



Research Paper 4: COVID-19 Recovery

Rebuilding Digital Inclusion for the Rural Counties in Kenya

Information Session 3: Digital Connectivity and Resilience

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Research Overview



The focus of our research is to assess the connectivity challenges faced by two sectors (healthcare and education) in the rural counties of Kenya and identify broadband opportunities that can help build digital resilience through Dynamic Spectrum Access (DSA) – based on two regulatory frameworks enacted at the height of the pandemic – TV White Spaces and Community Networks.

The study focuses on 3 Counties: **Kakamega**, **Turkana** and **Machakos**

Our **overall objective** is to contribute to the goal of having some form of systemic platform with reliable dataset on broadband needs versus infrastructure coverage and demonstrate to the regulator the potential models that can be adopted to reinforce Kenya's digital Infrastructure and deliver on "Pandemic Recovery"

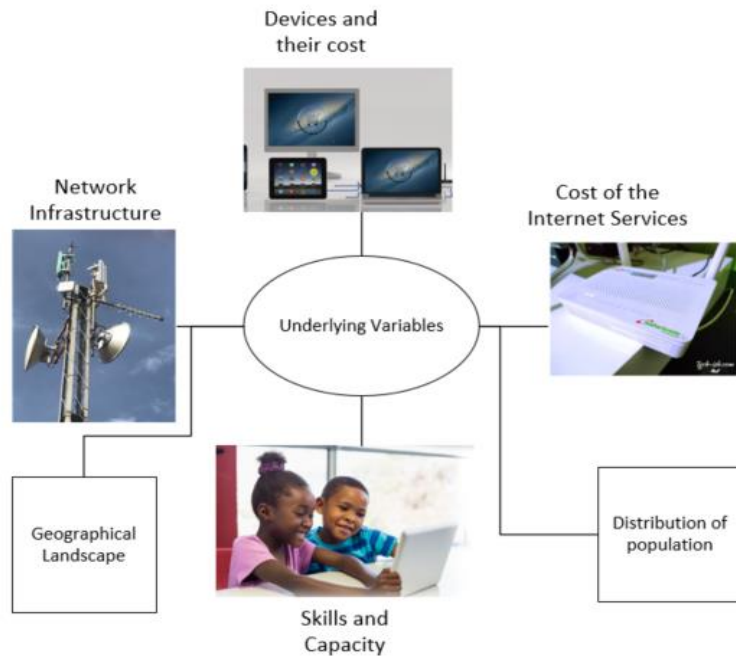
Research Questions

1. What was the underlying digital infrastructure for Kakamega and Turkana pre-pandemic?
2. How has the COVID-19 pandemic affected the institutions of healthcare and education in regards to previously laid out plans of normal continuity in the two counties?
3. How can dynamic spectrum access (DSA) through the identified RF bands (UHF TV band, LTE bands as well as Wi-Fi 6/Wi-Fi 6E) together with community networks be practically realized (within the guidelines of established frameworks and beyond) to achieve better digital inclusion and resilience?
4. What usable findings and data sets can be obtained from this research to contribute to the government and other relevant bodies' strategies that clearly map the broadband needs versus infrastructure coverage for rural educational and healthcare institutions?

Research Activities

#	Activity Description	Current Status
1	Conduct a desk assessment of the State of Connectivity and digital infrastructure in Kakamega and Turkana counties.	Completed and Developed a report – Accessible through this Link :
2	Conduct a Site Survey to Schools and Healthcare Centre in Kakamega and Machakos Counties (Machakos replaced Turkana).	Done
2	Engage Stakeholders – Both Internet Service Providers and Equipment Manufacturers.	Ongoing
4	Conduct SDR Experiments in both Kakamega and Machakos	Ongoing
4	Conduct a desk assessment of the regulatory frameworks on TV White Spaces and Community Networks in Kenya	Scheduled to begin
4	Study the opportunity of dynamic spectrum access (DSA) for Kakamega, Turkana and Machakos	Scheduled to begin
5	Publish findings and a report	<ol style="list-style-type: none"> 1. Publish a research paper on the state of connectivity, opportunity of recovery through DSA, surveys and experiments 2. Publish a report on the overall project with technical and policy recommendations

Research Findings - Background



Fundamental Considerations of Connectivity:

1. Network Infrastructure
2. Skills and Capacity
3. Availability and cost of devices
4. Cost and affordability of the Internet services
5. Relevant content

Stats on Population (Based on 2019 Census):

1. Kenya – 47.6 million people
2. Kakamega County – Area: 3,051.3 sq.km., Population: 2,079,669 people, Population density: 618 persons per sq. km.
3. Turkana County – Area: 71,597.8 sq.km., Population: approx. 1,000,000, Population density: 13 persons per sq. km

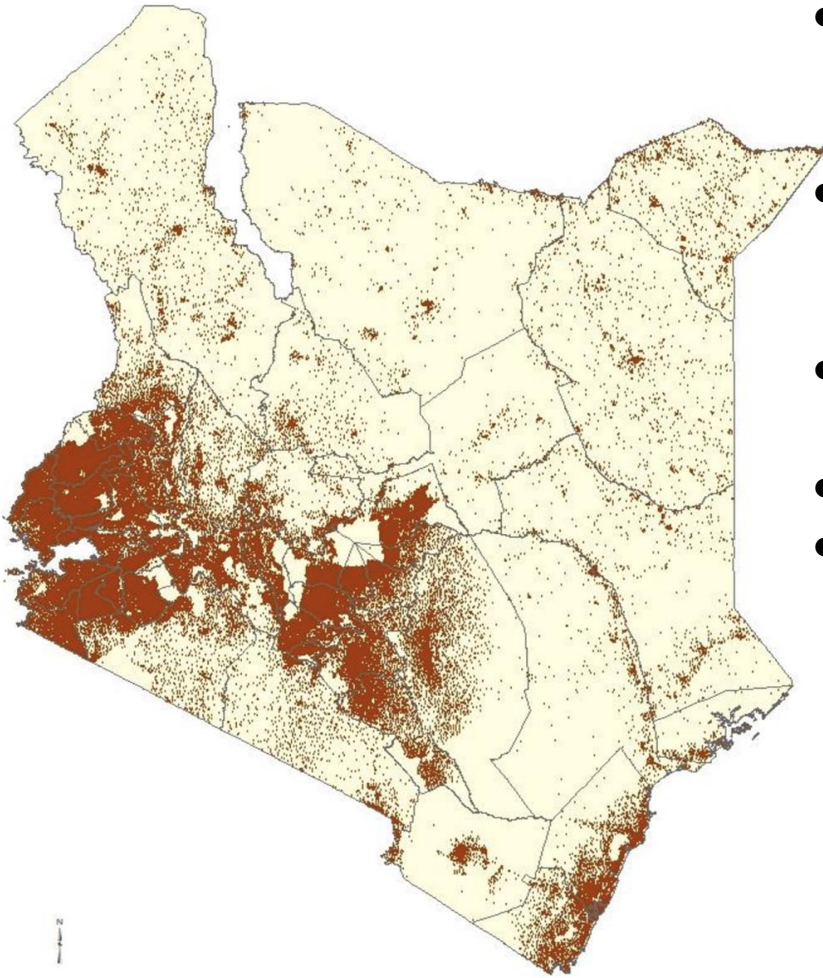
❖ In January 2021, Datareportal reported that 28.2% of Kenya's population lived in urban centres while 71.8% resided in the rural areas. 21.75 million people was the number of Internet users in Kenya making the Internet penetration to stand at 40.0%. At the height of the pandemic, while battling Internet challenges, rural counties of Garissa, Mandera, Samburu, Marsabit and West Pokot were also battling internal insecurity challenges.

❖ Before the pandemic in early 2020, 22.6% of individuals aged 3 and above used the Internet while 10.4% used a computer. The proportion of population, aged 15 years and above who searched and bought goods and services online was 4.3%.

Research Findings – State of Connectivity

- A surge of traffic of data and voice began getting experienced when the COVID-19 restriction measures came into effect in Kenya.
- Safaricom – Kenya’s largest Mobile Network Operator (MNO) saw a 70% surge in cellular data usage.
- Despite the surge, millions of students could not sustain their state of learning.
- In 2020, Safaricom’s 4G coverage was said to be at 77% - although sufficient data to back this up is missing even for now.
- There is little information on 4G coverage for the other two MNOs – Airtel and Telkom.
- CA assigned additional frequencies to both Airtel and Safaricom in both 1900 MHz and 2100 MHz bands at a bandwidth of 10 MHz for a period of 9 months during the pandemic.
- Although cellular Internet access is the leading Network technology, challenges were experienced across the country during the pandemic. Most data is reported based on active SIM cards (hard to tell if most of them are in feature phones).
- Cost of mobile broadband seen as relatively high at the height of the pandemic, especially for the rural folk.
- For Fixed Internet data – largely concentrated in the cities with Safaricom and Wananchi Group (Zuku) commanding 60% of the market. 71% of the country (in rural areas still missing out on this).
- Information on the National Optic Fibre Backbone Infrastructure (NOFBI) is consistently missing to determine the overall picture on other access technologies. There is also a significant amount of “dark fibre.”
- Students expressed frustrations of accessing online learning platforms that the government had set up due to lack of good Internet coverage.
- The initiative of the High-Altitude Platform Stations (HAPS) led by Google and Telkom Kenya did not live up to the promise and was terminated on 1st March 2021 (almost a year after approval by President Kenyatta on 23rd March 2020).
- Satellite and Microwave technologies had minimum contributions with data about them conspicuously missing.

Key Statistics : Kenya



Map of Kenya's Population Distribution

Source: Kenya National Bureau of Statistics, 2020

Inclusive Digital Transformation??

- **22%** of Kenyans used digital services to access only basic digital services limited to sending and receiving money, buying airtime and data using mobile money.
- **85%** of rural residents with non-primary education, **45%** people with disabilities and **44%** of older people across all geographies are basic digital services users or non-users.
- **35%** of women are advanced digital services users, compared to **54%** of men.
- Inequalities accelerated by the COVID-19 Pandemic.
- A number of key challenges limit basic digital services users to the use of mobile money:
 - **69%** of basic digital services users have no access to the internet,
 - **95%** basic services users have only basic phones,
 - **54%** cannot pay for internet connection,
 - **69%** need help to use digital services, and
 - **71%** who use shared devices are allowed less time than other family members to use digital services.

Source:

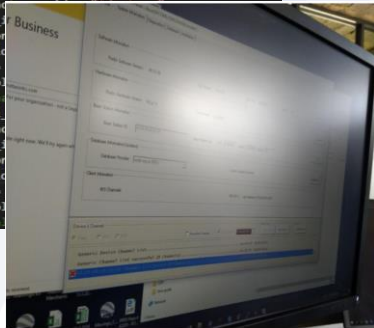
https://digitaleconomy.ke/assets/download/Kenyas_Digital_Economy_Full_report_Aug_2021.pdf

Research Findings – Opportunities & Challenges



Enactment of the TV White Spaces Framework in the 470-698 MHz band to enhance rural connectivity.

```
class PAWS:
def __init__(self):
self.etsiRulesetId = "ETSI-EN-301-598-1.1.1"
# device characteristics
self.device_serial_number = ""
self.device_manufad
self.device_model
self.device_categor
self.device_emissio
self.device_type =
self.device_techno
# master device ch
self.master_serial
self.master_manufad
self.master_model
self.master_categor
self.master_emissio
self.master_type =
self.master_techno
# device horizonta
```



Development of the Community Networks Framework

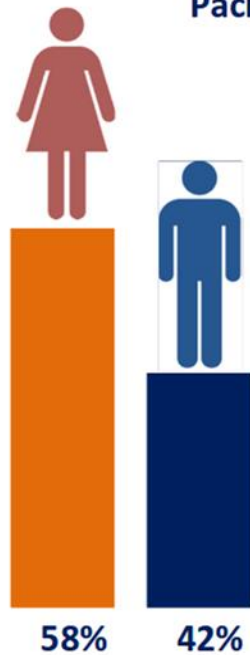


1. Capacity – power and backhaul
2. Coverage
3. Affordability
4. Lack of Equipment and ICT facilities
5. Lack of sufficient digital skills
6. Delay in enactment of policies



Source: "Working Together to Connect the World by 2020 – Reinforcing Connectivity Initiatives for Universal and Affordable Access", available from: www.broadbandcommission.org.

The Gender Gap is most pronounced in Africa, the Arab States and Asia-Pacific



Half have a GNI/capita of < US\$ (PPP) 6,500, a large proportion of which are located in Africa and Asia-Pacific



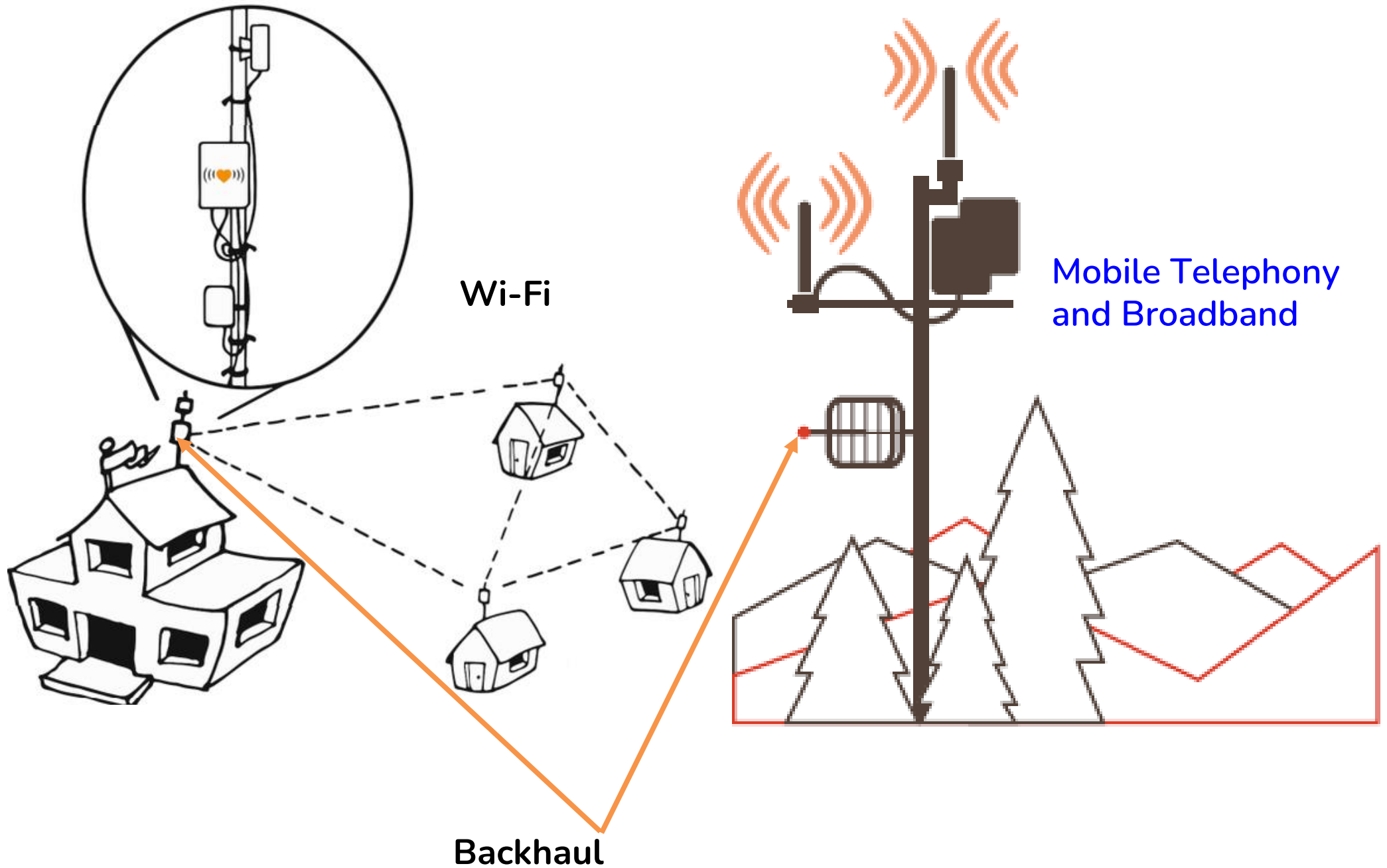
The elderly have much lower Internet penetration levels than the overall population across all regions



Individuals with low educational attainment often remain unconnected across all regions



Diversity in Access Technologies for Community Networks



Community Networks Framework & Social, Economic Impact



Community Network Service Provider

Licensing

- ★ For Cooperative societies, Community-Based Organizations and Non-Governmental Organisations.
- ★ Limited in geographic scope to a division (sub-county).
- ★ Licence term of 10 years with simplified application requirements and fit-for-purpose quarterly compliance reporting.

Spectrum

- ★ Fee waiver for access to spectrum.
- ★ Establishment of a regulatory sandbox for localised spectrum access for small operators.
- ★ Development of a framework for dynamic assignment of IMT spectrum.

- Local control over how the network is established and operated.
- Attention to gender & age gaps and community needs → Covid19 response
- Fostering the digital ecosystem: production of content, skills, etc.
- Lower costs and retention of funds and skills in the community.

Framework: <https://www.ca.go.ke/public-consultation-on-draft-licensing-and-shared-spectrum-framework-for-community-networks-in-kenya/>

Research Findings – Site Surveys

Machakos



No. of Schools Surveyed – 4
No. of Healthcare Centres surveyed - 7

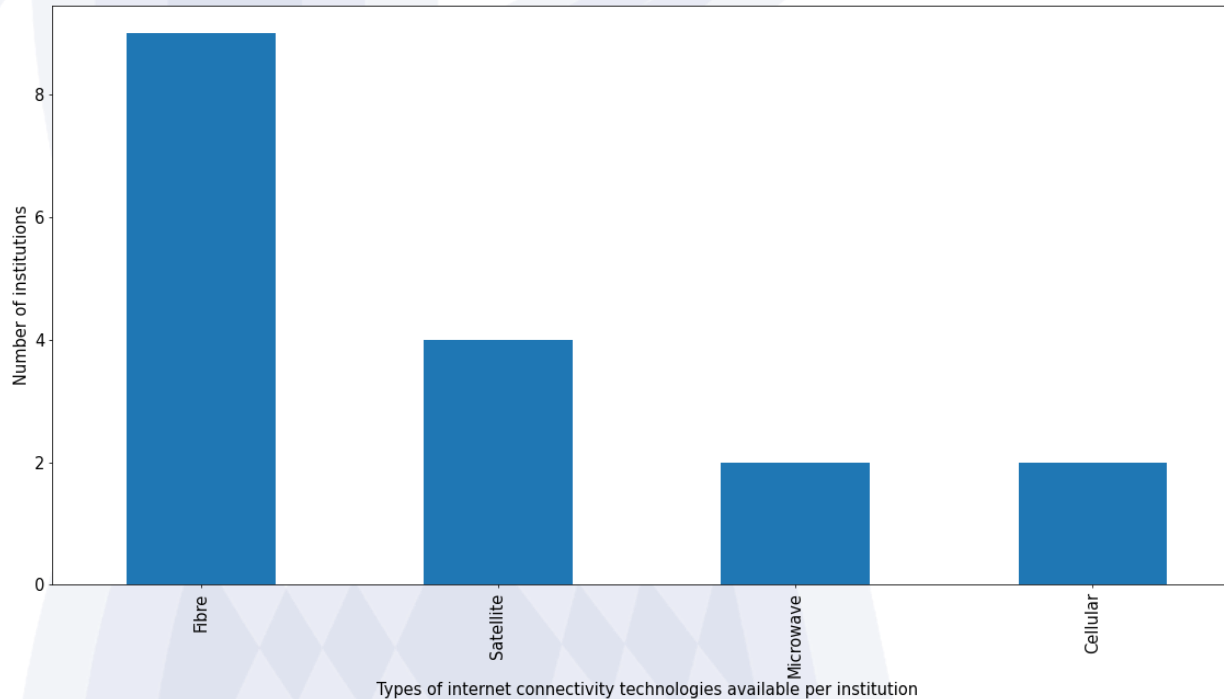
Kakamega



No. of Schools Surveyed – 6
No. of Healthcare Centres surveyed - 6

Site Surveys – Connectivity Options

Machakos



Available Options of Connectivity

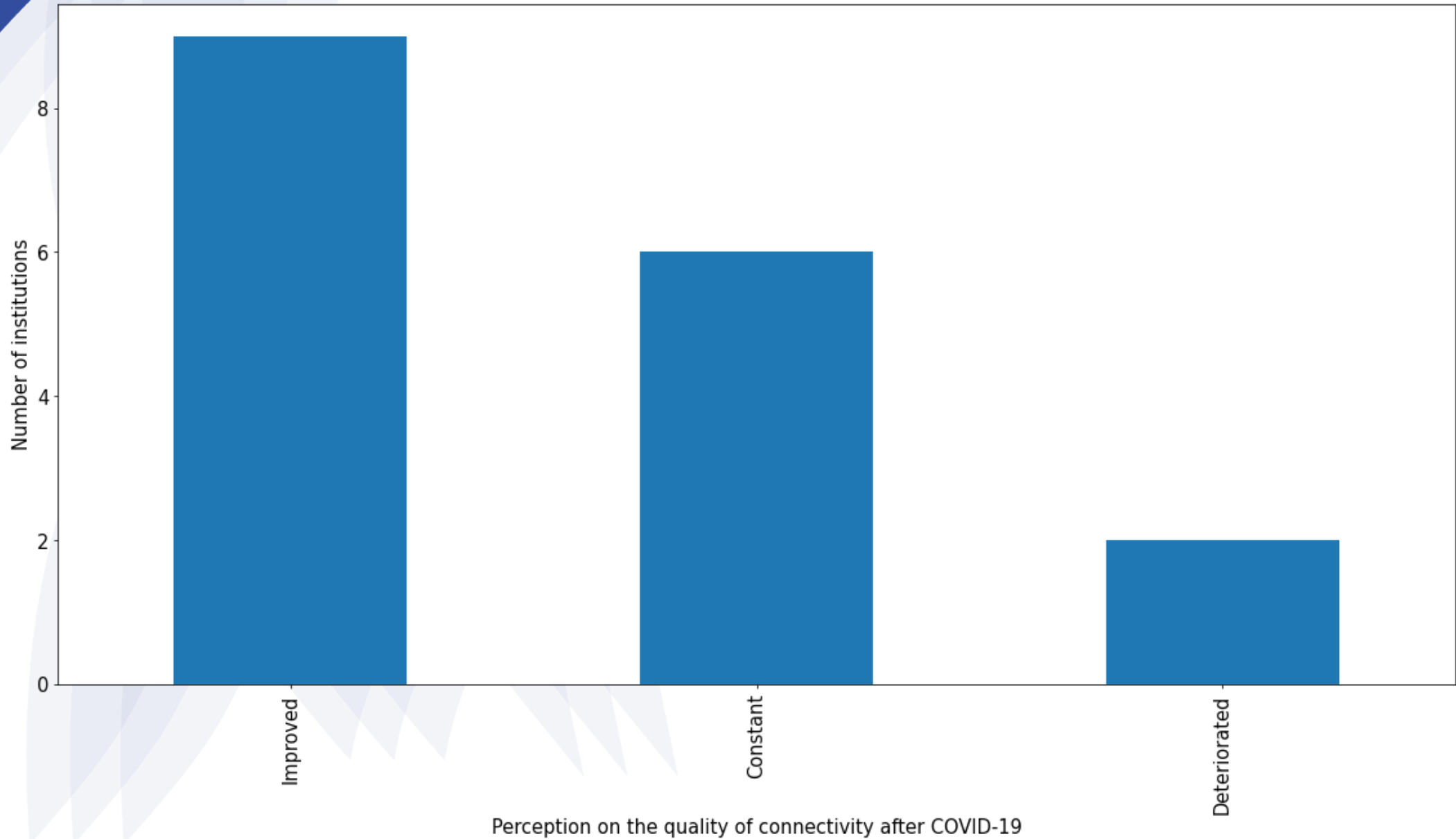
Kakamega

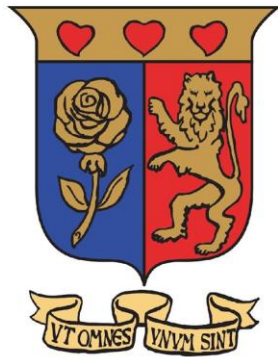
Fibre is the dominant Networking technology though coverage to the last mile is not there yet.

Satellite is also available.

During the pandemic, both staff and students were given mobile data bundles, but it was quite challenging for remote connections.

Machakos & Kakamega – Present State of Internet Access





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Asante Sana!

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