bureau of Statistics),
- technical and scientific advisory, consultancy and extension services, including patent offices (Kenya National Academy of Sciences, Kenya Industrial Property Institute, professional associations, etc.),
- national resources survey and mapping, and facilities for geological and geophysical mapping (Department of Resources Survey and Mapping, Regional Center for Services in Survey and Remote Sensing, etc.),
- library and information services for dissemination of results of scientific and technological activities (Kenya National Library Services, university libraries) and
- National museums, zoological and botanical gardens (National Museums of Kenya, Kenya National Archives, etc.).”⁴

³ In 2013 the National Council for Science and Technology (NCST) became the National Commission for Science, Technology and Innovation (NACOSTI)

⁴ www.unmillenniumproject.org/documents/kenya_ST.doc (accessed 28/04/17)

A more recent attempt to diagrammatically present the actors that make up the national system of innovation (NSI) in Kenya is provided in Figure 1.⁵ This is very much focused on a national level and the idea of a closed system. However, STI activities do not just occur in a vacuum but, especially in the era of globalisation, are influenced by external actors and events. A UNIDO study of the Kenyan national innovation system (Koria et al, 2014) included international development partners as financial ‘arbitrageurs’ who are key to ensuring connection between the other major elements of the Kenyan NSI: government; medium and high technology industry and; knowledge-based institutions. The UNIDO study more generally found that Kenya has strong linkages between knowledge based institutions (universities and research institutes) and government agencies but few other linkages and none of any note between the medium and high technology industry and knowledge based institutions (Koria, 2015).⁶ Figure 2 outlines UNIDO’s pictorial analysis of Kenya’s national system of innovation at the time of the report (2015).

Figure 1: Diagrammatic representation of Kenya’s national system of innovation

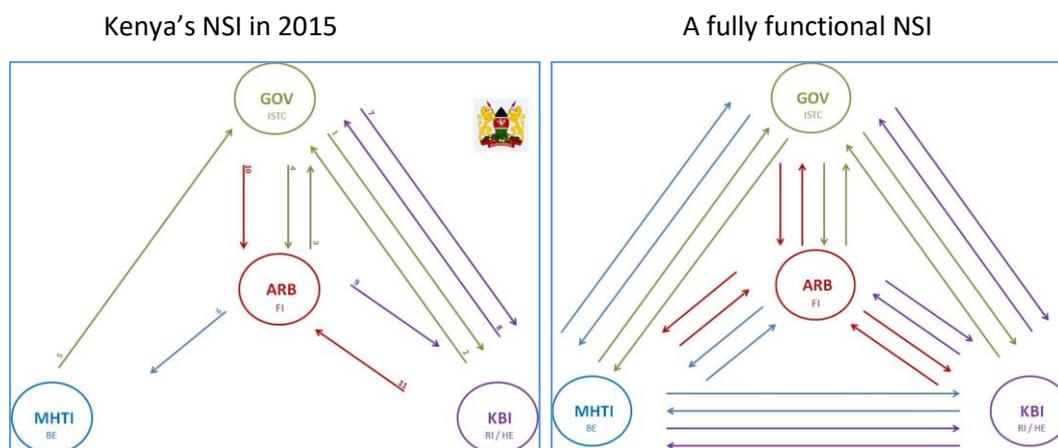


Source: Kitsao (2009)

⁵ The change in focus from thinking in terms of actors in a science and technology system to specifically ‘national systems of innovation’ more broadly mirrors a global change in thinking that occurred from the early 2000s which recognises the limitations of thinking only in terms of science and/or technology for economic and social development (c.f. Martin, 2016)

⁶ That said, Kenya does have a well-established organisation that promotes industry-university linkages: Linking Industry to Academia or LIWA.

Figure 2: Kenya’s national system of innovation as depicted by UNIDO in 2015



Source: Koria, 2015

1.2 Economic overview

In July 2015 Kenya was re-categorised by the World Bank from low income country status to lower-middle income country status (average annual incomes between \$1,046 and \$4,125) due to its continued economic performance.⁷ Kenya’s Gross Domestic Product (GDP) growth rate has averaged 4.8% for the last 15 years and has been consistently above 5% since 2013. It is expected to raise to 6% in 2017.⁸ However, Kenya currently has a large trade deficit. Between 2011 and 2015 the country exported 5.5 million US dollars’ worth of goods and services while it imported 16.4 million US dollars work of goods and services (WITS, 2017).

The agricultural sector is the mainstay of Kenya’s economy but the services sector provided the highest value added to GDP in recent years (47.5% in 2015 according to World Bank figures). The growth in the services sector is significantly affected by the informal sector which currently creates the largest number of jobs in Kenya.⁹ It is estimated that the informal sector supports nine out of 10 private sector workers in Kenya (when agriculture is excluded) (ADB, 2013).

The ability to find work is a major challenge in Kenya which has a growing youth population. Unemployment is around 10% but youth unemployment (15-24 year olds) is officially around 20%;¹⁰ although when you look at youths at different ages inside this age range, you see youth unemployment can be as high as 35%.¹¹

It is perhaps not surprising therefore that Kenya has, despite the high growth rates, serious poverty and increasing levels of inequality. While, poverty rates have reduced, 42% of Kenya’s population still live under the poverty line (UNICEF, 2016) while “between 2003 and 2011, the proportion of Kenyans

⁷ <http://www.worldbank.org/en/news/press-release/2015/07/01/new-world-bank-update-shows-bangladesh-kenya-myanmar-and-tajikistan-as-middle-income-while-south-sudan-falls-back-to-low-income> (accessed 29/04/17)

⁸ <http://www.worldbank.org/en/country/kenya/publication/kenya-economic-update-economy-strong-challenging-global-environment> (accessed 29/04/17)

⁹ <http://www.worldbank.org/en/country/kenya/publication/kenya-economic-update-economy-strong-challenging-global-environment> (accessed 29/04/17)

¹⁰ World Bank data - <http://data.worldbank.org/> (accessed 20/04/17)

¹¹ [http://www.undp.org/content/dam/undp/library/Poverty%20Reduction/Inclusive%20development/Kenya_YEC_web\(jan13\).pdf](http://www.undp.org/content/dam/undp/library/Poverty%20Reduction/Inclusive%20development/Kenya_YEC_web(jan13).pdf) (access 25/05/17)

describing their living conditions as very bad or fairly bad doubled, from 36 to 72 percent.”¹² The World Bank’s “Poverty in a Rising Africa” (Beegle et al, 2015) reports that 62 per cent of Kenya's wealth is controlled by less than 8,500 people in a population of 44 million. In 2015 the UNDP ranked Kenya 146th out of 188 countries in terms of human development designating Kenya as a “low human development category” country (UNDP, 2016).

A key issue for ensuring long term high rates of growth is the unfavourable business environment. This needs to become more favourable for companies in Kenya while there is a need for more incentives to be created to encourage informal businesses into the formal sector (ADB, 2013). Unfortunately, while Kenya’s ‘ease of doing business’ ranking is slowly improving year-on-year since the 2007 dip due to the political violence of that year, the country has some of the lowest foreign direct investment (FDI) rates in Africa. As outlined in a 2013 African Development Bank report, “[t]he most commonly cited challenges in the business climate are the cost and reliability of energy; a poor logistics system, including physical infrastructure and processes, a perception of corruption and political interference and patronage, resulting in anti-competitive behaviour; the burden of inefficiencies within the tax system; political uncertainty; and barriers to formalisation that give rise to a large, fragmented and delinked informal sector.” (ADB, 2013: xxii).

An overview of the current state of STI in Kenya by indicator

The 2015 UNESCO Science Report is the latest document that provides published data on Kenya’s current state of STI by internationally recognised indicators. Data provided in the report shows the following:

- Kenya’s overall investment in R&D, also called Gross Domestic Expenditure on Research and Experimental Development (GERD), as a percentage of GDP was approaching the 1% target set by the Executive Council of the African Union on Science and Technology in 2006. Latest figures (2011) place it at 0.79%.
- In 2011 47% of GERD was from foreign sources as opposed to 4.3% from the local business sector and 26% from government.
- The agricultural sector received the lion’s share of GERD at 44.8% followed by the medical and health sciences at 17.5% (2010 figures).
- Kenya has the highest density of researchers per million inhabitants in East and Central Africa starting at 318 (compared to South Africa’s 818 and Ethiopia’s 87).
- Kenya has a low number of female researchers as compared to other African countries with only 25.7% (2010) female researchers compared to over 40% in Namibia, South Africa and Mauritius.
- Tertiary education enrolment was 4% in 2009 (latest official figure) as compared to over 10% in the Congo and Cameroon.¹³
- Kenya dominates East and Central African scientific publication with 1,374 papers published in 2014 compared to the next best, Ethiopia at 865. The majority of scientific papers published

¹² <http://documents.worldbank.org/curated/en/763771468197384854/pdf/103822-WP-Kenya-Country-Economic-Memorandum-PUBLIC.pdf>

¹³ It should be noted that this figure corresponds to 2009 i.e. before the first cohort benefiting from free primary school education graduated which saw university education swell significantly in 2012, more than doubling in some estimates between 2012 and 2014 (<http://wenr.wes.org/2015/06/education-kenya>, accessed 05/05/17).

by Kenyan based researchers between 2008 and 2014 were in the field of biological or medical sciences (4,399 papers) as opposed to agriculture (587 papers).

- Kenya also leads on internet penetration in East and Central Africa with internet penetration rates raising from 14% to 39% between 2010 and 2013.

2. Kenya's science, technology and innovation system

Kenya's STI system is based on foundations over 100 years old. The first research institutes were set up by the colonial government including the Scott Agricultural Laboratories in 1903, the Coffee Research Services in 1908, the Veterinary Research Laboratories in 1910 and the Medical Research Laboratory in 1958 (Adhoc committee on STI and KNAS, n.d.). Following independence the country saw its first Science and Technology Act come into force in 1977. This established the National Council for Science and Technology (NCST) to coordinate science and technology policy development and implementation. NCST also had a role in funding research in Kenya although this role was less clearly articulated (Tumushabe and Mugabe, 2012:81).

An amendment to the Act in 1979 enabled the setting up of a number of research institutions in agriculture, industry, fisheries and human medicine. Between 1979 and 2016 Kenya has established five public research institutes:

- The Kenyan Agriculture and Livestock Research Institute or KALRO (previously known as the Kenyan Agricultural Research Institute or KARI);
- The Kenyan Medical Research Institute or KEMRI;
- The Kenyan Forestry Research Institute or KEFRI;
- The Kenyan Industrial Research Institute or KIRDI and;
- The Kenyan Marine and Fisheries Research Institute or KEMFRI.

Until the new Science, Technology and Innovation Act of 2013, the structure of decision making and line management between the public research institutes, NCST and the line management ministry was predominantly as follows:

- The Government was made up of a number of Ministries. These included a Ministry of Education, Science and Technology (MEST).
- MEST housed the National Council of Science and Technology (NCST) although NCST was answerable to multiple ministries as science and technology is a cross-cutting issue.
- Public research institutes were line managed by their respective ministries e.g. KARI was line managed by the Ministry of Agriculture.

This did occasionally change depending on whether the line management ministry for science and technology was a separate 'Ministry of Science and Technology' or it was subsumed into the Ministry of Education. For example, from 1987 to 1999 Kenya had a separate Ministry of Science and Technology. During this time the public research institutes fell under the remit of this Ministry. When the Ministry was disbanded in 1999 the responsibility for line management of the public research institutes went back to the relevant ministry e.g. the KARI fell back under the Ministry of Agriculture.

As such, the 1977 Science and Technology Act does not give NCST any specific research funding role. The responsibility of research funding has predominately been through line management ministries for the public research institutes and the Ministry of Education for public universities.

According to the Ad hoc Committee on STI/KNAS report (n.d.) for the UN Millennium project in the mid-2000s, because science activities were housed in various Ministries over time, this has made it difficult for science issues to be fully considered and addressed. This is also complicated by the number of private (now mostly international facing) research facilities that have set up in Kenya since independence. These include ICIPE which was created in Nairobi in 1970, the International Livestock

Research Institute (ILRI) which was founded in 1994¹⁴ and the African Population Health Research Centre (APHRC) founded in 1995. In addition, NGOs, INGOs and industry associations also conduct research activities in Kenya.

As already indicated, in the mid-2000s, a renewed momentum took place to strengthen the Kenyan STI system and provide more policy and strategic direction as a result of global attention on national systems of innovation and political changes taking place in Kenya. The result was that between 2008 and 2016 a series of new strategy and policy documents have been developed and implemented by various Kenyan governments as well as the setting up of new organisations to coordinate and support STI in Kenya. Table 2 provides an overview of the timeline of these changes and how they map onto the events and policies already discussed. The key changes since 2000 are then introduced in more depth below.

Table 2: Timeline of key policy and strategy events and organisations’ founding

1903	First research institute opens in Kenya
1963	Kenya gains independence
1970	University of Nairobi, the country’s first public university opens its doors
1977	Enactment of the first Science and Technology Act
1979	Amendment to the S&T Act set up the first public research institutes
2005	Creation of an Inter-ministerial taskforce on STI and Sector Working Groups including stakeholders from outside government
2008	Launch of Kenya Vision 2030, a national developmental plan where STI is seen as a foundation stone to success
2010	Kenya adopts a Constitution devolving power to counties and includes STI as fundamental requirements for the country’s development
	Nairobi’s iHub opens its doors
2013	Enactment of a new Science, Technology and Innovation Act which creates new structures to assist the promotion, regulation and funding of STI in Kenya
	Launch of a Vision 2030 STI sector plan

2.1 The establishment of University of Nairobi and the rise of university education

1970 marked the start of the rise of university education in Kenya creating a cadre of scientists and researchers who would go on to staff the public research institutes once they were founded in Kenya as well as take up other research roles around the world.

For many years, the university scene in Kenya was dominated by the University of Nairobi. Until 2009 there were only “7 traditional public universities and 12 newly established university colleges and over 22 private universities with varying levels of accreditation.” (Otieno, 2009: 1). By 2017, the number had risen to 22 public universities and 17 private universities together with a number of constituent colleges run by both private and public universities (Kivati, 2017). The Commission for University

¹⁴ ILRI joined the international CGIAR network in 2010

Education in Kenya listed 71 accredited higher education institutions in Kenya in 2017.¹⁵ In 2011 a government task force was launched by the Ministry of Education to bring the education and training system into line with the 2010 Constitution of Kenya and Kenya Vision 2030 (Kivati, 2017).

However, the quality of Kenya's higher education system has been routinely criticised for not producing the type of graduates the country needs.¹⁶ In 2017 the government audited the country's universities (public and private) and found many wanting. On release of the report, the government immediately withdraw a number of types of university courses (school based teaching programmes and Executive Master of Business Administration), and gave all universities a month to correct irregularities with regards to enrolment procedures. It has subsequently also brought in rules that make it illegal to be employed as a lecturer at a university if you do not have a PhD.¹⁷

That said, some universities and/ or their academics are well known for quality research and education. For example, University of Nairobi was ranked 8th in Africa in the 2015 Times Higher Education World University Rankings¹⁸ and is home to innovation hubs (FabLab, C4DLab and Maker Space) while Egerton University is partner in several influential international and regional research and training programmes including RUFORUM (www.ruforum.org/).

2.2 Inter-ministerial taskforce and bringing in other stakeholders

The 2005 inter-ministerial taskforce and related sector working groups saw government widen out very publically who it engaged with on the subject of promotion of science, technology and innovation. The Inter-ministerial Taskforce and Sector Working Groups were made up of representatives of the private sector as well as representatives of the education sector and research institutes. Kenya has a vibrant private sector which has vocal lobby groups in the form of the Kenyan Association of Manufacturers (KAM) and the Kenya Private Sector Alliance (KEPSA). KAM and KEPSA have specific committees whose remit includes elements of STI promotion. Both organisations hold regular meetings with government on issues related to the promotion of STI and research in Kenya. For example, in April 2016 the KEPSA Ministerial Stakeholder Forum that focused on TVET education and training. Since 2009 the country has also had the Linking Industry with Academia (LIWA) organisation which works to encourage industry and universities but also technical and vocational colleges to work together for achievement of the sustainable development goals.

2.3 Kenya Vision 2030 and the solidification of STI as a foundational stone for development

Kenya Vision 2030 sets out the importance of STI as a key foundation on which the social, political and economic pillars of the country's development plan are built. The development plan includes two flagship projects that are seen as essential for cementing the STI foundation for Kenya. These are: (i)

¹⁵ http://www.cue.or.ke/images/phocadownload/Accreditted_Universities_March_2017.pdf (accessed 25/05/17)

¹⁶ See for example <http://www.nation.co.ke/news/World-Bank-raises-concern-over-Kenya-s-graduates/1056-2893556-n01bv0z/index.html> (accessed 25/05/17)

¹⁷ See for example: <https://www.standardmedia.co.ke/article/2001229645/academic-rot-in-universities-exposed-as-executive-degrees-set-to-be-recalled>; <http://www.universityworldnews.com/article.php?story=20170426133359770>; <https://www.standardmedia.co.ke/article/2001235614/end-of-road-for-quack-lecturers-as-cleanup-of-universities-begins>; <https://www.standardmedia.co.ke/article/2000228622/matiang-i-orders-special-quality-audit-as-focus-shifts-to-varsities> (accessed 25/05/17)

¹⁸ It didn't reach the top 15 in 2016. For 2015 ranking see: <https://www.timeshighereducation.com/news/top-30-african-universities-times-higher-education-reveals-snapshot-university-ranking> (accessed 25/05/17)

the progression and enactment of the STI legislation and; (ii) the improvement of STI capacities and capabilities in the country across all sectors of the economy. The latest update on these projects was published in March 2016 and stated the achievements so far were:

- Draft STI and Information Bill has been finalized and is ready to be presented to the Cabinet
- Research fund has been established under the National Council for Science and Technology
- A group of students from University of Nairobi were sent to Korea to study nuclear science on an exchange
- Ministry of Education, Science and Technology has developed a technology development, transfer and diffusion programme¹⁹

That said, Vision 2030 also includes a number of other flagship projects that are directly or indirectly linked to the development of STI capacity in Kenya these include:

- Konza City, a ‘technopolis’ that will house the National Physical Science Research Laboratory, a Science Park including the Kenya Electronics Telecommunications and Computing Research Institute (GoK, 2013) and the Kenya Advanced Institute of Science and Technology, a post-graduate university (Kenyatta, 2017).
- The development of five small and medium size business enterprise industrial parks to be created across the country, mostly in agro-processing
- The development of the Nairobi Industrial and Technology Park in collaboration with Jomo Kenyatta University of Agriculture and Technology.
- Technology innovation hubs to be set up in every county
- Various large scale infrastructure projects such as the Lake Turkana Wind Power project that have the potential to build new skills and capabilities for the country

2.4 Nairobi’s iHub and Kenya’s innovativeness

In 2010 Nairobi’s iHub opened, perhaps Africa’s most well-known innovation hub having incubated Ushahidi the crowdsourcing platform that came to prominence during the Arab Spring. However, Kenya or rather Nairobi had innovation hubs before the iHub including University of Nairobi’s FabLab. Yet, the opening of Nairobi’s iHub is a relevant milestone in the STI system timeline because it is what effectively put Kenya – or rather Nairobi – on the world map in terms of innovativeness. It showed further evidence of Kenya’s innovativeness and its ability to innovate just as well as developed economies following the other over-used example of M-Pesa, Kenya’s first money sharing platform launched in March 2007. Since M-Pesa and the iHub, Nairobi has become a geographical hub for innovation on the continent with several international companies setting up R&D labs in the capital such as IBM Research which opened its R&D lab in 2013 in Nairobi. The UNESCO Science Report of 2015 notes the importance of these technology and innovation hubs across Africa and their potential to create new growth paths where skills and expertise are built inside the country and not imported in.

But innovation isn’t just an application taking place in Kenya’s formal technology space. As outlined above, Kenya’s informal sector is a massive contributor to employment in Kenya and therefore extremely important to the economic development of the country. Innovation and research is not absent from this sector; there is recognition of linkages between the rise in innovation hubs and informal sector R&D activity²⁰ while research on the innovative activity in Kenya’s informal metal

¹⁹ <http://www.vision2030.go.ke/496/progress-2016-march-science-technology-innovation-sti/>

²⁰ <https://www.openair.org.za/informal-sector-innovation/> (accessed 03/05/17)

manufacturing sector has been conducted (Bull, 2014). It has long been recognised that STI can be utilised to increase the productivity of this sector. For example, Kenya's draft STI Policy developed from 2008 recognises at various places throughout the document the importance of supporting the linkages between researchers and the STI community with the informal sector – and not just the formal sector.

2.5 2013 STI Act and the new organisational arrangements

The 2013 STI Act outlined a new triangular structure for the promotion and coordination of STI in Kenya. It created the National Commission for Science, Technology and Innovation (NACOSTI); a new incarnation of the NCST. NACOSTI is tasked with advising national and county governments on all STI related matters including the prioritisation of certain STI activities to ensure achievement of the country's development goals. NACOSTI is also in charge of regulating the sector i.e. conducting regular quality audits on the country's research institutes and approve all research activities that take place in Kenya. NACOSTI is to be a 'body corporate' i.e. a semi-autonomous public body that is its own legal entity. It is currently housed within the offices of the MEST in Nairobi and has taken over staff and offices of NCST. NACOSTI is managed by a board made up of representatives from the MEST and Ministry of Finance, the Directors of the NRF and KENIA as well as three STI experts and a private sector representative amongst others.

The Act also created a National Research Fund (NRF), which is mandated to fund research activities in Kenya to both public and private research institutions (i.e. not limited to public universities). It is expected to manage funds received from government as well as other actors such as international development partners and industry. The government has pledged in the STI Act of 2013 to provide up to 2% of the country's GDP from the national budget each year for use in funding research through the NRF – see below for more details. The fund can support personnel as well as infrastructure development e.g. fund the creation of new, or updates to existing, laboratories. The NRF was physically established in 2015 with the Acting Director taking up position in October 2016 working with a further two staff seconded from the MEST. Over time the NRF is expected to become a staff of around 70. The Fund is currently in the process of setting up various research funding schemes or taking over existing research funding schemes from NACOSTI. NRF is managed by a Board made up of representatives of the MEST, the finance ministries as well as representatives of the finance and private sectors.

Finally the Act created a Kenyan National Innovation Agency (KENIA) which again will be a 'body corporate' that is tasked with managing and promoting the conditions for the country's innovation system. This includes promotion of linkages between industry, academia and other actors in the national innovation system. It is tasked with the promotion and encouragement of innovative activity including through funding innovation prizes and creation of innovation spaces (e.g. science parks). It also promotes knowledge on intellectual property rights and the latest in global technology. KENIA was established formally in 2016 and as of February 2017 still had an Acting CEO in charge and a Secretariat of two other staff besides the Acting CEO. Eventually the idea is to have an officer of KENIA in all county governments as well as national level staff (SGC representative interview, February 2017). KENIA is managed by a Board made up of representatives of the MEST, a representative working in a body linking industry and academia together with four STI experts amongst others.

3. Research funding activities of science granting councils of Kenya

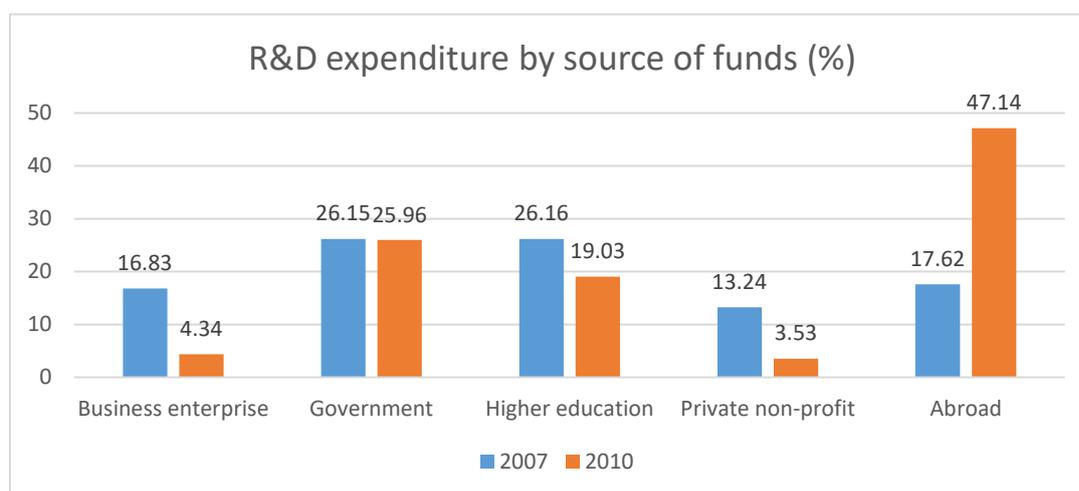
As outlined above, the STI Act of 2013 set up three new organisational bodies that between them regulate, promote and support STI activities including research activities in Kenya. The principle research funding body is the NRF although KENIA also holds innovation prize competitions. This section will outline the historical set up of research funding in more detail and provide as detailed a list as possible of the current researching funding opportunities that are available in Kenya in early 2017 through the NRF.

3.1 Research funding: the numbers

The 2013 STI Act sets out a target of 2% of GDP to be spent on R&D each year. As stated earlier, this is a whole 1% more than was recommended by the African Union. Kenya has however not yet managed to reach this target, although it has almost reached the African Union recommended 1%. R&D expenditure in Kenya has risen from 0.36% of GDP in 2007 to 0.79% of GDP in 2010 (latest official figures as recorded in UNESCO Science Report of 2015 and confirmed with Ministry of Education Science, Technology and Innovation (R Liahona, 2017, pers. comm. 11 April).

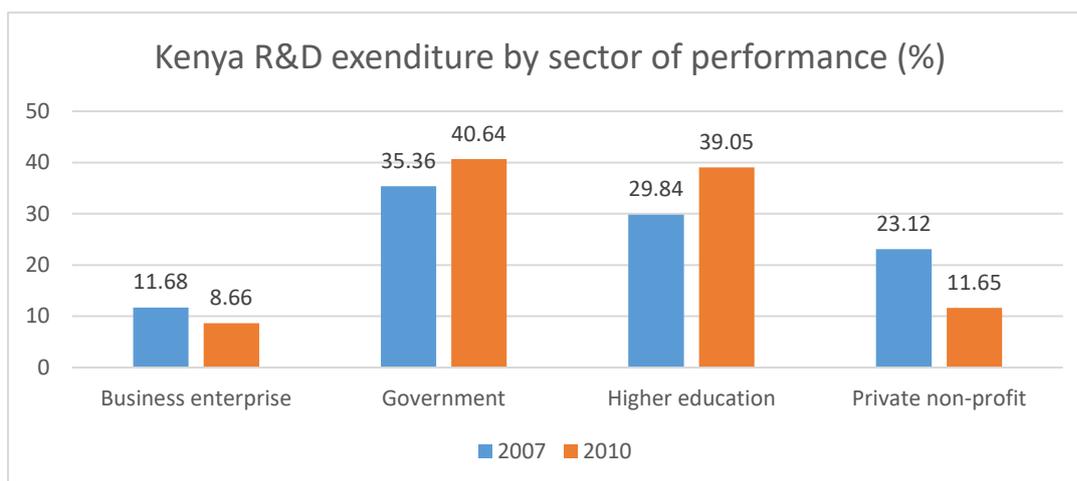
In 2010 the total R&D funding made available as per official figures was just under 30 billion Kenyan Shillings (approx. 300 million US dollars). It was predominately provided by funders from abroad (see Figure 3) and the vast majority funded R&D efforts in the area of the natural sciences (notably agriculture) in the public/ government and higher education sectors of the economy (see Figure 4 and Table 3).

Figure 3: Kenyan R&D expenditure by source



Source: (UNESCO, 2016)

Figure 4: Kenya R&D expenditure by sector



Source: UNESCO, 2016

Table 3: Total expenditure in 2010 on R&D by sector of performance and field of science (millions of Kenyan Shillings)

	Business enterprise	Government	Higher education	Private non-profit	Total
Natural sciences	107.8	303.6	486.3	153.8	1,051.5
Engineering and technology	288.1	1,416.9	1,458.9	136.3	3,300.2
Medical and health sciences	840.8	3,137.5	1,847.9	1,015.4	6,841.6
Agricultural sciences	689.9	4,554.5	4,960.3	957.3	11,162.0
SUB-TOTAL: Natural sciences and engineering	1,926.6	9,412.5	8,753.4	2,262.8	22,355.3
Social sciences	86.2	506.1	583.6	377.1	1,553.0
Humanities	129.4	202.4	389.0	261.1	981.9
SUB-TOTAL: Social sciences and humanities	215.6	708.5	972.6	638.2	2,534.9
Not specified	13.8	0.0	0.0	0.0	13.8
Total expenditure on R&D	2,156.0	10,121.0	9,726.0	2,901.0	24,904.0

Source: R. Liahona, 2017, Pers.comm. 17th March.

3.2 Research funding: historical organisation

The Figures and Table in sub-section 3.1 provide detail on what was funded and through which types of organisation. The details that are outlined also provide a snapshot of the situation prior to the enactment of the STI Act of 2013 and the creation of the new triangular organisational structure for science granting mechanisms in Kenya. Specifically, based on the results from key informant interviews conducted for this study, the organisation of research funding (resource mobilisation and allocation) can be described pre-2013 as follows:

- Public research institutes were funded directly from their parent ministries and therefore vied for funding against implementation programmes. The vast majority of funds received by public research institutes went to staff salaries with little or no funding provision of equipment or infrastructure upgrading or the implementation of research projects.
- Public sector higher education institutions (universities and further education technical colleges etc.) received their funding from the Ministry of Education. Again the vast majority of funds received went on staff salaries with little or no funding for equipment, infrastructure development or research.
- The funding that is captured by Figures 3 and 4 and Table 3 on the other hand is the result of sourcing of funds from the then NCST in Kenya or external funding from international development partners or through international partnerships or research agreements with universities or other organisations based outside Kenya.
- NCST funding available before 2013 included the following opportunities (total number of projects funded between 2008 and 2012 in brackets) (Rugutt, 2014):
 - Research projects (189)
 - Innovations (74)
 - Post graduate studies for PhDs (241) and Masters (194)
 - Women scientists (90)
 - Research facilities (8)
 - Support for conferences and symposia (100)
 - Post-doctoral research (36)
 - A number of bilateral programmes:
 - Joint research projects between Kenya and South Africa (27)
 - Joint projects with the Japan Society for Promotion of Science (5)
 - Kenya/ German joint PhD programme, DAAD (54)
- Much of this funding was made possible by a research endowment fund created in 2008. Which started with an initial investment of 200 million Kenyan shillings.
- The idea of University Research Chairs and incentives to publish were also initiated prior to 2013 but implementation took place after the Act was legislated and therefore these are discussed in the next section. In addition, NCST also initiated the idea of industry-university linkages before the 2013 Act but for this no data could be found.
- Examples of funding from outside of Kenya that was utilised by Kenyan research institutes and universities include the following illustrative (not exhaustive) list:
 - Wellcome Trust, US Centres for Disease Control and other international development partners working directly with Kenya's public research institutes or open calls through regional funding initiatives such as AESA and the East Africa Research Fund.
 - University scholarship programmes such as the Commonwealth Scholarship Fund (through the Kenyan Ministry of Education).
 - Ad hoc research projects won based on personal contacts or through independent search activities by individual researchers for one-off time limited research projects.

3.3 Research funding: the current situation

Since the 2013 STI Act, the responsibility of many of the above funding schemes that previously were provided by NCST/ NACOSTI are in the process of being moved to the remit of KENIA for the innovation funds and NRF for everything else. In early 2017 the only funding scheme that had been fully transferred to NRF from NACOSTI was the post graduate research funding scheme (SGC representative interview, March 2017). NACOSTI was also in the process of conducting an evaluation of research funding impact for the preceding years (SGC representative interview, March 2017).

In addition, the following new schemes have started since 2013; the genesis of which are not necessarily linked to the STI Act itself:

- As stated above, the idea of funding University Research Chairs was initiated prior to 2013 but came into being post-2013. NACOSTI and IDRC agreed to fund the programme with equal amounts of funding. The idea was to provide opportunities for long term research capacity building to take place through three research chairs in: agriculture-biotechnology; health systems and; technology for manufacturing. The first chair was awarded in March 2015 to Moi University in Health Systems to Prof. Fabian Omoding Esamai. The second chair was awarded in March 2017 in the area of Technology and Manufacturing to Jomo Kenyatta University of Agriculture and Technology's Prof. Bernard Iku.²¹ The third research chair in agriculture biotechnology has yet to be awarded due to difficulties in finding a sufficiently suitable application (SGC representative interview, February 2017)
- Also stated above, an 'incentives to publish' programme was devised pre-2013. In 2014, this was rolled out and the authors of at least 40 papers published were awarded with incentives of between 50-200 US dollars on publication of their paper (Rugutt, 2014).²²
- In February 2017, the NRF rolled out a new funding scheme in collaboration with the UK government. The Newton-Utafiti Fund provides funding for both researcher and institutional capacity building through a series of researcher-linkage funding platforms (providing funding for collaborative workshops to develop research projects) and an institutional-links platform (to provide funding to strengthen collaborations between different research groups and/or between researchers and other stakeholders e.g. industry). The first round of funding was completed in 2016 and 14 awards were made to Kenyan researchers in March 2017.
- NRF is currently in the process of discussing a number of other potential bilateral funding projects with international development partners.
- The additional forms of research funding not linked to government funding pots outlined above as existing pre-2013 also continue to be used by researchers in Kenya since 2013 to date.

Finally, the above lists formal research orientated funding opportunities that are available through government challenges or through external funders or collaborations with other universities or researchers. However, there are other forms of research that get undertaken which may not be listed under formal R&D figures. Such research is often undertaken as part of implementation programmes and as such is not formally classified as 'research' although it may still be published or lead to researcher or institutional research capacity building taking place.

²¹ <http://www.jkuat.ac.ke/hope-coconut-industry-nacosti-launches-research-chair/> and <https://www.idrc.ca/en/article/highlight-kenya-selects-first-research-chair-health-systems> (accessed 03/05/17)

²² More recent data was not available for this award.

4. Factors influencing activities and performance of SGCs and STI activities in Kenya

During the literature review and the key informant interviews undertaken for this project, a number of political and economic constraints and enablers were identified that have the potential to have influenced, or have been identified as having already having influenced, activities and performance of the SGCs and/or STI activities more generally in Kenya. This section briefly outlines these constraints and enablers. It should be noted that the constraints and enablers that are outlined below all require further analysis. The interviews and literature review were conducted to provide an indication of the issues that are being faced by Kenya's STI community and its SGCs so that such further analysis can be conducted and remedial action taken where required. The key informants chosen were purposively selected due to their knowledge of the STI field in Kenya and having interacted regularly with the SGCs and/or NCST/ MEST prior to 2013. The number of key informant interviews conducted was less than 10 but the field as a whole is not large in Kenya, despite the fact Kenya is significantly more research active than many of its neighbours. We believe that the key informants interviewed represent the breadth and depth of views likely to be have been received by others working in this arena.

4.1 Overarching political constraints and enablers

4.1.1 Vision 2030

Four interviewees noted the usefulness of the Kenyan development strategy Vision 2030 as a means for providing a focus of STI activity in Kenya. The medium term plan 2013 – 2017 was said to provide a guiding force for NRF (SGC representative interview, March 2017). A specific Sector Plan for STI 2013 to 2017 (GoK, 2013) was developed by MEST to provide direction for the sector. The Plan outlines sector priorities and main programmes and projects for this period. However as will become clear in forthcoming sub-sections several interviewees felt priority setting was not always as focused as it could or should be. One interviewee (education representative 1 interview, February 2017) felt that the National Strategy for University Education also provided priority areas for assistance with priority setting.

Another interviewee (education representative 2 interview, February 2017) saw Vision 2030 as one of the reasons the 2% of GDP figure could be successfully lobbied for in Parliament; because it makes so very clear the importance of STI for the country's development. Another (international development representative interview, February 2017) stated that, in their opinion, Vision 2030 was the catalyst for the movement on the STI Act.

4.1.2 Competing interests of stakeholders

All interviewees noted some element of competition within the current research funding environment. Six of the interviewees (interviews with MEST, international development representative, Education representative 1 and 2, two SGC representatives) noted that there is a perception that the majority of funding goes towards agriculture and health. Table 3 above validates this notion with figures on where R&D funding was allocated in 2010. That said, since 2010 the research calls undertaken by NCST/ NACOSTI have been focused on multidisciplinary calls first in food security and climate change (2010-2011), then energy and rural electrification (2011-2012) and in 2012-2013 on health, water and sanitation (Rugutt, 2014). In the 2016-2017 call for research projects there was no overarching theme for projects to fit into. Instead the focus was on multidisciplinary of topic focus and multi-institutional make up in any of the following: Agriculture, Health, Environment

and Natural resources, Extractive sector, Renewable Energy, Water, Sanitation, Tourism, Security, ICT, and Social Sciences.²³

In addition, the two education representatives in the key informant interviews (February 2017) both argued that there was a disconnect between a dominant focus of attention by research funding in Kenya on applied research at the expense of basic research. There was also widespread recognition across the majority of the interviews of an unevenness in the way research institutes as opposed to universities were treated. This issue will be addressed below in section 4.1.5.

4.1.3 Political cycles and devolution

There was widespread recognition that research funding was heavily dominated by party politics due to the fact funding isn't 'ring fenced' i.e. dedicated to STI and research activities – See section 4.2.1 below. One interviewee spoke about how research generally wasn't a key vote winner for politicians. Another talked about how health and agriculture aren't top priorities for politicians. A further interviewee spoke of how governments worked in only five year plans but STI activities required a longer perspective.

At the same time however, there was – even amongst those who argued political cycles were a hindrance – consensus that having support of politicians was key. Several interviewees cited the positivity towards STI when there was a dedicated ministry for science and technology. Related to this sentiment, another spoke of the positive role of supportive politicians who could and would push STI and research issues in the legislature. However, one interviewee cautioned that this was 'all well and good but only if ministers and parliamentarians had expertise to understand the debates and requirements of the research community'.

Furthermore two interviewees gave an example of politics and politicians' influence over how the new organisational framework of the SGCs in Kenya would operate. This is outlined in Box 2.

Box 2: The decision to make NRF a separate entity

The STI Act 2013 sets out that the NRF will be a research funding body. One interviewee described it as "a small treasury". But the organisation of that funding body was not clear for some time after the Act was passed. There was a debate within government as to whether the NRF should be (i) a department within NACOSTI; (ii) a department within the Higher Education and Loans Board¹ or, (iii) a separate entity totally independent of all other entities. The Minister of Education, Science and Technology appeared to support option (ii) because the skills and experience of managing large amounts of funds was already built up within HELB. In the end other arguments won the day and NRF has become a body corporate which will become fully independent.

4.1.4 Role of development partners

Five interviewees (the representatives of international development, private sector and MEST together with one representative from both the education sector and the SGCs) all acknowledged that international development partners and external funders played a significant role in funding research in Kenya at present. As illustrated in Figure 2 this is currently at 40% of all funding. Three of the interviewees focused on the constraints of this situation and argued that the implication of this was that research funding was often skewed to the priorities of funders and not necessarily the requirements of the country. While this might be the perception of many, one SGC representative interviewee noted how the newly created Newton-Utafiti Fund was a joint venture between the UK

²³ <http://www.researchfund.go.ke/wp-content/uploads/2016/10/National-Call-for-Multidisciplinary-Research1.pdf> (accessed 05/05/17)

and Kenyan governments with equal funding being put in and the priorities being set by the Vision 2030 Medium Term Plan for STI. Such an approach tallies with the perspectives of the representatives of the private sector and international development agencies interviewed who both stressed the importance of seeing the support by international development partners and other external donors as an enabler; to work with them but to ensure the country benefits. These interviewees did however acknowledge that this required strong SGCs and a generally stronger demand side for research. One of the interviewees talked about the importance of working through existing structures and building up the capacity of existing funding structures.

4.1.5 Issues of quality and the creation of a 'super league' of researchers

Finally, much of the above discussion on the relative power of different interests led to several interviewees talk about the creation of a 'super league' of researchers; as one interviewee referred to it as (international development agency representative interview, February 2017). It was generally felt that the research funding environment in Kenya had traditionally funded the same types of researchers (from the country's research institutes and/or a handful of established universities) who worked in two main areas (agriculture and health research) to do the same types of applied research as had always been awarded. The result was a cadre of scientists that were more powerful and influential – winning more grants and receiving more support – than the rest.

However the story was more nuanced that this as the same interviewee recognised that part of this was due to institutional level issues and the lack of capacity to conduct high quality research. He stated that the vast majority of research proposals he reviewed were just too low quality to be accepted for funding. In addition, both education sector representatives noted that there was a lack of research infrastructure in many universities and/or a lack of incentives to do high quality research. This led one of the education sector interviewees to state that as a result the only way to develop skills was to partner with foreign universities in research projects in order to use them to gain the skills and infrastructure needed.

The discussion of skills and expertise to conduct high quality of research relates to another issue raised by a number of the interviews regarding the focus and quality of teaching at universities. Interviewees from an SGC, the international development sector and education noted, that, not only was there insufficient incentives to do high quality research, it was also that universities were not being encouraged to do research full stop. The focus was placed on teaching – to receive more funding – and not on research. During this discussion, the MEST interviewee highlighted the need to create more attractive career pathways within universities to move into research.

4.1.6 The politics of impact

As outlined above, there was disconnect between answers with regards the way research priorities are decided and implemented in Kenya. On the one hand several interviewees stated that there were well established procedures for the allocation of funding in particular sectors or priority areas. On the other hand, the majority of interviewees noted that funding is concentrated in two sectors and within a small group of universities and research institutes, if not a small 'super league' of individual researchers. This resulted in a series of discussions about priority setting of research funding and its linkage to impact. The private sector interviewee and one of the education sector interviewees noted that despite the large amount of funding that had been spent, especially in the area of agriculture and health, there was a lack of clarity on where it had gone/ what it had been spent on in terms of visible impact. One of the education sector interviewees stated that even the well regarded international centres such as ICIPE and ILRI were not able to show impact. This was recognised several years ago when both of these Centres were involved in the DFID funded 'Research into Use' project (2006-2012) which aimed to get research ideas out of the lab and into the field (Frost, 2013). However, even the ILRI project selected was dropped mid-way through the programme because it was deemed to have too little potential for real impact. This raises a key question of who determines what impact is

important. This links to the issues raised earlier about the decision-making process to fund certain sectors or types of research.

It also links to decisions on whether to focus more on linkages with the private sector or not. Several private sector bodies have been written into the governance mechanisms of the new SGCs due to the overwhelming support for the need for more private sector involvement in the STI sector and research funding activities more specifically. This matter is discussed below under the economic factors.

4.2 Overarching economic constraints and enablers

4.2.1 Ring fencing of funding

Three interviewees (the MEST, an SGC and the international development sector representatives) noted that Kenya does not ring fence research funding. As a result, although pledges have been made to significantly increase the percentage of GDP allocated to R&D, the NRF has witnessed incidences of where it has had to give back funds to the Treasury in 2016. As an SGC representative interviewed described:

“NRF get their budget from treasury and often NRF have to spend it or return it in a time frame that doesn't fit easily with the timeframe for research calls. With government policies there is a way institutions are supposed to spend their monies. However, if NRF are found to have not spent this money by a certain point then they decide NRF don't need it and so they divert the funds to other areas. But they don't understand that in research the process is long and you need to give people time to do the call (people need time to apply – to write a good proposal – and then the review process takes time). Because of that, NRF have experienced challenges. NRF have had money taken back.”

4.2.2 Funding from private sector

There was general consensus across all the interviews that the current arrangement in terms of how research funds were generated would not be viable long term. Six of the interviewees spoke about the role of the private sector in promoting, funding or conducting research activities. Interviewees from two SGCs, MEST and the private sector all argued that the private sector would be required to fund more research. This in turn would potentially increase their influence over the type and direction of research that is funded. In addition, one SGC representative noted that often the private sector does not trust government and prefers to fund research organisations directly while the private sector interviewee noted that it was difficult often for the private sector to trust universities because of the lack of leadership and the focus on teaching at the expense of research. The private sector interviewee went on to then question the ability of the private sector to become the principal funder of research when such an environment prevails. As such it is not surprising that several of the interviewees (from the private sector, an SGC and international development sector) discussed the importance of building partnerships between stakeholders, especially the private sector in order to leverage more funding and to achieve the 2% goal.

4.2.3 Capabilities and skills availability

Finally, it is worth noting an additional economic factor that is under-recognised for its economic implications despite widespread use of the term 'knowledge-based economy' and an increasing recognition of the importance of capabilities building for economic development (c.f. Kruss et al, 2015). The issue of institutional capabilities in universities has been mentioned above; the lack of a large number of high quality researchers and the lack of a pathway to a research career suggesting difficulties in getting research experience for graduates. In addition, more indirectly, the issue of capabilities in understanding STI and the requirements of government and regulatory stakeholders

was also raised during the interviews. Six interviewees mentioned the problems of absorptive capacity within the whole 'research system' (i.e. not just universities but also the SGCs, private sector, regulatory bodies, banks and finance institutions etc.). Two interviewees from the SGCs noted that 2% of GDP is around 120 billion shillings (1.2 billion US dollars) which, as one of them noted, "is a lot of money" to put into the system each year and "managing it is a huge task" and it is understandable that there were discussions over which agency model to use regarding where to house the NRF (Box 2 above).²⁴ As one of the education sector interviewees noted: "you have to have capacity to do research and we need to build this. We don't have enough humans or institutes that these people can work in. This is what is needed." Yet as an SGC interviewee noted, "Kenyan researchers are eager and so it's not a matter of absorptive capacity to be able to disburse these funds" which again raises the question of how such funds should be used to build capabilities and capacities and/or continue to fund research excellence.

²⁴ A back of the envelope calculation suggests that if equally divided between each university and research institute registered in Kenya this would mean 16 million US dollars in research related grants and prizes going to each of these organisations every year.

5. Conclusion and recommendations

This national case study report has provided an overview of the political and economic context of the Kenyan STI field. It has narrowed down into the make-up and operation of STI activities in the country and the funding of research, specifically through the so-called 'Science Granting Councils' of the Kenyan National Research Fund, the Kenyan Innovation Agency and their allied organisation, the National Commission for Science, Technology and Innovation. The key findings are:

1. Kenya has a high level of R&D expenditure relative to others in the region at 0.79% of GDP and has legislated to meet a 2% of GDP target
2. Kenya has three SGCs although only two can providing funding and only one, the National Research Fund (NRF), provides research grants funding
3. Kenya has a guiding development plan – Vision 2030 – that has provided funders with a set of priority areas to fund in recent years but the majority of funding still goes towards health and agriculture sub-sectors.
4. The Kenyan government has started to encourage change in this through the issuing of multi-disciplinary calls for research grants since 2013 and through the funding of a research chair in the technology of innovation in 2016.
5. Serious capacity issues remain as yet unaddressed in Kenya not just in terms of how to increase the number of high quality researchers that are interested in conducting research in Kenya but also the degree of knowledgeable experts to run the new SGC organs of government (NRF, KENIA and NACOSTI) especially in light of the expected increase in research funding entering the Kenyan STI environment and research system.

As a result, and based on the evidence reviewed during this study, the following recommendations for Kenyan STI and research funding stakeholders are made.

5.1 Recommendations for the Kenyan SGC

5.1.1 An increased clarity of priority setting mechanisms for research funding

Priority setting needs more attention and some form of mechanism set up to encourage private sector engagement if the 2% target is to be met. More particularly, there is a need for greater clarity over the areas which receive funding especially to reduce – or legitimate – the spending undertaken in the 'classical' areas of health and agriculture. This would also provide an opportunity to countercheck that the priority areas set out in the Vision 2030 Medium Term STI Plan fit with those in the National Strategy for University Education and the more recent developments in Kenya to work towards achievement of the new Sustainable Development Goals.

5.1.2 Utilising the opportunity created by devolution

The move towards devolved governments provides Kenya with an opportunity to ensure more targeted research takes place at local levels. This, together with current efforts to enhance the quality of university education in the country, provides the basis on which to enhance further the creation of 'developmental universities' (Arocena et al, 2015) which are focused on solving the problems of their local community. In so doing, they also provide an opportunity for the promotion of targeted Local Innovative Production Systems (LIPS) (Cassiolato and Soares, 2015) to support the informal sector. This is necessary as current focus of innovation hubs, science parks etc. is predominately on formalised business.

5.1.3 Enhancing capabilities and capacities in research

While the final transfer of the research funding opportunities takes place to NRF from NACOSTI and both NRF and KENIA build up their list of services that they provide the research community, one

additional area of attention to consider is intra-university capacity building projects. Much of the time individual capacity building is promoted either through training (e.g. postgraduate level studies) or through collaborative research projects. However, additional mechanisms could include formal mentorship programmes for post-doctoral researchers and exchange programmes between Kenyan research institutes and universities; taking advantage of the expertise built within the existing 'super-league'. In addition, stakeholders should consider developing a new category of early career researcher grants to assist those who still need capacity building and perhaps include dedicated training programmes within such grant programmes in order to ensure both (i) a breadth of research capability across Kenya's universities and research institutes and (ii) a visible career path as well as incentives to follow such a career path (rather than the current focus on teaching).

5.1.4 Maintaining SGC momentum through capacity building

A final recommendation relates to the building up of capacity and capabilities within the SGCs and associated Ministries and other stakeholders in order to ensure momentum continues to enable the SGCs to grow. A dedicated capacity building plan is needed to ensure the SGCs meet their targets e.g. KENIA can achieve a countrywide reach and the NRF get to a staff of 70 who are able to manage large sums of money. This requires dedicated sections in strategic plans for capacity building activities over the whole period of the plan; to enable a stepwise increase in skills as they become available. Just as the country needs to build up its cadre of researchers able to absorb increased levels of research funding, so too do the SGCs need to build their capacity to manage such funds. This strengthening the understanding of the division of responsibility between the three SGC organisations in Kenya as well as recruiting the right mix of financial and scientific talent.

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