



THE ICT LANDSCAPE IN NORTHERN KENYA: CHALLENGES AND OPPORTUNITIES

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Executive Summary

The northern region of Kenya, which is arid and semi-arid in nature, forms 70% of the total landmass in the country and is one of the least developed regions of Kenya. Although Kenya is an African leader in ICTs and technology in cities such as Nairobi and Mombasa, the northern region has limited network coverage and where available, is limited to 2G level. Poverty levels are also high, further increasing barriers to technology implementation. This research sought to investigate the ICT landscape in Northern Kenya and investigate opportunities for digital technologies in the region, majorly in the fields of Education, Agriculture, Health and Jobs.

In partnership with Huawei and iGov Africa, Engineering for Change Fellows performed an ICT landscape analysis in Kenya, with a focus on Northern Kenya. Desk research included the analysis of news articles, research reports, government policies (e.g., the Kenya Vision 2030, the Kenya Digital Economy Blueprint, the Vision 2030 Development Strategy for Northern Kenya and other Arid Lands, and the Third Medium Term Plan 2018-2022), and other online-available materials. Furthermore, fellows conducted fourteen (14) semi-structured interviews with stakeholders in the ICT sector, specifically those with expertise in agriculture, education, health and income generations. Interviewed practitioners had a variety of different backgrounds such as social enterprises, policy makers, county government employees, community members and innovation hubs participants. Data from both desk research and interviews were analyzed and organized for claims and themes.

The challenges that the region faces include less developed infrastructure, low levels of education and limited exposure to opportunities that digital technologies can offer. There are limited solutions targeting the region and innovators venturing into the region have to overcome several cultural barriers. However, there are a few digital solutions that have been successfully deployed in the region and there are several positive trends that promote investment and innovations that target Northern Kenya.

Through desk research and expert interviews, we found out that innovators working in Northern Kenya need to tailor their solutions to be suitable by making them less power intensive or taking advantage of solar power, making them simple for use with basic phones, allowing them work offline and also understanding the complex social factors that may affect the adoption of their solutions. There were also various trends that promote innovation in the region, including the devolved governments, favorable policies and collaboration between different stakeholders in the region.

Incubation hubs would also play a major role in the success of innovators in Northern Kenya by providing them with the space for collaboration and networking, as well as helping increase the skills of the young people in Northern Kenya. While there are not many digital solutions targeting Northern Kenya, we found several opportunities within areas of agriculture, education, health and income generation.

Table of Contents

1 Northern Kenya: Education, Health, Income Generation, and Agriculture	2
1.1 Education in Northern Kenya	3
Education Statistics	3
Education Challenges	3
Government Interventions for Education	4
1.2 Health in Northern Kenya	4
Health Statistics	4
Health Challenges	5
Government Interventions for Health	5
1.3 Income Generation in Northern Kenya	5
Income Generation Statistics	5
Income Generation Challenges	6
Government Interventions for Income Generation	6
1.4 Agriculture & Pastoralism	6
Agriculture & Pastoralism Statistics	6
Agriculture & Pastoralism Challenges	7
Government Interventions for Agriculture & Pastoralism	7
1.5 Mobile Connectivity Access Overview	9
2 ICT in Northern Kenya: Trends, Challenges & Opportunities	10
2.1 Technology Solutions in Northern Kenya	11
2.2 Opportunities Available	11
3 Enabling an Environment for ICTs in Northern Kenya	12
3.1 Devolution	12
3.2 Policies	12
3.3 Collaboration	13
4 Challenges for Implementation of ICT solutions	14
4.1 Supporting Infrastructure	14
4.2 Level of Education & Digital Skills	14
4.3 Exposure to Digital Technologies	16
4.4 Diverse Cultural Context	16
4.5 Innovation Ecosystem	17
4.6 Localized Terrorism and Conflict	17
5 Considerations for Innovators	18
5.1 Consideration of Supporting Infrastructure	18
5.2 Partnerships	19
5.3 Simplicity	20
5.4 Offline Apps	20
5.5 Sociocultural Considerations and Contextual Factors	20
6 Conclusions and Recommendations	21

1 Northern Kenya: Education, Health, Income Generation, and Agriculture

According to the National Drought Management Authority (NDMA), Northern Kenya refers to a vast area of Kenya that experiences little or no rain and is too dry to support vegetation. This arid region of Kenya is what is referred to as the Arid and semi-Arid Lands (ASALs), is roughly the area that was referred to as the Northern Frontier District.¹

Northern Kenya consists of the counties of Mandera, Wajir, Isiolo, Lamu, Tana River, Garissa, Marsabit, Turkana, Baringo, West Pokot. Most of the land is occupied by the pastoralist and agro-pastoralist tribes of Turkana, Daassanach, Borana, Rendille, Pokot, Samburu, Gabbra and the Somalis. These are all distinct people groups with distinct languages and cultures.²

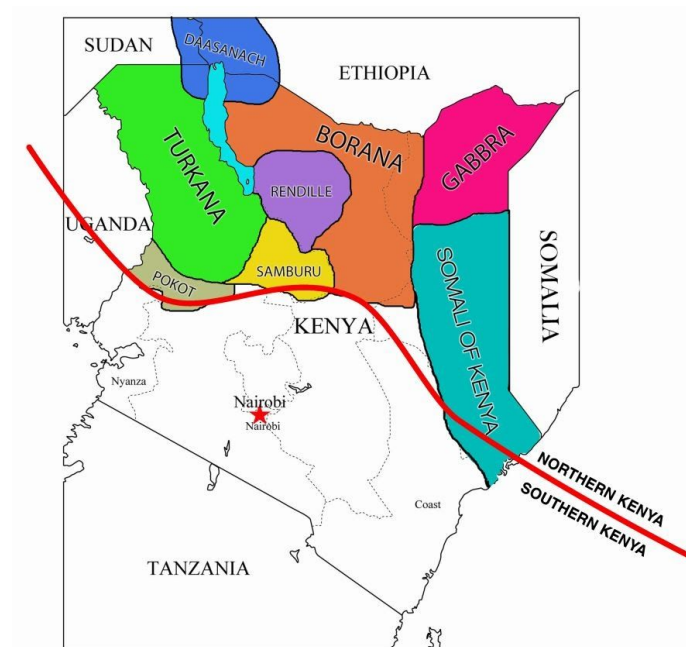


Figure 1. Map of Kenya

A key defining characteristic of Northern Kenya is the extreme weather conditions that include low average annual rainfall of 150-450 mm. The climate is a major influence of economic wellbeing in Kenya since agriculture is the main economic activity in the country. Consequently, the northern region home to 18 of the 20 poorest constituencies in Kenya (where 74 -97% of people live below the poverty line).

In terms of size, Northern Kenya occupies 70% of the total land mass in Kenya but only holds 38% of the population.³ In most places, people are clustered together to form settlements with the distance between settlements being huge. This vast land also allows for nomadic pastoralism to be practised and the communities keep moving from place to place.

¹ Government of Kenya, [Vision 2030 Development Strategy for Northern Kenya and other Arid Lands](#), 2012

² ResearchGate, [Map of the Arid and Semi Arid Counties in Kenya](#), 2019

³ PopulationData.Net, [Kenya Population Density](#), 2019

The low population density makes it difficult to provide adequate infrastructure and resources due to the vast distances involved. This includes roads, hospitals, schools and even mobile network infrastructure. People have to move for long distances to access most of the major services and the government presence is not felt.

Key characteristics of Northern Kenya

- Low population density
- Nomadic lifestyle, mobility is essential for pastoral production
- Extreme poverty
- High risk of famine due to drought
- Provision and monitoring of services is constrained by poor infrastructure
- Lack of access to quality services such as health, education, energy, water and transportation
- Persistent inequality in the number and quality of skilled personnel
- Low retention of trained personnel (teachers and healthcare workers)
- Limited economic activities outside pastoralism
- Farming and pastoralism are increasingly becoming vulnerable due to climate change and population growth
- There is a high opportunity cost for children to attend school, pastoral production systems are built on a substantial body of indigenous knowledge and skill
- Gender inequalities and retrogressive practices such as Female Genital Mutilation and child marriages

*Data taken from the Vision 2030 Development Strategy for Northern Kenya and other Arid Lands report.⁴

1.1 Education in Northern Kenya

Education Statistics

Education remains a major challenge in Northern Kenya. More than 50% of children live more than 11 km from a school and 11% live 6-10 km away from school.⁵ There are also many children out of school, a survey conducted for three counties found that more than 50% of households have a child out of school.⁶

Education Challenges

Education from primary to tertiary education enrolment in Northern Kenya faces several challenges, such as lack of access to learning facilities coupled with the region's low population density and nomadic culture. The nomadic lifestyle poses a challenge for education initiatives since families continue moving depending on the availability of water and pastures. The nomadic lifestyle presents a high opportunity cost for children's education. Children must often choose between school or being trained to keep cattle in the fields. Those who go to school end up missing out on informal learning that is usually passed on by their family on nomadic pastoralism, which is a very important economic activity in the region. Unfortunately, the current quality level of education they receive in an eight-year period in many cases is largely insufficient for young adults to enter the job market. If they fail to get jobs due to their level of skills or the general unemployment in Kenya, they are left without necessary skills to return to their society and practice nomadic pastoralism.⁷

⁴ Government of Kenya, [Vision 2030 Development Strategy for Northern Kenya and other Arid Lands](#), 2012

⁵ Government of Kenya, [Vision 2030 Development Strategy for Northern Kenya and other Arid Lands](#), 2012

⁶ SDGs KENYA FORUM, [The Second Progress Report on Implementation of SDGs in Kenya](#), 2019

⁷ Government of Kenya, [Vision 2030 Development Strategy for Northern Kenya and other Arid Lands](#), 2012

Culture plays a major role in continued enrollment of children in school in Northern Kenya, and education cannot be provided in isolation of the community's spiritual, social, security and moral concerns.⁸ Girls are less likely to enroll in school due to the existing social inequalities pertaining to domestic responsibilities and practices such as early marriage and female genital mutilation. Children with special needs also face stigmatization and there is a shortage of facilities and staff to cater for their education.

A shortage of trained teachers also affects access to quality education in Northern Kenya. The aridity of Northern Kenya and the nomadic lifestyle make the deployment and retention of teachers very difficult. There are also few teachers from a nomadic background who are able to meet the needs of the region.⁹ In addition, insecurity targeting non local people in parts of Northern Kenya has forced many teachers to leave the region, leaving schools underequipped and relying on untrained teachers.¹⁰

Government Interventions for Education

There are several interventions taking place to improve access and quality of education in Northern Kenya. The government aims to develop appropriate infrastructure and services that can meet the needs of nomads, such as mobile schools and mainstreaming the Early Childhood Development Education.¹¹ Girls-only boarding schools have been implemented empower girls to receive education in a safe place, particularly to avoid early marriage and Female Genital Mutilation practices. The government has also created the Policy Framework for Nomadic Education in Kenya to provide quality education to children from nomadic families.¹²

Other interventions include improving teacher-to-student ratio by moving more trained teachers in Northern Kenya schools. The quality of learning is also a focus of the government initiatives, aiming to ensure that students from Northern Kenya perform as well as students from other parts of the country. Historically, regional student performance has lagged behind the national average. Further, the government has implemented a school feeding program that seeks to solve the nutritional challenge and attract children to school.¹³

1.2 Health in Northern Kenya

Health Statistics

Northern Kenya faces a number of health challenges when compared to the rest of the country. Due to the remoteness of the region, the average distance to the health facility is 52 km, ten times longer than the national average.¹⁴ There is also an acute shortage of healthcare workers in the region and access to care is more limited since care and available specialists are unevenly distributed across regions, leading to inequities in access and quality of care in the northern counties.¹⁵ Cost also presents a barrier since some Kenyans may not seek health

⁸ Ministry of Education, [The National Council for Nomadic Education in Kenya - Strategic Plan 2015/2016-2019/2020](#), 2016

⁹ Ministry of Education, [The National Council for Nomadic Education in Kenya - Strategic Plan 2015/2016-2019/2020](#), 2016

¹⁰ International Crisis Group, [The Hidden Cost of Al-Shabaab's Campaign in North-eastern Kenya](#), 2019

¹¹ UNICEF, [Mobile Schools aim to ensure education in Kenya](#), 2011

¹² Ministry of State For Development of Northern Kenya and other Arid Lands, [Getting to the hardest-to-reach: a strategy to provide education to nomadic communities in Kenya through distance learning](#), 2010

¹³ Leveraging Agriculture for improved nutrition & health International conference, [School feeding Programmes in Kenya](#), 2011

¹⁴ USAID & Capacity KENYA, [Human Resources for Health \(HRH\) Assessment Report for Northern Kenya: Overview of Health Workforce Distribution across 10 Counties](#), 2013

¹⁵ Mulaki, A. and S. Muchiri, S., Health Policy Plus, [Kenya Health System Assessment](#), 2019

services due to lack of money. As a result, traditional community-based practices play an important role in meeting people's needs.¹⁶

In the region, healthcare indicators are deficient, affecting most directly women and children. The percentage of children delivered with trained healthcare in Northern Kenya is less than one third of the national average. Consequently, the maternal mortality rate is high. As an example, among the Gabbra community in Marsabit, the maternal mortality rate is 599 per 100,000 births.¹⁷

Health Challenges

From a healthcare perspective, a mobile population occupying a large area with poor infrastructure is difficult to serve, particularly in terms of ensuring that families are within the reach of a health facility. In Northern Kenya, the lack of education and training opportunities in the healthcare sector further hinders the increase of personnel with the required skills. Kenya currently has six Rural Health Training Demonstration Centres (RHTDS) but none are located in the arid regions. As a result, aspiring health workers in Northern Kenya do not have access to training opportunities in their region. Moreso, healthcare workers trained in other regions of the country are often not exposed to the unique conditions of supporting pastoralists communities.¹⁸

Furthermore, retention of healthcare workers is low in Northern Kenya. A study carried out by USAID and Capacity Kenya in 2013 identified that poor working conditions, poor remuneration, harsh environmental conditions, and unsafe working environment are among the reasons why healthcare workers avoid working in the region.¹⁹ In contrast, in other regions of Kenya, there is a vibrant private health care system that includes the support of local churches to supplement the availability of healthcare services. This additional support is not the case in Northern Kenya, where high levels of poverty also limit the participation of private health and insurance service providers.

Government Interventions for Health

Through the Vision 2030 Development Strategy for Northern Kenya and other Arid Lands, the government plans to increase access to health care for all populations in Northern Kenya. One of the goals is to increase and retain health and nutrition professionals in Northern Kenya. This will also involve strengthening logistics for medical supplies and patient referral, something that is hindered by vast distances and lack of transport infrastructure.

Public health initiatives can also play a major role in improving health care in Northern Kenya. This is another area that the government is seeking to strengthen by expanding culturally appropriate health education programmes on disease prevention, immunisation, nutrition, and HIV/AIDS.²⁰

1.3 Income Generation in Northern Kenya

Income Generation Statistics

Income generation, particularly for young adults, is one of the major challenges facing Kenya today. With 75% of the population below the age of 35 years, there is a growing need for income-generating opportunities. At the moment, 800,000 young Kenyans enter the labor market every year and the majority of those can only find jobs

¹⁶ Government of Kenya, [Vision 2030 Development Strategy for Northern Kenya and other Arid Lands](#), 2012

¹⁷ Government of Kenya, [Vision 2030 Development Strategy for Northern Kenya and other Arid Lands](#), 2012

¹⁸ USAID & Capacity KENYA, [Human Resources for Health \(HRH\) Assessment Report for Northern Kenya: Overview of Health Workforce Distribution across 10 Counties](#), 2013

¹⁹ USAID & Capacity KENYA, [Human Resources for Health \(HRH\) Assessment Report for Northern Kenya: Overview of Health Workforce Distribution across 10 Counties](#), 2013

²⁰ Government of Kenya, [Vision 2030 Development Strategy for Northern Kenya and other Arid Lands](#), 2012

in the informal sector.²¹ This problem is widespread all over Kenya although jobs are easier to find in urban areas than rural areas, making most people migrate to urban areas.²²

Income Generation Challenges

In Northern Kenya, there are a limited number of learning facilities that are necessary to equip young people with technical and vocational skills to thrive in the non-pastoralist world. The region does not have universities and only has one teacher training college, one technical training institute and very few TIVET institutions (Technical, Industrial, Vocational and Entrepreneurship Training).²³

Employment opportunities in this region are primarily classified as labor in the pastoral economy and a town's economic activities. Jobs in towns are mostly informal, provide less protection under law and the rates of remuneration are below the national minimum wage.²⁴ For the case of labor in the pastoral economy, the rise in population does not match the employment opportunities in this sector since its productivity depends on a balance between population and environment. Although pastoralism is the main economic activity, increasing population growth and effects of climate change are requiring new economic practices outside of pastoralism.

Job creation is a critical priority in Northern Kenya because of its relevance to the prevalent poverty rates of this region. 57% of Kenyan population are among the poorest 20% of the world population, while Northern Kenya has 18 of the 20 poorest constituencies of the country. This is a region with a human capital reservoir of more than 4 million inhabitants. However, to increase employment and labor opportunities, Northern Kenya must overcome the lack of access to training and the chronic under-investment of new economic activities.²⁵

Government Interventions for Income Generation

Through the Vision 2030 plan, the government is seeking to promote job creation, self employment and entrepreneurship. There is also interest in the expansion of the number of educational institutions which has seen many universities opened throughout Kenya, including a number of training institutions in Northern Kenya. For institutions in Southern Kenya, there are affirmative action programs meant to specifically give students from Northern Kenya placements in secondary schools and tertiary training institutions as well as job openings in the public service sector.

To deal with unemployment, there are various government agencies that are working to help the young people get jobs and relevant experience. This includes bodies such as Micro and Small Enterprise Authority (MSEA), and Kenya Youth Employment and Opportunities Project (KYEOP).

1.4 Agriculture & Pastoralism

Agriculture & Pastoralism Statistics

Northern Kenya is made up of Arid and Semi-Arid Lands (ASALs) that experience a low average annual rainfall of 150-450 mm,²⁶ which is spasmodic and not reliable for conventional agriculture. Thus, nomadic pastoralism is the main economic activity in the region. Northern Kenya is home to 99% of all camels in Kenya, 67% of goats,

²¹ World Bank, [Youth Unemployment Initiatives](#), 2014

²² SDGs Kenya Forum, [The Second Progress Report on Implementation of SDGs in Kenya](#), 2019

²³ Government of Kenya, [Vision 2030 Development Strategy for Northern Kenya and other Arid Lands](#), 2012

²⁴ Government of Kenya, [Vision 2030 Development Strategy for Northern Kenya and other Arid Lands](#), 2012

²⁵ Government of Kenya, [Vision 2030 Development Strategy for Northern Kenya and other Arid Lands](#), 2012

²⁶ ResearchGate, [Map of the Arid and Semi Arid Counties in Kenya](#), 2019

59% of sheep and 36% of all cattle²⁷. The ASALs livestock provides more than 67% of the red meat consumed in the country. The cattle raising economy of the ASALs in Kenya and the neighboring countries (Ethiopia, Somalia and Tanzania) is growing with an annual value exceeding USD 60 million.²⁸

Agriculture & Pastoralism Challenges

Pastoralists in the arid regions face challenges in cattle raising particularly when there is a lack of access to markets, capital, energy, and communications (e.g., transport and ICT). Since the arid regions are so dependent on livestock and livestock survivability is dependent on the access to grass and water, families that have this practice as their sole economic activity are vulnerable to impact shocks such as low coefficients of rainfall and drought. Pastoralists depend on being able to move their livestock constantly to places with appropriate resources. However, mobility in this region is constrained by settlements, administrative boundaries, conflict, and competing forms of land use.²⁹

Small crop farmers in the semi-arid regions depend on mixed agricultural systems and are affected by the low value production and the low bargaining power of producers to participate adequately in the market. Although farming activity is largely a subsistence farming practice, the surplus is used for family income. A persistent challenge for agriculture in this region is the low production of local crops, as farmers attempt to produce crops such as corn that have higher failure rates compared to indigenous crops such as sorghum and millet. Farmers mistrust that there is a market for these types of crops or that they cannot generate significant profits. Additional constraints for agricultural production identified by the Government of Kenya in semi-arid lands include soil erosion, low soil fertility, frequent droughts, reduction of available labor in the region, limited access to credit, and inadequate research and extension.³⁰

Semi-arid regions are also very vulnerable to the current population growth and climate change effects, the Vision 2030 Strategy for Northern Kenya and other Arid Lands state that in this region is vulnerable because there are “too many people trying to make a living on too little land.”³¹ Thus, without diversification of the economy, families are economically vulnerable to climate effects. And since many families depend on these practices to ensure subsistence, their nutrition and health can be at risk.³² Climate change and desertifications continue to negatively affect livelihoods in both arid and semi-arid regions of Northern Kenya. These environmental pressures are forcing people to travel longer distances in search of water and pasture, leading to loss of livestock and crops as extended periods of drought become more common.

There is local and international interest in the development of dryland bio-enterprises in these regions. Meat production from pastoral areas is a point of interest because this activity does not compete with crop production and could help alleviate poverty and environmental strain. However, for these regions to dabble in these practices, investment will be required to meet the standards required.³³

Government Interventions for Agriculture & Pastoralism

There are several interventions and plans that the government is implementing to address these problems and improve the agriculture sector in Northern Kenya. To improve the quality of livestock and help pastoralists

²⁷ KNBS, [Distribution of Livestock Population by Type, Fish Ponds and Fish Cages by County and Sub County 2019 Census Volume IV](#), 2020

²⁸ Government of Kenya, [Vision 2030 Development Strategy for Northern Kenya and other Arid Lands](#), 2012

²⁹ Government of Kenya, [Vision 2030 Development Strategy for Northern Kenya and other Arid Lands](#), 2012

³⁰ Government of Kenya, [Vision 2030 Development Strategy for Northern Kenya and other Arid Lands](#), 2012

³¹ Government of Kenya, [Vision 2030 Development Strategy for Northern Kenya and other Arid Lands](#), 2012

³² Government of Kenya, [Vision 2030 Development Strategy for Northern Kenya and other Arid Lands](#), 2012

³³ Government of Kenya, [Vision 2030 Development Strategy for Northern Kenya and other Arid Lands](#), 2012

receive higher returns, the government is planning to increase the reach and quality of technical support as well as supporting livestock production and marketing. Additional interventions and programs include milk and meat processing facilities, as well as diversifying breeds of cattle. The government also plans to establish a Northern Kenya Investment Fund and a livestock insurance scheme.

1.5 Mobile Connectivity Access Overview

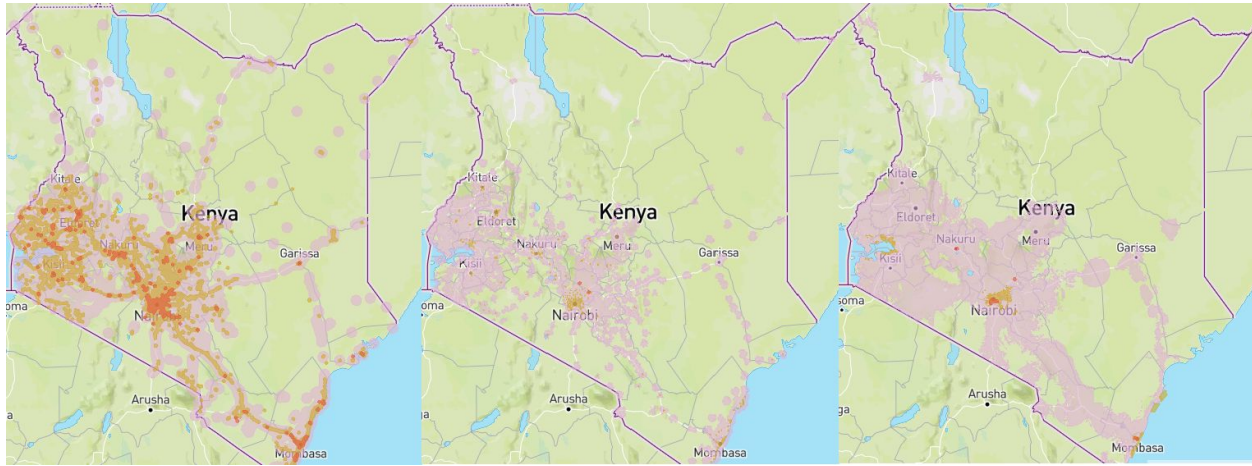


Figure 2. Network coverage map from left to right Safaricom, Airtel, Telkom (pink-GSM, yellow-3G, orange-LTE)³⁴

Kenya has four major mobile services providers: Safaricom, Telkom, JTL and Airtel. As of April 2019, Safaricom's market share was 62.4% with about 31.8 million users.³⁵ In terms of population network coverage, the majority of Kenyans are covered by a mobile network. As of 2019, Safaricom's 2G network covers land where 96% of the Kenyan population resides, and provides 3G and 4G where 93% and 57% of the population reside; respectively.³⁶ The other telcos have less coverage and in most cases overlap with Safaricom. As shown in Figure 2, much of Northern Kenya is not covered by mobile networks. In this region, the network is usually concentrated in the settlement pockets where communities live.

There are 20.6 million mobile phone users in Kenya and 49.8 million registered SIM cards.³⁷ Even though there is a 92% coverage of 2G networks in Kenya,³⁸ 48% of the population still remains without access to mobile networks for various reasons.³⁴ The total cost of mobile ownership is the primary barrier to the adoption of mobile networks by users from low and middle income households. In Kenya the poorest 20% of the population in Kenya spend approximately 8.0% of their monthly income on mobile ownership for a minimal amount of data (500 MB), and up to 26.5% of monthly for a medium-level amount (1GB of data + 250 min of voice + 100 SMS).³⁹ This figure is far from the goal the United Nations Broadband Commission adopted for 2025 "1 for 2" which aims for 1 GB of data cost less than 2% of monthly income.⁴⁰ A study conducted by GSMA identified that, in Kenya, 38% and 33% of men and women, respectively, cite affordability as the single most important barrier to the adoption of mobile internet.⁴¹

In Kenya, people that are still not connected to mobile services can be classified in two groups, the 'uncovered' and the 'covered but not connected'. The 'uncovered' are the people that are still out of reach of the broadband

³⁴ GSMA, [Network Coverage Maps](#), 2020

³⁵ Safaricom Limited, [Safaricom 2019 Sustainability Report](#), 2020

³⁶ Safaricom Limited, [Safaricom 2019 Sustainability Report](#), 2020

³⁷ KNBS, [2019 Kenya Population and Housing Census Reports](#), 2020

³⁸ Communications Authority of Kenya, [Increased access to mobile network signal, exciting product offers push mobile penetration to 112 per cent](#), 2019

³⁹ GSMA, [Mobile taxation in Kenya](#), 2020

⁴⁰ [United Nations Broadband Commission](#)

⁴¹ GSMA, [The Mobile Gender Gap](#), 2020

network, while the ‘covered but not connected’ are people that have not adopted mobile services.⁴² In Kenya, the divide between these two groups is mostly predominant in rural areas.

2 ICT in Northern Kenya: Trends, Challenges & Opportunities

Sector	Trends	Challenges	Opportunities
ICT Overall	Android apps	Connectivity	NOFBI program
	Youth empowerment	Lack of mentorships programs	AJIRA program
	Interest of foreigner investors	Low policy related to patent and intellectual property	Interest from the government and stakeholders to connect investors with solutions makers
Education	Teaching language apps	Most of the solutions are aimed to urban areas	Supplementing class activities
	Monitoring school attendance	School desertion	Promoting school attendance with apps
Health	Monitoring and social protection of expectant mothers.	Most of the solutions require good connectivity	Health care financing
	Disease outbreak surveillance		Contact tracing apps
Jobs	Linking people with jobs	Lack of solutions and programs for rural areas	Career mentorship
	Interest to create learning centers to train	Lack of adequate resources	
Agriculture	Micro insurance for agriculture	Over regulations and too many data requirements	Connecting farmers with markets
	Weather prediction apps	Lack of digital knowledge	Provide information to improve their skills

The use of android applications is growing strongly in the region, that is why innovators and solutions makers are aiming to develop mobile apps as a way to solve problems related to education, health and give more opportunities to rural workers. We found that there is a big challenge regarding the school desertion and attendance, especially during the pandemic context where children can't attend lectures. Because of this problem a lot of innovators are targeting solutions to monitor the student progress and participation on virtual lectures, also how to keep students motivated and reduce the school desertion.

Regarding health, most innovators are working on solutions to improve the experience with healthcare financing and medical expenses and connect patients with doctors to be able to do remote consulting. Also there is a trend in e-health destined to women care and monitoring of expecting mothers. There is a big trend regarding weather prediction apps and improving the skills of rural workers in agriculture. Also a lot of opportunities regarding AI in digital solutions which is a topic of interest between the investors. In the case of both agriculture and jobs most of the solutions aim to link people with jobs or farmers with local buyers.

⁴² GSMA, [The State of Mobile Internet Connectivity](#), 2019

2.1 Technology Solutions in Northern Kenya

According to our findings (Annex I), most of the solutions in Kenya are mobile apps which target students and young people. The solutions based on SMS are decreasing, indicating that more people are using smartphones, which presents a challenge for users in rural areas who rely on feature phones. Some examples include using chatbots to connect individuals with health workers or apps promoting literacy programs. In spite of the challenges facing the region, there are a number of digital technologies in use in Northern Kenya. Some of the trends and innovative applications of digital technologies that we found are listed in the table below.

SECTOR	SOLUTIONS AVAILABLE
Education	<ul style="list-style-type: none"> ● Monitoring teacher and student attendance through WhatsApp ● Teacher literacy using applications
Health	<ul style="list-style-type: none"> ● Disease outbreak surveillance ● Providing antenatal care to expectant mothers ● Social protection through cash transfer using mobile money
Jobs	<ul style="list-style-type: none"> ● Providing digital skills using a mobile truck by Computers for Schools Kenya
Agriculture	<ul style="list-style-type: none"> ● Providing crop microinsurance to farmers ● Availing weather information ● Formalizing agricultural value chains ● Enabling financial inclusion by digitising payments to farmers

Other innovative ways that that people are solving challenges in Northern Kenya include:

- Using solar power to power the Vocational Training Institutes and offer ICT courses.
- Using automated vending machines to manage borehole water using prepaid cards.
- Using mobile phones to call in to live FM radio stations, and sending messages to people who have access to radio but not to mobile networks.
- Opening up Northern Kenya to tourism using Google Earth.

2.2 Opportunities Available

From the interview with the different stakeholders, several potential areas of impact where digital technologies can be employed were mentioned. These are shown below:



3 Enabling an Environment for ICTs in Northern Kenya

3.1 Devolution

Devolution of the government in Kenya has been setting the foundations for an enabling environment for development in many regions of the country, mainly impacting regions that have traditionally been excluded. Thanks to the new constitution of Kenya, in 2013 a decentralized system of government was established where the executive and legislative branches are devolved to 47 Counties. Efforts to decentralize the government are aiming to devolve power, resources and representation down to the local level.⁴³

The advantages of the devolution in Kenya, as identified by Samuel Ngigi from the University of Nairobi and Doreen Busolo from the University of Queensland in a research published in 2019, are the following:⁴⁴

- Equitable distribution of national resources
- Platform for economic and social development: county governments have the power to implement their own growth strategies to foster social, economic, and political development of local communities.
- From exclusion to inclusion: as devolved systems, marginalized and minorities that have traditionally been left out are empowered and the county governments aim to reduce poverty, minimize differences in income opportunities and access to social services, making sure the services and opportunities are tailored to their needs.
- Informed decision-making through public participation: participation of civil society is encouraged to inform the decision-making process of county affairs so that the interests of the communities are taken into consideration .
- Promotion of transparency, accountability and democracy: since participation and decision-making are reachable for the people at the grassroots levels, leaders are chosen by the people and are held accountable.
- Promotion of national unity: with the purpose of obtaining equal opportunities in the country, a devolved government promotes equal distribution among counties which in return creates unity, cohesion and co-existence between different counties.

The devolved government structure in Kenya is also helping empower communities in Northern Kenya. Innovators have also noted that Northern Kenyan counties are very receptive and collaborative and willing to partner with people who are providing solutions in Northern Kenya.

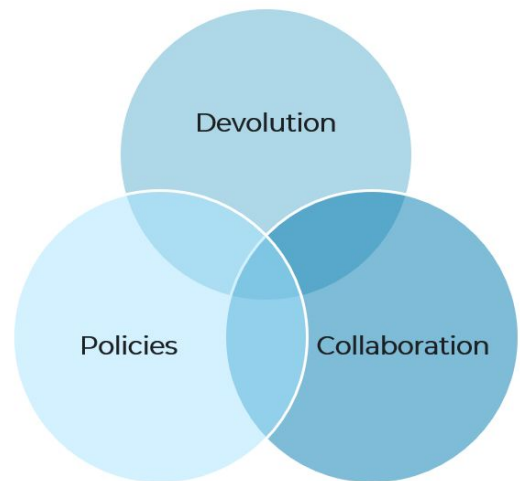
3.2 Policies

During the past two decades, several policies aimed at strengthening the ICT ecosystem have been created. Some of the most relevant have been the ICT policy⁴⁵ from 2006 that focused on harnessing the potential of economic growth and poverty reduction, and the Kenya Vision 2030 that included the development of the ICT sector and its use as a cross-cutting enabler among its objectives. The Economic Recovery Strategy for Wealth

⁴³ Ngigi, S., & Busolo, D. N. (2019). [Devolution in Kenya: The Good, the Bad and the Ugly](#).

⁴⁴ Ngigi, S., & Busolo, D. N. (2019). [Devolution in Kenya: The Good, the Bad and the Ugly](#).

⁴⁵ Ministry of Information & Communications, [National Information & Communications Technology \(ICT\) Policy](#), 2006



and Employment Creation (ERS), which was active from 2003 to 2007, aimed to reduce unemployment with a variety of initiatives including public infrastructure. Importantly, the ERS recognized ICT infrastructure as an enabler for creating economic growth.⁴⁶ Additional policies that have contributed to the improvement of both hard and soft infrastructure include the ICT Master Plan and the National Broadband Strategy.^{47,48} Most recently, the 2019 National Information, Communications and Technology (ICT) Policy is aiming to drive social, economic, cultural and political transformation through the enhancement and accessibility of new generation mobile, high-speed, secure and ubiquitous ICT infrastructure.⁴⁹ The following policies have been found to promote the development of the ICT ecosystem in Northern Kenya, these include both from the National government and the County government. Some of them include:

- The Digital Economy Blueprint⁵⁰
- The Ajira Digital Program⁵¹
- Vision 2030 Development Strategy for Northern Kenya and other Arid Lands⁵²
- The Universal Service Fund⁵³
- Third Medium Term Plan 2018 - 2022⁵⁴

However, it is important to note that many policies feel outdated and do not fully or adequately support the digital innovation ecosystem. Overall, many interviewed stakeholders feel excluded from participating in the policy-making process, citing both lack of awareness and disinterest. The public sector expressed a different opinion and noted that all consultation mechanisms are open and transparent, but only very large companies take part. Entrepreneurs can be involved with the public sector if there are clear and transparent mechanisms to support the ecosystem. These views were supported by many respondents who noted the lack of trust between government departments, and between the public and private sectors. The lack of awareness and trust seems to lead to low engagement in the ecosystem, and these challenges are seen as widening the gap between the public sector, innovators and the private sector.⁵⁵

3.3 Collaboration

Collaboration plays a key role in implementing solutions in Northern Kenya. Some of the different stakeholders helping drive innovations include the national and local governments, autonomous government agencies, private sector players, civil society, community based organizations and various partnerships between two or more of those. There are also hubs and networks of hubs that are in various rural areas, such as the Countrywide Innovation Hubs.⁵⁶ These collaborations help subsidize the cost of entry and the initial set up costs that are involved, as well as providing an environment for innovators to learn and understand the Northern Kenya context. However, more partnerships are needed to solve some of the most pressing challenges such as in the education sector.⁵⁷

⁴⁶ International Telecommunication Union (ITU), [ICT centric Innovation Ecosystem Kenya: Country Review](#), 2019

⁴⁷ The Information and Communication Technology Authority, [National Broadband Strategy](#),

⁴⁸ ITU, [ICT centric Innovation Ecosystem - Kenya: Country Review](#), 2019

⁴⁹ Ministry of Information, Communications and Technology Kenya, [National Information, Communications and Technology \(ICT\) Policy](#), 2019

⁵⁰ Government of Kenya, [Digital Economy Blueprint](#), 2019

⁵¹ [Ajira Digital](#)

⁵² Government of Kenya, [Vision 2030 Development Strategy for Northern Kenya and other Arid Lands](#), 2012

⁵³ Communications Authority of Kenya, [Universal Service Fund](#), Accessed: 10/19/2020

⁵⁴ Government of Kenya, [Third Medium Term Plan 2018-2022](#), 2018

⁵⁵ ITU, [ICT centric Innovation Ecosystem - Kenya: Country Review](#), 2019

⁵⁶ Interview with Caroline Kiarie, UNDP Innovation Labs, August 2020

⁵⁷ Interview with Ali Guracha, County Government of Isiolo, August 2020

4 Challenges for Implementation of ICT solutions

4.1 Supporting Infrastructure

In Northern Kenya, there is limited network coverage beyond 2G. And, although most of the people are covered with 2G networks, there still remain many isolated uncovered areas. A representative from the County Government of Isiolo from Northern Kenya claims that *travelling through this region means that one is out of mobile network coverage occasionally*.⁵⁸

For digital technologies to function, all infrastructure must be in place, including the First Mile (the undersea cables), Middle Mile (the backbone and metro networks along with transmission and core networks) and Last Mile (the final connection to users such as fiber, wireless, VSAT and delivery centres/hubs) infrastructure.⁵⁹ Infrastructure in the Middle Mile and Last Mile remain some of the greatest challenges in rural Kenya, due to the high cost of infrastructure deployment. Deficiencies in utility services cascade to key absences in the ICT ecosystem. Without access to power, potential mobile network users cannot recharge devices even if the users can afford the service or the broadband reaches them. The transport network deficiencies are also a key factor hindering the delivery of telecommunications services and supplies, telecommunications providers cannot reach remote customers. Access to electricity is also key, and as of 2018, only 7% of the northern region population had reliable access to electricity⁶⁰ and, although access to off-grid energy sources such as solar energy are becoming more accessible in the region, most of the population still relies on dirty fuels.

There has been significant progress in the development of the Middle Mile infrastructure because of the National Optical Fiber Backbone Infrastructure (NOFBI) project. This initiative aims to ensure connectivity in all of Kenya's 47 counties by laying terrestrial fibre optic and carrying out network device installations. To date, the project has been completed for the 47 counties and fibre has been installed.⁶¹ However, Last Mile Infrastructure still needs to be developed in order for these services to reach final users. For users to adopt high-speed broadband networks, these services will need to be affordable as well. Where there are Internet Service Providers (ISPs) to provide internet, the cost of the service can be three to four times higher in Northern Kenya than the urban areas in Southern Kenya. And, the grade of service is cited to be very low, with frequent interruptions and interferences from the telecommunications services in Somalia, which are unregulated.⁶²

4.2 Level of Education & Digital Skills

Literacy and digital competence are some of the primary barriers for the adoption of ICT solutions in Sub-Saharan Africa. The GSMA Mobile Connectivity Index for Kenya shows that basic skills considered for consumer readiness is at a score of 43.8 from a range of 0 to 100 (100 represents the highest score).⁶³ The Index measures key enablers of mobile internet adoption: infrastructure, affordability, consumer readiness, and content and services. Consumer readiness measures citizens' awareness and skills needed to value and use the internet and is considered to have mobile ownership, basic skills and gender equality as its composing pillars. Basic skills evaluated are literacy levels and participation in formal education.⁶⁴

⁵⁸ Interview with John Mutea, County Government of Isiolo, August 2020

⁵⁹ Government of Kenya, [Digital Economy Blueprint](#), 2019

⁶⁰ World Bank, [The North and North Eastern Development Initiative](#), 2018

⁶¹ ICT Authority, [National Optic Fibre Backbone \(NOFBI\)](#). Accessed: 10/15/2020

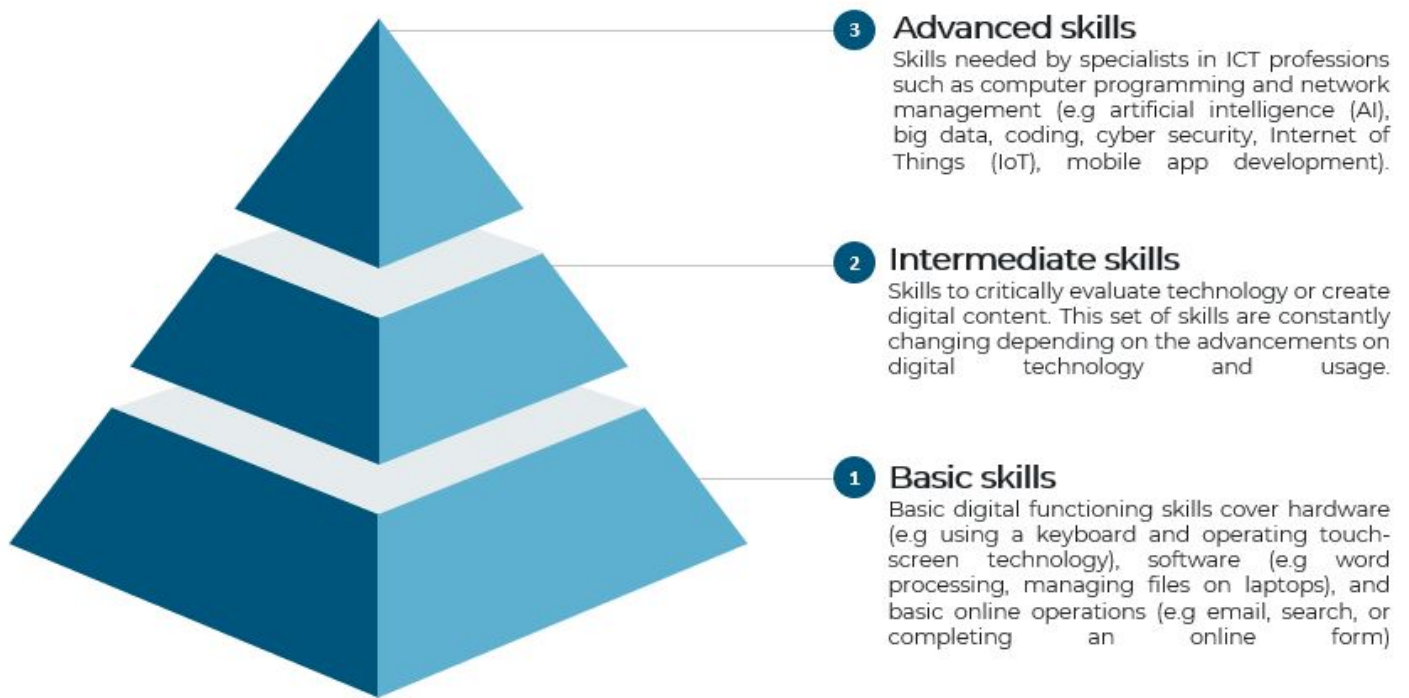
⁶² Interview with Michael Ouma, Entrepreneur in Mandera Town, September 2020

⁶³ GSMA, [GSMA Mobile Connectivity Index - Kenya](#), Accessed: 10/16/2020

⁶⁴ GSMA, [GSMA Mobile Connectivity Index](#), Accessed: 10/16/2020

Stakeholders in the ICT sector in Northern Kenya consider the level of education as one of the top challenges in implementing digital solutions in the region.⁶⁵ With a primary education net enrolment ratio of 88%, Kenya has made significant progress in country-wide access to education.⁶⁶ However, this ratio has been almost stagnant since 2011 because of the challenges to reach remote groups such as children living in pastoral and nomadic communities.^{67,68}

While literacy skills are necessary for users to interact with mobile technologies, digital skills (Figure 3) are required to harness the full potential of ICT solutions. Digital skills, required for both users to adopt mobile solutions and entrepreneurs to develop digital solutions, consist of basic, intermediate, and advanced skill levels. Basic skills allow users to be part of the ICT ecosystem, and intermediate and advanced skills allows people to leverage the ICT ecosystem tools to create digital solutions or content.



*Information taken from Kenya's Digital Economy Blueprint.

Figure 3 The Digital Skills Pillar⁶⁹

Digital basic skills still remain to be very low in Sub-Saharan Africa and in regions such as Northern Kenya even people who have attained a reasonable level of education such as teachers, still find digital solutions difficult to use.⁷⁰ This divide may also mean that the technologies do not incorporate necessary user needs and context-appropriate interfaces. In an interview with Caleb Ndaka, Program Lead of Kids Comp Camp, Ndaka mentioned that this gap in digital literacy calls for a focus on empowering people with knowledge and skills to leverage mobile technologies. Kids Comp Camp is an EdTech initiative that aims to help young people from

⁶⁵ Interview with Abdinoor Alihamad, M-Lugha, August 2020.

⁶⁶ UNICEF, [Situation Analysis of Children and Women in Kenya](#), 2017

⁶⁷ UNICEF, [Situation Analysis of Children and Women in Kenya](#), 2017

⁶⁸ UNICEF, [Quality Education: Providing inclusive and equitable quality education for every child in Kenya](#), 2017

⁶⁹ Government of Kenya, [Digital Economy Blueprint](#), 2019

⁷⁰ Interview with Caleb Ndaka, Kids Comp Camp, September 2020.

underserved rural areas or low-income communities “gain competitive edge to tackle today’s digital driven society.”⁷¹

The term “Soft infrastructure” is used to describe important aspects of digital development, such as training centers or mentoring programmes are necessary to upskill young people’s digital abilities. In Kenya, soft infrastructure is currently mostly concentrated in urban centres such as Nairobi.⁷² Training centers, such as the ICT Centers by World Vision can help increase digital literacy,⁷³ can act as a means to foster digital innovation in Northern Kenya and produce the necessary human capital required to develop local solutions that can be enabled by ICT. In Northern Kenya, since there are challenges with education, as well as a general lack of an innovation ecosystem, local innovators struggle and need more intensive support compared to those in Nairobi.

4.3 Exposure to Digital Technologies

Driving awareness of the benefits of ICT solutions through the exposure to digital technologies is key to showcase the relevance of the digital ecosystem for personal and community-wide socioeconomic improvement. However, exposure to digital technologies and the perception of their relevance are two persistent challenges for the adoption of ICT solutions in rural areas.

Regarding exposure to digital technologies, people in Northern Kenya mostly use feature phones, which the most affordable option, are more predominantly used instead of smartphones.⁷⁴ While feature phones provide phone calls and text messaging capabilities, many don’t include internet features or if they do the capabilities are limited. In Northern Kenya mobile users may not have sufficient motivation to use or invest in internet-enabled feature phones or smartphones.

A 2019 GSMA Consumer Survey determined that other than the lack of digital skills and literacy, one of the barriers for mobile internet use is that many people feel the internet is not relevant for them.⁷⁵ In Kenya, the percentage of mobile internet users who are aware of mobile internet but do not use it because they think it is not relevant for them is 15% for men and 14% for women.⁷⁶ Within Northern Kenya, this technology aversion is a contributor to the gap of people's capacity to adopt ICT offerings.⁷⁷ There is a question as to which is the demand of users in Northern Kenya and if they have a compelling reason to buy data and use it, or if users find value in the ICT solutions that are currently available.⁷⁸

4.4 Diverse Cultural Context

With more than eight ethnic groups that have distinct cultures and speak more than 60 languages, navigating the different cultures in Northern Kenya to develop appropriate solutions is a challenge. Being such a linguistically diverse region, much of the content that has been developed so far for ICT applications in Kenya is not available in the first or preferred language of communities from Northern Kenya. Cultural factors such as a nomadic lifestyle and specific gender roles also add complexity into the adoption of ICT offerings.

The nomadic lifestyle makes it difficult for telcos to provide services and for the government to install education and healthcare infrastructure. The constant mobility of communities in Northern Kenya and the lack of

⁷¹ [Kids Comp Camp](#), program website

⁷² Government of Kenya, [Digital Economy Blueprint](#), 2019

⁷³ Interview with Leila Godana, Community member in Isiolo, September 2020

⁷⁴ Interview with Patrick Sampao, ACRE Africa, August 2020

⁷⁵ GSMA, [The State of Mobile Internet Connectivity](#), 2019

⁷⁶ GSMA, [The Mobile Gender Gap](#) Report, 2020

⁷⁷ Interview with Charles Otine, Innovation lead at UNICEF, August 2020

⁷⁸ Interview with Andrew Karlyn, Chief Impact Officer at Living Goods, August 2020

appropriate delivery methods constrain the access to basic services. While telcos still need to develop innovative delivery methods to provide their services, ICT solutions have an immense potential to create alternative pathways to implement appropriate delivery methods for other basic services such as education, health and jobs. For example, digital solutions in Northern Kenya could allow remote learning for all ages, telemedicine, and connecting farmers with markets.

The different gender roles in communities from Northern Kenya also affect education and adoption of technologies. Girls have lower literacy levels since their education is not highly valued, and cases of early marriage are common. In Kenya, although the gap of mobile owners between men and women is only 5%, the gap of mobile internet users between men and women is 34%.⁷⁹ Meanwhile, in Northern Kenya, women are also less likely to have phones compared to their husbands and often require permission to make any significant purchases, such as a mobile device.⁸⁰ The gender gap causes many women to systemically miss out on benefits of mobile internet such as information, services and content. In the case of specific sectors such as agriculture, where women may be the primary farmer, the gender gap can be a fairly relevant barrier to the adoption of solutions in Northern Kenya.

4.5 Innovation Ecosystem

Although scale up of hard infrastructure has been rising in all of Kenya including the ASALs, as mentioned previously, soft infrastructure is still facing major gaps in Northern Kenya. Soft infrastructure is not only required for the improvement of digital skills but for innovation capacity as well. The ecosystem of soft infrastructure for innovation in Kenya has been growing with the appearance of players such as iHub, NaiLab, mLab, Gearbox, Akirachi and BRCK.⁸¹ These have spearheaded what is now famously known as the Silicon Savannah. However, the innovation capacity is majorly limited to Nairobi and there is a noticeable gap between urban and rural settings.⁸² Many digital technologies, particularly those in the field of Agriculture, Health, Education and Jobs developed in Nairobi, are not suitable for Northern Kenya. Since the startup environment remains to be mostly urban, innovators lack the requisite exposure and experience for innovating in Northern Kenya where indigenous and socio-cultural context knowledge is critical.

Due to the early-stage of the ICT sector in Northern Kenya, there is a high cost of entry to the market as compared to more developed ICT markets. Low return of investment due to economic factors and challenges navigating different cultures, and high operational costs are also factors constraining the development of innovations of the ICT sector in the region.⁸³ Some Kenyans suggest that implementing innovation hubs, similar to those in Nairobi, could increase digital knowledge in Northern Kenya and assist graduates into self-employment or encourage business people in the region to try digital channels.⁸⁴

4.6 Localized Terrorism and Conflict

In the last decade, localized terrorism by radical groups such as Al-Shabaab has caused attacks to non-muslims in Northern Kenya to civilians and essential workers such as teachers,⁸⁵ leading to insecurity and a growing fear of non-residents or non-muslims to work or dwell in this region. Hundreds of essential workers such as teachers, nurses, public administrators and construction workers have fled the region in response to the growing

⁷⁹ GSMA, [The Mobile Gender Gap Report](#), 2020

⁸⁰ Interview with Calvince Okello, M-Shamba, September 2020

⁸¹ Wired, [The Techies Turning Kenya Into a Silicon Savannah](#), Aug 2018

⁸² ITU, [ICT centric Innovation Ecosystem - Kenya: Country Review](#), 2019

⁸³ Interview with Michael Ouma, Entrepreneur in Mandera Town, September 2020

⁸⁴ Interview with Leila Godana, Community member in Isiolo, September 2020

⁸⁵ The Nordic Africa Institute, [Radicalisation and Terrorist Recruitment among Kenya's Youth](#), 2016

insecurity.⁸⁶ Terrorist attacks on telecommunication infrastructure and personnel has led to a barrier for the expansion of the ICT sector in Northern Kenya. Radicalization in Kenya varies between social groups but some of the reasons for youth, particularly uneducated and jobless, to join extremists organizations include promise of money and material reward and distrust of the government; among other reasons.⁸⁷

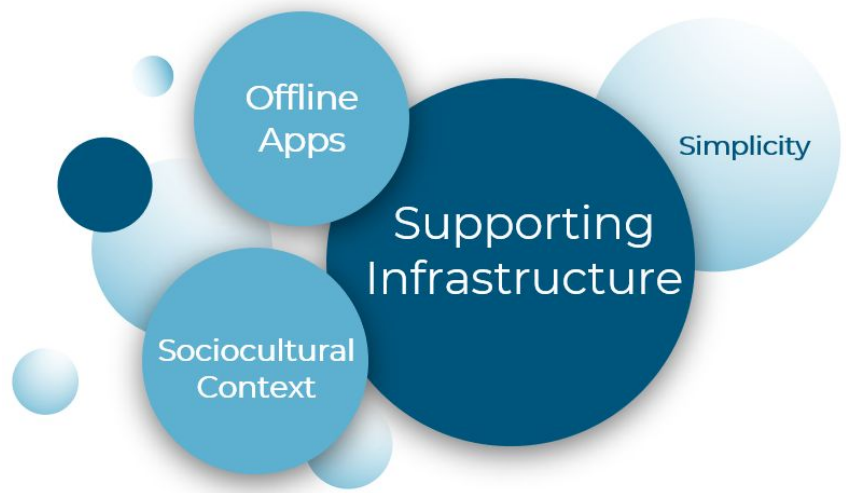
Furthermore, tribal clashes in Northern Kenya are also considered to be a barrier for the advancement of the ICT sector in the region. Ethnic clashes are common in the region because of disputes over grazing land, water access points, and territorial expansion.^{88,89}

5 Considerations for Innovators

For digital solutions to be adopted in Northern Kenya, innovators need to consider the available supporting infrastructure, simplicity, ability of the solution to work offline, the sociocultural context and other contextual factors.

5.1 Consideration of Supporting Infrastructure

If innovators need to work around the currently available infrastructure, they will need to design solutions that perform well under the context-specific conditions. When designing applications, since availability of electricity in Northern Kenya is a major challenge, designers should intentionally require the app to be less power-intensive so that they do not drain a user's device battery. Further, if applicable when designing a hardware device, innovators are encouraged to use solar power, since solar radiation is readily available in the region.⁹⁰



Additional types of infrastructure, such as innovation hubs, are key to the success of ICT solutions because they allow access to entrepreneurial support, skills training and co-working spaces. From the findings, the need to have innovators working in and in collaboration with other stakeholders on the ground for maximum impact is clear. This calls for the creation of spaces for experimentation, which can also be the nodes for accessing the internet for communities and promoting digital literacy.

Initiatives in Kenya such as the Ajira Youth Empowerment Centers, exemplify how soft infrastructure can promote the development of the digital economy by providing the necessary tools for young people to participate and benefit from this growing sector through shared access points. These Centres are part of the government-led Ajira Digital program carried out by the Ministry of ICT, Innovations and Youth Affairs, which

⁸⁶ International Crisis Group, [The Hidden Cost of Al-Shabaab's Campaign in North-eastern Kenya](#), April 2019

⁸⁷ The Nordic Africa Institute, [Radicalisation and Terrorist Recruitment among Kenya's Youth](#), 2016

⁸⁸ Anadolu Agency, [4 killed in ethnic clashes in northern Kenya](#), June 2020

⁸⁹ International Crisis Group, [Ethnic Contest and Electoral Violence in Northern Kenya](#), July 2017

⁹⁰ Interview with Abdinoor Alimahdi, M-Lugha, August 2020

aims to “empower over one million young people to access digital job opportunities.”⁹¹ The Centres provide free Wi-Fi and access to internet-enabled devices. Participants can also benefit from peer learning or ICT solutions awareness training.

Innovation hubs can play this role effectively by allowing innovators to spend time on the ground and learn the environment as well as learn from one another. To achieve this, innovation hubs should seek to create a community of different stakeholders by creating collaboration spaces, skill training events, networking opportunities and providing mentorship opportunities.⁹² These hubs can also contribute by gathering local market information, which in return can attract innovators to Northern Kenya by providing on-the-ground support and sharing local knowledge. Integrating local innovation hubs with other stakeholders make the innovation process easier, cost-effective and context-appropriate.

5.2 Partnerships

Partnerships with local government or local community groups can help overcome various challenges such as understanding local context, distribution and reach to citizens and users, and be more cost-effective and sustainable. Kenya’s ITU identified that innovation in the ICT sector relies on an interconnected group of stakeholders that guides innovator’s through lifecycle: entrepreneurs, public sector, private sector, finance, academia and entrepreneurial support networks.⁹³ However, the ITU claims that there is a need for additional collaboration and partnerships to build the ecosystem that can support ICT sector growth, including research and development, seed funding, investments, trade policies, and more.

Another approach for considering partnership opportunities is the government of Kenya’s five pillars presented in the Digital Economy Blueprint Report: (1) digital government, (2) digital business, (3) infrastructure, (4) innovation-driven entrepreneurship, and (5) digital skills and values. For a strong innovation-driven entrepreneurship pillar, this must be anchored to the “presence of an accessible, inclusive and collaborative innovation ecosystem.” This innovation ecosystem must consist of a collection of stakeholders: government agencies, venture capitalists, educators, R&D agencies, service providers and support agencies, and entrepreneurs.⁹⁴

ICT innovations have the ability to have cross-cutting impact on most of the sectors of the economy and therefore on every aspect of people’s lives. Partnerships ensure that the benefits of the field of ICT are leveraged in other sectors by allowing the necessary interactions between relevant stakeholders. The image below⁹⁵ shows the need for these interactions so that every stakeholder has all the tools and information required to contribute appropriately.

⁹¹ The Future Works Online, Ajira Digital, Accessed: 11/11/2020

⁹² World Bank, [Growth and Sustainability of Tech Innovation Ecosystems in City Environments](#), 2015

⁹³ International Telecommunication Union (ITU) Kenya, ICT centric Innovation Ecosystem Kenya: Country Review, 2019

⁹⁴ Republic of Kenya, Digital Economy Blueprint, 2019

⁹⁵ International Telecommunication Union (ITU) Kenya, ICT centric Innovation Ecosystem Kenya: Country Review, 2019

5.3 Simplicity

Due to the low use of smartphones in Northern Kenya, simple solutions designed for use on basic phones are preferred. These solutions enable users of smartphones and basic phones to access the capabilities, improving inclusion.⁹⁶ Some of the solutions that work well with feature phones include:

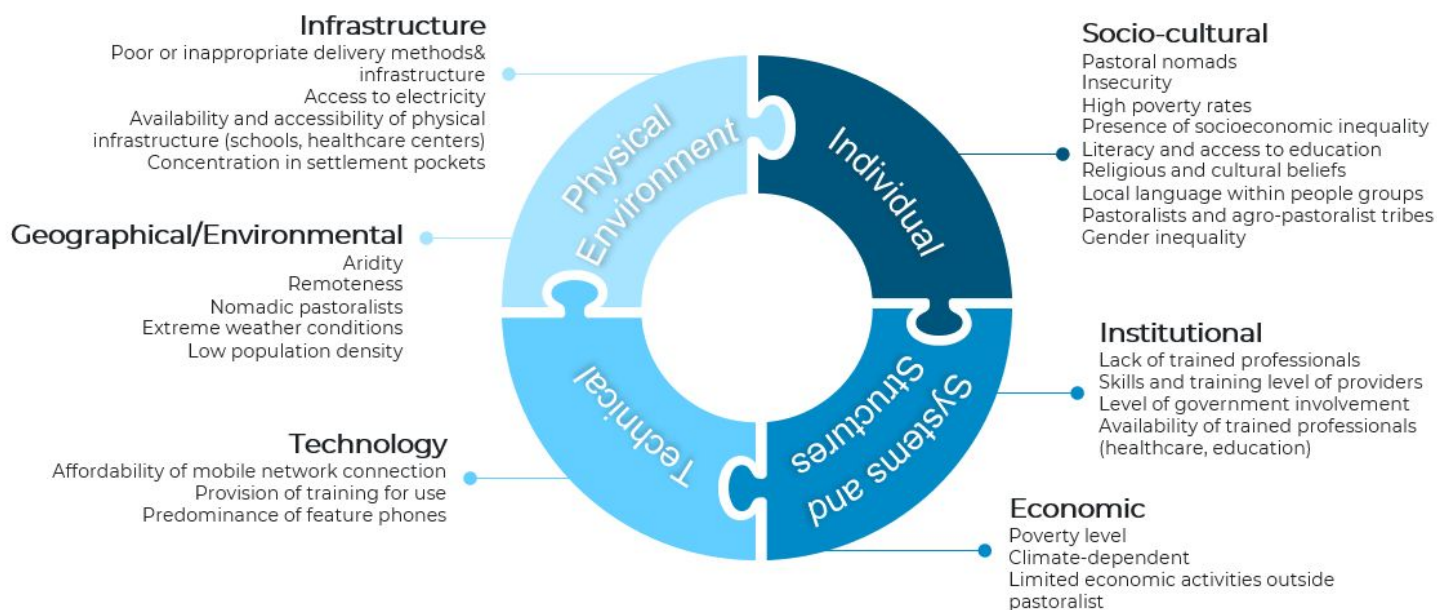
- SMS
- USSD
- Interactive Voice Response

5.4 Offline Apps

Smartphone applications provide more options when it comes to the data that can be collected and processed. In the case where one needs to use an application, it is important to have ones that can collect data offline and if need be, synchronize the data with the servers when the network is available.⁹⁷ This is the approach that Living Goods has used while providing level one healthcare in Isiolo County.⁹⁸

5.5 Sociocultural Considerations and Contextual Factors

In addition to understanding the market and digital ecosystem, designers must understand the social and contextual landscape as well. When it comes to designing a product, it is important for innovators to find out what exactly the users need⁹⁹ and one way to do this is to have a meaningful presence on the ground. Innovators should involve the community in the design and consider an ecosystem approach as opposed to trying to penetrate the market alone.¹⁰⁰ Various stakeholders, such as close partnerships with county governments and non-governmental organizations can help facilitate community involvement. Analysis of contextual factors are key for any technology design, thus, we've identified key considerations for ICT solutions in Northern Kenya.



⁹⁶ Interview with Patrick Sampao, ACRE Africa, August 2020

⁹⁷ Interview with Rob Winters, Rebel Group, September 2020

⁹⁸ Interview with Andrew Karlyn, Living Goods, August 2020

⁹⁹ Interview with Caroline Kiarie, UNDP Innovation Labs, August 2020

¹⁰⁰ Interview with Andrew Karlyn, Living Goods, August 2020

6 Conclusions and Recommendations

In Kenya, there remains substantial opportunity for the continued development and growth of the ICT sector. Within the education sector, solutions for supporting schools and teachers can help bring more accessible learning materials to students. In the health sector, services such as tele-medicine and information sharing have the opportunity to improve community health outcomes, particularly for nomadic communities. With regards to job creation and income generation, ICT solutions have the potential to connect youth with mentors, job boards, and training opportunities. Importantly, in the agricultural sector, solutions that provide key weather information and connect farmers with markets have promising impact in the region.

The devolved government structure in Kenya and recent policies supporting the development of ICT infrastructure has been helping empower communities and innovators grow the sector. Over the last two decades, several policies aimed at strengthening the ICT ecosystem have been created, although there is opportunity to increase their inclusivity and comprehensiveness for the northern region specifically, particularly related to the investment in both soft and hard infrastructure.

For now, since innovators need to work around the currently available hard and soft infrastructure, they will need to design solutions that perform well under the context-specific conditions. These considerations must incorporate the diverse cultural context, which includes a variety of nomadic and settled communities, languages, and education levels. Some notable design challenges include creating desirable and suitable user experiences for individuals with lower levels of education and less exposure to digital technologies. Furthermore, keen understanding of current market trends and solutions is also key for producing successful innovations. In northern Kenya, the innovation ecosystem is in its early stages, thus requiring higher costs to enter the market. Partnerships are key for the growth of the innovation sector in northern Kenya. Collaborations with local government or local community groups can help overcome the challenges such as understanding local context, distribution and reach to citizens and users, and cost-effective market entrance.

Appendix: ICT Solutions available in Northern Kenya

Education								
Solution	Description	Need that is covering	Target user	Does it need Connectivity?	SMS	web	mobile	chatbot
Eneza Education	Offers revision and learning material to students.	Literacy problems in Kenya	Students	Yes, but only basic mobile connection	x	x	x	
Hadithil Hadithil	Provides learning material in a gamification way for both English and Kiswahili in Foundation Level	Child demotivation on education	Children	No			x	
KCPE Revision	Provides alternative learning material for Students such as life skills, financial literacy, entrepreneurship and digital safety.	Lack of modern topics in education	Students	No			x	
M-shule	Analyze the student progress and performance and provides personalized learning content to the user according to their abilities	Literacy problems in Kenya	Students	Yes, but only basic mobile connection	x			x
Ubongo Kids	Provides learning content through a gamification way	Child demotivation on education	Children	Yes		x	x	
Kytabu	Allows students to rent preinstalled textbooks on a low-cost tablet or desktop application	Lack of affordable education materials	Students	Yes		x	x	
Mosabi	Provides fintech oriented content such as entrepreneurship, business skills, and financial literacy.	Lack of modern topics in education	Students, Young entrepreneurs	Yes			x	
Educartis	Helps connect students and higher education providers	School desertion	Students, University Staff	Yes		x		
Funke Science	Seeks to make learning science fun and enjoyable to school children.	Child demotivation on education	Children	Yes		x		
Arifu	Provides users training programs via any mobile device for free	Literacy problems in Kenya	Students	Yes, but only basic mobile connection			x	x
M-Lugha	Provides learning material to teach languages in north kenya	Literacy problems in Kenya	Students	No			x	

Health								
Solution	Description	Need that is covering	Target user	Does it need Connectivity?	SMS	web	mobile	chatbot
DAKTARI POPOTE APP	Connect patients to health consultancy services	Health care	Citizens	Yes		x	x	x
M-TIBA	Helps users to save money for medical expenses	Expensive costs of medical expenses	Citizens	Yes			x	
MEDAFRICA	Provides direct access to health-related content and services	Health care	Citizens	No			x	x
MYDAWA	Enables users to conveniently purchase authentic medicines and wellness products	Expensive costs of medical expenses	Citizens	Yes		x	x	
Hello Doctor	Provides free essential healthcare information that is daily updated, access to healthcare advice, answers to health-related questions in live group chat forums, confidential one-on-one text conversations with a doctor, and the ability to receive a call-back from a doctor within 60 minutes	Expensive costs of medical expenses	Citizens	Yes			x	
Baobab Circle	Provide personalized health management for chronic diseases across Africa	Lack of public resources about health	People with chronic diseases	Yes			x	x
Lily Health	Offers personalized information on women's health	Lack of public resources about health	Women	Yes			x	x
Sophie Bot	Chatbot driving conversations on sexual health	Lack of public resources about health	Teenagers	Yes			x	x
ISikCura	Enables users to access healthcare by matching them to service providers	Health care	Citizens	Yes		x	x	
Jobs								
Solution	Description	Need that is covering	Target user	Does it need Connectivity?	SMS	web	mobile	chatbot
KenyaJob	Recruitment service	-	Citizens	Yes		x		

Career Point Kenya	Connect professionals with companies	-	Professionals and companies	Yes		x		
Fuzu	Provides courses and guidance of useful skills to enter the job market	Lack of resources to enter in the job market	Unemployed	Yes		x	x	
MyJobMag	Connect professionals with companies	-	Professionals and companies	Yes		x		
Kenya.jobzz	Connect professionals with companies	-	Professionals and companies	Yes		x		
Brighter Monday	Offers tips for best practices in job interviews	Lack of resources to enter in the job market	Unemployed, People who wants to improve their careers	Yes		x	x	
Job web Kenya	Job advertisement and vacancies web page	-	Citizens	Yes		x		

Agriculture

Solution	Description	Need that is covering	Target user	Does it need Connectivity?	SMS	web	mobile	chatbot
Afriscout	Provides current water and vegetation conditions on localized grazing maps, enabling pastoralists to make more accurate and cost-effective migration decisions	Reduce the risk of herd loss	Farmers	Basic internet connection			x	
MyAnga	Provides daily weather observations from the past seven days, daily weather forecasts for the next seven days, the rainfall distribution over the past 30 days, expected moisture conditions and expected drought conditions	Empower rural workers	Farmers	Basic internet connection			x	
Mfarm	Matches farmers with local buyers across Kenya		Farmers and local buyers	Basic internet connection			x	
VetAfrica	Allows any farmer to record their livestock data in the process obtaining diagnostic guidance and advice on the most ideal treatment	Empower rural workers	Farmers	Basic internet connection			x	



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