



**KENYA INNOVATION
OUTLOOK STUDY**

2022

THE KENYA INNOVATION
OUTLOOK INDICATORS
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This section presents the outlook in form of indicators developed for each of the domains and sub-domains outlined in the KIO 2022 framework. For each domain/sub-domain, indicators are discussed in terms of their status, trends, challenges and opportunities for learning and improvements as well as potential interventions. The detailed list of indicators and values can be accessed in Annex 1.

5.1 DOMAIN 1: NATIONAL/GLOBAL ECONOMIC AND LEGISLATIVE CONTEXT

The recognition of innovation in national and global economic contexts is critical in legitimizing and allocating resources to the innovation agenda. Out of the five sub-domains under this domain, 18 indicators were identified (Figure 8) with most indicators aligned to the Innovation Governance (n=5). Forty-five (45%) percent of all the indicators in this domain are qualitative while the rest are quantitative. Data could be accessed for about 80% of the indicators even though going forward, information will be required through policy surveys/ interviews.

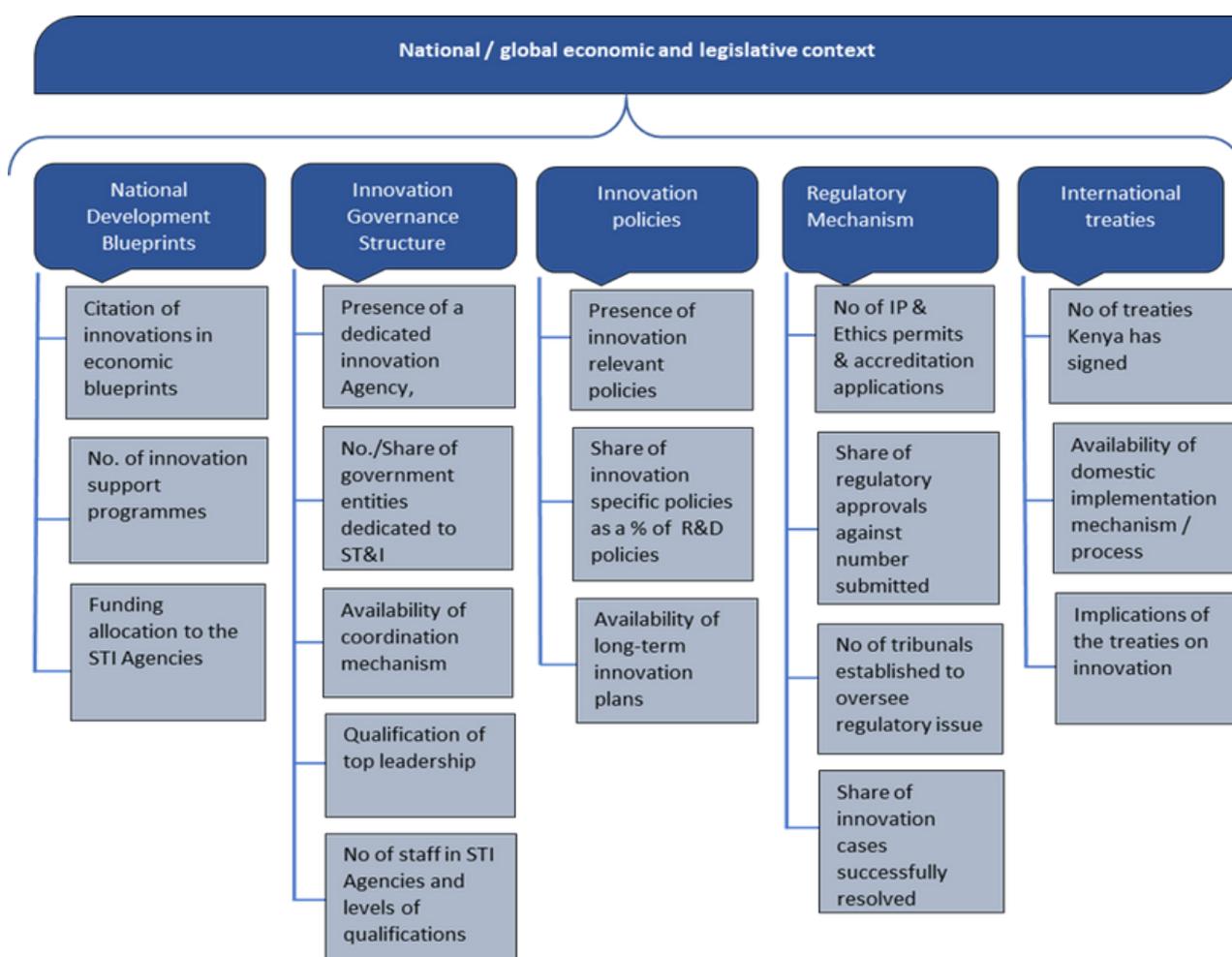


Figure 8: National/Global economic and legislative context Indicators

5.1.1. National Development blueprints

Even though innovation is highlighted in Kenya’s Vision 2030 and other blueprints, there is no consolidated visibility of innovation agenda in these blueprints. A National Innovation Masterplan could fill this gap.

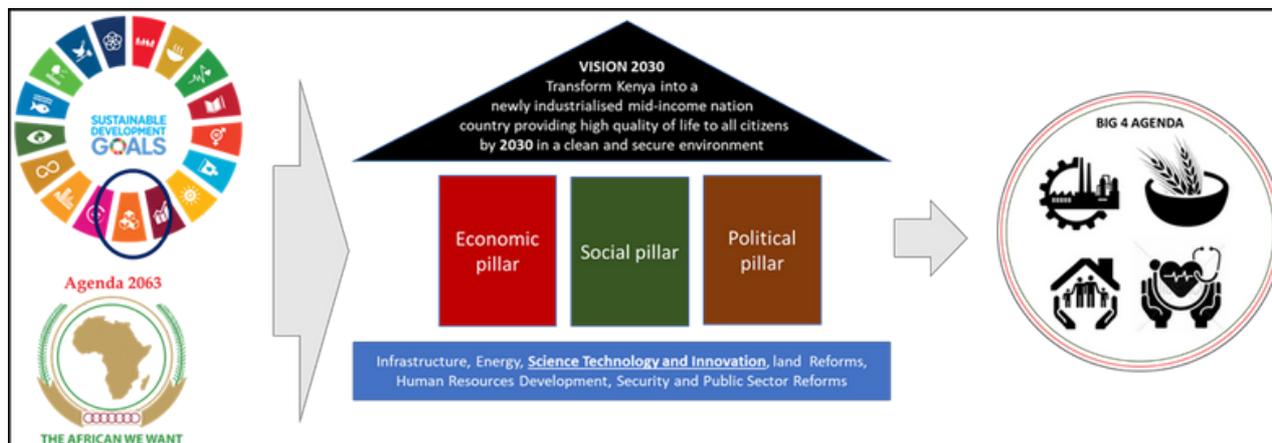


Figure 9: The key economic blueprints documents underpinning the mainstreaming of ST&I in Kenya's development planning

The role of Science Technology and Innovation in the Kenya development plans is anchored in the Vision 2030 and the Big 4 Agenda. In a nutshell, Vision 2030, first mooted in 2008 aims to transform Kenya into a newly industrializing, middle-income country providing a high quality of life to all its citizens by the year 2030 in a clean and secure environment. The achievement of the Vision is predicated on the coalescence of three pillars that focus on economic, social, and political programmes for national development. Science, technology, and innovation is highlighted as one of the foundational enablers underpinning all three pillars. The government of Kenya has built the development ambitions under Vision 2030 and the Big 4 Agendas on innovation for businesses and job creation.

Innovation is cited across the three Vision 2030 pillars and identified as a catalyst for achieving the goals of the pillars. While innovation is not discussed in detail in the Vision 2030 pillars, some elements of innovation such as research, education, and technology development are widely recognized as foundational actions and investment areas to support the Vision. Drawing from the main Vision document, the current government (2013–2022) established the Big Four Agenda focusing on four priority areas for socio-economic growth: universal health care, food security, affordable housing, and manufacturing. The Second Medium Term Plan of Vision 2030, (MTP2, 2013–2017), recommends intensifying the coordination of technology, innovation, research, development, and commercialization for economic growth.

The country has also developed sector specific innovation blueprints. The Ministry of ICT, Innovations, and Youth Affairs has developed a Digital economy blueprint (2019) focused on progressing innovation through harnessing the resources and value addition. The Kenya National ICT masterplan (2013) aims to promote the digital economy for efficient governance, service delivery, and skills development.

Other sectoral blueprints have not been considered in this outlook even though they have some elements of innovation.

In terms of the number of innovation support programmes, the assessment reveals that a very small share of the total programmes in all Government departments i.e., less than 10% of the total programmes on research and development is focused on innovation or its elements. Due to the lack of consolidated innovation agenda, it is a challenge to identify innovation-related programmes. While most programmes, e.g., special entrepreneurship funds (women, youth) have innovation elements such as value addition, innovation is not primarily their agenda. Relatively clearer innovation support programmes are identifiable within the Ministries of Education and ICT, Innovation and Youth Affairs. Under the Ministry of Education, KeNIA for instance has embarked on developing specific support programmes such as the national guidelines on commercialization, aimed at accelerating the commercialization of innovative ideas and establishment of the coordination mechanism for incubation and innovation hubs, which are clear-cut efforts toward facilitating innovations.

The funding allocation for STI Agencies established under the STI 2013 act (NACOSTI, NRF and KeNIA) remains at 2% of the GDP in 2021 and this has been increasing slightly at a rate of 1.3% over the last three years (UNCTAD, 2021). There is other innovation-related funding that goes to other Ministries such as ICT and trade, but it is a challenge to extract what exactly goes to innovation.

Overall, Kenya is making progress in mainstreaming innovation in the development blueprint. The 2021 Global Innovation Index report indicates that Kenya performs above expectation in innovation relative to her income level as a lower-middle class country. The country ranks 9th out of 34 globally, and 3rd out of 27 LMICs in Sub-Saharan Africa.

5.1.2. Innovation Policies

Kenya is making good progress in the innovation policy domain anchored on the ST&I Act of 2013, but most policies and plans are regulatory in nature. More effort is required towards facilitative policies, e.g., commercialization policies and/or strategies.

In the policy sub-domain, three main indicators were identified: the presence of innovation policies more generally, share of innovation-specific policies as a % of all R&D policies and the presence of long-term strategies/plans. These indicators can be broken down further but for the purposes of this study, Kenya has developed more than 10 policies and plans relevant to innovation (Figure 10) in addition to the national blueprints that stipulate innovation as discussed above (please see a detailed policy mapping is provided [here](#)).

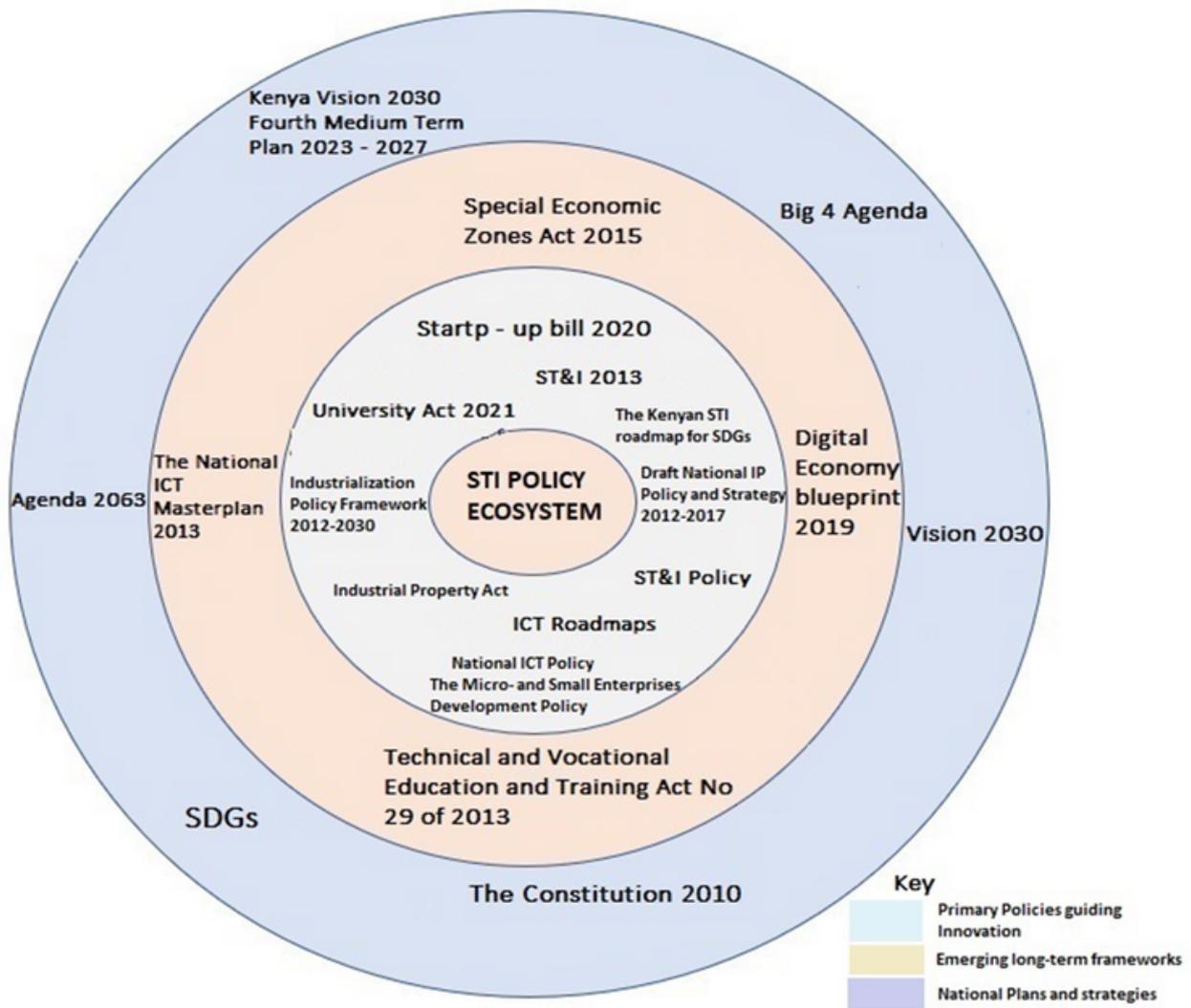


Figure 10: Blueprints laws and policies underpinning innovation in Kenya

The primary document guiding innovation investments in the country is the ST&I Act of 2013. The Act established KENIA, NACOSTI and NRF, and stipulated the entities' mandate for promotion, coordination, regulation, and funding of ST&I respectively. The draft ST&I policy of 2019 provides a framework for coordinating innovation across sectors and Ministries, mainstreaming ST&I into all sectors of the economy and promoting the buy Kenya build Kenya agenda to promote competitiveness and consumption of locally produced goods among others. The policy is premised on increasing R&D to improve efficiency by incentivizing productive sectors and strengthening university, industry, and government linkages for impact.

Other policies, such as the IP draft policy, Start-up Bill and Industrial Property Act, among others, are key in promoting the commercialization of innovative ideas from both formal (e.g., Universities) and informal (e.g., indigenous knowledge) sources. From a long-term perspective, Kenya lacks a consolidated innovation framework to guide innovation activities across sectors. Instead, the existing policies are sector specific. Emerging long-term frameworks such as the Country's Digital Economy Blueprint and the planned National Innovation Master Plan provide opportunities for consolidating the innovation agenda across sectors and accelerate economic growth in Kenya.

Despite the relatively progressive policy outlook, interviews with relevant authorities revealed that weak IP policies are a challenge to innovation in Kenya. The National IP Policy and Strategy of 2012–2017 is still in draft form, with only the establishment of four semi-autonomous institutions for the management and administration of IP. Compared to other African countries, Kenya has submitted a significantly low number of IP policies per capita to WIPO (Figure 11). Part of the challenge relates to the lack of a dedicated agency to operationalize this process or support the overall coordination. These IP policies are also not well mainstreamed in the innovation platforms such as universities and research institutions, most of which, consequently, still lack frameworks to recognize and promote innovations.

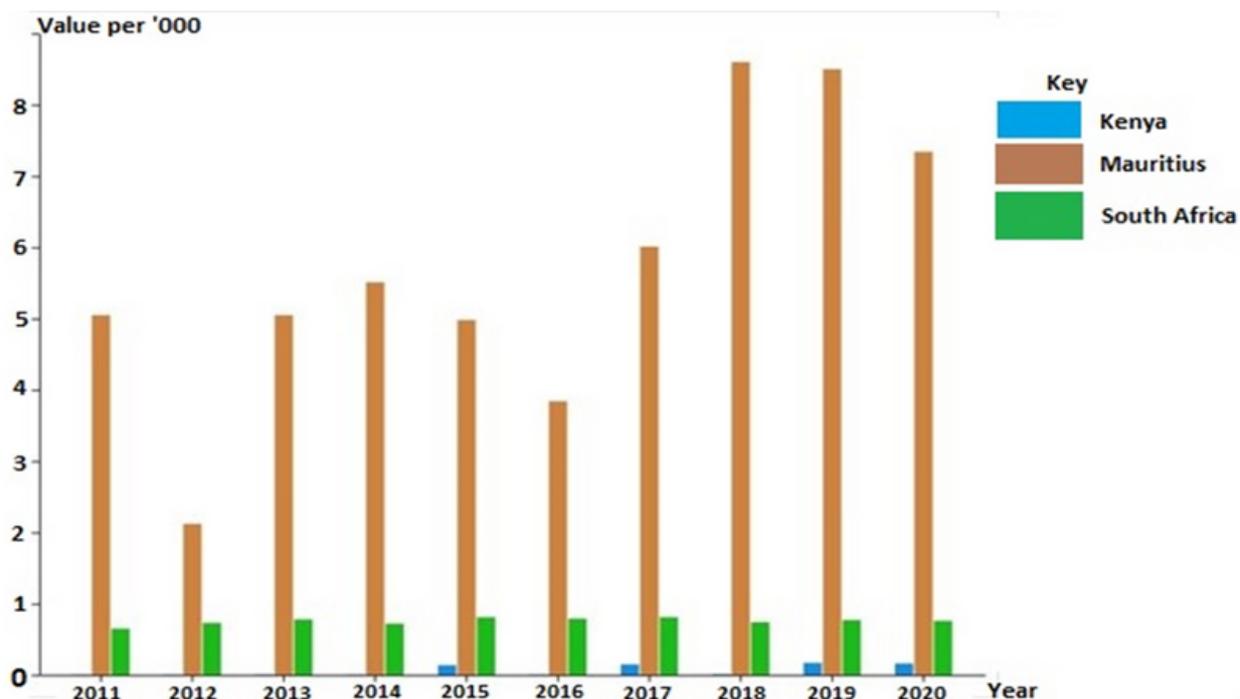


Figure 11: No of IP policies submitted by Kenya compared to the best performing Africa countries in the GII (Mauritius and South Africa) as a share of total population. Source: WIPO, 2021.

5.2 INTERNATIONAL TREATIES AND AGREEMENTS IMPACTING ON THE KENYA INNOVATION SYSTEM

Kenya has signed most international treaties but lacks a framework to evaluate their effectiveness. Three main indicators are prioritised in this sub-domain, i.e., the number of treaties Kenya has signed, availability of domestic implementation mechanisms/process, and the investment value/opportunities of these treaties. In terms of the number of treaties, Kenya is a signatory to various international policies on innovation. Out of a sample of eight (8) key international laws relevant to innovation, Kenya has ratified seven (7) of them (Figure 12). Indicatively, this shows potential alignment to the international policy systems. Some efforts are required to strengthen the domestication of intellectual property policies. Through international frameworks such as the Patent Cooperation Treaty (PCT), Kenya can protect its IPRs and learn best practices from other countries. Kenya is also part of existing assessment frameworks for monitoring and reporting innovations at regional and global levels, e.g., the Africa Outlook, the AU-NEPAD Research and Development Surveys; and the Global Innovation Outlooks (e.g., GII, UN science surveys; the OECD surveys). Despite signing most of the treaties, there is very little information on the effectiveness or impacts of these treaties in Kenyan innovation or wider ST&I pursuit. There is a lack of a framework to evaluate these treaties from a domestic context, i.e., how well they are domesticated, existing structures, and value-addition to the country's innovation outlook.

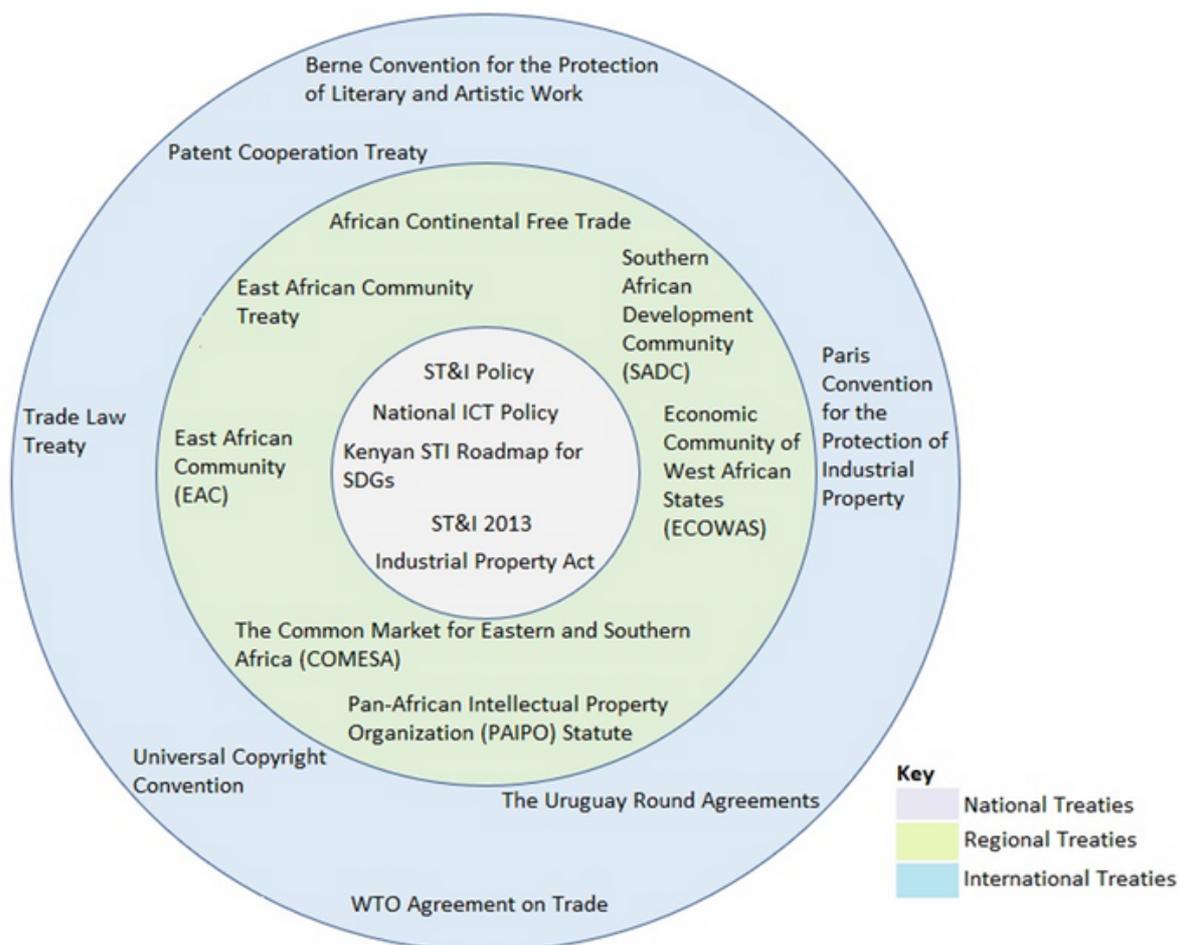


Figure 12: International Innovation Policies and guidelines to which Kenya is a signatory.

5.2.1. Innovation Governance Structure

Kenya's innovation governance structure is concentrated on the regulatory functions and less on the facilitative functions (e.g., marketization, funding etc.). Providing dedicated support to the lead Agency, the Kenya Innovation Agency, could steer facilitate more innovation and less regulatory restrictions.

Innovation governance structures refer to the institutions mandated to oversee innovation in the country. Five indicators were identified as relevant here including: presence of a national dedicated innovation Agency, number/share of government entities dedicated to ST&I, number of staff in innovation Agency, qualification of top leadership, levels of qualification of staff in STI Agencies, and availability of coordination mechanism. Table 2 shows a schematic representation of the State STI governance Agencies and their responsibilities. There are more than twenty (20) other state agencies from across five (5) Ministries playing different roles. The outlook shows that most agencies play regulatory and accreditation roles, but fewer are involved in funding and marketing and promotion.

Table 2: Agencies responsible for governing innovations in Kenya

MINISTRY	REGULATION AND ACCREDITATION	FUNDING	MARKETING AND PROMOTION	INVESTMENT AUTHORITIES
Ministry of Industrialization, Trade and Enterprises Development	Anti-Counterfeiting Agency (ACA)	Kenya Industrial Estate (KIE)	Kenya Export and Promotion Branding Agency	Kenya Industrial Property Institute (KIPPI)
	Kenya Bureau of Statistics (KNBS)	Kenya Development Corporation	Brand Kenya Board	Micro and Small Enterprises and Authority (MSEA)
	Kenya Copyright Body (KeCoBo)		Kenya Investment Authority (KenInvest)	Special Economic Zones Authority
	Kenya Accreditation Service (KENAS)			Export Processing Zones Authority (EPZA)
Ministry of Education	Commission for University Education	National Research Fund (NRF)	Kenya Innovation Agency	
	National Council of Science, Technology, and Innovation			
Ministry of Health	Drug Policy and Planning Centre (DPPC)			
	Poison and Pharmacy Board			
Ministry of ICT, Innovation and Youth Affairs	Communication Authority of Kenya (CAK)			Department of ICT and Innovation and Youth
Ministry of Agriculture, Livestock, Fisheries and Co-operatives	National Environment Management Agency (NEMA)			

The regulatory functions are critical in safeguarding innovations but might not necessarily catalyze innovations and might be restrictive in some instances. Kenya, through the ST&I Act 2013 established a dedicated State Agency, the Kenya National Innovation Agency to promote innovation. The Innovation Agency is a key player in catalyzing innovation and has recently developed programmes for promoting innovation such as the Innovation Bridge Platform, that links innovators to market actors/investors (<https://bridge.innovationagency.go.ke/>) and the commercialization guidelines under the Research to Commercialisation (R2C) programme (<https://academy.innovationagency.go.ke/research-2-commercialization>).

This programme is aimed at supporting universities and research institutes to commercialize research outputs. In addition, the longer-term National Innovation Masterplan under draft could enhance synergy in innovation across different sectors. These place KeNIA at a strategic position to catalyze innovations by leveraging on activities of other agencies and ministries such as ICT (currently implementing a digital economy blueprint).

While there is an opportunity to shift efforts from a regulatory governance structure to a more facilitative/catalytic governance structure, the capacity to do so remains weak in most agencies. For instance, a sample survey of the staff outlay in key ST&I agencies, e.g., NACOSTI, NRF, and KeNIA showed inadequate staffing often struggling to achieve the stipulated mandates. The leadership skills for these agencies also matter. An entrepreneurial, partnership, fundraising and analytical skillset as well as relevant academic qualification, e.g., PhD, are prerequisite for steering transformative interventions and governance shifts. But even with qualified leadership, availability of enough and qualified staff and team members remains key. For details on innovation governance structures and a description of the various Agencies and Ministries please see Annex 5.

In terms of coordination and synergies, the country currently lacks a clear mechanism for coordinating the innovation agenda of various ministries and their respective agencies. Rather, there are ad-hoc meetings and engagements across various forums such as the Kenya Innovation Week and other set-ups by the private sector or other players. This has reduced the opportunities to develop synergies and create inter-ministerial partnerships to catalyze innovation and minimize conflicts. Multiple agencies working in silos also result in confusing information regarding critical innovations in the country.

Globally, Kenya ranks position 80 on institutions and 92 on regulatory quality, measured in terms of perceptions of the quality of services stimulated by public policies, perception of policy stability, e.g., from political pressures, and the quality of policy formulation and implementation as well as Government's commitments (GII, 2021). This is an average performance, relatively distant from the leading African country (Mauritius) ranked at position 21 on institutions. Even though the country is making good progress in institutional development, some of the challenges highlighted above are important.

Reflecting on best governance practices elsewhere, Kenya has an opportunity to learn from Mauritius which leads Africa's innovation landscape on indicators such as institutions, human capital and research, infrastructure, market sophistication, business sophistication, knowledge, and technology outputs (GII 2021). Mauritius has specifically strengthened its facilitative governance model through strategic stakeholder partnerships including PPPs that have grown its innovation and technology sector. The Mauritius Research and Innovation Council (MRIC) recently signed an MoU with the UNDP to enable sharing of data on the innovation ecosystem in Mauritius and to facilitate joint research, multi-stakeholder experiments, and programmes.

5.2.2 Regulatory and accreditation mechanism

This sub-domain overlaps with the governance sub-domain but is mainly focused on enforcement. Three main indicators are prioritized here – availability of dedicated enforcement agencies, share of successful legal cases on innovation, availability of tribunals established to oversee innovation and property rights, and share of patent approvals against the number submitted. Kenya has dedicated agencies to protect innovations through intellectual property rights and patents. The Kenya Copyright Board (KECOBO) is a State Corporation under the Office of the Attorney General & the Department of Justice, established by section 3 of the Copyright Act 2001 and administers and enforces copyright and related rights thus protecting innovation ideas from piracy and counterfeits. Additionally, the Kenya Industrial Property Institute (KIPI) was established in 2002 under the Ministry of Industry, Trade and Cooperatives to administer Industrial Property Rights, and to provide technological information to the public.

In terms of patents registered and defended, about 38% of patents submitted, were registered with KIPI between 2016 and 2019 with only 8% of these being approved (KIPI, 2019). During the stakeholder interviews, there were concerns, especially from universities, that the patenting and regulation for research is weak, with instances where patents have been lost under unclear circumstances. Key challenges to IP enforcement, as identified by stakeholders, include a lack of prompt responses to queries, and long patent registration time coupled with the fact that some applicants are not familiar with the registration requirements and the documentation. At the same time, the high turnover of patent examiners impedes adequate and informative consultations between patent applicants and examiners. Some applicants resort to withdrawing their patent applications, subsequently resulting in very low numbers of patent applications in the country over the years. This lack of enforcement has created volumes of counterfeit products in the Kenyan markets. The low numbers have also been attributed to the lack of promotion of innovation-centric education in higher learning institutions while increased counterfeit is because of a lack of enforcement of standards.

5.3 DOMAIN 2: INNOVATION LIFE CYCLE/VALUE CHAIN

The sub-domains under this value chain include Ideation, Product development/commercialization and diffusion/uptake. A total of 58 indicators were identified (Figure 13) out of which 28 were prioritized by stakeholders as most relevant while the rest were ranked as “low/not relevant”. The commercialization domain had the highest number of indicators prioritized and highly ranked by stakeholders as relevant and was also identified as a key area of innovation support. Approximately fifty-four percent (54%) of all the indicators in this domain are qualitative in nature while the rest are quantitative. Data could be accessed for about 85% of the indicators through desktop analysis and rapid interviews. There is an opportunity to obtain missing data through in-depth sectoral analysis and interviews executed within an allowable timeframe.

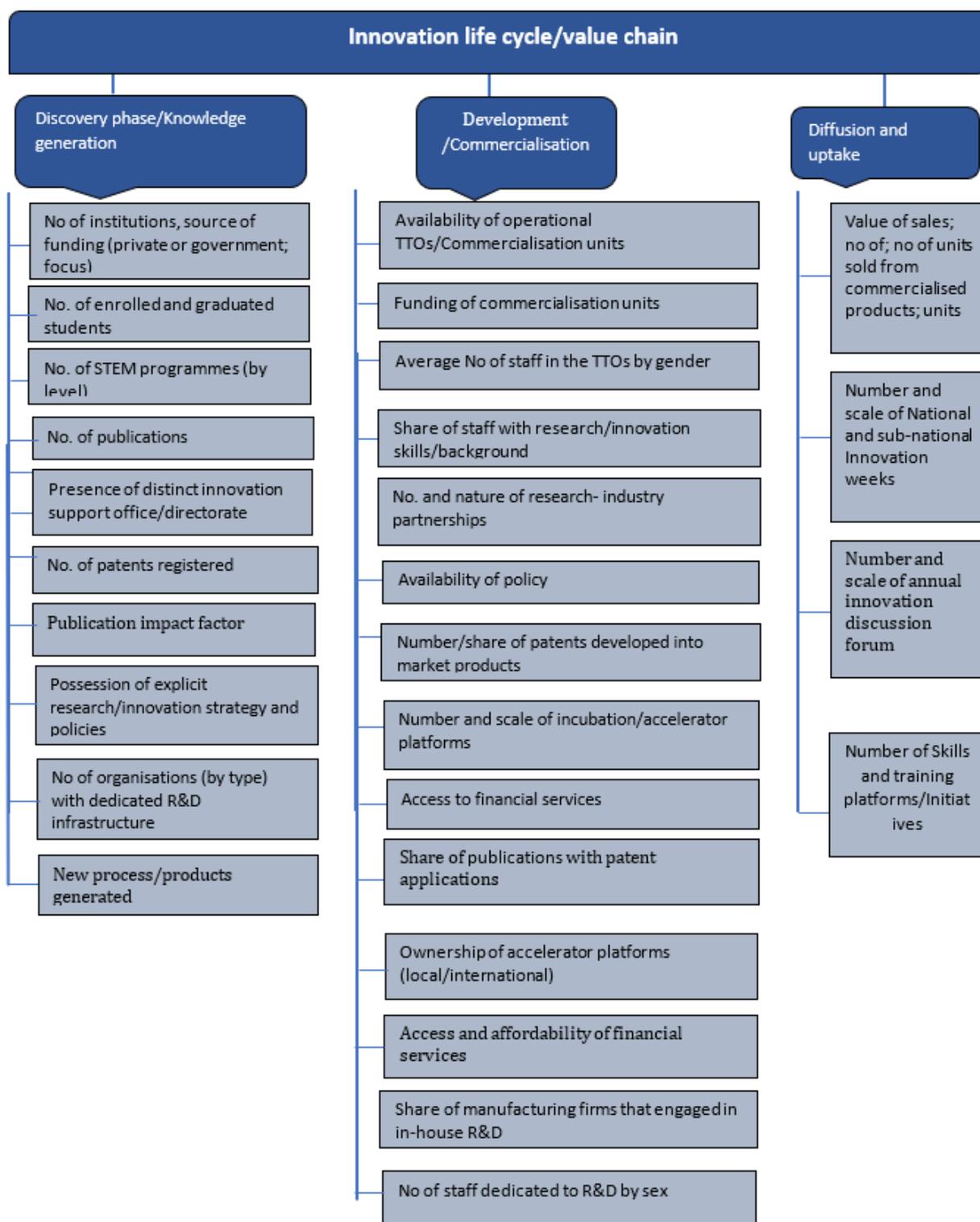


Figure 13: Innovation life cycle/value chain indicators

5.3.1. Discovery phase/Knowledge generation

Kenya's knowledge-producing platforms are increasing in number, but the number of innovation-relevant knowledge is still very minimal thus need for innovation-specific courses and academies to strengthen the production of innovation-relevant knowledge.

5.3.1.1 Academic Platforms

As of 2021, there are a total of 21 research institutions in Kenya out of which 11 are public and 10 are private. The number of universities and TVETS has been increasing in the past decade as shown in Table 4. The number of universities increased from 66 to 74 between 2015 and 2020, an increase of 12.12 % in five years. Similarly, the number of Technical Vocational Education and Training institutions in the country rose significantly by 87% from 874 to 2,191 between the years 2015 and 2020 (Figure 14). By design, the increase in numbers of TVETs signals opportunities for more technical skills to transform ideas into practical initiatives. The Government has made deliberate investments in the establishment of TVETS, recognizing their role in driving practical innovations for economic growth and employment for the increasing number of youths. Despite the Government's efforts to increase support, of these TVETS face some challenges especially inadequate funding 2017; Akala & Changilwa, 2018. In other words, investments in TVETS are more focused on their establishment but less on their operations thus challenging the overall objective around practical skill development and job creation

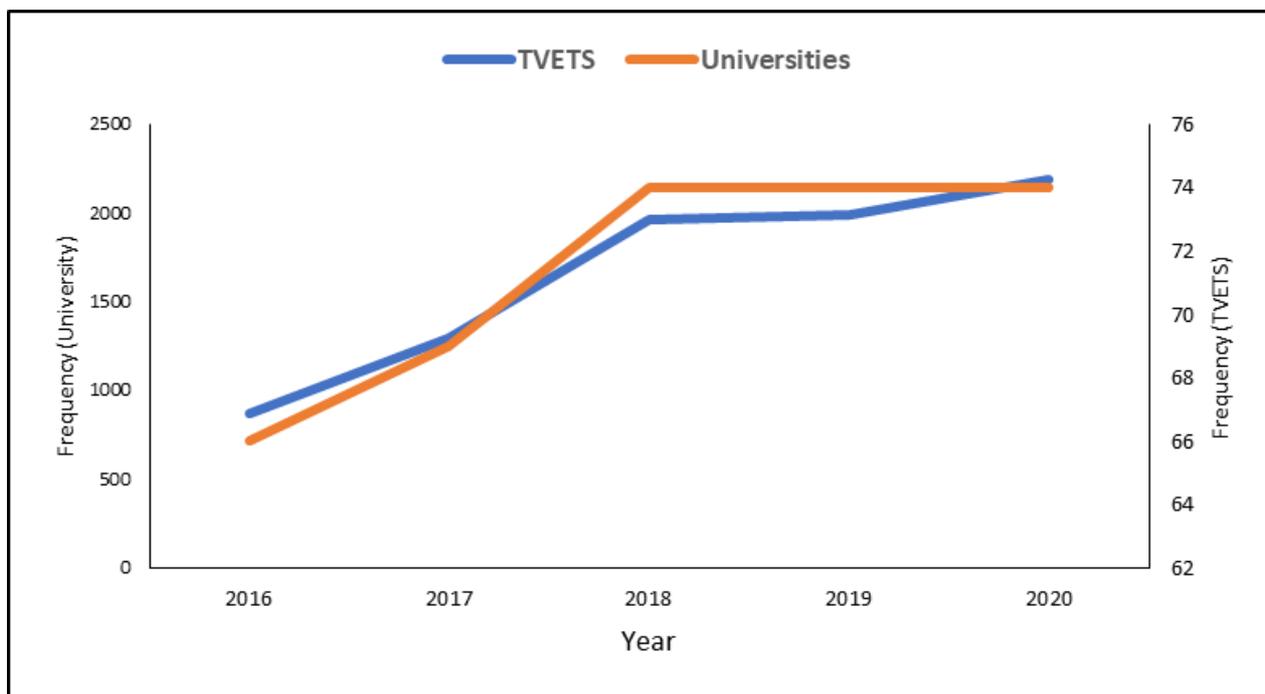


Figure 14: Number of universities and TVETs in Kenya between 2015 -2020

The expansion of TVETS and Universities has resulted in a significant increase in student enrolments. Between the years 2015 and 2020, the TVET subsector recorded a significant increase in enrolment of approximately 70% from a total of 142,410 in 2015 to 430,598 students in 2020 (Figure 15). The upsurge in TVET enrolment over the years is occasioned by the Government's deliberate effort to sensitize students on the relevance and benefits of TVETS accompanied by tailored incentives such as special funds, e.g., the Youth Fund. The enrolment in the university however recorded a 7% increase between 2015 and 2021 (KNBS, 2020). The relatively small increase in enrolment rates can be attributed to the decrease of self-sponsored students, the availability of alternatives such as TVETS, the COVID-19 pandemic, and the ongoing reforms in the education sector.

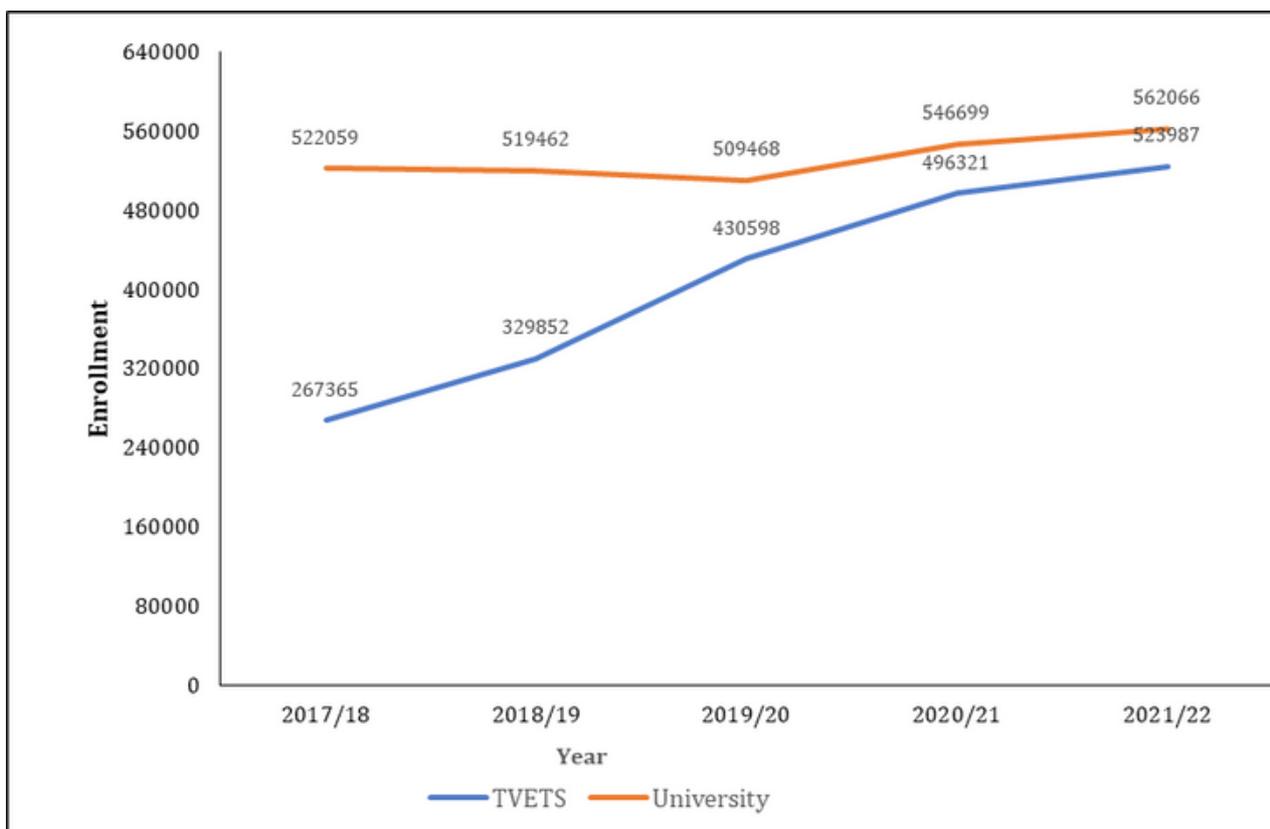


Figure 15: Trends in enrolment in the Kenyan Universities and TVETS from the year 2015–2020.

Source: Commission for University Education, 2020 / KNBS Economic Survey, 2020

In terms of the subject area, only 16% of students graduated from STEM subjects between 2016 – 2021 indicating that there is a need to support more enrolment of both males and females in STEM courses even though this is expected to increase in 2022. Out of this, only 30% were female, signaling a gender imbalance that needs to be addressed. In terms of research, Kenya has 225 full-time researchers per million inhabitants. This figure, although impressive amongst Kenya’s EAC peers (e.g., Tanzania has 26.5 researchers per million inhabitants) is still dismal by global standards in innovation related R & D. There is need for more researchers who would dedicate their time and expertise in strengthening the governance structure in the innovation sector.

There has been a modest increase in research activities and associated outputs. According to the economic survey of 2021, doctoral and postdoctoral researchers that were granted research licenses were 781 in 2016/2017, 1,129 in 2018/2019, and 1,046 in 2019/2020 (Kenya National Bureau of Statistics, 2021). In terms of research, there was a slight decrease in the number of research licenses granted to individuals and institutions from 2017–2020. The number of research license applications to NACOSTI declined by 1.5% from 6,077 in 2019/20 to 5,985 in 2020/21, while the total number of licenses granted decreased from 6,112 in 2019/20 to 5,153 in 2020/21 (KNBS, 2022). This could be attributable to the COVID-19 pandemic that affected businesses, and academic and research institutions that had to adhere to the containment measures.

The number of funds disbursed for the successful research funding applications was Kshs 59.9 million in 2019/20 while the number of applications for multidisciplinary research funding was 811 of which only 58 were successful. In 2019/20, the number of funds disbursed for the successful multidisciplinary research funding applications stood at Kshs 506.73 million. Based on the surveys and stakeholder engagements, the performance in knowledge generation is highly hinged on funding. Measured as Investments in the Research and Development (R&D), Kenya invests 0.7% of GDP in R & D and this is relatively lower than the global average of 2.63% and the aspirations of the STISA 2024 on 1% GERD. Narrowing down to the expenditure on education the percentage of GDP expenditure on higher education slightly increased by 0.1% and currently stands at 5.3%.

In comparison to other countries in Africa and the world, the % of GDP expenditure on education is slightly higher than that of Mauritius and relatively lower than the South African value (Figure 16). The allocation spent on research and development is also lower than the UK but slightly higher than the Mauritius allocation and at par with the South Africa allocation. Kenya also needs to enhance the university-industry linkages to promote innovation uptake and commercialization. The Country's enrolment in tertiary institutions is relatively lower compared to the regional and global giants and thus needs improvements. The human capital is also low thus corresponding to the lower enrolment rates and the poor university-industry linkages. Overall, Kenya has a chance to improve on the knowledge platforms to improve performance through enhancing innovation-oriented training/skill development and courses which are currently weak in universities, research organizations, and TVETS.

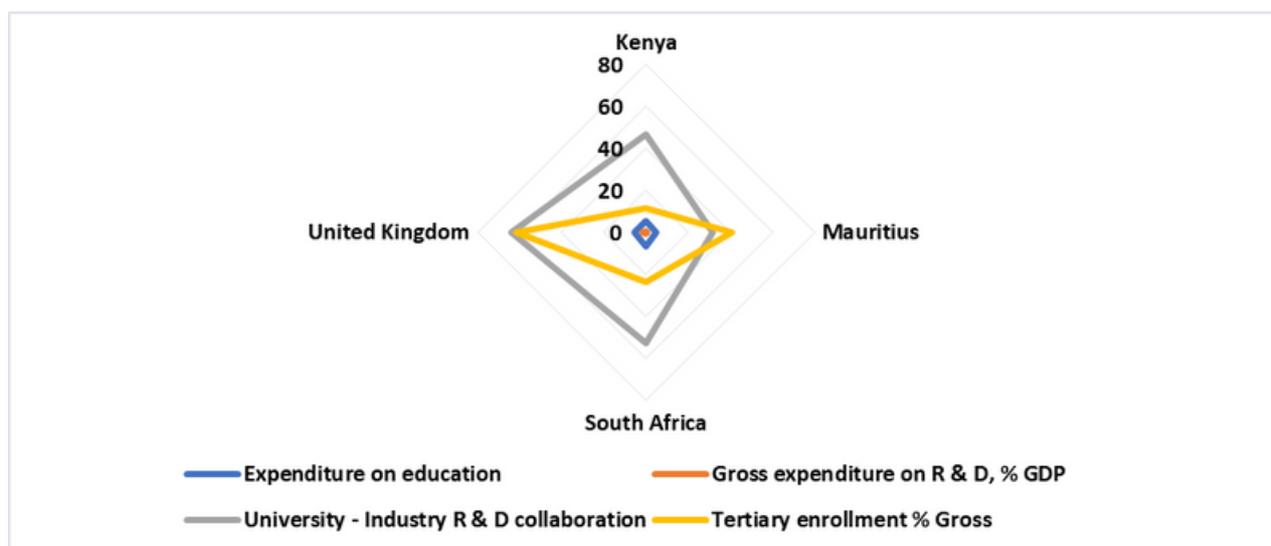


Figure 16: Knowledge platforms metrics for Kenya against the Global and regional best-performing countries

5.3.1.2 Non-Academic platforms

Non-Academic Platforms are knowledge-generating sources outside Universities/TVETS and research institutions including private firms and CSOs. Some of the identified indicators here include the number of NGOs involved in knowledge and innovation-led activities; the percentage of manufacturing firms with a focus on R&D; Private R&D firms; State-funded R&D entities; University-Industry collaboration among others. Kenya is making progress in the area as the number of firms embracing R&D through strategic collaborations is increasing. The latest data from the Second National Innovation Indicators Survey 2015, indicate that the % of manufacturing firms in 2014 that cooperated with universities or other higher education institutions was about 61 firms out of 100. Kenya ranked No. 1 in 2014 in Africa.

The analysis above gives an overview of knowledge producing platforms from both academic and non-academic sources. The analysis is relatively biased towards the Universities and TVETS with little in-depth focus on other research institutions that also produce knowledge e.g., National, and international research organizations that play a key role in the country's knowledge systems. Despite this limitation, the overall trend indicates that the country is experiencing an increase in knowledge producing platforms and outputs both in terms of graduates and publications. As part of the innovation value chain/life cycle, the next step is to transform these ideas into marketable products through a commercialization/development process as outlined in the next section.

5.3.2. Knowledge Development /Commercialisation

Commercialization is a key part of innovation outlook. Platforms for commercializing knowledge products are becoming prominent but are small-scale, uncoordinated, and not properly linked to the knowledge producing platforms.

From the stakeholder and expert inputs, the commercialization subdomain is critical for the country's innovation aspirations. Commercialization is key in turning the increasing number of knowledge products into marketable products, industrialization, and ultimate job creation and economic growth. A total of 21 indicators were identified with 14 out of these being prioritized. Some of the main indicators here include the number, distribution, and funding of innovation start-ups; the existence and functionality of technology transfer units (TTUs) or innovation commercialization units in academic platforms, and the patenting processes.

Even though the commercialization rate of innovations is still low in Kenya, the number of platforms aiming to commercialize innovations has generally increased in the recent decade. The proliferation of innovation hubs and technological advances in Kenya has led to increased interest in converting ideas into resource streams through commercialization.

The establishment of technology transfer offices (TTUs) in the universities and research centres has received policy attention in the recent past as a way of catalyzing research commercialization. Despite such efforts, survey results show that most TTUs lack adequate capacity including staff and funding to effectively commercialize research products/ideas. In most universities for instance, researchers are not aware of the existence of TTUs or their functions- i.e., the connection between the TTUs and researchers are very weak. This is further complicated by weak IP policies that are yet to be well mainstreamed in the innovation platforms such as Universities and Research Institutions. For instance, academic and research institutions still lack adequate capacity to draft patent applications for their innovations and successfully commercialize their innovations. Consequently, the number of patents and successfully commercialized innovations by academic institutions is still low. There is a need for a clear innovation commercialization framework/guideline that Universities and research institutions can adopt.



Figure 17: Number of patents from Kenya between 2010–2020

The development and commercialization of innovation ideas/knowledge in Kenya are further supported by the numerous start-ups, incubation, and hubs. Start-ups in Kenya are increasing rapidly due to enabling business environments such as the ease of starting a business. Kenya has also experienced growing access to start-up funding (e.g., specialized enterprise funds) from domestic and international sources (e.g., the World Bank, FDI especially from development partners such as the United Kingdom). The Kenyan government has been strengthening the start-up ecosystem through targeted investments in enabling platforms.

The Association of Start-up and SMEs Enablers of Kenya (ASSEK) has brought together and represents the interests of organizations supporting the development and growth of start-ups and SMEs for maximum impact. Analysis of start-ups shows major regional imbalances in the numbers of start-ups. Out of a sample of 34 start-ups, about 70% are based in Nairobi city and this is a major challenge in promoting innovation and technology across the country. Further review of the overall distribution of startups across the country as shown in Figure 18 show that Nairobi is leading in the number of startups followed by Mombasa, Uasin Gishu and Kisumu. This is mainly attributed to Nairobi being a hotspot for financial success and having a conducive enabling environment to support startups through platforms like Nairobi Innovation Week. However, Wajir, Bomet and Kajiado record the least number of startups due to the lack of sufficient innovation forums/ platforms and low knowledge generation platforms in these areas.

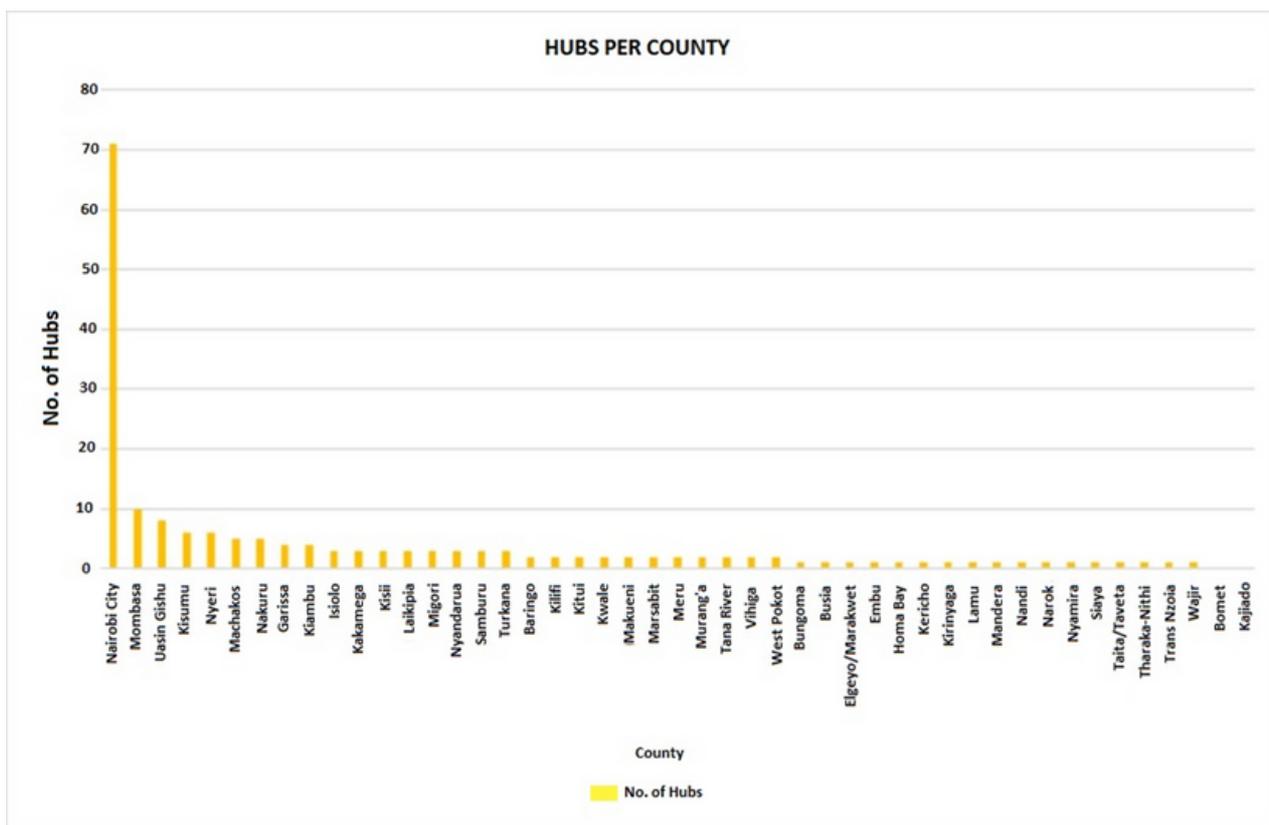


Figure 18: Start-up distribution in Kenya

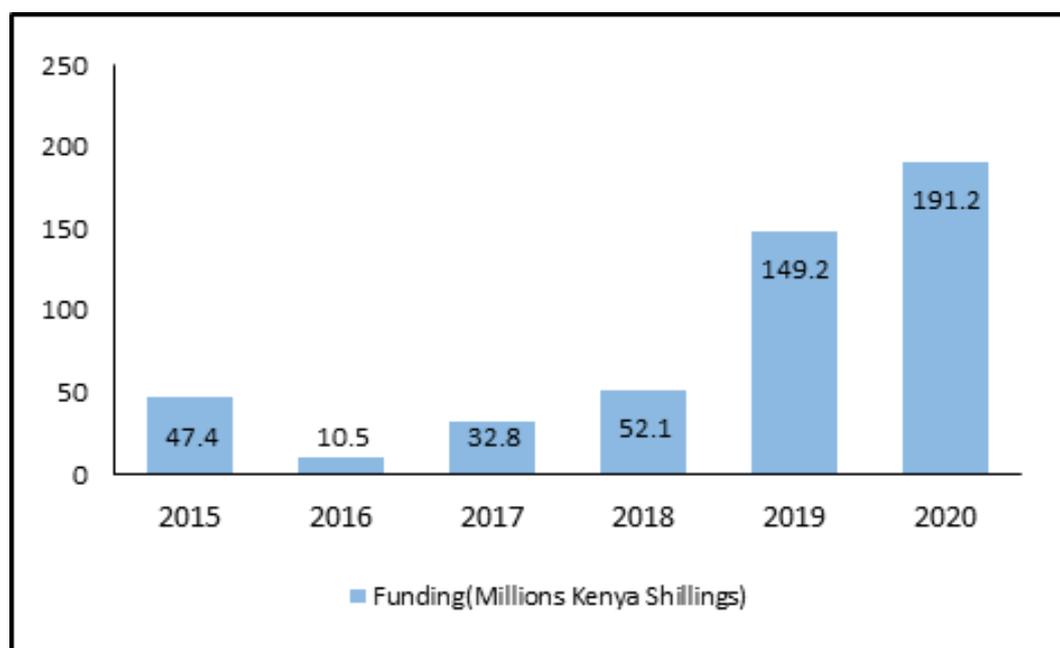


Figure 19: Total start-up funding in Kenya by year (2015-2020)

From the sample, 98% of the start-ups have access to some form of funding even if inadequate. Funding for start-ups has been increasing, over the last five years (5) even though average funding per- start-up remains low. The main sources of funding include Government, internal seed funds, GIZ, USAID, the World Bank and Bilateral development funds through FDI. Despite the funding, most start-ups i.e., about 73% fail to reach their maturity due to lack of adequate funding and technological advice. The current start-up bill might be useful to address these concerns by facilitating linkages and partnerships for scaling up start-ups. There are also concerted efforts through the Kenya Innovation Agency (KeNIA) with the support of FCDO to establish Innovation Bridge Platform <https://bridge.innovationagency.go.ke/> where innovations can be identified and linked to the market processes. Such platforms have the potential to protect and nurture start-ups to maturity.

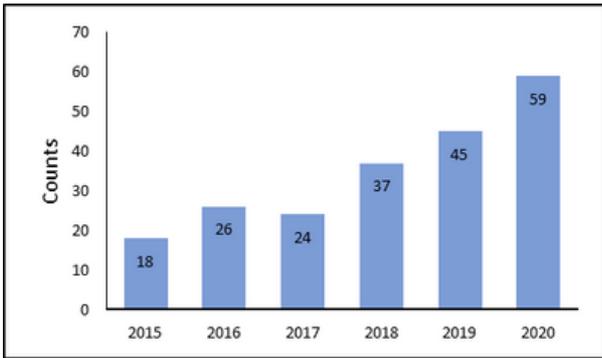


Figure 20: Number of funded Kenyan start-ups per year from 2015–2020.

Source: *The African Tech Start-ups Funding Report 2020*

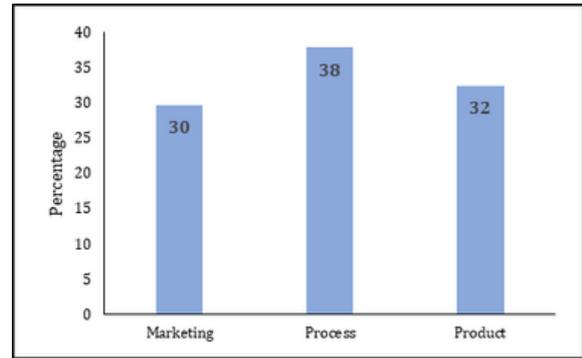


Figure 21: Typology of Innovations in various start-ups operating in Kenya

In terms of typology of innovations being pursued, most start-ups are engaged in process innovations (41%) owing due to a conducive technological environment in Kenya while 36% and 23% are focused on product and marketing innovations, respectively. Most of the start-ups are owned by males 76% while 24% are female-owned. This gender bias in ownership reflects some of the social and cultural barriers that impede innovations as described in section 4.6.

Innovation hubs also play a role in the ecosystem and it's worth noting that innovation hubs ecosystem has been rapidly growing in Kenya, since the establishment of the hub in Nairobi in 2010. The ihub is primarily dedicated to accelerating the application of social capital and technology for economic prosperity and supports startups as instruments of fostering innovation and economic growth in tackling poverty.

According to the 2020 Kenya National Bureau of Statistics survey report, efficient transport, infrastructure, and access to business licence simplify the conduct of businesses. However, innovation hubs still lack established structures to assist young people in exploiting their full entrepreneurial potential and tapping into their technical and business skills. This is evidenced by the lack of incubator centres and common facility centres that enable research and innovation to commercialization.

The academic and industry linkage has been a key part of commercialization. However, this relationship has been deteriorating in the recent past. Currently, it stands at 46.8% of the universities linking to the industries from 55.1% in 2019. Additionally, the linkage between the start-ups/incubators and the university/Research Institutions is relatively weak or unclear. There were no clear channels of communication and linkages between universities and existing start-ups and incubators. This signals a major gap in the innovation process where weak university-Industry linkages limit the contribution of these universities to the innovation impacts. About 73% of the start-ups mapped do not have access to innovation and technological advice. For instance, while information on IP policy and commercialization is key for start-ups, there is no mechanism through which most start-ups receive this information. A ranking by WEF-GII, indicated that Kenya was no. 32 out of 137 in 2017.

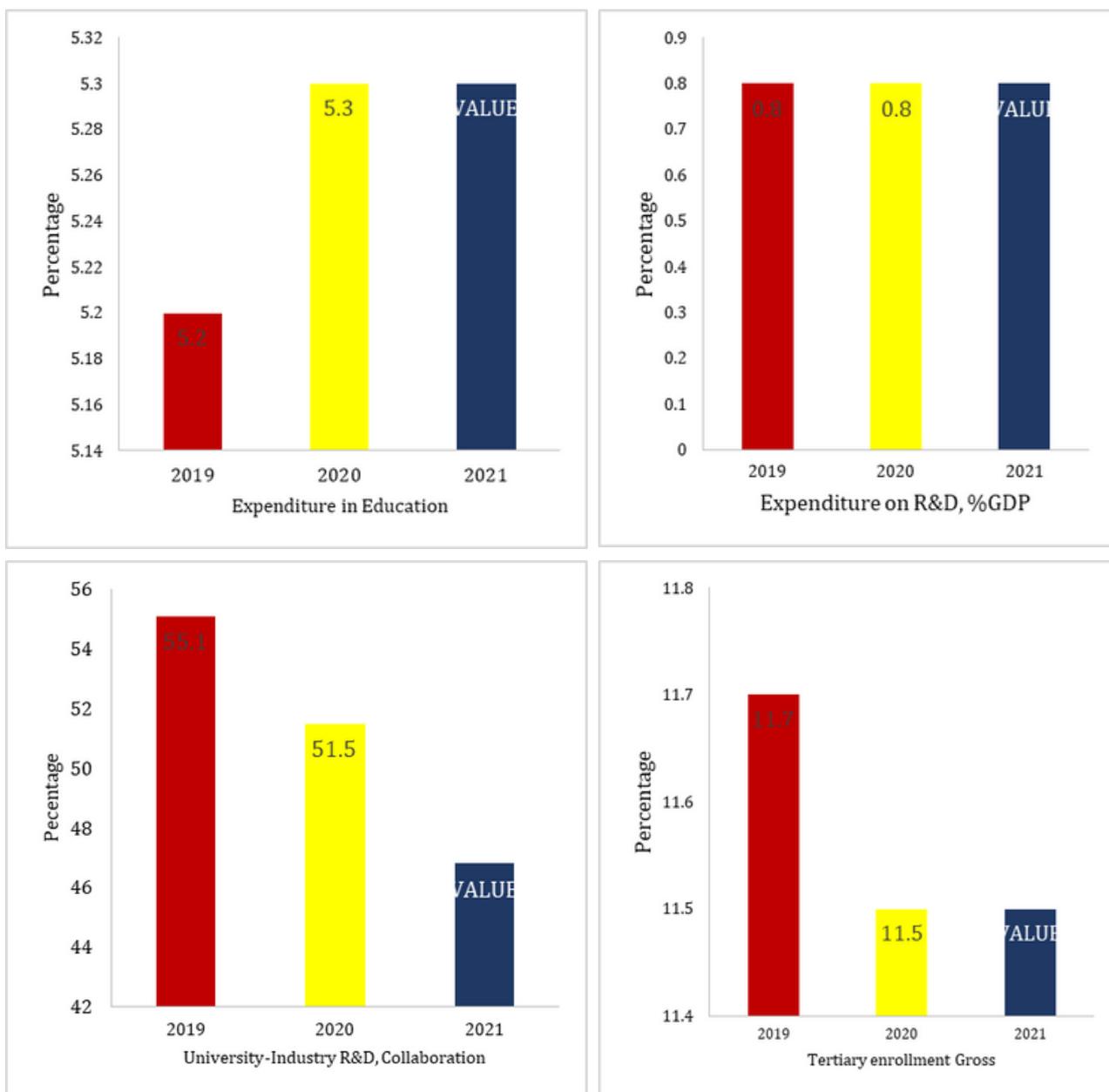


Figure 22: Knowledge Platforms metrics performance trend for Kenya

5.3.3. Diffusion and uptake

Kenya has a number of platforms that support innovation diffusion /uptake through awareness creation but still needs initiatives that promote investments as part of diffusion/uptake through market and product expansion.

The country has various innovation forums that are key in creating awareness about innovations and disseminating new innovative ideas. Innovation is widely dependent on uptake opportunities that usher the resulting products into the market. Innovation weeks have become a key platform for diffusion innovations. The Kenya Innovation Week (KIW) for instance brings together innovators and enterprises from across the country to showcase their innovations and during the sessions, the best innovations are recognized and awarded. In 2019, KeNIA awarded twenty-five (25) innovators cash prizes while twelve (12) innovators were provided with grants to enable them to commercialize their products and services. In efforts to support social inclusion, recently the assistive innovation category was launched to include people living with disability and the elderly.

There are also County Innovation Weeks e.g., the Pwani Innovation week among others. Specific focus is given to the operations of these platforms, when they were established, how often they happen, the key players, the key stakeholders targeted, the status of these platforms, the existing incentives used for upscaling, funding sources, the specific activities of the platforms, outcomes, and impacts, how this impact are monitored and existing gaps. Scaling up and uptake of innovation is receiving keen attention in Kenya as the country seeks to fast-track its Vision 2030 through targeted agendas such as the Big 4 Agenda. Kenya has embraced several fora and market opportunities to create awareness and scale up innovation.

The universities are also convening Innovation weeks e.g., the just concluded Nairobi University Innovation week; the Eldoret University week among others. In 2019, the Nairobi innovation week of June 10th-14th focused on building capacity, a core in forming a movement comprising over 30 start-up enablers. In 2020, Konza Metropolis Innovation Program convened a session that attracted entrepreneurs, policymakers, innovators, development agencies, government officials, and other ecosystem players. A total of 1000 youths were empowered. A series of symposiums and dialogues also formed a strategic opportunity to link innovators to potential donors to fund their research. For example, through the Kenya Innovation Forum, Leaders in Innovation Fellowships are linked with new researchers to establish collaborations. Besides, the innovators are encouraged to register and participate in a grant program to build and deliver high-impact, collaborative projects, or activities. The forum supports and accelerates innovations and entrepreneurship at all levels.

At the regional level, efforts by EASTECO and ASARECA in championing innovation are evident. ASARECA has been vital in disseminating agriculture in the region with Kenya being a beneficiary. Through the ASARECA research network, adoption, and dissemination of the research approaches among the members' organizations has improved technology uptake and upscaling. There are also several digital platforms for interactions between innovators and market players. With the support from FCDO, KeNIA is working with partners to develop an Innovation Bridge platform aimed at exposing prototypes in Kenya in a virtual marketplace where they can be linked to investments/partnerships for commercialization and contribute to job creation and overall economic growth of Kenya.

5.4 DOMAIN 3: INPUTS/INVESTMENTS

Investments are a critical driver of innovations. The investments domain constitutes two sub-domains: funding and infrastructure. Under this domain, 14 indicators were identified and prioritized by stakeholders. The funding sub-domain was prioritized as a critical sub-domain and as a critical enabler of innovation actions across all domains. Four (4) of the indicators prioritized are qualitative in nature while 10 are quantitative. Data challenges were mainly experienced in share of funding from non-state actors.

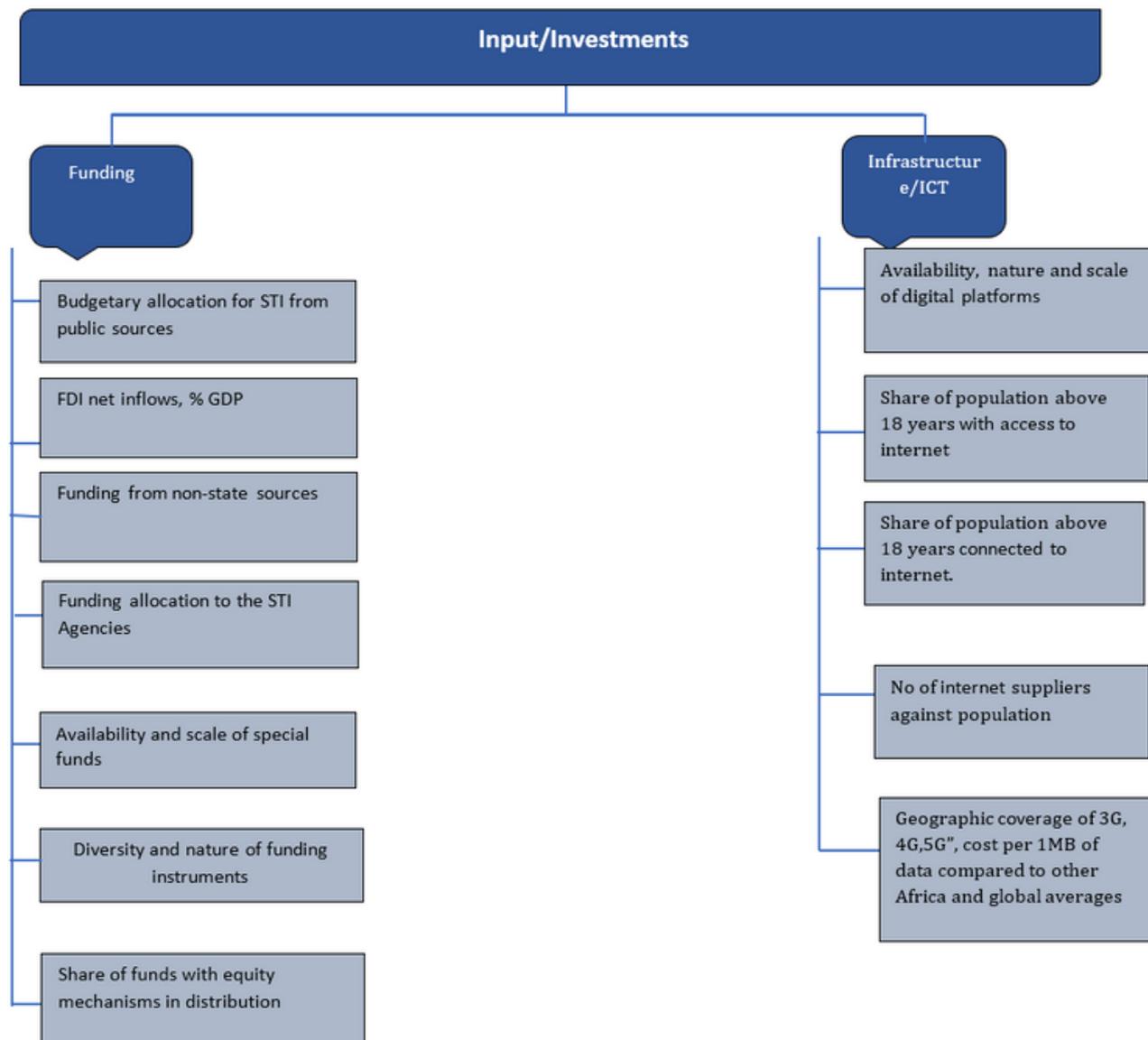


Figure 23: Investments domain, sub domains and Indicators

5.4.1 Funding

The National Budgetary Allocation to ST&I is inadequate. Nevertheless, Kenya enjoys more inward Foreign Direct Investment (FDI) in Africa.

Funding remains a major factor in the innovation cycle. Kenya draws ST&I funding from a variety of sources – financed by the public sector, international donors, development, banks, or the private sector. These are discussed below.

a) National budgetary allocation

The National budgetary allocation to ST&I remains low with a Gross expenditure on research and development rate of 0.8% since 2019, relatively lower than the global average of 2.63 and the aspirations of the STISA 2024 of 2%. Other than the national allocation, special funds exist such as the women and youth enterprise funds targeting entrepreneurship development and innovation. The funds target to support innovative and promising business ideas. Over the last three years, the Government disbursed sh600 million to sh800 million to enterprises even though it's unclear the extent to which these funds mainstream innovations in their operations. A tailored guideline is required to enable these funds to assess, identify and mainstream innovations targeted to particular social groups as well as their alignment to the country's innovation niches and opportunities. Private sector funding of R&D is gaining critical consideration in Kenya's ST&I funding. This is however hampered by the weak connection between University-Industry linkages and weak commercialization infrastructure. There is no consolidated framework to assess the amount of private sector and CSO funding for ST&I and this is partly due to the missing coordination mechanism, highlighted in section 4.2.4 (Innovation governance). Consequently, data for this indicator is scarce and largely unavailable.

b) Foreign Direct Investments

Kenya continues to be a priority country in international investments in ST&I given its long-term collaborative relationships and enabling environment for international business. There is increasing foreign investments and funding of innovations especially through innovation hubs and start-ups in Kenya. According to UNCTAD (2020), FDI stood at USD 1.3 billion in 2019 with the ICT sector attracting the lion's share of that. Alongside South Africa, Ethiopia, Uganda, Nigeria and Rwanda, Kenya has benefitted from USD 10 billion in funding from international sources that have been directed to the ST&I sector in the last five years. The main contributors to this funding portfolio are the FAO, AFD, NORAD, and UK FCDO. Kenya received 23% of the USD 10 billion portfolio, the second highest after Ethiopia.

The country also attracts additional international funding especially from multilateral sources such as the World Bank as part of FDI. These funds are largely disbursed as a mix of instruments including debts, grants, new operation facilities such as green fields and blended financing. However, the instruments used to disburse these funds are shifting fast. For example, FDI in form of cash flow decreased from \$1139 million in 2018 to \$1098million in 2019 while greenfield investments rose from 65 in 2018 to 95 in 2019 . Service-based sectors remain the major focus for investors. This requires Kenya to identify innovations that not only support national economic growth but also align with the new global funding requirements. For instance, the new UK spending strategy prioritizes enhanced trade rather than Aid as a way of funding ST&I. The shift from Aid to trade is an opportunity for Kenya whose business environment is ranked as globally competitive.

⁴<https://www.lloydsbanktrade.com/en/market-potential/kenya/investment>

c) Equity funding

Kenya is one of the largest recipients of annual equity funding in Africa for tech start-ups such as Tala initiative that embrace mobile loans for greater financial inclusion. In 2018, Kenya was among the nine African countries, which received more than \$10 million in annual equity funding from FDI for tech start-ups. The M-Pesa revolution, government investments in Konza City, and the launch of innovation labs in the country have made Kenya the technology hub of Africa. This niche market is estimated to be worth \$ 1 billion by 2019. This revolution has also brought about an increased flow of venture capitalist (VC) funding to the region. Kenya accounted for 76% of \$ 121.9 million invested in East African start-ups in 2016, of this amount.

d) Capital and credits

While we note an increased flow of VC, the country lacks clear investment policy frameworks through which venture capital could provide seed money for innovation. There is no explicit mention or recognition of venture capital firms as legal entities equity (Divakaran et al., 2018). Policymakers should consider re-orienting financial institutions to focus their efforts on providing credit for venture capital funds and financing collaboration between PRCs, universities, the productive sector and industry. For example, the provision of incentives to firms to substitute one form of investment (e.g., access to loans) for another could support more innovations in firms. The business environment is also conducive for innovations to thrive. This includes the time required to start a business which is favourable and the ease of access to loans and the attitude towards entrepreneurial risk.

5.4.2 Infrastructure

Kenya is investing in infrastructure as an enabler of innovation but there is need to facilitate the utilization of this infrastructure across sectors.

a) Digitization

Kenya's digitization blueprint targets to achieve three elements relevant to Kenya's economic transformation 1) enhanced good governance, where digitization is expected to enhance government efficiency, improve accountability and enhance revenue collection; 2) transforming human capital through path breaking technological innovations, enhanced capabilities on data, digital skills and platforms; and 3) creating favourable business climate for innovation to thrive. While the digital economy blueprint is hinged on digitalization across government, business, and infrastructure to achieve the three outcomes, the focus is more on digital skills 'in professionals and lacks a strategy to support general public participation. However, through the Ministry of ICT, the National ICT and Innovation Policy bridge this gap by focusing on four areas: prioritizing mobile access; expansion of the digital economy, skills and innovation for research, technology products and industries and government. The National ICT policy has recently in 2020 developed a number of guidelines. The guidelines have facilitated the formation of the infrastructure that enables the use of high speed, wireless and internet, across the country. The guidelines have further supported infrastructure and frameworks for the growth of data centres and the pervasive Internet of Things technologies, machine learning and local manufacturing. This has positioned the country to embrace emerging trends.



Figure 24: Change in digital services usage during COVID-19 lockdown period % of respondents

Currently, Kenya has a mobile phone ownership rate of 73.6% and internet access rate of 26.3%. Over 60% of the country is covered by network services- delivered through established firms such as Safaricom and Airtel. Kenya's Economic Report 2021 shows that Fibre to the Office (FTTO) and Fibre to the Home (FTTH) have significantly increased due to enhanced digital platforms and especially during COVID-19. The recent Kenya Digital Economy Report 2021 also revealed the degree to which Kenyans rely on and are satisfied with digital tools and services, with an overwhelming majority of people (84%) reporting that digital devices and services are making their lives better and especially through creating new connections.

By increasing internet coverage and utilization by most Kenyans, the country could enhance more awareness and market outreach on various innovations. Some of leading Kenya's giant innovations such as M-Pesa - Tekizo Africa Limited and M-Kopa have thrived in digitization as the frontier technology. Digitization has also put Kenya on the map a regional digital hub where Giants like Google, Microsoft, Samsung, and Intel find their home in Africa i.e., in Nairobi. The internet subscribers grew in the country because of improved infrastructure and access to phones and the internet. According to the 2021 economic survey, the number of Internet service providers grew from 302 in 2019 to 366 in 2020. This availability of conducive enables innovations to thrive in Kenya. Kenya and Ghana dominate the mobile money market globally ranking second and third after China (Boston Consulting Group (BCG), 2020).

b) Access to electricity

Electricity is pivotal in running various innovation activities including machinery, internet, etc. Currently, about 75% of Kenyan households have access to electricity. Special programmes such as Last Mile Connectivity programme has catalyzed access to electricity even among rural households. There is however a need to create more awareness and provide support for households on innovative usage of electricity beyond lighting. Emerging innovations such as electric cooking e.g., promoted through the Modern Energy Cooking Programme (MECS)[1] (see Atela et al., 2021), solar irrigation among others can promote widespread use of electricity for innovation.

5.5 DOMAIN 4: INCENTIVES

Incentives motivate and promote innovation. The incentives domain constitutes four sub-domains: fiscal incentives, policy incentives, business process incentives and Awards/recognition. Under this domain 29 indicators were identified in this domain out of which 12 were prioritized by stakeholders (Figure 25). The sub-domain “business process incentives” with wider impacts on commercialization and enterprise development was prioritized About 14 (50%) of the indicators prioritized are qualitative in nature while 15(60%) are quantitative. Data could be accessed for 26 (90%) of indicators. Data challenges were mainly experienced in the “fiscal incentives’ sub-domain because of the difficulty of clearly linking fiscal measures to innovations.

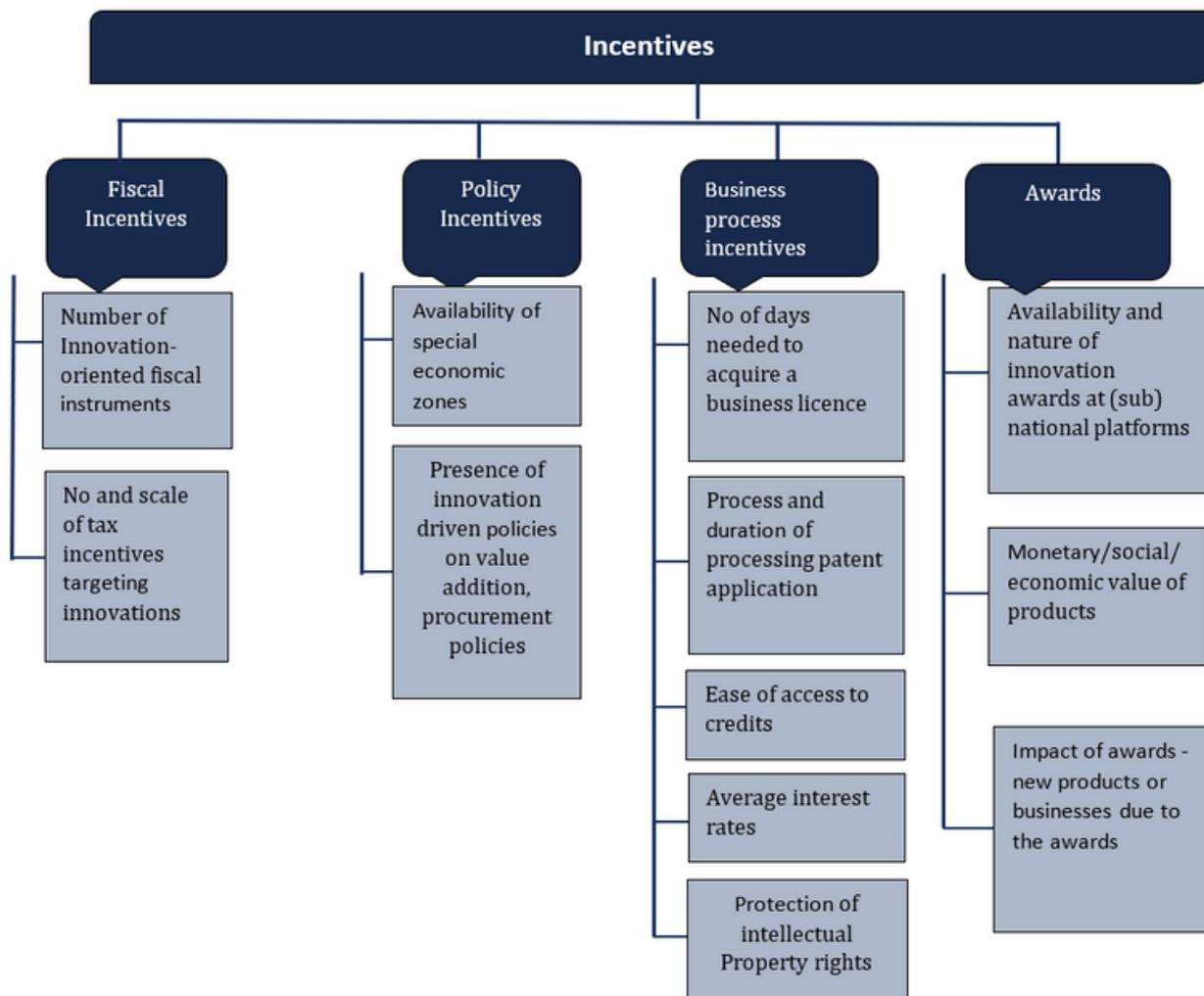


Figure 25: Indicators on Incentives

5.5.1 Fiscal Incentives

a) Innovation-oriented fiscal instruments.

To spur innovation, Kenya has put in place individual fiscal instruments to entice investors into its commercial space. The banking industry has been a key player in product and service innovation. Therefore, the fiscal related instruments that touch on innovation are mostly found in the banking and technology sector. These instruments are meant to regulate innovative goods and services such as: MPESA, M-Kesho, Pesa-Pap, M-Shwari, KCB Mtaani, Faulu Popote, ATMs mobile phone link, SMEs, Microfinance services, financial lending services and the ICT sector. The laws and policies governing the above aspects are: Central Bank of Kenya Act (2015), Banking Act (2015), Microfinance Act (2006), The National Payment System Act (2011) and the Kenya Deposit Insurance Act 2012, Central Bank of Kenya (Digital Credit Providers) Regulations 2022, Microfinance Act 2006, Microfinance Deposit Taking Microfinance Institutions Regulations, National Payment System Act (No 39 of 2011), and National Payment System Regulations 2014. These fiscal instruments speak to the regulation of financial innovation in Kenya which has grown with the wide use of services such as mobile money transfers, FinTech and credit systems.

Further, there is a Start-up Bill 2021 that is aimed at augmenting innovation in the country for SMEs, incubating businesses and increasing funding mechanisms and capital for innovation activities. The bill was passed by senate in December 2021 but is yet to be affected into law. If implemented as law, it will be a strong indicator for the growth of innovation in the country more so for start-up businesses/SMEs that need nurturing and funding in their formative stages.

b) Tax incentives targeting innovations

Kenya has a number of tax incentives targeting innovation mainly in the industry, trade and manufacture sectors. The Kenya Revenue Authority implements the issuance of the fiscal (tax) incentives in collaboration with other regulators and facilitators such as the Capital Market Authority, Export processing zones Authority (for issuance of the EPZ incentives) among others as provided under the Income Tax Act. In Kenya, the main form of tax incentives for businesses is through capital deductions.

For instance, in the 71 Export Processing Zones, companies enjoy 100% investment deduction on capital expenditure for 20 years, exemption from customs duties on imported inputs, streamlined licensing procedures under EPZ Authority and expedited customs procedures. Aside from these ad hoc incentives, these companies benefit from a 10-year corporate-tax holiday and a 25% tax thereafter. Further, there is a 10-year withholding tax holiday for such ventures and stamp duty exemption on legal instruments, 10-year withholding tax exemption on dividends and remittances paid to non-residents. EPZ companies enjoy perpetual exemption from VAT and customs import duty on inputs such as raw materials, machinery, office equipment, certain petroleum fuel for boilers and generators, building materials, other supplies. The VAT exemption also applies on local purchases of goods and services supplied by companies in the Kenyan customs territory or domestic market. These tax incentives boost Kenya's viability as an innovation haven on a regional and international plane.

5.5.2 Policy Incentives

Even though Kenya anchors its growth on innovation, innovation specific policies are still at an emerging state.

a) Special economic zones

Special economic zones are key in scaling up markets reach and growth of innovations. They are integrated modern Industrial parks designed with incentives to attract Foreign & Domestic Direct Investments with goods and services regarded, as being outside the customs. The special zones help to create a business's ecosystem for frontier innovations. They promote interactions among various innovations and market players and open opportunities for scaling-up technological and market breakthroughs. Kenya enacted Special Economic Zones Act in 2015 under vision 2030 to boost the market in competition and link different stakeholders to share their capabilities, thus creating more job opportunities. Under the Kenya's Vision 2030, three (3) world-class Special Economic Zones are anticipated:

- 📍 Greater Mombasa SEZ: 3,000 sq. km – (to create 2 million new jobs).
- 📍 Lamu SEZ: 700 sq. km – (to create 1 million new jobs) and
- 📍 Greater Mombasa SEZ: 3,000 sq. km – (to create 2 million new jobs).

A key challenge anticipated for the Kenya's SEZ, is the infrastructural connectivity issues and governance loopholes that might drain anticipated business environment for the SEZs.

b) Innovation driven policies on the promotion of local innovations and procurement policies

While Kenya's development blueprint is anchored on innovation, innovation specific policies and plans are still emerging. The country has made it favourable and attractive through its regulatory framework for foreign direct investment but has also tried to promote local innovations through various mechanisms such as provision of targeted incentives e.g. through special economic zones and export processing zones. Other regulatory frameworks, the Mining Act (2016) restricts foreign participation in the mining sector and requiring 60% Kenyan ownership of mineral dealerships and artisanal mining companies, ICT policy now requires increased Kenyan ownership in foreign companies providing ICT services from 20% to 30%. While this is the case, the country has a long way to go particular in the procurement of local goods and services, for example, government's export promotion programs have not yet distinguished goods produced by local or foreign-owned firms in the country, something that perhaps need to be enacted to promote local innovations.

5.5.3 Business Process Incentives

Kenya has made efforts in easing the establishment of business through the e-citizen platform however political stability remains a threat to business growth.

Supporting businesses and creating a conducive environment to ease business establishment growth is an important incentive. These include enablers' indicators ranging from ease of doing business, government effectiveness, and county business environment among others. In terms of ease of doing business in Kenya, it takes about 23 days to register a company in Kenya although this differs across counties with Nairobi County ranked the first, followed by Nyandarua county and Nakuru third place while Isiolo County was ranked the forty-second (Musamali & Ngugi, 2019). Time taken to acquire single business permits and to register with the tax authority has also reduced (Kenya National Bureau of Statistics, 2020) supporting a conducive environment for innovations. According to the Kenya National Bureau of Statistics survey report 2020, an improvement in transport and infrastructure allowed ease of business registration as well as and access to business licenses (42.4%) in 2018 and 2019). While Kenya performs relatively fairly in these indicators, 2021 GII ranked Kenya averagely at position 80 out of 132 with the country ranking lowest on political stability i.e., 106 out of the 132 countries ranked.

5.5.4 Awards

Awards exist but are relatively small scale to spur development of innovation ideas, but the impacts of these incentives are unclear and untracked.

Awards are becoming prominent innovation incentive scheme. A variety of innovation relevant awards currently exist including awards given during innovation weeks, the annual presidential honour award, international awards (monetary). In 2019, for instance, KeNIA awarded twenty-five (25) innovators cash prizes while twelve (12) innovators were provided with grants to enable them to commercialize their products and services. In efforts to support social inclusion, recently the assistive innovation category was launched to include people living with disability and the elderly.

In 2021, KENIA coordinated the National Innovation Awards as a way of motivation and showing stakeholder support for innovation ventures country wide. The Awards came in 3 major awards categories: Big4 Innovation Award, Assistive Technology Award, and Government Agency Innovation Award with over 200 applicants. Twelve government agencies and institutions were recognised and awarded for having adjusted to technological changes and enabling innovation to spur the country including Homabay County.

Overall, four 4 innovations won the 2020/2021 National Innovation Award. They consisted of Malkia incu-brooder, Solar powered cooking boilers, Wild Eye and the Mobile Healthcare services for pastoralists. The awards were given in line with the key thematic areas which were: Agricultural and Food Technologies; Energy Systems; Manufacturing, engineering, and ICT; and Medical Technologies & Health Solution reflective of Kenya's priority areas in innovation.

While innovation awards encourage the culture of innovation and commercialization of innovation products and services, they have a relatively small effect on spurring innovation, and their impact is unclear and untracked. The local awards system needs more visibility in the country to attract more innovation applications. It also needs more funding to cater for crucial and emerging categories such as digital finance, climate technology, innovation as a tool to spur education etc. After the awards, KENIA needs to have a tracking mechanism of how the awarded funds have been utilized to propel commercial ventures and innovation start-ups. Through this, the impact of the award shows can be tracked and areas of strengthening, and capacity building identified for subsequent years.

On an international plane, Kenyan start-ups and businesses have been singled out and recognized over the years as innovation giants.

Table 3: Innovation awards from 2020–2022

YEAR	WINNER	PRIZE	INNOVATION
2022	Norah Magero	Royal Academy of Engineering's 2022 Africa Prize	Engineering Innovation with Vaccibox
2021	Solar Freeze	Ashden Award for Humanitarian Energy	Sustainable and affordable refrigeration service for food and medicine in refugee camps
2021	Jacqueline Kiage -Innovation Eye Centre	Gian Marco Moratti Award 2021	Jacqueline is the co-founder of the Innovation Eye Centre, an Eye care clinic that offers high quality, affordable and accessible eye care services to the community.
2021	Standard Chartered Bank	CIO Africa 100 Awards	Exemplary performance in digital innovation
2020	SokoWatch	E- Commerce award, AppsAfrica Awards 2020	Providing free delivery and financing of essential goods to local retailers.

5.6 DOMAIN 5: IMPACT

Currently, there is no framework for measuring the impacts of innovation activities. For this outlook, we used a select innovation case studies to understand how innovation activities yield, measure and scale-up impacts and lessons (see summary in Table 3 and detailed case study information in Annex 3). The impact domain constitutes four sub-domains: social, economic, political/cultural, and environmental impacts. Under this domain, 22 indicators were identified while 11 were prioritized by stakeholders. The “economic impacts” was prioritized as a frontier sub-domain especially its role in job creation and economic growth. 35% of the indicators prioritized are qualitative in nature while 65% are quantitative. Data could be accessed for 60% of indicators. Data challenges were mainly experienced in share of funding from non-state actors.

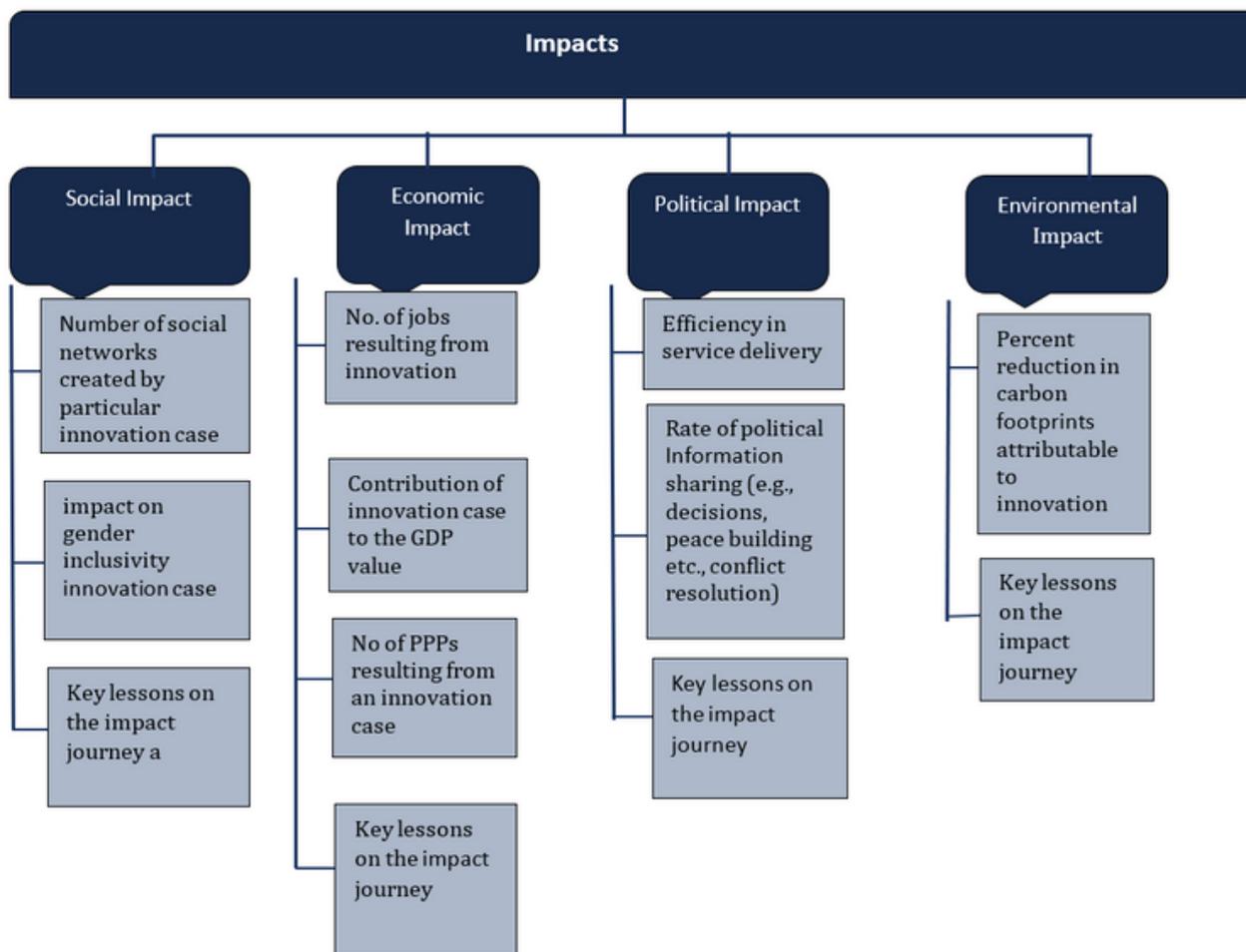


Figure 26: Indicators of Innovation Impacts

5.6.1 Social Impact

Social impacts of innovation are multiple but often overlooked due to the focus on economic impacts

A key social impact of innovation in Kenya is the strengthening of social networks. The case study of SmartBeba innovation shows that during the pandemic, innovations around digital communication and repository platforms strengthened several professional and innovators networks (See Figure 25). However, using ShopOkoda as a case study, social impact is based on every dollar that is lend out through the app to the citizen, the number of jobs created and the number of families ShopOkoda has helped meet their day-to-day emergencies.

5.6.2 Economic Impact

Under the economic impact, the study identified 6 indicators including number of jobs resulting from innovation, contribution of innovation case to the GDP, number of PPPs resulting from an innovation case and key lessons on the impact journey. Generally, Kenya's economic growth in 2021 was supported by improved performance in innovation-oriented sectors of the economy including manufacturing (6.9%), wholesale and retail trade (7.9%), real estate (6.7%), transportation and storage (7.2%), and financial and insurance activities (12.5%) (KNBS Survey 2021). Innovations in the services and industrial output sector contributed to an average economic growth of 7.5% achieved in 2021, especially in the context of COVID recovery strategies. During the review period, the number of new jobs created in the economy was 926,000 of which 172,000 were in the formal sector, while 753,000 were in the informal sector.

These jobs were not necessarily due to innovation even though according to the Kenya Economic Outlook, 2022, innovation in the service sectors and digitization, steered by COVID-19 generated several new jobs. Additionally, wage employment in the private sector increased by 6.8% to 1,984,000 persons in 2021 from 1,858,000 persons in 2020. Within the public sector, wage employment increased from 884,600 thousand persons in 2020 to 923,000 persons in 2021. Notably, recent data from the Kenya National Bureau of Statistics shows total recorded employment from 17.4 million in 2020 to 18.3 million in 2021. (KNBS) 2022 Economic Survey). The case of Adanian Lab shows that during 2021, the firm put in place Venture Building innovation and through this delivered 5 Venture studios across Africa, invested in 35+ startups and 1500+ jobs. Case study interview shows that the firm focused on capacity building to achieve these impacts an indicator that for innovation to achieve much impact, it should focus or re-orient to economic impact.

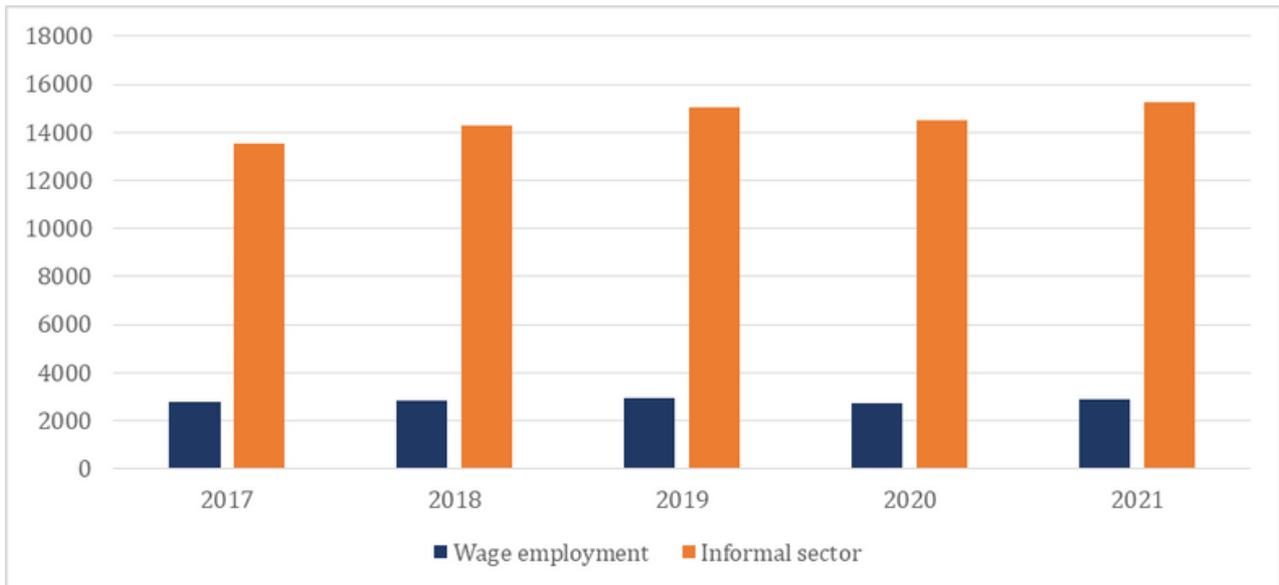


Figure 27: Age employment and informal sector employees from 2017 to 2021 in '000

An analysis of the statistic above indicates that the 2021 tally of jobs beat the 2019 pre-pandemic total of 18.1 million. The informal sector has once again birthed the most jobs recording 753,800 in new employment opportunities across the year to account for more than three quarters of all jobs created. Unfortunately, there is no specific documentation of jobs that have been created directly through innovation activities. For example, UniPron, Smugel and Smusacan innovations, because the innovator did not have sufficient funds for clinical trials despite the product being useful, some of the products were commercialized which cannot be quantified. Besides as noted by C4D lab, some of the innovators tend to shy from sharing with the institution lab their innovation despite the impact. This data was significantly missing from the KNBS report alluding to difficulty in coordination and documentation of the impact of innovation in Kenya.

Using an example of ShopOkoo, the innovation has increased convenience especially in the sector of financial services. Most ventures have now embraced mobile financial services that has increased access to goods and services through e-delivery, giving such ventures a competitive edge. According to Kenya's Digital Economy Report, 94% of Kenyans use mobile money; 44% of them increased their usage during the COVID-19 pandemic. As a nod to the increased use of mobile money, mobile subscribers increased by 8.5% to 35.2 million in 2021. Subsequently, the value of mobile commerce, which entails transactions via pay bill and till number platforms, increased from Kshs 9.4 billion in 2020 to Kshs 15.3 billion in 2021.

Whereas there are no official statistics on the number of PPPs stemming from innovation from the case study, there are opportunities to strengthen PPPs through innovation. The PPP project under the Ministry of health intended to enhance research in the medical sector and effect the manufacture local vaccines in Kenya. The project is being rolled out (it is at the prefeasibility study phase) by DAWA Group together with Merck. It proposes to put up the first Human Vaccine production plant in Kiambu with a targeted investment of over USD 45 million and projected annual turnover in excess of USD 41 million. Upon successful completion of the project, it will supply vaccines to domestic and export markets, improve local vaccine access and creating over 200 quality jobs with 30% being highly skilled. It will also boost Kenya's innovation portfolio in the health care sector by spurring health related research and the production of vaccines for exportation. It contributes to SDG 9 whose primary focus is industry, innovation, and infrastructure. It also aligns with SDG 3 on health and wellbeing which is a key pillar in Kenya's Vision 2030. With more of such PPP initiatives that bring on board private sector actor, robust economic growth would be anticipated as a long-term effect.

5.6.3 Ecological Impacts

Ecological impacts such as carbon footprints are globally recognised but are yet to be prioritised in the domestic efforts. As the world is going green, innovation has played a key role in promoting environmental sustainability in Kenya and curbing climate change in line with the Paris ambitions. The Africa Union Green Innovation Framework has identified priority sectors for catalyzing green growth including energy, digital infrastructure, forestry, agriculture, and trade. Innovation around cleaner production are critical in reducing carbon footprints and mitigating climate change according to Kenya's commitment to the Paris Agreement on reducing emissions by 32% in 2030. The ecological implications of innovations can be estimated through the innovation life cycle lens. Based on figure 30 it is eminent the identified percent reduction in carbon footprints attributable indicator is prioritized under the sub-domain which is quantitative. Using an example from the impact case study, Pyro-degrade Waste Management Ltd (Pyro-degrade Energy) innovation is pivotal towards waste recycling which is key in reducing waste disposal and thus reduction in emission of greenhouse gas. Currently, there are no clear frameworks to measure ecological impacts and there is little attention to these impacts in innovation debates. There are nonetheless a number of case initiatives that are driving ecological benefits:

The Kenya Green Initiative participate in making briquettes from rice husks. Further, the Kenya National Cleaner Production Centre (KNCPC) promotes cleaner production technologies that enhance the efficient use of raw materials, water, and energy resources. KNCPC provides technical support to industries to adopt cleaner production technologies in their systems. As such, the Centre is an important tool for the promotion of green economy in the country as it promotes activities that reduce carbon emissions, enhance efficient use of resources thus making industrial production profitable while supporting creation of job opportunities and alleviating poverty.

Additionally, institutions such as the Chandaria Business Center, KIPPI, Tumaini Center and Perdue University offers incubation, capacity building and financing options to new, small and medium business ventures and entrepreneurs that are developing innovations to address the challenges of climate change. As at 2022, it had 21 registered IPs, 298 incubated SMEs, 44 million USD mobilized for climate change and invested over 1.2 million USD in innovation enterprises. It provides technical expertise, financial assistance, and mentorship in different spheres of business management, technical skills and competencies in order to turn appropriate technologies into feasible enterprises. In so doing it had created over 20,000 jobs for the youth in the innovation sector with a specific focus on environmental sustainability.

5.6.4 Political Impact

Innovation has increased Kenya's portfolio placing it on the regional map as a favourable investment haven for innovation related commercial ventures. The ST&I Act of 2013, established innovation governance framework that have increased the incentives to innovate, including guaranteeing intellectual property rights, government assistance with the costs of research and development, and cooperative research ventures between universities and companies. The growth of innovation is dependent on the government's political good will to implement progressive sectoral policies and practices and in increasing the research funding for higher learning institutions. The upcoming 2022 elections is reliant on digital database that could minimize cases of rigging and enhance post-election stability.

Table 4: Summary of impacts from case studies

IMPACT SUB-DOMAIN	CASE STUDY	MAJOR REPORTABLE IMPACT	KEY LESSON, OPPORTUNITIES, AND CHALLENGES
Economic impact	ShopOkoo	The impact is measured based on every dollar that is lend out through the app, the number of jobs created and the number of families shopokoo has helped meet their day-to-day emergencies	Access to flexible funding and strategic partnerships. Partnerships with SACCOs in Kenya is the key opportunity
	Ajira Digital Program	The Ajira club has 35 members, Ajira Center 228 and Ajira members are over 245. Through the training, 7774 youths have secured a job opportunity	Ajira Digital Clubs initiative focuses on creating an environment for work generation and skills development to meet the demand and supply side on job creation in all higher learning institutions in Kenya. The key lesson is that resource mobilization both internally (through profits) and externally through credits is key to economic impact of innovations. Facilitating interactions and information flow in any innovation is key to market awareness of an innovation and economic return.
	Zalego academy	Trained over 2231 students, 84 courses, 113 seasoned mentors and 1461 job placements.	Funding is a challenge is facilitating the training as the academy is self-funding.
	Smatbeba App	Number of successful startups incubated at C4DLab	Funding remains a big challenge the Lab is dependent on grants to run. Key lesson is the need for innovations to be dynamic - moving beyond 'single point' product-based interventions to stimulating the processes and paradigms.

Social impact	SIMLESA Innovation	<p>a.)More farmers have taken up conservation agriculture technologies in the western region</p> <p>b.)Registration of the IP</p> <p>c.)Yield increase for maize from 8 to 16 bags per acre and beans from 1 to 5 bags per acre</p> <p>d.)More farmers have taken up conservation agriculture technologies (herbicides, crop residues left on farm, cover crops, and fodder crops.)</p> <p>e.) Farmer group plans and holds demonstrations and field days</p>	Social impacts are largely depended on outreach through innovation foras but this also requires resource mobilization skills in central to the success of innovations. Limited technical expertise and funding
	Inceptor Innovation Centre	Creating opportunities for local talent through training on Technologies to reduce poverty and stimulate economic growth.	There is low partnership commitment and differing interests and objectives among the participating partners.
	3-wheeled agricultural vehicle.	A start-up supporting youths with agricultural machinery (the 3-wheeled vehicle). Impacts measures in terms of number of products made and sold	Getting standard approvals from KEBS is a major challenge to start-ups, impeding scaling-up. For this case, slow and expensive approval of product by KEB was a major impediment.
	Innovation Awards	In 2011, 170 applications registered their interest to participate and 11 were selected. In 2019, 318 entries were registered. In 2018, 111 innovations were evaluated for the competition. Since the inauguration of the award in 2011, the award has since recognized more than 45 new ICT products and solutions.	Awards generate useful incentives for individual innovators, but impacts of such awards could be scaled through adequate awareness and multi-sectoral focus beyond ICT.
Political	e-citizen	Number of citizens benefiting from efficient government services and information flows	Public service innovation is critical for political impact especially perception of citizens on government services.
Ecological	Pyro-degrade Energy	The amount of plastic waste recycled annually: Process ten 30kg batches of plastic per day, producing 0.6-0.7 litres of pyro-diesel from each kg of plastic waste.	Slow uptake and low interest among investors to invest in the innovation. There is need for local investors to trust our local innovations and invest in them.

5.7 DOMAIN 6: IMPEDIMENTS TO INNOVATION

Impediments are both internal and external barriers that impede innovation progress. The impediments domain constitutes three sub-domains: structural inefficiencies, economic and cultural barriers. Under this domain, fourteen (14) indicators were identified while six (6) were prioritized by stakeholders. The “Structural inefficiencies” was prioritized as a frontier sub-domain posing a significant challenge to innovation in the country.

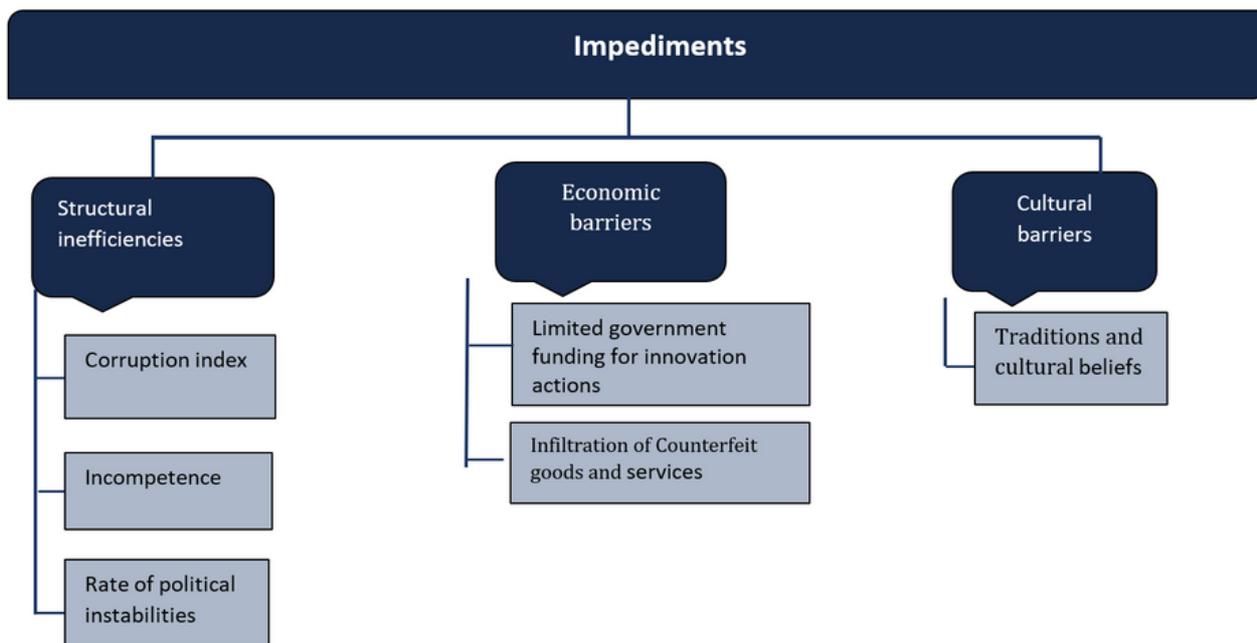


Figure 28: Impediments indicators

5.7.1 Structural Barriers.

a) Corruption Index.

Kenya scored 30 points out of 100 on the 2021 Corruption Perceptions Index reported by Transparency International. More specifically, Kenya is the 128 least corrupt nation out of 180 countries, according to the 2021 TI Corruption Perceptions Index. This affects its investment portfolio as investors are wary of financial losses and improper infrastructure to secure their innovation related ventures.

b) Incompetence

As part of the structural barrier, there is limited expertise in the innovation governance structure that is crucial in augmenting strategic innovation practices in the country. This expertise refers to enhanced professional qualification and experience among the institutions in charge of regulation, accreditation, funding and branding of the innovation sector. Currently as depicted in the academic platform domain, there exist few researchers in the Country in both academic institutions as well as in public research organizations.

Related to this challenge is the non-alignment of the innovation curricula in learning institutions. This then is a hindrance in developing the passion for innovation amongst learners and students of higher learning institutions. Unfortunately, there is low awareness of Intellectual Property Rights (IPR) among practitioners, stakeholders, and policy makers. This then translates to the low rates of commercialization of innovation products which discourages the economic growth of the innovation sector. (KENIA Strategic Plan 2018-2022)

c) Political Instabilities

Politics, at times, has a detrimental effect on the innovation sector. In Kenya, political goodwill has not been sufficiently directed in ensuring that investors and startups have a favorable environment to carry out their commercial activities. This is most evident during the election period when most businesses take extra precautions as they anticipate spates of violence. In the last election, the economy literally shut down due to an apprehension of electoral violence that has become cyclic. Still, in 2017, the Kenyan economy shed 1% of the gross domestic product due to disputes and a prolonged electioneering period.

Business organizations tend to thrive in an environment where there are strong and stable institutions, which play a crucial role in defining political, economic, and social relations. Where this is missing then the business would operate with a lot of caution thus limiting their research and development capacities. On the other hand, companies and countries must develop strategies to ensure innovation and compete in an uncertain socio economic and political environment.

5.7.2 Economic Barriers

a) Limited government funding for innovation actions

Innovation still faces the perennial problem of limited funding especially in strategic sectors such as health, manufacture, trade, and technology. For instance, Kenya Medical Research Institute (KEMRI) is the main recipient of funds for research and innovation, but only a small proportion of their research and development costs are government funded. Despite their mandate to promote Kenya's health in terms of research, the institution heavily relies on external donors to fund its activities. In 2018, the government provided only US\$2.6 million of the total US\$20 million KEMRI received to fund its research mandate. As opposed to government stakeholders, the private sector players have played a huge role instead in innovation funding with mega tech entities such as Safaricom allocating more than \$5 million to its Spark fund for innovators in tech-enabled start-ups that are strategically aligned with its vision and with priority areas being health, agriculture and education.

Despite the increase in funding mechanisms recently, (the increase was noted after in 2020 it emerged that Kenyan startups in the African Tech Startups Funding Report, raised a record amount of funding, amounting to 19.1 billion Kenyan shillings) there is still a gap in long term funding initiatives for innovation related activities in various ventures.

b) Infiltration of Counterfeit goods and services

In Kenya, innovation also faces the impediment of counterfeit goods and services. Many brands have lost their market viability due to counterfeit goods that affect their reputation (KIPPRA, 2019). This is despite the presence of an Anti-counterfeit Authority in the country to curb such vices. There has been a difficulty in ensuring that ventures share their innovation, while at the same time prevent the counterfeiting of their goods and services. Research done by the Anti-Counterfeit Authority showed that the level of counterfeiting in major towns in Kenya stood at 23% in 2016 and 16% in 2018. A national survey by the Anti-counterfeit Authority in 2019 revealed that the value of illicit trade in Kenya is at about Kshs 726 billion. As of 2021, the government estimated that the country is losing between Ksh85 billion and Ksh100 billion annually to counterfeit and illicit trading. This discourages commercial enterprises from employing their innovations in the country when they are uncertain that they will reap the fruits of their products or services. It ultimately points to an unstable regulatory environment for goods and services. Consequently, the level of uptake and commercialization of intellectually protected products and services remains low.

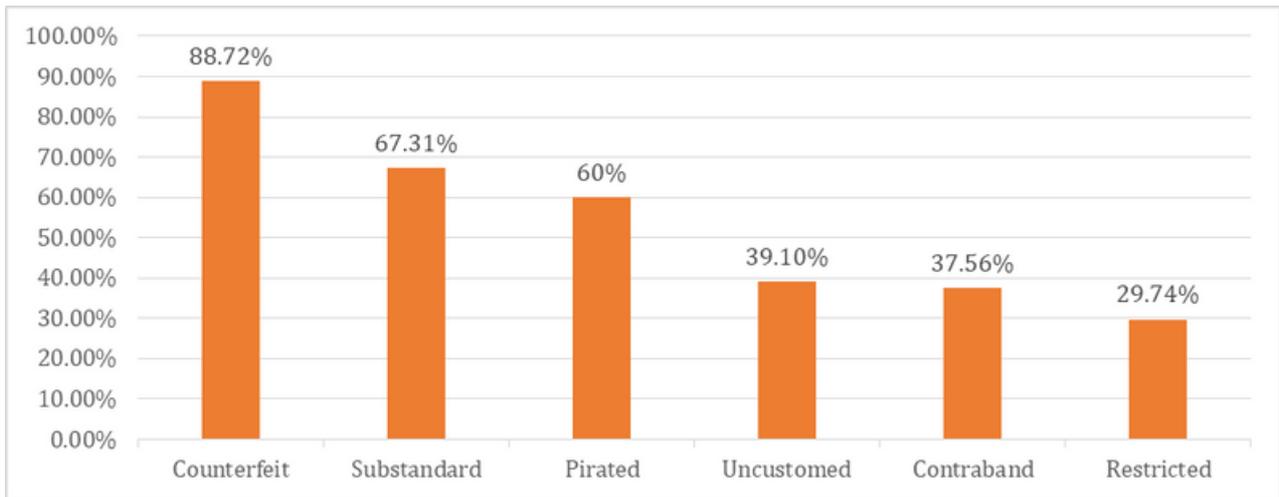


Figure 29: Most purchased form of illicitly traded products; 2019 ACA National Survey.

5.7.3 Cultural Barriers.

a) Traditions and Cultural Beliefs.

Cultural beliefs and practices slow down uptake of innovative activities. In Kenya, cultural barriers are important in the rural areas where information and awareness about innovations remain weak. For example, it took some time for Kenyans to get used to the private taxi apps that entered the market such as uber in 2015. Today, it is among the go-to-means for transport for Nairobi city dwellers. As at 2020, it had created jobs for more than 12,000 people with more than 100,000 users monthly from its inception. The e-cab market in Kenya has since attracted other market players such as bolt. The e cab business had gone ahead to gradually revolutionize the food industry in the country by the introduction of online ordering platforms such as uber eats, bolt food and glovo.