Sierra Leone National Broadband Strategy (2023 - 2028)

Acknowledgments

Ministry of Communication, Technology and Innovation (MoCTI)

Sierra Leone's Ministry of Communication, Technology and Innovation (previously Ministry of Information and Communications) formed in 2023 is the organization responsible for the formulation of policies and laws that regulate the ICT sector in Sierra Leone. The Ministry's primary focus is to transform Sierra Leone into a Digital Economy through developing regulatory frameworks used to create roadmaps for the implementation of Communications, Technology and Innovation solutions. The Information Technology, Telecommunications, and Postal sectors are under the direct supervision of the Ministry.

For further information: http://moic.gov.sl/

Ministry of Finance (MoF)

The Ministry of Finance (MoF) is an organization within the Government of Sierra Leone tasked with developing and implementing solid economic policies, managing public finances, and ensuring the effective use of public resources to support steady economic growth and development within the framework of a stable macroeconomic climate. It is an institution set up to manage public resources effectively, guarantee a stable economic environment, and achieve the highest rate of economic transformation and poverty reduction. Other responsibilities include revenue and expense management of the government, updating the public on fiscal objectives and debt management.

For further information: https://mof.gov.sl/

The National Communications Authority (NatCA)

The National Communications Authority (NatCA) was created by the National Communications Authority Act of 2022 to oversee the telecommunications industry, grant licenses to operators and service providers, safeguard consumer interests, and promote fair competition among service providers. The Authority is mandated to carry out the functions of management of: Sierra Leone's National Numbering Plan, Cybersecurity, ICT development and the National Frequency Spectrum. NatCA also organizes events, meetings, trainings, and prepares annual reports and industry overviews in the ICT domain. For further information: https://www.natca.gov.sl/

Universal Access Development Fund (UADF)

The Universal Access Development Fund (UADF) was established by the National Telecommunications Act of 2006 (as amended) to encourage universal service and provide all Sierra Leoneans with access to information and telecommunications services. The organization's aims are to enable the attainment of universal access through a public-private collaboration that results in the availability, accessibility, and affordability of basic ICT and Broadband services, that supports economic and social development, and good governance in underserved and unserved communities. The Fund is being administered to enable social fairness and inclusion for the people of Sierra Leone by facilitating the widest possible access to inexpensive telecommunications services.

For further information: http://uadf.gov.sl/

Zoodlabs

Zoodlabs Group is a comprehensive technology and smart utility infrastructure company, headquartered in Freetown, Sierra Leone. They are a part of the Africa Coast to Europe (ACE) fiber cable, a consortium of 20 partners, which provides unprecedented connection between the West Coast of Africa and Europe. This 700-million-dollar system is competitive, effective, and uses the most cutting-edge high-speed broadband fiber optic technology. They provide services in the fields of connectivity infrastructure, big data, and energy - smart grid and automation, while working with mobile operators, internet service providers, content providers/delivery networks and OTT players.

For further information: https://zoodlabs.com/

Leonecom

Leonecom is a neutral fiber optic operator working as a private partner with the Government of Sierra Leone to manage the country's fiber optic backbone and auxiliary infrastructure. Leonecom is mainly responsible for the operations, maintenance, and commercialization of the ICT infrastructure with cost-effective solutions to provide better connectivity throughout the country. Moreover, the organization provides E-LAN, Dark Fiber, Layer 3 Network, Co-location, IP VPN, and Metro services, with more than 40+ coverage points in their network. For further information: https://leonecom.sl

Smart Africa

Smart Africa is a bold and innovative organization with commitment to accelerate sustainable socio-economic development in the African continent and usher Africa into the knowledge economy through affordable access to Broadband and the use of ICTs. The Smart Africa Alliance brings together Heads of State who seek to accelerate the digitalization of the continent and create a common market. Launched in 2013 by seven (7) African Heads of State at the Transform Africa Summit in Kigali, jointly adopted the Smart Africa Manifesto, the Alliance now has 35 member countries, representing over one billion people.

For further information: https://smartafrica.org/

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

The Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH shortened as GIZ, is a German provider of services in the area of global collaboration for sustainable development and worldwide education. The corporation has more than 50 years of experience in a range of areas, including the creation of economic growth and employment, energy and the environment, and ensuring peace and security. GIZ partners with various organizations, civil society groups and research centers to ensure a successful relationship between development policy and other policy areas of action. The German Federal Ministry for Economic Cooperation & Development (BMZ) is their principal commissioning party and thus German and European values are at their core.

For further information: https://www.giz.de/en/

Table of Contents

Table of Figures

List of Tables

Foreword

The Information and Communications Technology (ICT) sector in Sierra Leone has grown significantly in recent years, leading to an increase in the number of people accessing various ICT services, including Digital Finance, Social Media, Videoconferencing and E-learning platforms, with positive impacts on the economy.

The advancement in ICTs is a result of several factors including the enabling regulatory environment created for the service providers in the ICT sector by the Ministry of Communication, Technology and Innovation (MoCTI) and the National Communications Authority (NatCA).

The growth recorded in the sector was duly recognized on the occasion of the State Opening of the Fourth Session of the Fifth Parliament, of the Second Republic of Sierra Leone, in which His Excellency the President of Sierra Leone, Brig. (Rtd.) Dr. Julius Maada Bio, mentioned in his speech the improving regulatory environment. Regarding this, the President highlighted that, “There has been an improvement in the regulatory space for Information and Communications Technologies with the enactment of five Regulations governing Licensing, Spectrum, Quality of Service, Type Approval, and Subscriber Identification and Registration”.

Additionally, the Cybersecurity and Crime Act and Data Protection Bill were ratified in 2021 and on September 8th 2022, the President also signed into law the revised National Communications Authority Act 2022.

Due to the conducive regulatory environment and amendment of the Act and subsequent Regulations, Mobile Voice Geographical coverage increased from 79% in 2018 to 85% in 2020, and up to 93% in 2022. Internet penetration improved from 12% in 2018 to 25% in 2020, and up to 46% in 2022. The deployment of submarine fiber cable in Sierra Leone in 2009 drove Internet penetration in the country, which in 2022 was at 46% utilization.

There has been an upward surge in Internet Service Providers, Metropolitan Terrestrial Fiber Cable Networks, Value Added Service Providers, Digital Financial Service Providers and Innovative ICT Service Providers, including traditional Media Houses, Newspapers, Radio and Television Stations and Mobile Network Operators, all making full use of high speed and vast capacity fiber cable Internet through fixed, wireless and mobile broadband solutions in many cities, towns and villages across Sierra Leone.

There are challenges to overcome though, with the digital divide between the served and unserved population in accessing broadband services still to be bridged. In addition to infrastructure capacity limitations for remote and underserved regions and restricted institutional frameworks, cybersecurity, privacy, and data protection issues also deter the uptake of broadband services in Sierra Leone.

The main aim of the National Broadband Strategy (2023-2028) is to transform Sierra Leone into a knowledge-based society enabled by high-capacity nationwide broadband connectivity. The knowledge economy which is a result of the fourth industrial revolution and previous technology waves, provides a platform upon which Sierra Leone can adopt new technologies such as the Internet of Things (IoT), Machine to Machine (M2M), Fifth Generation Mobile Networks (5G), Advanced Computing, Virtual and Augmented Reality, Datafication, Artificial Intelligence (AI), among others, to actively participate in the global economy and improve the local economy. This invariably demands high-speed broadband and data services.

This Strategy gives us the opportunity to correct past failures and build on key successes in infrastructure access and regulation. Through this process, we envision the strategic objectives for the future while noting the rapidly changing ICT environment. The strategic themes adopted in this Strategy reinforce our broadband vision to be a globally competitive knowledge-based society powered by broadband. This is in line with the Sustainable Development Goal (SDG) No. 9 (investing in ICT access) and Cluster 3.5 of the Sierra Leone Medium Term National Development Plan 2019-2023 which relates to ICT and connectivity service to bridge the digital divide.

In the application of the National Broadband Strategy (2023-2028), we entrust key stakeholders with the firm belief that through implementation of the strategic initiatives, the societal and economic benefits of digital transformation will be fully realized. I therefore call for the needed inter-relationships among stakeholders in the digital landscape in Sierra Leone to make this strategy become a collective responsibility.

Let us all embrace broadband fully, the key to a true knowledge-based economy that will cement the position of Sierra Leone within the global information society.

Hon. Salima Monorma Bah
Minister of Communication, Technology and Innovation
Sierra Leone

In recent years, broadband connectivity has impacted and transformed peoples' lives in

different ways and continues to shape the modern economy.

Broadband, a General-Purpose Technology of our time impacts our daily socio-economic endeavours in health, education, industry, and other areas. It is now more than just a technology but the underlying enabler for the transformation that Africa seeks.

Smart Africa, in collaboration with its stakeholders developed the SMART Broadband 2025 Strategy to establish the foundation for an interconnected Africa. This strategy will also serve as baseline to inspire the growth of Africa's broadband ecosystem, while benefiting all other sectors of the economy. The Smart Broadband 2025 strategy serves as a baseline to develop the national broadband strategy.

In this journey, the Republic of Sierra Leone started working on the National broadband strategy for the next five years, 2023- 2028, leveraging on the past successes and challenges. Together, we have envisioned the strategic objectives for the future, keeping in mind the rapidly evolving ICT landscape, and defining practical projects that will move us closer to increasing connectivity and moving us towards the sustainable development goals. The strategic themes adopted, reinforces Sierra Leone's broadband vision, to grant universal connectivity access for every citizen and thereby, create a knowledge-based society.

I invite all the actors to join us in achieving the Sierra Leone Broadband Strategy 2023-2028 goals and together transform Sierra Leone and Africa.

Mr. Lacina Koné
Director General, Smart Africa

Glossary and Abbreviations

2G: Second Generation
3G: Third Generation
4G: Fourth Generation
5G: Fifth Generation
ADI: Affordability Drivers Index
Alt-net: Alternative Network
Apps: Websites and web applications
BB: Broadband
CII: Critical Information Infrastructure
CIRT: Computer Incident Response Team
CLS: Cable Landing Station
CM: Continent Median
CSR: Cooperate Social Responsibility
DSTI: Directorate of Science, Technology, and Innovation
EPA: Environmental Protection Agency
FM: Frequency Modulation Radio Stations
FTTX: Fixed and wireless broadband and fiber to the home/office
FWN: Fixed Wireless Networks
GDP: Gross Domestic Product
GNI: Gross National Income
GSMA: GSM Association
HAPS: High Altitude Platform Stations
ICT: Information and Communication Technologies
IGMS: International Gateway Monitoring System
ISP: Internet Service Providers
ITU: International Telecommunication Union
IXP: Internet Exchange Point
LPC: Least Progressed Country
MAFS: Ministry of Agriculture and Food Security
Mbps: Megabytes per second
MBSSE: Ministry of Basic and Senior Secondary Education
MDA: Ministries, Departments and Agencies
METRO: Metropolitan Fiber Optic Cable Infrastructure Providers
MELSS: Ministry of Employment, Labour and Social Security
MGGA: Ministry of Gender and Children Affairs
MHS: Ministry of Health and Sanitation
MLGCA: Ministry of Local Government and Community Affairs
MLHCP: Ministry of Lands, Housing and Country Planning
MMO: Mobile Money Operators
MNO: Mobile Network Operators
MoCTI: Ministry of Communication, Technology and Innovation
MoE: Ministry of Energy
MoECC: Ministry of Environment and Climate Change
MoF: Ministry of Finance
MoPED: Ministry of Planning and Economic Development
MOMMR: Ministry of Mines and Mineral Resources
MoYA: Ministry of Youth Affairs
MPC: Most Progressed Country
MSWGCA: Ministry of Social Welfare, Gender and Children's Affairs
MTHE: Ministry of Technical and Higher Education
MTNDP: Medium-Term National Development Plan
MWPA: Ministry of Works and Public Assets
MWR: Ministry of Water Resources
NatCA: The National Telecommunications Authority
NC3: National Cybersecurity Coordination Center
NCAC: National Cybersecurity Advisory Council
NCIRT: National Cyber Incident Response Team
NCPD: National Commission for Persons with Disabilities

NDDP: National Digital Development Policy
NDiDA: National Digital Development Agency
NDTR: National Digital Transformation Roadmap
NRA: National Revenue Authority
NTFB: National Terrestrial Fiber Backbone
OTT: Over-the-top
PPP: Public Private Partnership
QoS: Quality of Service Vendor
RFP: Request for proposal
SALCAB: Sierra Leone Cable Limited
SC: Short Code Users
SCLS: Submarine Cable Landing Station
SL: Sierra Leone
SLIX: Sierra Leone Internet Exchange Point
SLREN: Sierra Leone Research and Education Network
SMS: Short Message Service
SS: Ship Stations
TA: Type Approval Authorizations
TV: Television
UADF: Universal Access Development Fund
USB: Universal Serial Bus
USD: United States Dollar
USSD: Unstructured Supplementary Service Data
VASP: Value Added Service Providers
VSAT: Very Small Aperture Terminal
WAPP: West Africa Power Pool
WATRA: West African Telecommunications Regulatory Agency
WoG: Whole-of-Government
W3C: World Wide Web Consortium

Executive Summary

The Government of Sierra Leone presents the National Broadband Strategy (NBS) [2023-2028] for the country. This strategy takes into account recent technological and industry trends as well as market realities. The vision of the NBS 2023-2028 is to transform Sierra Leone into a globally competitive knowledge-based society enabled by affordable, secure and fast broadband connectivity. Broadband is expected to facilitate connections that will create opportunities for smart solutions resulting in transforming the daily lives of Sierra Leoneans, their common creativity, and the development of business ideas, regardless of their location. This will enable societal and economic benefits of digital transformation to be realized. In collaboration with the private sector and development partners, the Government intends to leverage broadband to deliver flagship ICT projects as well as related Sustainable Development Goals.

By implementing NBS 2023-2028, the Government aims at increasing broadband access reaching 50% of urban areas by 2027 and 95% by 2030 and improving rural connectivity to 80% by 2027; and increase digital literacy in schools to 85%, and to have 50% digital literacy amongst the workforce by 2027. The strategic objectives of this strategy are outlined in the implementation plan which is organized into seven thematic areas namely: (1) Infrastructure and Connectivity, (2) Services, Content and Applications; (3) Capacity Building and Innovations (4) Policy, Legislation, and Regulation; (5) Privacy and Security; (6) Broadband Devices; and (7) Finance and Investment. The seven thematic areas cover the broadband ecosystem, which has been broken down into gap analysis, opportunity identification, strategic objectives and an implementation plan for each theme.

The strategy underscores the role of both the public and private sector in the funding of broadband infrastructure and emphasizes the participation of Government, private sector investments and development partners in financing broadband projects, particularly by incentivizing infrastructure rollout in remote areas and in areas encumbered by challenges concerning the profitability of broadband investments.

Under this framework, to become a globally competitive and informed society that effectively participates in the knowledge-based economy, the availability, access to high-speed broadband countrywide and access to reliable, affordable, and secure broadband is imperative. To this end, Sierra Leonean societies; businesses, Government agencies and individuals are envisaged to embrace paperless transactions.

The implementation of this strategy requires intervention in several strategic areas as follows:-

- Government to facilitate access to National Terrestrial Fiber Backbone (NTFB-Leonecom) on an open access basis for all operators.
- Treating broadband as critical infrastructure, sensitizing everyone on its importance and using it to elicit demand and uptake.
- Harmonization of the development of infrastructure to reduce duplication and encourage sharing of infrastructure thus increasing coverage and achieving cost efficiency.
- Engagement at both National and Regional Government levels to increase awareness, and use of broadband services.

• Promoting development and universal access to digital content and services, including emerging technologies in Fintech (Blockchain, Mobile Money, Big Data Analytics, IoT and Artificial Intelligence).
• Capacity building to increase digital literacy among citizens.
• Adoption of common technical standards and facilitate the development of international, regional and national backbones.
• Providing an enabling environment and encouraging local industry device manufacture, maintenance and recycling which will create jobs and address e-waste issues.
• Protection of consumer interests and ensuring security in accessing broadband services.
• Draft policies on broadband ecosystem as a whole including spectrum and develop instruments and practical tools such as Guidelines and Regulations that would more precisely define various risk levels as relates to particular information security scenarios.
• Promotion of private sector investments, Joint Ventures, and Public Private Partnerships (PPPs) within the ICT sector; and introduce tax and regulatory incentives for infrastructure investment, particularly where initial capital outlay is high among others.

The achievement of the 2023-2028 broadband strategy is anchored on execution of key flagship projects among other projects within each thematic area as presented below.

Thematic Area	Project	Proposed Target
Policy, legal and regulatory framework	Enact Data Protection Act Enact law pronouncing broadband as critical infrastructure	Enactment of Act by 2025 Enactment of Act by 2025
Infrastructure and Connectivity	Last mile connectivity by extending broadband to the ward level - entails construction of ward base stations, at least 2 stations for each of the 446 wards in the country	100% connectivity by 2028
Services, Content and Applications	Creation of standards for services, content and applications	Services, Content and Applications Standards by 2025
Capacity Building and Innovation	National public education on broadband	One awareness campaign every quarter
Devices	Design and manufacture broadband devices in Sierra Leone	At least 1 device by 2027 by a local manufacturer
Privacy and security	Establishment of a cyber-security operations center and international	Operationalization of the NC3 by 2024

	collaboration on cybersecurity	
Finance and Investment	Creation of conducive environment for Broadband investment through fiscal and regulatory incentives	Fiscal and regulatory incentives to be implemented by 2025
ICT SDGs and BB	Universal healthcare services delivery at level 1-6 heath facilities. Develop e-agriculture systems to improve food security	80% by 2028, embed broadband in all

In order to implement this strategy, a multi-stakeholder National Broadband Steering Committee shall be set up and mandated to coordinate the implementation of NBS 2023-2028 with monitoring and evaluation done by the National Communication Authority. A robust monitoring and evaluation framework with timelines for deliverables will be prepared and publicized to guide in the tracking of the implementation. The Ministry of Communication, Technology and Innovation is confident that this NBS 2023-2028 will usher in an era of coordinated investments in national ICT infrastructure in order to eliminate unnecessary duplication of investments and thus ensure optimal use of resources in the sector.

This strategy comprises six (6) Chapters and three (3) Appendices. Chapter 1 gives the Introduction and Situation Analysis, Definition of Broadband, Background, Justification, Status of Broadband in Sierra Leone, Broadband in the Context of National Development, Relevant Policies, SWOT Analysis for Sierra Leone and its Broadband Rollout, and Key Pillars and Cross-Cutting Issues for Broadband Implementation. Chapter 2 considers the Global and African Benchmarks. Chapter 3 explains the Principles, Vision, Milestones, and Targets. Chapter 4 highlights the Strategy and Recommendations. Chapter 5 describes the Socioeconomic Benefits Calculations. Chapter 6 outlines Implementation, Monitoring and Governance.

1. Introduction and Situation Analysis

1.1. Definition of Broadband

There are various definitions of Broadband. According to Oxford Languages, it is "a high-capacity transmission technique using a wide range of frequencies, which enables a large number of messages to be communicated simultaneously."[1]. According to the International Telecommunication Union (ITU), "the term broadband typically describes recent Internet connections that range from 5 times to 2000 times faster than earlier Internet dial-up technologies. Broadband combines connection capacity (bandwidth) and speed."[2]

Most would agree with the following definition: broadband, as a telecommunications term, is generally defined as the services or systems with high-speed transmission of high-capacity data, in particular speeds greater than 1 Mbit/s. In addition to being a technology, broadband is having an impact on our daily socioeconomic pursuits in business, education, and healthcare, among other areas.

For the purposes of this report, broadband is defined as broadband speeds over 1 Mbit/sec, regardless of the transmitting technology which may be wireline or wireless. Speeds of up to 1Mbit/sec are defined as narrowband for the purposes of this report.

1.2. Background to the Policy Formulation

Information and Communication Technologies (ICTs) are global enablers of socio-economic development. When fully implemented, these technologies can reduce or eliminate poverty and imbalances in society. To harness the full developmental potential of ICTs, a well-coordinated and synchronized strategy for the ICT sector in Sierra Leone is needed.

The MoCTI builds on previous supervisory and regulatory work done in the ICT sector which was supported by the World Bank and Telecommunications regulatory agencies like the ITU, Africa Telecommunications Union (ATU) and West African Telecommunications Regulatory Agency (WATRA) to develop a national strategy for broadband capacity, access and distribution to the last mile across the country to enable service providers and users of Internet services exploit the full potential of the Internet in the government, health, finance, education, and entertainment sectors, among others.

[1] Oxford Languages
[2] ITU

1.3. Justification of Broadband Policy

There are limitations in the capacity and access of broadband services across the country which need to be addressed in order to realize the full capability of the Internet for citizens.

With monopoly networks along some layers of broadband capacity and access networks, there is a need to create a liberalized space for competition in providing key services like submarine fiber cable Internet gateway for redundancy and reduction in the cost of broadband packages, the opening up of terrestrial fiber cable access to other players, and the promotion of many last mile access providers and solutions.

The creation of a unified licensing regime for major service providers and the re-farming and diversified use of spectrum resources will further push digital adoption by citizens throughout the country.

1.4. Status of Broadband in Sierra Leone

1.4.1. The ICT Sector

The ICT sector in Sierra Leone has been experiencing significant growth in recent years, leading to an increase in the number of Sierra Leoneans accessing various ICT services. NatCA as the ICT Regulator, with supervision from the Ministry of Communication, Technology and Innovation (MoCTI), in partnership with national technological institutions and regional and global telecommunications regulatory bodies like the ITU has created the enabling regulatory environment for service providers to thrive in the Telecommunications sector in the country. The classes and count of ICT Service Providers is shown in Table 1 with the plot in Figure 1.

NO.	CATEGORY	ICT SERVICE PROVIDERS	ICT SERVICE PROVIDERS - AMOUNT	DESCRIPTION
1	Mobile Network Operators	MNO	4	2G, 3G & 4G Networks
2	Fixed Wireless Networks	FWN	1	Sierratel ADSL Network
3	Mobile Money Operators	MMO	2	E-Money Vendor
4	International Gateway Monitoring System	IGMS	1	International Voice Call Monitoring
5	Metropolitan Fiber Optic Cable Infrastructure Providers	METRO	3	Metropolitan Fiber Network

6	Quality of Service Vendor	QoS	1	QoS Vendor
7	Submarine Cable Landing Station	SCLS	1	International Fiber Gateway
8	Terrestrial Fiber Optic Cable Network	NTFB	1	National Terrestrial Fiber Backbone
9	Internet Service Providers	ISP	24	Primary ISPs
10	Television Stations	TV	17	Religious – 2 Public – 1 Education – 1 Commercial – 13
11	Frequency Modulation Radio Stations	FM	156	Commercial – 70 Community – 37 Education – 10 Public – 7 Public Foreign – 6 Religious – 38
12	Very Small Aperture Terminal Operators	VSAT	12	VSAT Broadband Internet
13	VHF/UHF Radio Users	VHF/UHF	17	VHF/UHF Radios
14	Ship Stations	SS	87	VHF Radio & Call Signs for Vessels
15	Short Code Users	SC	22	For Financial Services, Information, USSD Applications
16	Value Added Service Providers	VASP	5	SMS, VAS, USSD Gateways
17	Type Approval Authorizations	TA	100	Electronic Equipment Type Approval, about 100 yearly
18	Universal Access (Development Fund) Service	UADF	1	Agency for providing access to unserved and underserved areas

Table 1. Classes and Count of ICT Service Providers (2022)

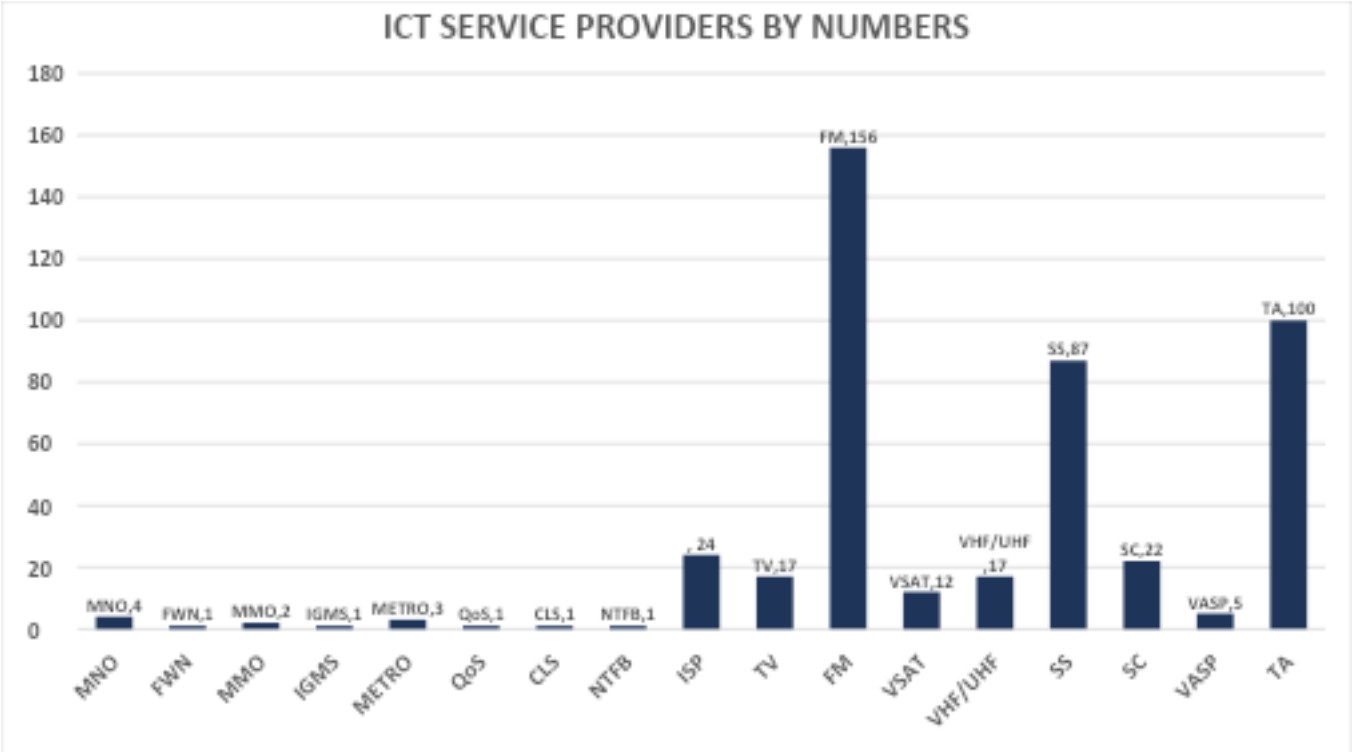


Figure 1. A Plot of Service Providers by Numbers

1.4.2. Network Coverage

Figures for 2022 from Mobile Network Operators show a maximum of 89% mobile voice population coverage and 93% mobile voice geographical coverage.

The highest nationwide geographical coverage of the Second Generation (2G) Mobile Technology is about 93%, Third Generation (3G) is around 84% and the Fourth Generation (4G) stands at 57%.

The capital city Freetown has almost 80% of Metropolitan Fiber Cable Infrastructure coverage with the three (3) licensed Metro vendors (Metro, Base and Onlime).

Additionally, three (3) of the Mobile Network Operators (Africell, Orange and Sierratel) have their own point-to-point fiber interconnections through overhead (Africell and Orange) and duct (Sierratel) for their cell sites, mobile networks and Internet exchanges.

There is also an increase in the reach of the National Terrestrial Fiber Backbone managed by Leonecom across the country covering the Capital City (Freetown), all major District Headquarter Towns (Makeni, Bo, Kenema) and other bigger towns (Port Loko, Moyamba, Kailahun). More towns are earmarked for access to the terrestrial fiber cable, with government

and other public institutions like schools, hospitals, libraries, and offices being connected to the Internet.

No.	Site Name	Site Type
	NORTH - WEST REGION (5 Sites)	
1	Jui NOC	ADM
2	COHMAS	University ADM
3	Waterloo	ADM
4	Masiaka	ADM
5	Rogbere Junction	ADM
	NORTH -EAST REGION (17 Sites)	
6	Port Loko	ADM
7	Port Loko Teachers' College	University ADM
8	Kambia	ADM
9	Gbalamuya (Guinea Border)	ADM
10	Lungi	ADM
11	Lunsar	ADM
12	Makeni	ADM
13	Bumbuna	ADM
14	Magburaka	ADM
15	Masingbi	ADM
16	Jaiama Sewafe	ADM
17	Koidu	ADM
19	Fadugu	ADM
18	Kabala	ADM
20	Daru	ADM
21	Pendembu	ADM
22	Tokbombu	ADM
	SOUTH - EAST REGION (20 Sites)	
23	Mile 91	ADM
24	Moyama Junction	ADM
25	Taiama	ADM
26	Njala University – Mokondeh	University ADM
27	Njala University – Towama	University ADM
28	Bo (Joe Town)	ADM
29	Kenema	ADM
30	Eastern Polytechnic (Kenema)	University ADM
31	Joru	ADM
32	Zimmi	ADM
33	Gendema Liberia Broder	ADM

34	Segbwema	ADM
35	Mano Junction	ADM
36	Kailahun	ADM
37	Moyamba	ADM
38	Gbangbatok	ADM
39	Matru	ADM
40	Koribondo	ADM
41	Moriba Town	ADM
42	Pujehun	ADM

Table 2. Leonecom Fiber Infrastructure Coverage

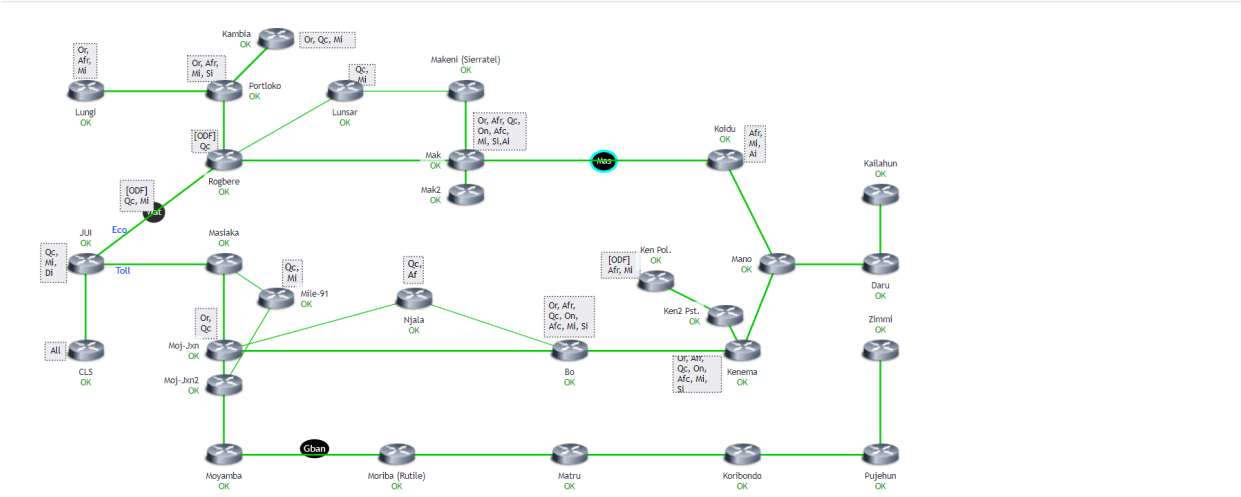


Figure 2. Leonecom Fiber Infrastructure Coverage

Fiber coverage also interconnects from the cable landing station in Freetown up to the Guinea border town of Pamelap at the Gbalamuya crossing point and to the Liberia border town of Bo Waterside at the Gendema crossing point.

Major Internet Service Providers (e.g., Afcom, Onlime, AI Networks, Diakem, IPTEL) have a presence in all the district headquarter towns and big cities across the country, with more licensed ISPs (20+) following the trend to utilize the 100GB fiber Internet capacity at the Cable Landing Station (CLS) managed by Zoodlabs for the population in Sierra Leone for private and public networks.

The UADF service also has some footprints in the country, with up to ten (10) cell sites in remote and underserved communities being in place and available for service provisioning and infrastructure sharing.

Table 3 details the number of cell sites, population, and geographical coverage for 2G, 3G and 4G technologies for Mobile Network Operators, the main providers of Mobile Voice and Broadband (3G, 4G) and Fixed Broadband Services in Sierra Leone.

OPERATOR	NO. OF SITES [2G, 3G, 4G]	POPULATION COVERAGE (%) [2G, 3G, 4G]	GEOGRAPHICAL COVERAGE (%) [2G, 3G, 4G]
ORANGE	501 [501, 501, 271]	80.30, 79.24, 48.68	93.10, 83.56, 57.00
AFRICELL	410 [410, 352, 116]	89.20, 63.18, 38.90	83.30, 29.75, 10.17
QCELL	189 [189, 189, 25]	60, 60, 19.00	72.00, 72.00, 35.00
SIERRATEL	38 [0, 0, 38]	0, 0, 15	0.00, 0.00, 25.00

Table 3. Cell Sites, Population and Geographical Coverage for Mobile Network Operators per Technology (2G, 3G & 4G

The plot of cell sites per mobile network operator per technology (2G, 3G, 4G) in Figure 3 shows the wide reach of voice services (501 sites maximum, for Orange) as well as mobile broadband services through 3G and 4G networks (501 and 271 respectively, for Orange).

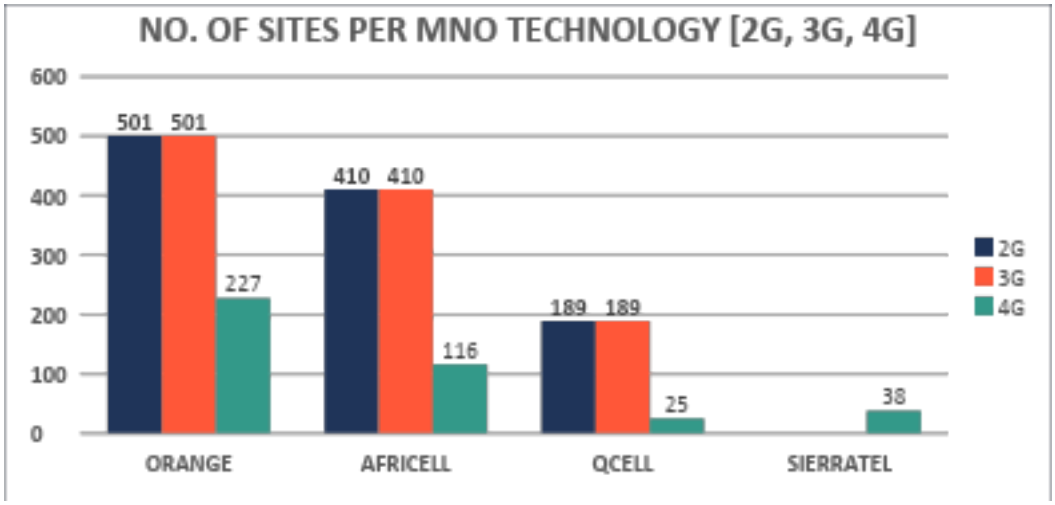


Figure 3. Plot of Cell Sites of MNOs per Technology (2G, 3G, 4G)

Figure 4 shows the Population Coverage Percentage per Technology (2G, 3G, 4G), with a maximum Voice coverage of 89% for Africell.

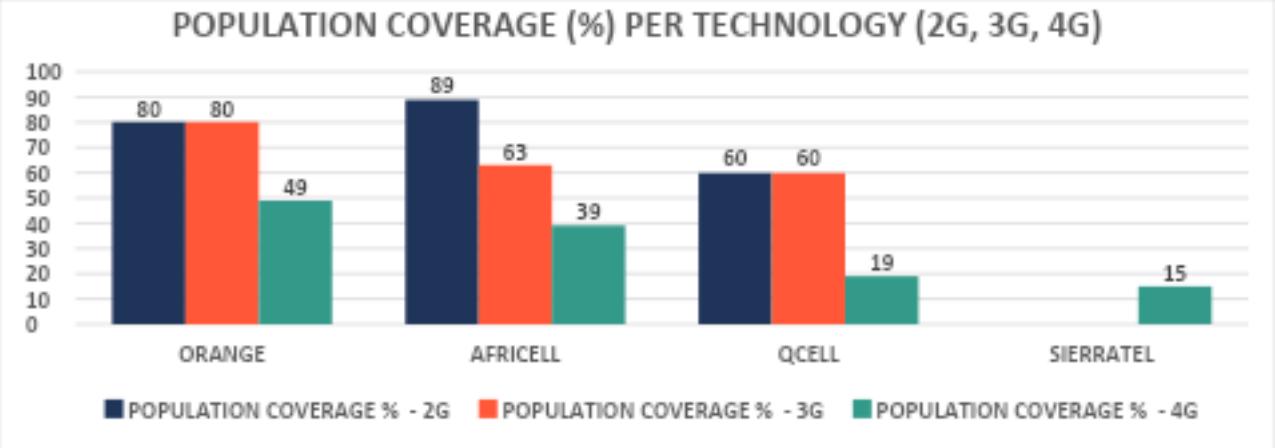


Figure 4. Population Coverage Percentage per Technology (2G, 3G, 4G)

Figure 5 shows the Geographical Coverage Percentage per for Technology (2G, 3G, 4G) Mobile Network Operators, with a maximum of 93% for Orange.

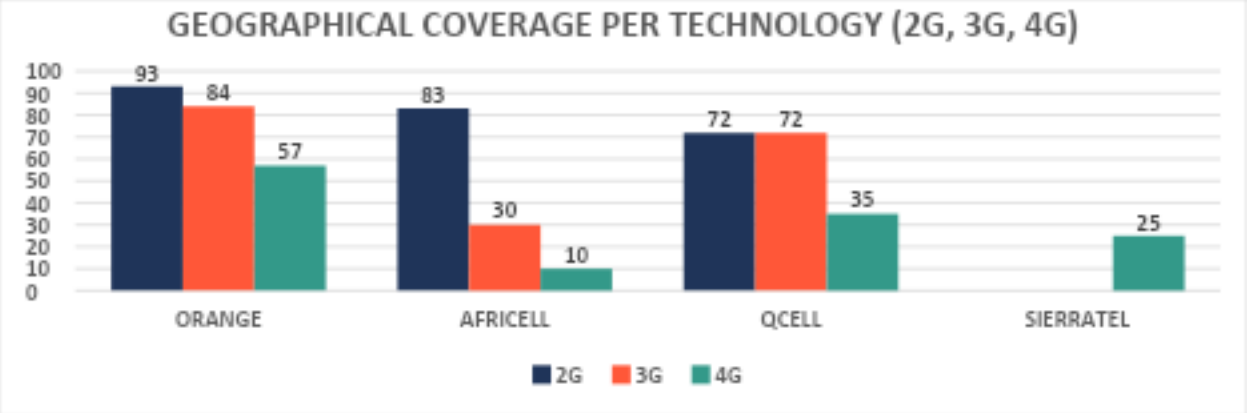


Figure 5. Geographical Coverage Percentage per Technology (2G, 3G, 4G)

1.4.3. Broadband

The deployment of submarine fiber cable in Sierra Leone in 2009 led to an increase in Internet penetration which now stands at 46% utilization, as shown in Table 4, with broadband data supplied by the monopoly Cable Landing Station managed by Zoodlabs SL Limited.

Broadband Measurement Counter/Indicator	2022 Update
Total Internet Bandwidth Available	100 Gbps
Total Internet Bandwidth Utilised or Assigned	46 Gbps
Percentage of Broadband Utilization	46%
Total Number of Operators (MNOs, ISPs) Served	26

Table 4. Broadband Capacity vs. Usage

Formally, it was managed by the Sierra Leone Cable Limited (SALCAB), but the unbundling of the Government of Sierra Leone Fiber Cable Assets in August 2021 by a Cabinet White Paper created two distinct entities, firstly, the Cable Landing Station (now managed by Zoodlabs), and the National Terrestrial Fiber Backbone (now contracted to Leonecom).

The 100GB capacity at the CLS has caused an upward surge in Social Media use, e-commerce, e-governance, mobile and fixed broadband, among other ICT services, with the number of ICT service providers also increasing steadily as seen from Figure 6, with 22+ licensed Broadband Operators including Mobile Network Operators (4) and Internet Service Operators (22).

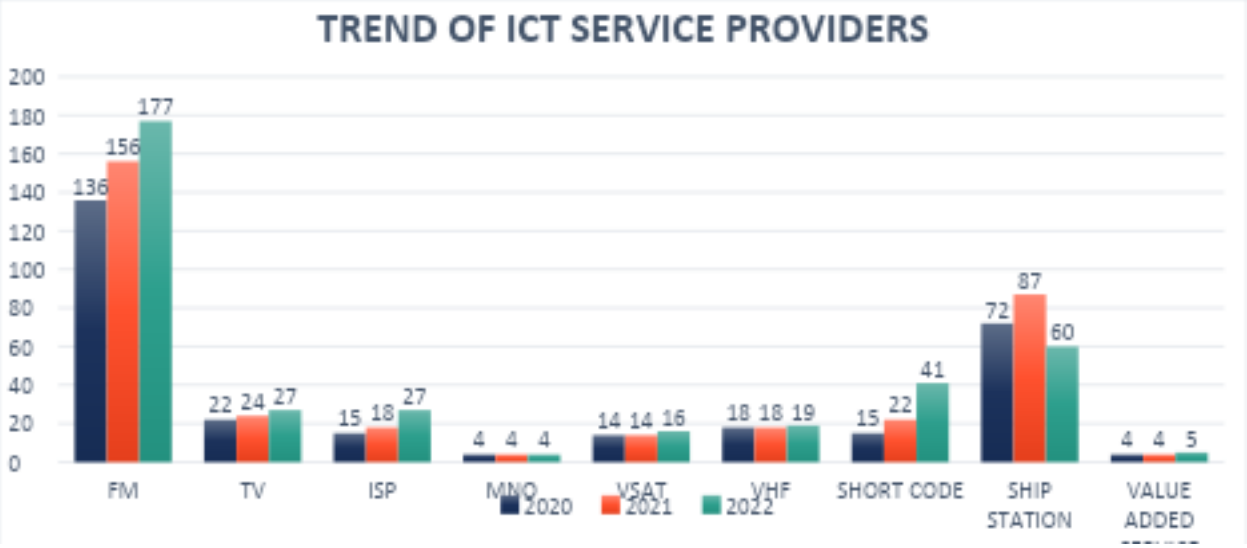


Figure 6. Trend of ICT Service Providers

Maximum Bandwidth Utilization per Service Provider (in Mbps) is shown in Figure 7, with the values indicating more than 90% maximum usage for Mobile Network Operators (MNOs) and 80% for major Internet Service Providers (ISPs), showing the increase in broadband utilization among the dominant ICT operators and the upward trajectory of broadband penetration in the country and the need for more capacity, infrastructure, service providers, content creation and digital literacy, among other necessities.

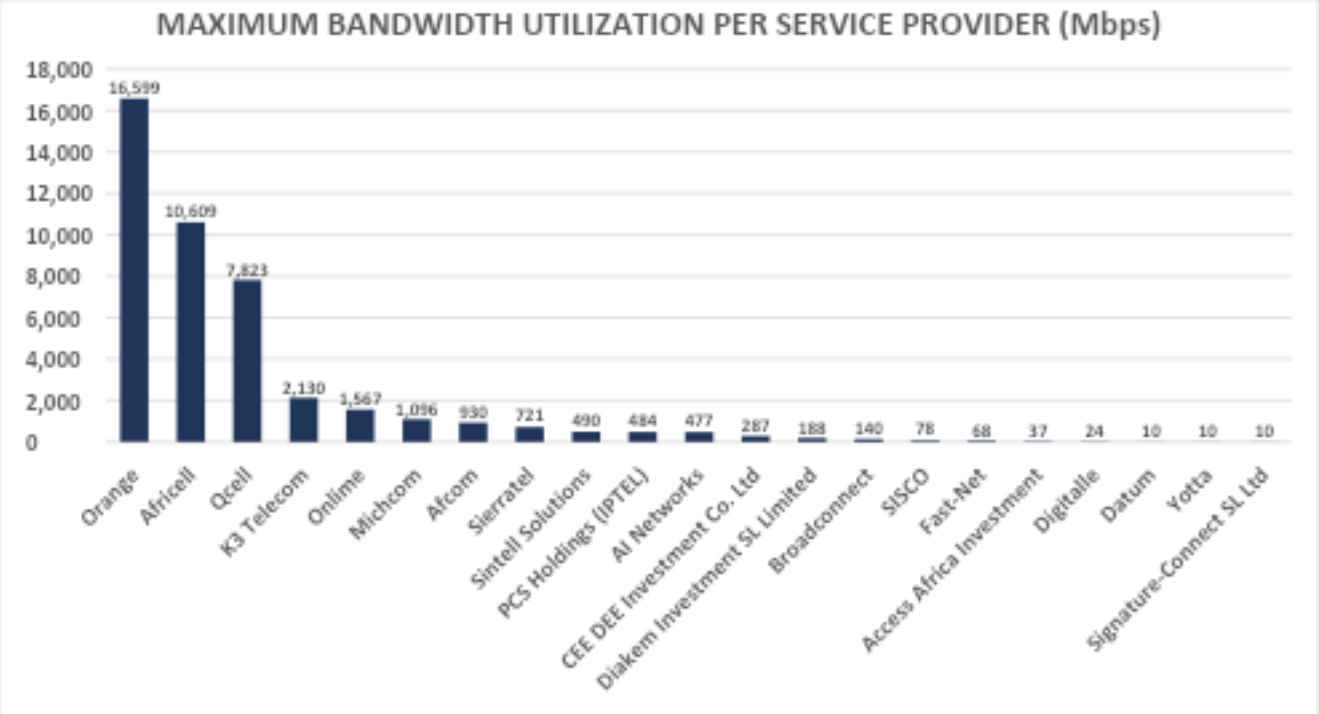


Figure 7. Maximum Bandwidth Utilization per ICT Service Provider (Mbps)

1.4.4. Digital Literacy

With the increase in broadband capacity and services as well as network providers, the Government is spearheading digital literacy across the country through Ministries, Departments and Agencies (MDAs).

The Ministry of Information and Communications with collaboration from MNOs, ISPs, Fiber Cable companies (formally SALCAB, now run by Zoodlabs and Leonecom) has connected many schools to the fiber cable network to provide Internet services which has aided the Ministries of Basic and Senior Secondary Education (MBSSE) and Technical and Higher Education (MTHE) to improve on digital literacy for primary, secondary, and tertiary institutions across the country. Computer use and Internet access is now introduced in primary schools to aid pupils in their digital knowledge and skills development at an early stage.

The ICT Regulator NatCA periodically supports digital literacy programs by conducting training sessions, hosting radio talk shows, sensitization workshops, consumer parliament sessions, ICT for girl's programs, hosting international ICT conferences and ITU Day Programs, ICT clubs for schools, and town hall meetings throughout the country to teach the population about ICT services that are now readily available. Consumers are taught about different ICT services; how they are used and charged, and the pitfalls to avoid in using these services to improve their

quality of life through enhanced knowledge, use of ICT services to aid work and business and access to information.

The NatCA Helpline (5050) and Mobile Network Operators' Call Center number (111) exist to aid the population in filing complaints against service providers, as well as obtaining information on available ICT services.

Corporate, business and government agencies as well as financial service institutions make use of Short Code numbers to breach the digital divide of their clients and users by providing access to information, services, and programs through SMS, Unstructured Supplementary Service Data (USSD), VAS, financial products, and online platforms. Non-Governmental organizations and private ICT companies offer digital literacy programs to the public at minimal rates, and also target critical age groups.

MNOs, ISPs, and other ICT innovators as well as Government technological agencies like the Directorate of Science, Technology, and Innovation (DSTI) engage in digital literacy programs by creating and supporting tech innovation hubs, coding schools and innovation competitions.

1.4.5. E-Services

The availability of high-speed broadband services through terrestrial fiber cable infrastructure serving 3G/4G networks of MNOs and ISP networks that provide mobile, fixed, and wireless broadband and fiber to the home/office (FTTX) has created the suitable technological platform for e-services to thrive in offices, businesses, financial service institutions, homes and on the go.

E-services through the Internet, Short Codes, websites and mobile applications (Apps) are offered to customers for different types of services including online banking, mobile money operations, online meetings, e-learning for schools and other institutions, government e-services, travel applications, online driver's license services, hospitality industry support, software services, entertainment and shopping, different types of telecommunications packages, tax returns, etc.

1.4.6. ICT Infrastructure

Sierra Leone is progressing in the area of ICT infrastructure spread across the country to cater for the needs of consumers for ICT products and services.

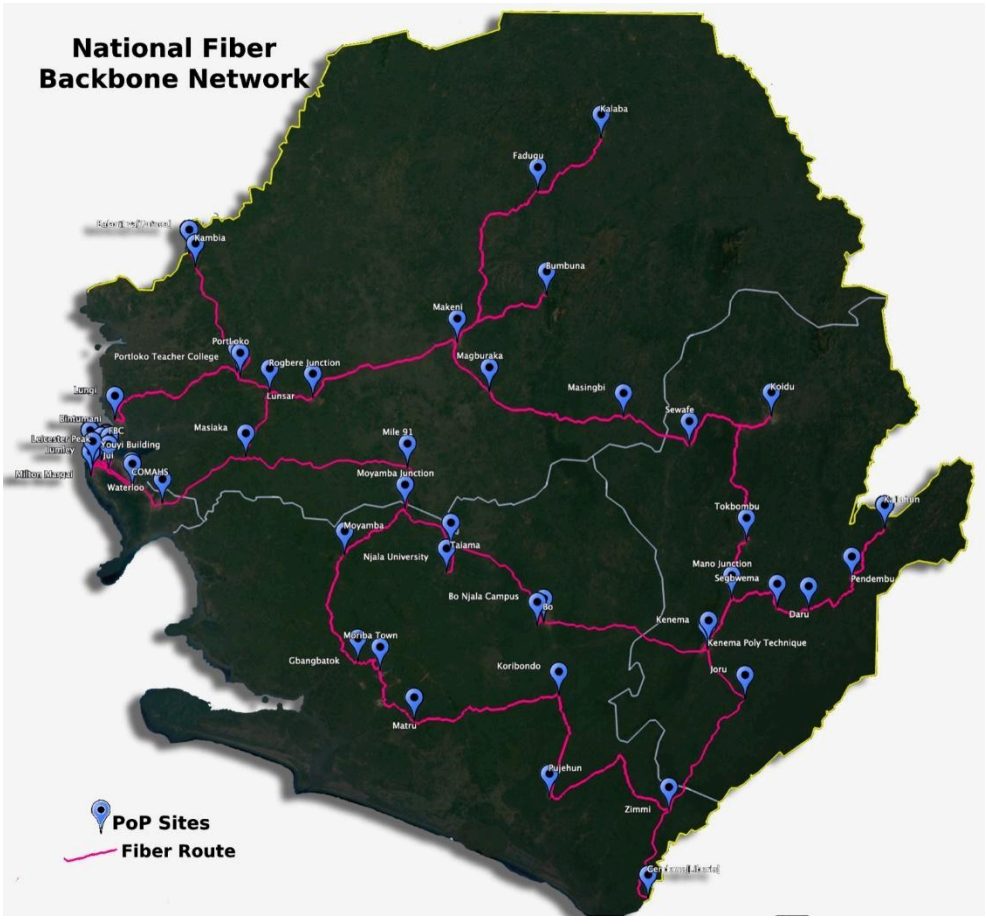
The Gateway to the Internet is the CLS which feeds MNOs and ISPs with broadband capacity through point-to-point Microwave links and Metropolitan fiber cable infrastructure networks. The National Terrestrial Fiber Backbone extends capacity to all provinces for the MNOs and ISPs,

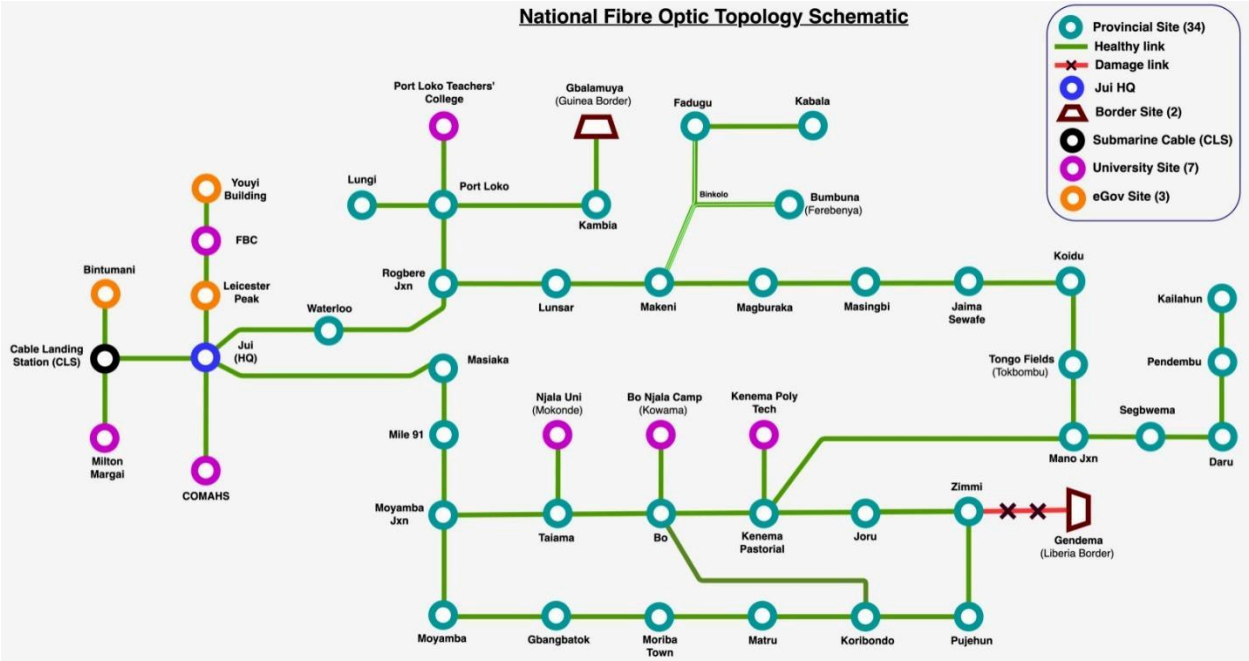
with backup Microwave links in place for major operators. Additional infrastructure is provided by the UADF in remote and underserved areas.

The National Terrestrial Fiber Optic Backbone which is 1600km long, has an extensive presence throughout the region, with 100% provincial headquarters and 90% district towns including Western Area Urban and Rural districts, and a metro network in 5 major towns (Bo, Kenema, Makeni, Port Loko and Kono).

All MNOs and ISPs utilize the cable as a primary link for provincial services, with a cumulative bandwidth of approximately 60 Gbps. The cable is capable of handling significant data traffic and supporting a range of different connectivity services.

In addition, it also connects the borders of Guinea and Liberia to support wider regional connectivity, including the ECOWAS WAN and international connections.





Supporting ICT infrastructure exists for the International Gateway Monitoring System (IGMS) to check MNO traffic, mobile money operations for financial services, quality of service for mobile networks, Value Added Service Providers (VASPs) for value added services, and other ICT operations.

Telecoms and civil works for ICT infrastructure of government and private companies MNOs, ISPs, METROS, NFBN, etc., are supported by local and international vendors, as are electronic type approval systems.

Public and private radio and television stations contribute to the ICT ecosystem and private, remote, or backup Very Small Aperture Terminals (VSATs) provide broadband Internet services for institutions like non-governmental organizations in remote areas and as backup for MNOs and ISPs.

Critical government and private ICT infrastructure sites, ducts and rights of way exist with support from other stakeholders and MDAs.

1.4.7. Infrastructure Sharing

The Telecommunications Act 2006 (as amended), Section 47 requires that, every operator providing public telecommunications service has the duty to make their network fully accessible to any other operator in a non-discriminatory manner, while protecting the privacy of subscribers and databases, to allow inter-operability and inter-communications between all public telecommunications operators, including providers of value-added services.

Section 48 (1) indicate that, public telecommunications operators shall enter into agreement governing the interconnection of their facilities as well as with value added service providers and the sharing of such infrastructure, local number facilities and other internetworking facilities as the Commission/Authority may direct in the public interest.

The Draft Competition Regulations 2021, Section 18 on Infrastructure Sharing requires that,

a) The Commission/Authority shall encourage infrastructure sharing and ensure that sharing between the operators of public telecommunication networks takes place under conditions of fairness, non-discrimination, and equality of access.
b) The Commission/Authority, in consultation with other stakeholders, shall elaborate a procedure for handling relations between the operators of public networks in the matter of the conditions and the sharing of infrastructure, in particular lead-times and access to the information needed to put it into place.
c) The Commission/Authority shall encourage infrastructure sharing between the incumbent and new entrants concerning in particular towers, posts, ducts, cables and elevated points to be made available mutually on a commercial basis, in particular where there is limited access to such resources through natural or structural obstacles.
d) The Commission/Authority shall encourage access to alternative infrastructure on the basis of commercial negotiations, in order to foster and entrench competition as rapidly as possible and shall ensure that such access is provided under conditions of fairness, non-discrimination and equality of access.

These laws are applied by the Telecoms Regulator NatCA to ensure infrastructure sharing among ICT service providers, MNOs with ISPs, FM/TV Stations with MNOs, etc.

1.4.8. Licensing Framework

The licensing regime of the Telecoms Regulator NatCA has undergone regular changes, with diversified licenses now being issued to accommodate emerging Service Providers, leading to new entrants and services for the Telecommunications market in the country.

The new Licensing Regulations of 2020 has further enhanced the introduction of new revenue streams in the sector from Individual and Class licenses and Business Authorizations for operators, to Infrastructure or Service-Based licenses, VASPs, Special Numbering Resources users, etc.

The following Licensing Regimes exist:

- Cellular Network (GSM and CDMA)
- Dealership
- Installer
- Internet/Data Service
- Value Added Services
- Numbering Resources
- Infrastructure-Based Communications
- Aeronautical Service
- Maritime Service
- Fixed and Land Mobile Service
- VSAT
- Equipment Type Approval
- Broadcasting (Radio and TV) Service
- Other ICT Services.

1.5. Broadband in the Context of National Development

Broadband is generally seen as a significant part of national socioeconomic development. Increased broadband penetration has significant positive impacts on the national economy. Research by the ITU and World Bank suggests that for every 10-percentage point increase in broadband penetration, the isolated economic effect on Gross Domestic Product (GDP) growth is between 1.38% and 2% of GDP. Thus, every 10% increase in broadband penetration is expected to result in a GDP increase around 1.38% to 2% for Sierra Leone.[3] Figure 9 shows that the GDP effect of broadband investment is steepest in the countries with a moderate level of ICT development moving towards a fuller use of ICT technologies throughout its population.

[3] ITU (International Telecommunication Union). (n.d.). Economic impact of broadband in LDCs, LLDCs, and SIDS. Retrieved from https://www.itu.int/en/ITU-D/LDCs/Pages/Economic-impact-of-broadband-in-LDCs,-LLDCs-and-SIDS.aspx.; Minges, M. (2016). Exploring the relationship between broadband and economic growth. World Development Report 2016: Digital Dividends, World Bank.

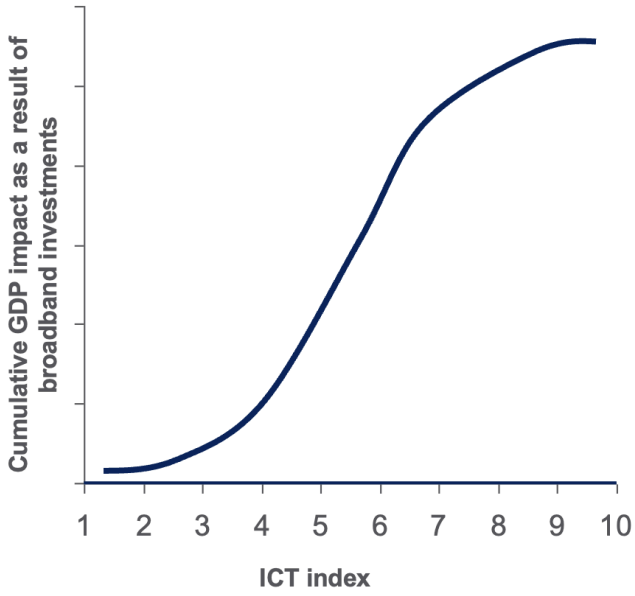


Figure 9. The S-curve Theory

For regions with very low ICT maturity, the introduction of broadband has limited economic leverage in the early years. Once broadband connectivity reaches a certain critical mass, usually described as approximately 20% of the population, then broadband connectivity and ICT use starts to have a pronounced effect on economic growth. Finally, when a country reaches very high ICT maturity and broadband connectivity, the marginal effect of additional investments may be reduced. Since Sierra Leone is in the early acceleration phase, the effects of broadband investment and uptake will likely be significant on the national GDP for years to come.

The effect of broadband development is not only limited to gross national metrics; this effect of greater economic growth also creates employment opportunities throughout the nation. For every 1000 additional broadband users, roughly 80 new jobs are created in various sectors. [4]Moreover, this effect creates a circulating positive impact on every part of the national economy. Figure 10 shows that appropriate financing through the private sector, public private partnership (PPP), and Universal Access Service Funds, leads to increase in broadband penetration. Hence this creates an increase in the GDP. The increase in GDP increases in turn taxable income throughout the nation. As the nation becomes more prosperous and the taxable income rises, stabilizing and over time reversing national debt levels, the country will become more attractive for international capital leading to higher credit ratings and lower costs for the national foreign debt. The increase in national GDP will improve the affordability of ICT connectivity and devices as income levels rise. Furthermore, increases in taxable income will

[4] (2013) *Socioeconomic effects of broadband speed*. rep. Ericsson.

mean that the government at national and local level can spend more money on ICT awareness and education, leading to a virtuous reinforcing cycle.

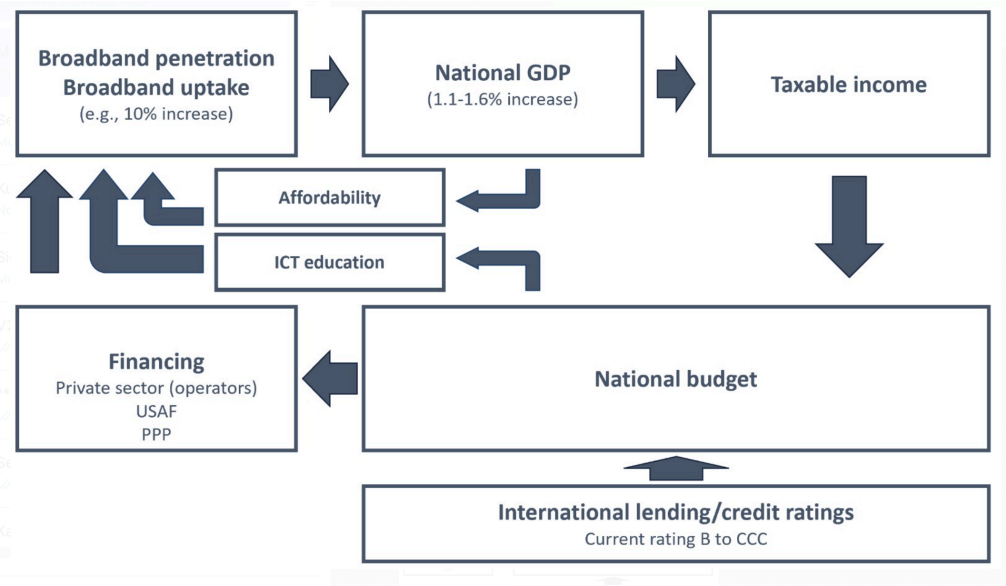


Figure 10. Circulating Effects of Broadband Development

Consequently, broadband development potentially has massive benefits to the national economy and people's lives, employment, services, and connectivity.

1.6. Relevant Policies

1.6.1. List of Relevant Policies

- The Cybersecurity and Crime Act, 2021
  - This Act establishes a thorough legal, regulatory, and institutional framework for the regulation and prosecution of cybercrimes as well as for the protection of computer networks, intellectual property, and privacy rights. It also aims to facilitate international cooperation in the fight against cybercrime. The act has allowed the formation of a National Cybersecurity Coordination Centre to manage cyber security incidences in Sierra Leone.
- The Data Protection Bill, 2021
  - This document serves as a legal guide for organizations in Sierra Leone that collect, utilize, and/or handle personal data. As the overseer of the rules and laws outlined in this measure, the Right to Access Information Commission is established.
- Sierra Leone's Medium-Term National Development Plan, 2019–2023

- The Medium-Term National Development Plan (MTNDP) 2019–2023 was established with a strong political commitment to provide development outcomes that will improve the welfare of Sierra Leoneans. The country's long-term plan, from which future medium-term plans would be developed, has constantly been referenced during the nationwide consultations for this new five-year development plan.

- National Digital Development Policy (NDDP)
  - To transform Sierra Leone into a middle-income nation by 2039, the National Digital Development Policy 2021 lays the groundwork for improved institutional coordination for the digital transformation as well as increased economic growth and, human capital development made possible by digital tools as essential enablers. Affordability, Digital Infrastructure and Access, Regulation and Standards, E-Government Services, Gender Mainstreaming, and E-Accessibility are a few of the policy goals outlined in this document.
- National Digital Development Strategy (NDDS)
  - This national strategy defines a blueprint that actors in the digital ecosystem need to refer to for continued engagement and efficient coordinated contribution to digital development. The document's goals include creating demand-driven ICT educational content for use in schools, securing the foundation for government e-services, and modernizing sectoral digital strategies. It also aims to ensure inexpensive connectivity with enhanced infrastructure.
- The Telecommunications Act, 2006
  - Act to establish the National Telecommunications Commission (now NatCA) and to provide for the licensing and regulation of telecommunications operators and for the promotion of universal access to basic telecommunication services, fair competition for the benefit of investors in telecommunications, and the users of telecommunication networks and services, to improve the national, regional, and global integration of Sierra Leone in telecommunications and to provide for other related matters.
- Telecommunications Licensing Regulations, 2020
  - In line with the Telecommunications Act of 2006, it contains regulations related to licensing frameworks for different ICT business types and organisations, along with schedules and application forms for use by related parties.
- The Competition Regulations, 2021
  - Regulatory framework for the promotion of fair competition in the telecommunications sector, infrastructure sharing and protection against the misuse of market power or other anti-competitive practices.

- The National Communications Authority Act, 2022
    - Revised ICT Act to establish the National Communications Authority and to provide for the licensing and regulation of electronic communications operators and other related matters.

For further details regarding these policies please refer to Appendix 2.

1.7. SWOT Analysis for Sierra Leone and its Broadband Rollout

1.7.1. Strengths

- Young and tech-hungry population
- A government that is united in the pursuit of technology for the benefit of the nation
- ≥ 93% of network availability (network availability is the ratio of probable attempts for mobile network services to total number of attempts.)
- Other relevant policies have already been developed such as the National Digital Development Policy and Strategy.
- Current 4G Technology coverage (58%, nationwide, 2022)
- 84% is covered by 3G technology (2022)
- Diversified license regime (both large operators, alt-nets and ISPs, 22+ in total (2022), Cloud-Based, Metropolitan Fiber Infrastructure Network, National Fiber Backbone, Cable Landing Station, etc.)
- Introduction of a unified licensing framework capable of accommodating technology and service neutrality
- The MoCTI, SMART Africa Secretariat, DIAL, and key MDAs are developing a Government Enterprise Architecture with the main goal of promoting collaboration among institutions and supporting the government's digitalization effort

1.7.2. Weaknesses

- Poverty levels and affordability
- Digital literacy
- Broadband penetration
- Percentage of broadband utilization of 46% (2022)
- Last mile still a challenge which needs to be addressed
- Device availability and cost: devices are expensive and an impediment to ubiquitous use
- Technology limitations
- Limited infrastructure sharing
- Resistance to change among mobile service providers

- Resistance to change in regulations
- Lack of compliance with proper standards

1.7.3. Opportunities

- Build a more positive image of Sierra Leone as a nation embracing technology. Over time, this will attract investors
- Increase broadband penetration both through enabling commercial operators and use of UADF
- Engage the private sector to accelerate the rollout. Create consensus among principal actors (this is easier done in a small nation)
- Leapfrog legacy technologies in favor of later technologies
- Release spectrum through the digital dividend and other means
- Provide broadband to “shared access” centers / locations for widespread deployment of connectivity
- Increase the use of renewable and hybrid energies to lower the energy cost
- Solve last mile access through private actors and PPPs (World Bank is working on this with the Ministries)
- Improve the affordability of connectivity and devices both by stimulating price competition and by fostering an innovation driven knowledge-based economy that improves average income levels
- Enable greater network sharing (especially among the MNOs and other big players like Metro, national fiber backbone, etc.)
- Boost general e-services and digital financial services
- Reduce the basic cost of living
- Enable digital migration from analogue side
- Boost e-learning and digital education
- Make the best use of the UADF and National Fiber Backbone by empowering MNOs, ISPs, other ICT innovators to extend broadband penetration, through easier regulation (reduced taxation for installations in remote areas, infrastructure sharing, etc.)
- 5G deployment (there are few countries with 5G networks, especially in Africa. But policy changes are being done by ITU and regional regulatory agencies to allocate frequencies for 5G deployment which will open up the market in Africa)
- Identify all enacted legislations that deal with various issues which affect national broadband and those pending
- E-waste process for recycling
- Monopoly for major operators of broadband infrastructure to be removed, e.g., Cable Landing Station (CLS) – need for another competitor and backup/redundancy, National

Terrestrial Fiber Backbone (NTFB) – other major operators, e.g., MNOs, ISPs, PPPs to have redundant/other terrestrial fiber backbone

- Active involvement of key stakeholders, e.g., MNOs, ISPs, is essential

1.7.4. Threats

- Bottlenecks from multiple and in part restrictive regulations and bureaucracy may slow the speed of roll-out
- Negative bias and false beliefs about the new technologies among some part of the citizens (e.g., 5G network and Covid-19 link misinformation)
- Lack of cooperation between stakeholders (e.g., lack of infrastructure and information sharing, lack of information sharing with the regulator)
- Anti-competitive behavior of major players
- Weakness of the currency may limit the ability to pay for needed infrastructure and may undermine confidence among investors
- Issue with infrastructure sharing among the traditional MNOs (still massive duplication of effort, hence the need to encourage network sharing)
- Protection of infrastructure (recurring damage to existing infrastructure happens with limited or no consequences)
- Lack of backup link (Guinea and Liberia links not yet operational)
- Power supply to ensure connectivity (many operators still running on single generators, hybrid systems transition not yet fully completed)
- Digital and financial fraud due to lack of extensive digital literacy

1.8. Key Pillars and Cross-Cutting Issues for Broadband Implementation

SMART Africa's SMART Broadband 2025 Blueprint report[5] defines five key pillars and two cross-cutting issues to address broadband development. The seven areas include:

Pillar 1: Technology, Infrastructure and Devices
Pillar 2: Demand Side-Capacity Building, Awareness and Affordability
Pillar 3: Content, Applications and Services
Pillar 4: Innovative Economic Models to Mobilize Investment
Pillar 5: Policy and Regulatory Frameworks
Cross-cutting Issue 1: Cybersecurity and Personal Data Protection
Cross-cutting Issue 2: Social Inclusion and Gender Equality

[5] (2022) *SMART Broadband 2025: A Trarnsformative Broadband Strategy to Single Digital Market*. Available at: https://smartafrica.org/wp-content/uploads/2020/12/SMART-BROADBAND-2025-Layout.pdf

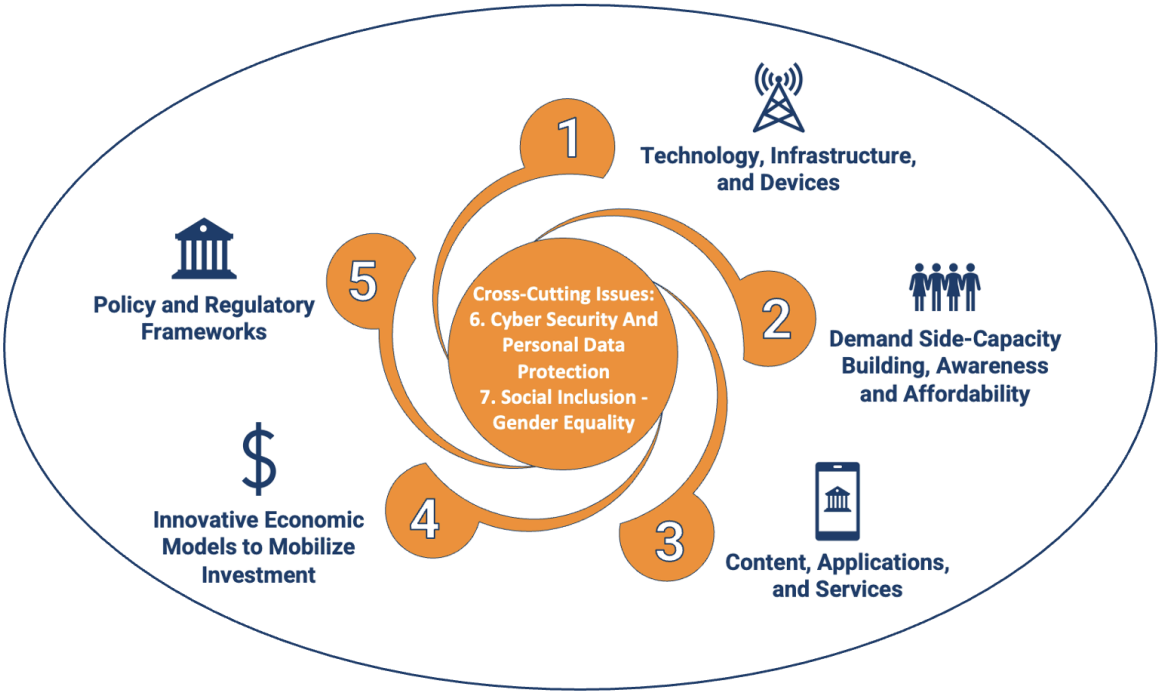


Figure 11. Illustration of Key Pillars and Cross-Cutting Issues

The SMART Broadband 2025 Blueprint report[6] defines the status, challenges, gaps, and opportunities for each pillar. These five pillars and two cross-cutting issues illustrated in Figure 11 are essential for any national broadband plan. These will be introduced and analyzed in the context of the Sierra Leone National Broadband Plan.

1.8.1. Pillar 1: Technology, Infrastructure, and Devices

The first pillar focuses on technology, infrastructure, and devices. This area addresses the construction and maintenance of the broadband network, as well as the development of broadband technology throughout the country. One common challenge throughout the continent is low population density in rural areas which makes rural deployment of broadband economically less feasible, which is specifically addressed for Sierra Leone in this plan.

Sierra Leone as a nation, is in an acceleration phase in terms of its commercial broadband deployment. Policy measures need to be carefully calibrated balancing the needs of commercial operators to make profitable investments, with the desire to provide low-cost ubiquitous access. For this purpose, recommendations for both policy and actions are given in the Recommendations Chapter, along with information on infrastructure and broadband technology financing and funding strategies disclosed in the Financial Opportunities Chapter.

[6] (2022) *SMART Broadband 2025: A Trarnsformative Broadband Strategy to Single Digital Market*. Available at: https://smartafrica.org/wp-content/uploads/2020/12/SMART-BROADBAND-2025-Layout.pdf

1.8.2. Pillar 2: Demand Side-Capacity Building, Awareness and Affordability

The demand side of national broadband is covered by the second pillar. For a greater inclusion of the people in the broadband network, the developments on the demand side should also be taken into consideration. Access is a requirement for this purpose, but it is not sufficient on its own because other demand-side factors also influence uptake. These elements include affordability as well as knowledge, education, and digital skills. Low digital literacy, limited affordability, locally relevant content and services, network deployments and coverage extension, spectrum costs, and high telecom tax rates are the main demand-side difficulties throughout Africa.

The benchmarking analysis in Chapter 2 reveals that affordability is a main concern for Sierra Leone. Therefore, the second pillar is crucial for Sierra Leone to address forcefully to ensure broad uptake of broadband technologies. The Recommendations Chapter discusses multiple factors and policy suggestions specifically designed to improve affordability.

1.8.3. Pillar 3: Content, Applications, and Services

The third pillar focuses on the content, applications, and services required to initially attract and maintain the online interest of a national population. In this regard, local content has been identified as a key motivator. As a result, the broadband strategy's development depends heavily on the quality of the content, applications, and services. Most of the content in Africa, according to SMART Broadband 2025, is not digitalized, and access to such content is currently limited. Furthermore, when addressing the content and services, language and various dialects should also be considered for sustainable and inclusive usage of broadband services.

Demand-side goals in terms of content, applications and services are addressed in the Principles, Vision, Milestones, and Targets Chapter. Recommendations for the provision of content, applications and services in Sierra Leone are given in the Strategy and Recommendations Chapter.

1.8.4. Pillar 4: Innovative Economic Models to Mobilize Investment

This pillar discusses funding and financing strategies in the context of SMART Broadband 2025 strategy[7]. The investments are generally used for an infrastructure rollout, with additional demand-side improvements. SMART Broadband 2025 strategy proposes diverse approaches and sustainable models towards mobilizing resources such as the governments, UADF,

[7] (2022) *SMART Broadband 2025: A Trarnsformative Broadband Strategy to Single Digital Market*. Available at: https://smartafrica.org/wp-content/uploads/2020/12/SMART-BROADBAND-2025-Layout.pdf

multilateral funding, development of financial institutions to fund broadband, the Private Sector, the NGOs, the community/grassroots, and the community networks.

For Sierra Leone, the National Broadband Plan discusses main funding opportunities such as public and private funding, PPP mechanisms, UADF and localized funding strategies. Detailed analysis can be found on the Financial Opportunities Chapter.

1.8.5. Pillar 5: Policy and Regulatory Frameworks

This pillar refers to policies and regulatory frameworks that are crucial for broadband growth in a country. There may be some additional challenges for African countries in their regulatory frameworks due to the rural nature of the continent. It is suggested that harmonizing policies for the broadband strategy and implementing public policy and regulatory frameworks, reducing mobile-specific taxes & fees, infrastructure sharing frameworks, satellite communication policy and regulatory framework, technology neutral licenses and reviewing conditions for market entry can be effective strategies in line with the National Broadband Plan.

Policies related to the ICT sector in Sierra Leone, with some additional supporting policies and regulatory frameworks are introduced in the Relevant Policies Chapter of this plan.

1.8.6. Cross-Cutting Issue 1: Cybersecurity and Personal Data Protection

This cross-cutting issue addresses issues related to cybersecurity. The Malabo Convention is mentioned by SMART Broadband 2025 blueprint[8] as a chance to implement data protection frameworks and address cybersecurity and personal data protection framework deficiencies. Effective approaches for this initiative include passing national legislation, signing the Malabo Convention, and forming a working group to support a unified framework. It is possible to observe that pan-African organizations and the Africa Union Commission have a significant impact on the development of DPP rules and cybersecurity.

Sierra Leone passed the Cybersecurity and Crime Act in 2021 to cover cybersecurity-related concerns in the country. In the context of the National Broadband Plan, additional cybersecurity and information/data protection recommendations are discussed in the Strategy and Recommendations Chapter.

1.8.7. Cross-Cutting Issue 2: Social Inclusion - Gender Equality

This area refers to the existing gender gap, especially in marginalized communities such as youth and people with disabilities. According to SMART Broadband 2025, the gap between

[8] (2022) *SMART Broadband 2025: A Trarnsformative Broadband Strategy to Single Digital Market*. Available at: https://smartafrica.org/wp-content/uploads/2020/12/SMART-BROADBAND-2025-Layout.pdf

genders decreases as more people relate to the implementation of Broadband Plan strategies. Successful access to phone and broadband connection is essential to get over this challenge as it helps society to reap the improved broadband benefits as disadvantaged communities get connected.

The benchmarking chapter compares indices that contain indicators of gender inequality for Sierra Leone. Solutions to this cross-cutting issue are discussed extensively in the Strategy and Recommendations Chapter. In addition, policies that address gender gaps, such as the NDDP, are introduced in the Relevant Policies Chapter.

2. Global and African Benchmarks

This chapter describes Sierra Leone's relative standing as compared to other African countries and important global examples. The benchmarking exercise compares standing on four parameters:

- Internet Speed
    - Fixed Broadband Median Download Speed
- Affordability
    - Affordability Drivers Index (for African countries only)
    - Cost of 1GB Data (as % of GNI per capita)
- Access
    - Mobile Connectivity Index (for African countries only)
    - Mobile Cellular Subscriptions per 100 People (for African countries only)
- Policy

For the Internet speed assessment, fixed median download speeds from *Ookla* (latest august 2022 data) are used. For the affordability assessment, data points are obtained from *Alliance for Affordable Internet*'s Affordability Report 2021, which is a report published annually for the benchmarking of Internet affordability. Lastly, for access assessment, GSMA's Mobile Connectivity Index and the World Bank's Mobile Cellular Subscriptions data of 2020 were used.

2.1. Global Benchmarking Assessment

The global benchmarking assessment compares Sierra Leone to countries in other parts of the world. The analysis is based on continents, and the most progressed country (MPC), the continent median (CM), and the continent's least progressed country (LPC). For all countries available, Internet speed and affordability measures are defined and compared to each other.

All selected countries are compared in terms of their August 2022 median download speeds. The analysis includes 182 countries, and Sierra Leone ranks 144th in the list consisting of countries all over the world. Among all selected countries, Sierra Leone performs better than the LPC of Asia, North America, Oceania, and Africa continents with a median download speed of 10.46 Mbps.

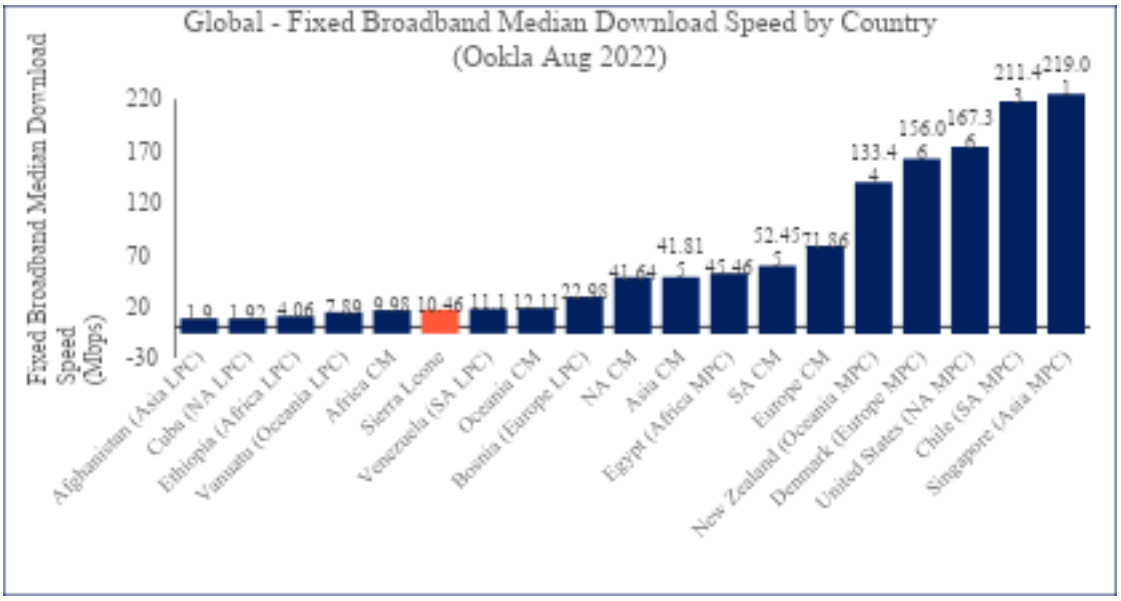


Figure 12. Global - Fixed Broadband Median Download Speed by Country

In terms of affordability, the cost of 1GB data as a percentage of GNI p.c. (Gross National Income per capita) is used to compare the selection of countries. The analysis is conducted for 189 countries without any restriction on the location or income level. Sierra Leone performs better than the LPC of North America, Oceania, and Africa with 1GB of Internet cost being equal to 9.9% of the Gross National Income per capita. 1GB cost data is obtained from the A4AI database.[9]

[9] Alliance for Affordable Internet. Retrieved from https://a4ai.org/policy-advocacy/good-practices-database/

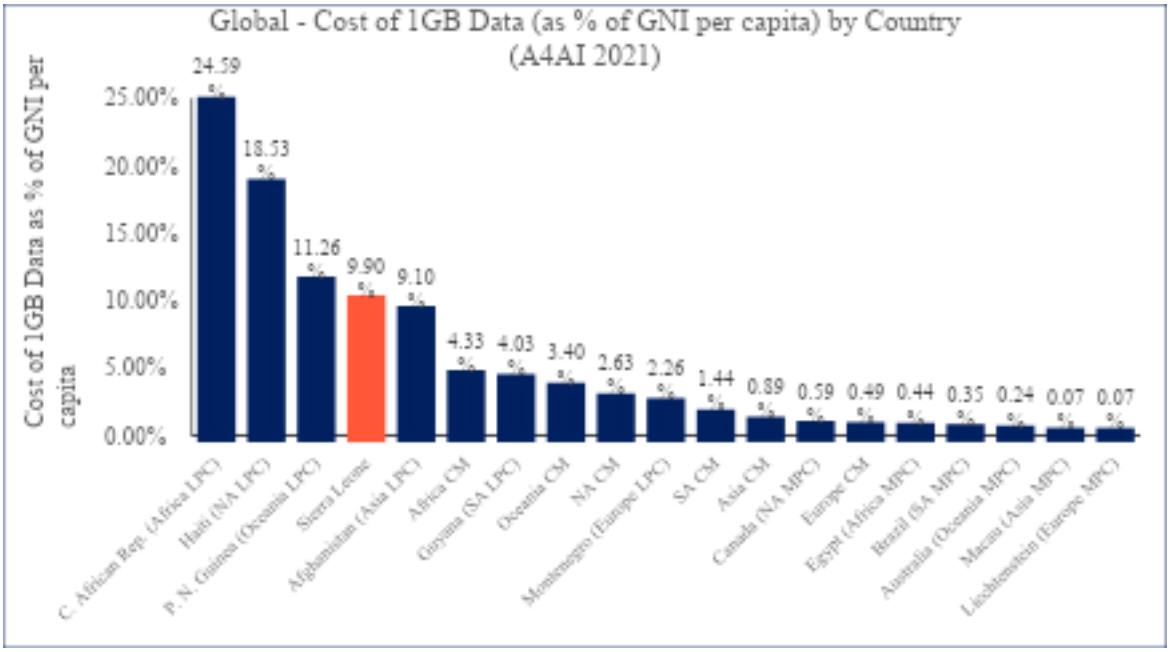


Figure 13. Global - Cost of 1GB Data (as % of GNI per capita) by Country

2.2. African Benchmarking Assessment

For the African benchmarking in addition to the fixed broadband download speed and the cost indices, a new metric based on general affordability is added. In addition, two more indices are introduced for access assessment which are GSMA's Mobile Connectivity Index and the World Bank's Mobile Subscription Data. In all three analyses, all countries with available information are included, with additional graphs of Sub-Saharan Africa and West Africa.

All African countries with Affordability Drivers Index (ADI) scores available are represented in the following chart (Figure 14). The ADI is a complex statistic that compiles an evaluation of the factors influencing Internet affordability across multiple nations into a single comparable number. The index evaluates 28 indices related to policies, regulations, broadband plans, electricity access, Internet Exchange Point (IXP) existence, etc. It covers 72 nations in total, 34 being in the African continent. Their calculations are rooted in policy surveys and series from large databases. (e.g., The World Bank)

Low-cost broadband is associated with high ADI scores, both for the industry and consumers. According to the Alliance for Affordable Internet, there is a positive and statistically significant correlation between a country's ADI score and the affordability of a 1GB mobile prepaid broadband plan, reiterating the idea that everyone, but especially low- and middle-income

countries, should prioritize improving policies and regulations to lower industry costs. Considering the ADI index only, Sierra Leone ranks 32nd out of 34 African countries.[10] To see Sierra Leone's Affordability Drivers Index ranking among Sub-Saharan African countries, please refer to Appendix 3.

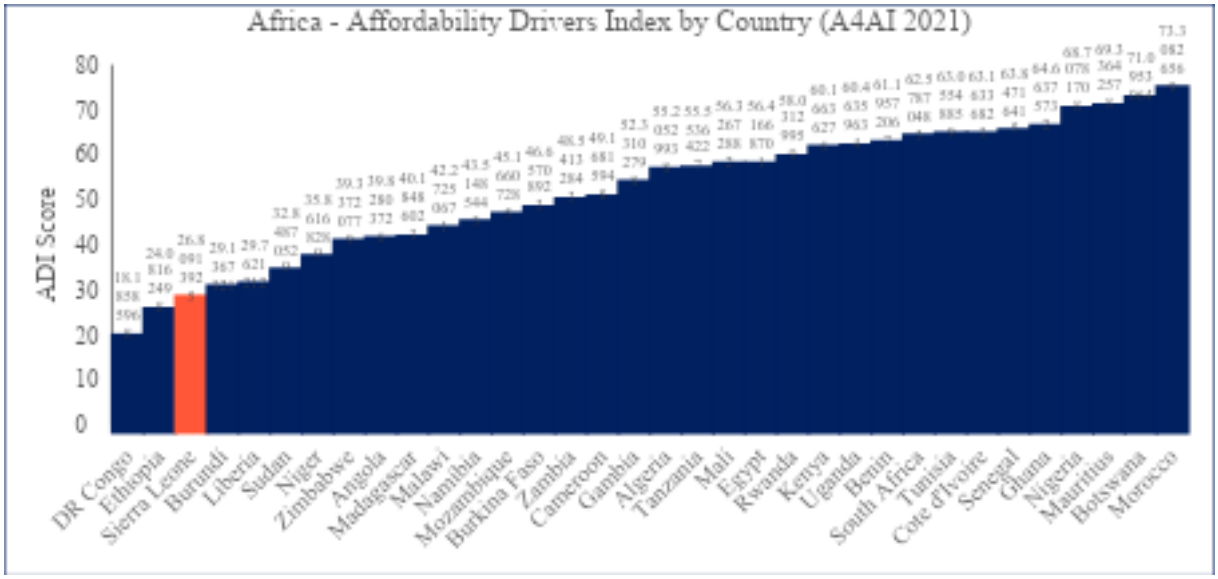


Figure 14. Africa - Affordability Drivers Index by Country

[10] Alliance for Affordable Internet. (2021). Affordability Report 2021.

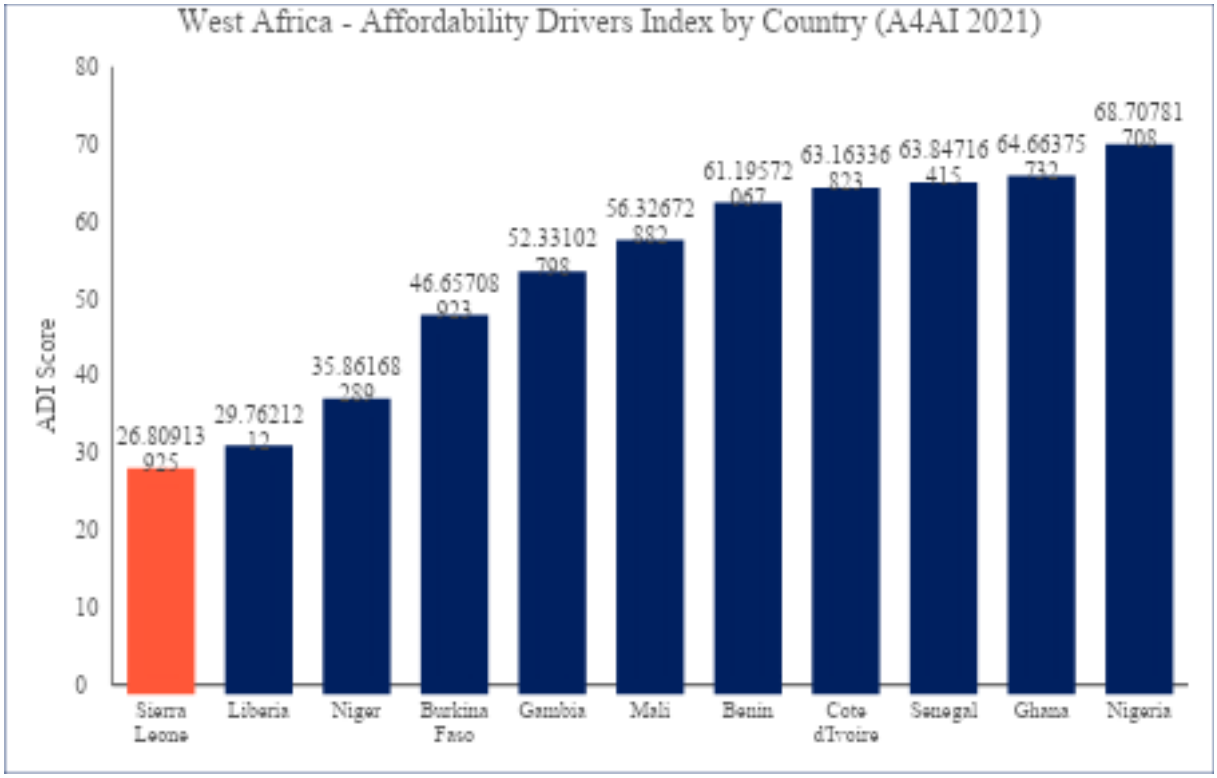


Figure 15. West Africa - Affordability Drivers Index by Country

The ADI index flourishes from two main indicators: The Infrastructure Sub-Index and the Access Sub-Index.[11] Sierra Leone is compared with its African peers using both of these indices. By the definition given by A4AI:

The access sub-index assesses the existing rates of broadband adoption as well as the legislative and policy frameworks in place to promote development and guarantee the availability of reasonable and equitable access. This sub-index considers factors including current Internet penetration rates and an evaluation of how well a nation's Universal Service and Access Funds are working. Some examples of those factors are market consideration as Herfindahl-Hirschman Index, existence of a national broadband plan and smartphone adoption.

[11] Alliance for Affordable Internet. (2021). Affordability Report 2021.

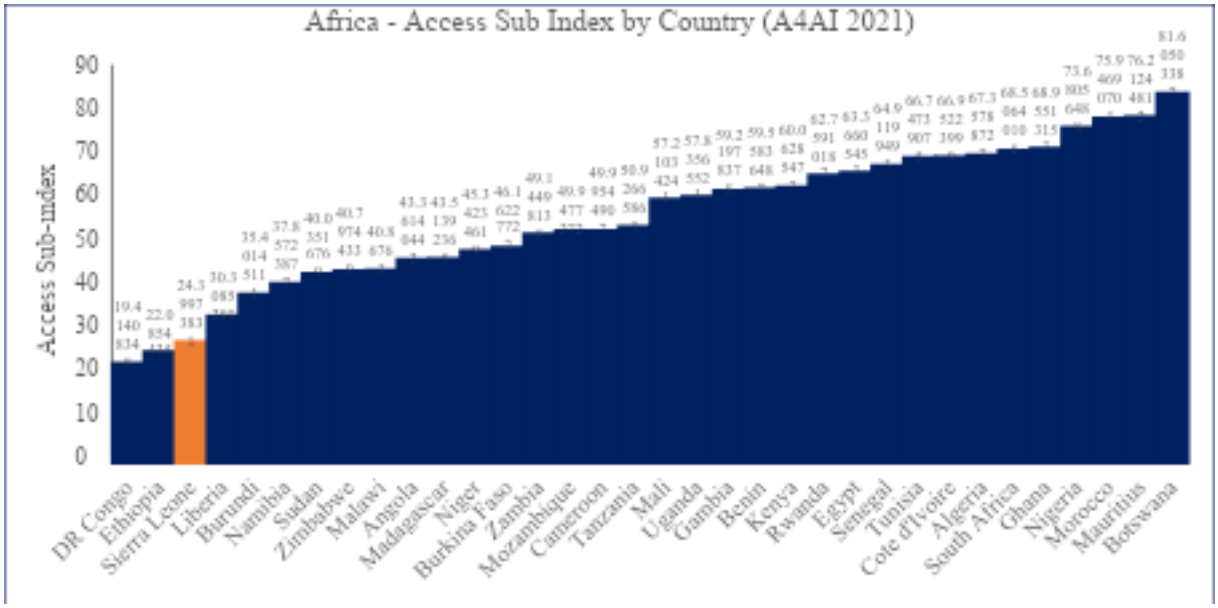


Figure 16. Africa - Access Sub Index by Country

Among West African countries, Sierra Leone is the least progressed with an Access Sub-Index of 24.40.

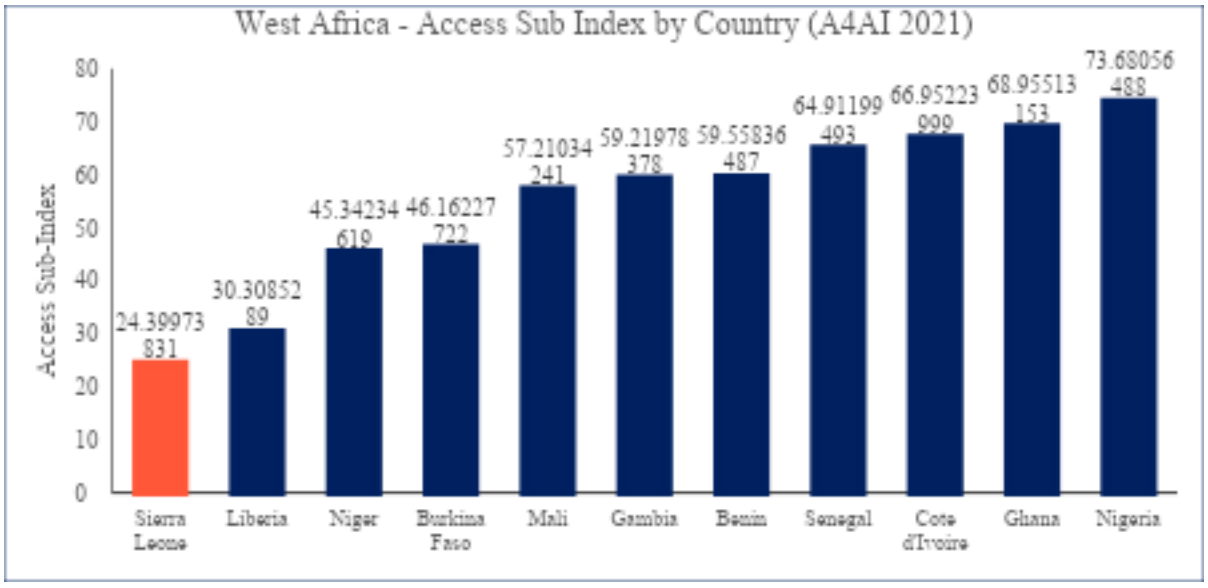


Figure 17. West Africa - Access Sub Index by Country

To see Sierra Leone's Access Sub-Index ranking among Sub-Saharan African countries, please refer to Appendix 3.

The same analysis is also conducted for the Infrastructure Sub-Index.

The infrastructure sub-index assesses the present deployment and operation levels of infrastructure as well as the legislative and policy frameworks that support and facilitate cost-effective investment in future infrastructure development. This sub-index considers factors like a nation's spectrum policy and the bandwidth that is offered in that nation. Some subsets of factors used in calculations are: Access to electricity (% of population), existence of IXPs and 3G network coverage, by population. To see Sierra Leone's Infrastructure Sub-Index ranking among Sub-Saharan African countries, please refer to Appendix 3.

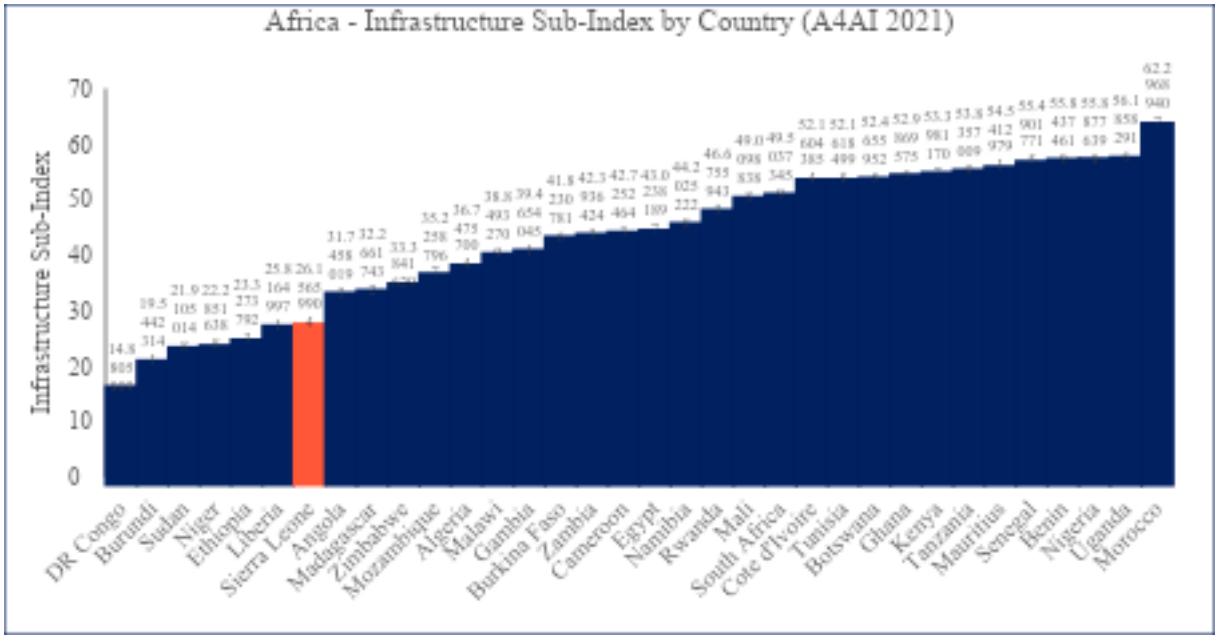


Figure 18. Africa - Infrastructure Sub-Index by Country

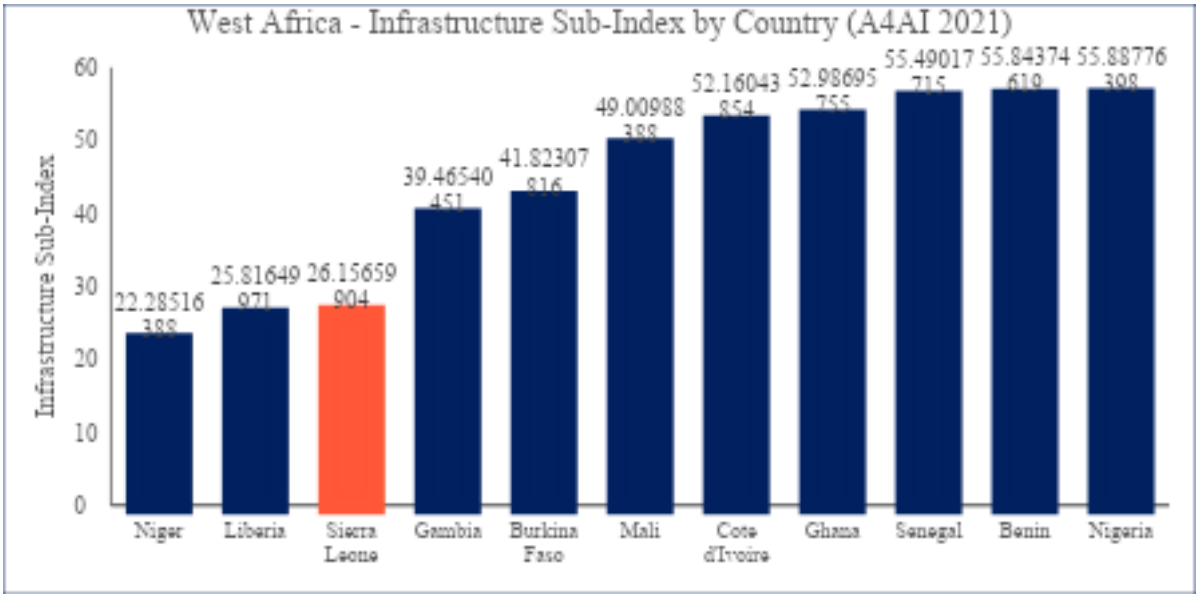


Figure 19. West Africa - Infrastructure Sub-Index by Country

As another affordability metric, the cost of data is compared among A4AI's list of African countries. The cost in terms of USD is scaled with GNI per capita so that it shows how much of an income an individual earning GNI per capita would spend to buy 1GB of data. In this list, Sierra Leone ranks 34th among 42 African countries with 1GB of data costing 9.90% of the GNI per capita.[12]

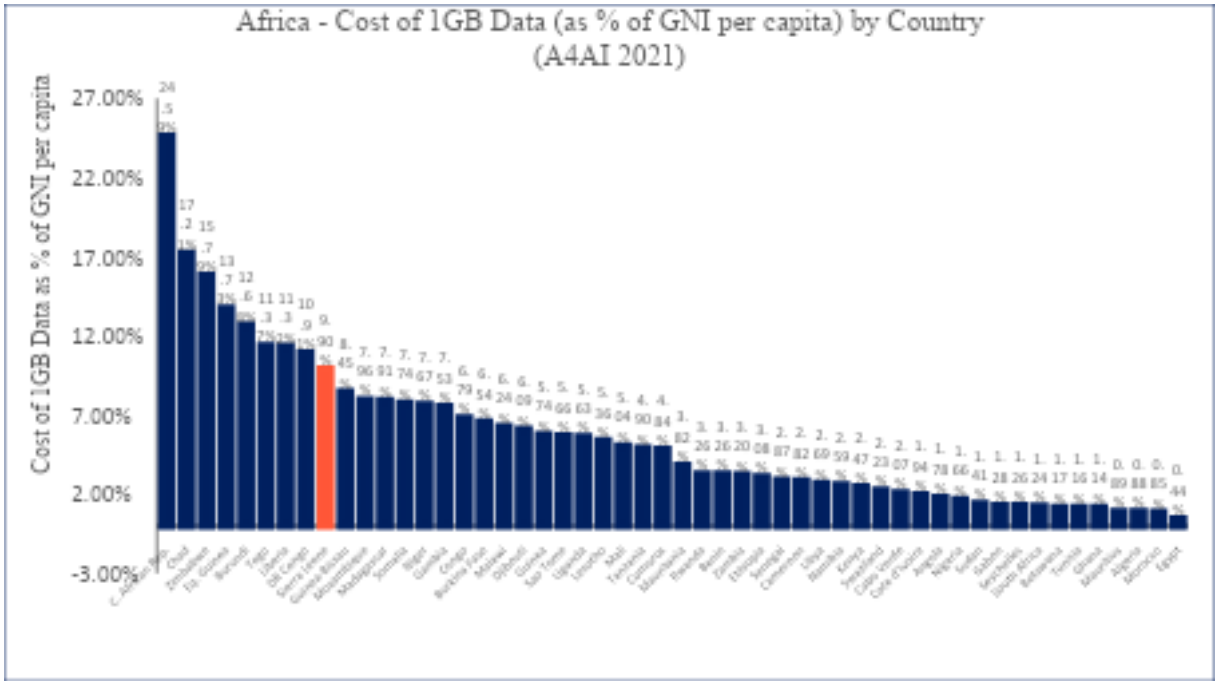


Figure 20. Africa - Cost of 1GB Data (as % of GNI per capita) by Country

[12] Alliance for Affordable Internet. Retrieved from https://a4ai.org/policy-advocacy/good-practices-database/.

In West Africa, Sierra Leone ranks 14th among 16 countries where the data is available. Sierra Leone offers cheaper 1GB of data than Togo and Liberia. Ghana offers the cheapest Internet in the West Africa Region with a cost ratio of 1.14%. To see Sierra Leone's ranking among Sub-Saharan African countries, please refer to Appendix 3.

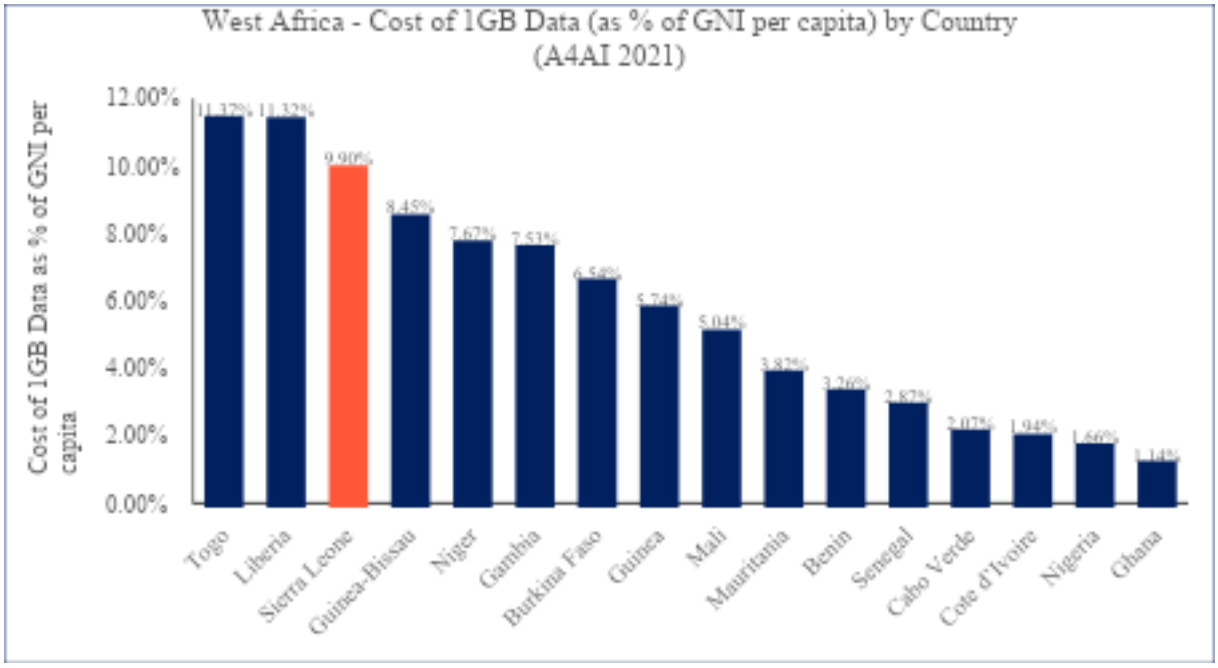


Figure 21. West Africa - Cost of 1GB Data (as % of GNI per capita) by Country

For African broadband speed assessment, like the global speed analysis, Ookla's median download speed data of August 2022 are considered. Sierra Leone ranked 23rd among 48 African countries where up to date data is available.[13]

[13] Ookla. (2022, August). Median broadband download speeds.

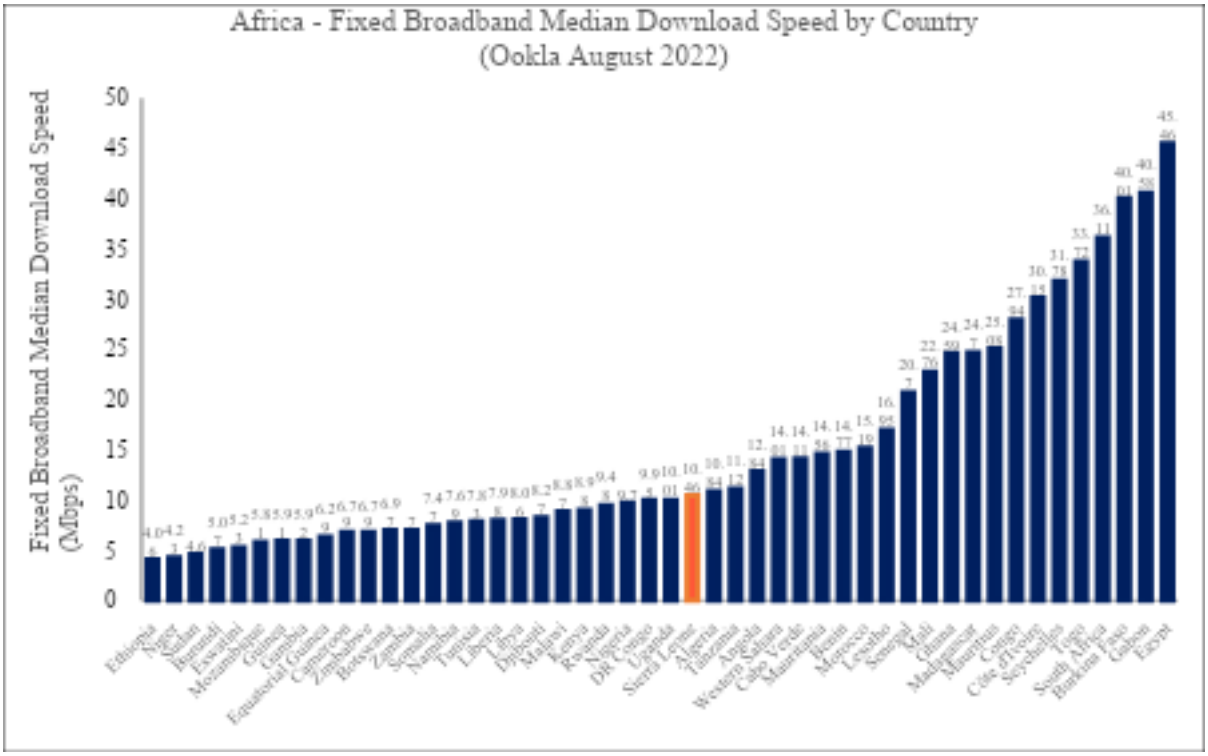


Figure 22. Africa - Fixed Broadband Median Download Speed by Country

Considering West Africa Region, Sierra Leone ranks 10th among 15 countries in terms of fixed broadband speeds. Sierra Leone performs better than Niger, Guinea, Gambia, Liberia, and Nigeria. To see Sierra Leone's Fixed Broadband Median Download Speed ranking among Sub-Saharan African countries, please refer to Appendix 3.

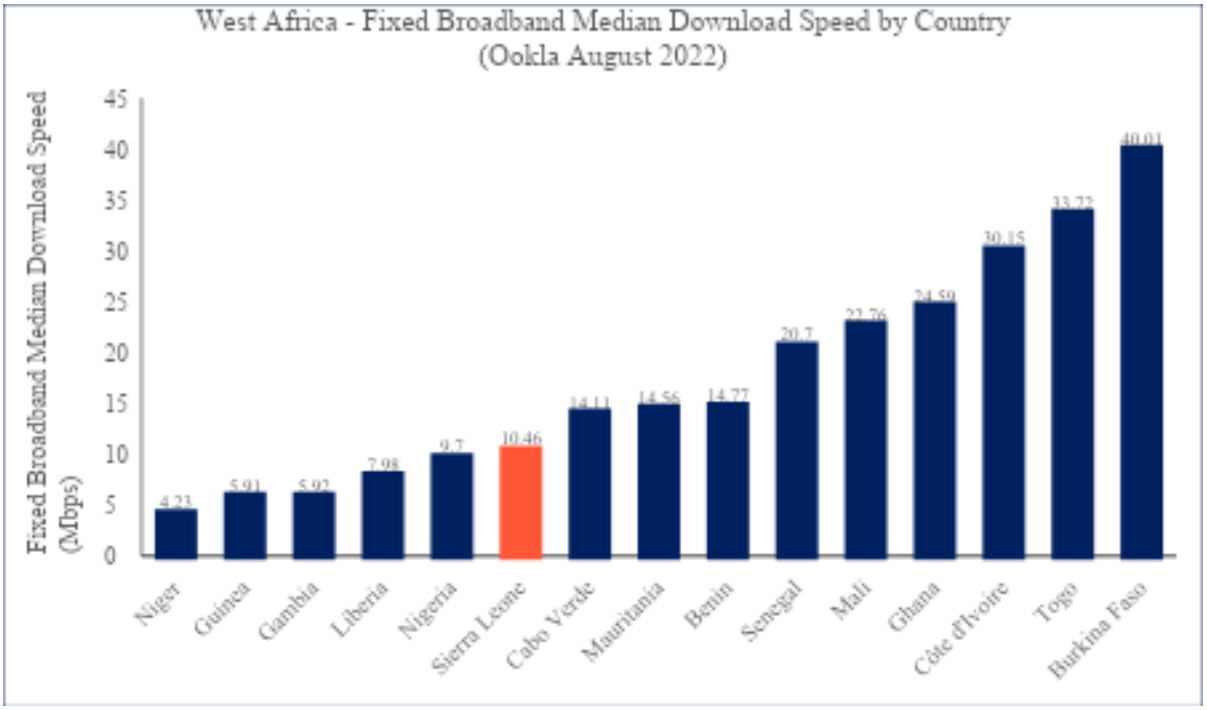


Figure 23. West Africa - Fixed Broadband Median Download Speed by Country

Considering both affordability and broadband speed metrics, it is possible to obtain the following scatterplot with median lines. Sierra Leone lies in the right lower quadrant (where the Internet speed is above the median and affordability is lower than the median) with the Democratic Republic of the Congo, Angola, Madagascar, and Burkina Faso.

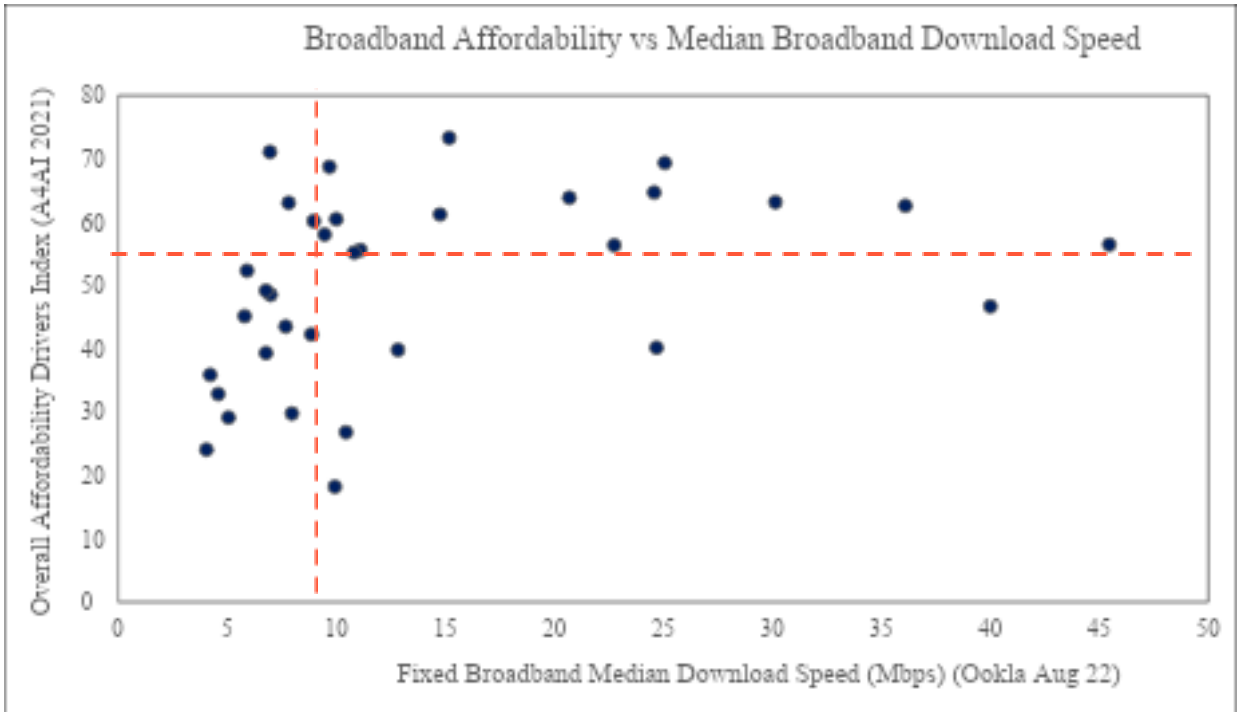


Figure 24. Broadband Affordability vs Median Broadband Download Speed

In terms of mobile access, Sierra Leone performs on average compared to African countries. The GSMA Mobile Connectivity Index is a tool that assesses how well nations perform in relation to the four main factors that influence the uptake of mobile Internet use: infrastructure, cost, consumer preparedness, and content & services. The index score is obtained by weighing many factors including network coverage, gender equality, local relevance, taxation, spectrum, and mobile network performance.[14] Considering the Mobile Connectivity Indexes, Sierra Leone ranks 26th among 48 countries represented in Africa.

[14] GSMA Intelligence. (2021). Mobile Connectivity Index 2021.

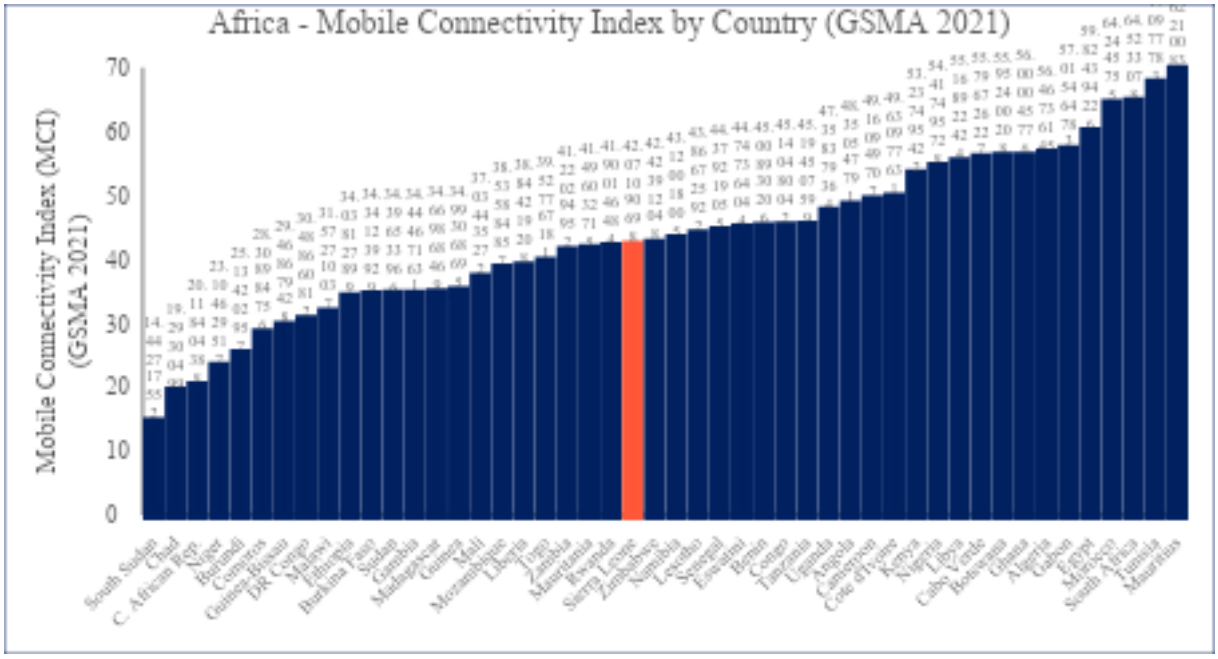


Figure 25. Africa - Mobile Connectivity Index by Country (GSMA 2021)

In West Africa region, Sierra Leone ranks 7th among 16 West African countries, being greater than the median. To see Sierra Leone's Mobile Connectivity Index ranking among Sub-Saharan African countries, please refer to Appendix 3.

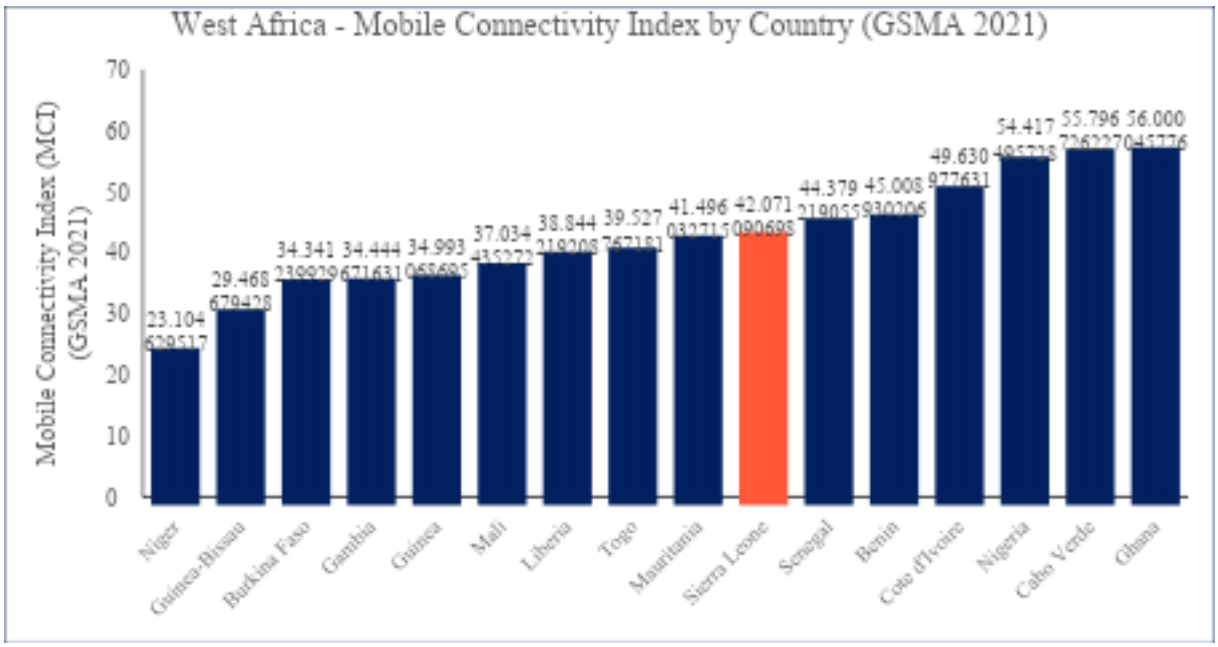


Figure 26. West Africa - Mobile Connectivity Index by Country (GSMA 2021)

In Addition to GSMA's Mobile Connectivity Index, the World Bank's data on Mobile Cellular Subscriptions was used for this analysis. The index includes the number of active prepaid

accounts and postpaid subscriptions. It does not include subscriptions to data cards or USB modems, public mobile data services, private trunked mobile radio, telepoint, radio paging and telemetry services.[15] Among African countries, Sierra Leone ranks 29th among a sample of 52 countries.

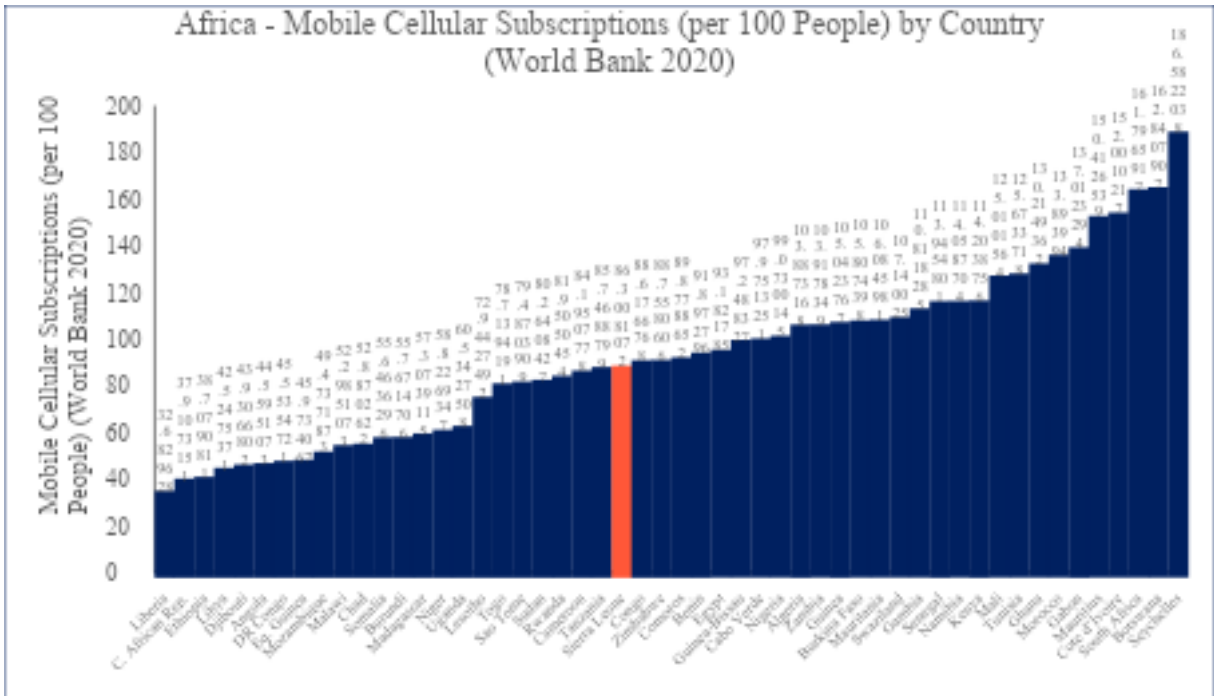


Figure 27. Africa - Mobile Cellular Subscriptions (per 100 People) by Country (World Bank 2020)

In West Africa, Sierra Leone ranks 13th among 16 countries. To see Sierra Leone's Mobile Cellular Subscriptions ranking among Sub-Saharan African countries, please refer to Appendix 3.

[15] The World Bank. (2020). Mobile cellular subscriptions.

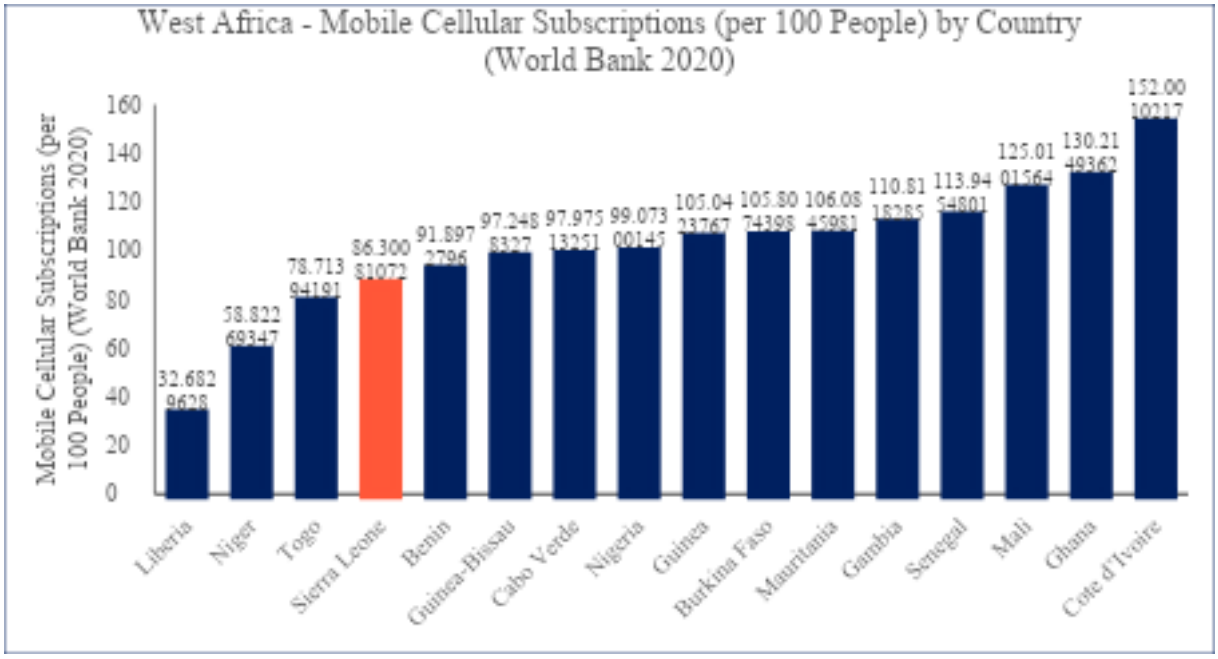


Figure 28. West Africa - Mobile Cellular Subscriptions (per 100 People) by Country (World Bank 2020)

In conclusion, Sierra Leone performs relatively well regionally and as compared to the African median in terms of fixed broadband Internet download speed. The biggest challenge and hence improvement possibility is affordability, where Sierra Leone is one of the least progressed countries. This means that an opportunity exists for Sierra Leone to work on demand side factors influencing affordability to ensure broadest possible uptake of broadband technologies among its population.

3. Principles, Vision, Milestones, and Targets

3.1. Vision and Mission

3.1.1. Vision: Long-Term Targets

To provide universal access for every citizen to broadband infrastructure thereby creating digital empowerment through online services and applications with enhanced quality of service at reasonable rates to promote a digitized and knowledgeable society.

To maintain a sustainable knowledge-based society powered by broadband access reaching 50% of urban areas by 2027 and 95% by 2030 and improving rural connectivity to 80% by 2027 with decentralized broadband infrastructure.

3.1.2. Mission: The Main Purpose of the Broadband Policy and Penetration

To provide broadband infrastructure by implementing future-proof, environmentally friendly, open access redundant networks and technologies, and promote inter-relationships among stakeholders to reduce costs of shared broadband infrastructure and services.

3.2. Supply Side Targets

The following are the supply-side targets in the implementation of the Sierra Leone National Broadband Strategy (2023-2028):

- Policy formulation and implementation by MoCTI and MoF to mandate and support the full implementation of the National Broadband Strategy (2023-2028).
- NatCA to implement favourable license conditions to support the deployment of broadband infrastructure across the country and ensure fair competition among service providers. To work with National Revenue Authority (NRA) and ensure minimum levies on equipment importation by service providers. To encourage service providers to deploy to remote areas at reduced regulatory charges.
- Provision of redundant broadband infrastructure by key stakeholders including Cable Landing Station (Zoodlabs), Metropolitan Fiber Infrastructure Companies (Base, Onlime, Metro), the National Terrestrial Fiber Backbone Company (Leonecom), MNOs and ISPs.
- Leonecom, MNOs, ISPs, UADF to increase broadband coverage to major towns and cities.
- MoCTI, and Leonecom to increase coverage and connection to public institutions, including schools, hospitals, and Government MDAs.
- MNOs and ISPs to provide CSR through affordable broadband access to such institutions and other communities.
- Major broadband stakeholders e.g., CLS, Metros, NTFB, MNOs, ISPs, UADF, to ensure open access to infrastructure for all broadband operators and consumers.

3.3. Demand Side Targets

The following are the demand-side targets in the implementation of the Sierra Leone National Broadband Strategy (2023-2028):

- MoCTI to enable policy formulation to support affordability of ICT devices including smartphones, PCs, and tablets.
- NatCA to ensure affordable tariffs for broadband operators by implementing recommendations of cost studies of tariffs for ICT services.

- MoCTI and NatCA in collaboration with major broadband companies, NGOs and private institutions to promote digital literacy across all levels of society, schools, institutions and communities.
- Major broadband companies and NatCA to provide training centres for school students and community members to improve on their level of digital literacy.
- MoCTI to ensure policy formulation to support the Ministry of Technical and Higher Education (MTHE) in its creation of local content development in local languages to extend digital literacy to indigenous people.
- MoCTI , MBSSE, MTHE, DSTI and ICT stakeholders to extend e-learning in schools, communities, and other institutions across the country.
- NatCA and other stakeholders to promote consumer awareness, safety and customer complaints redressing through individual and collective helpdesks.

4. The Strategy and Recommendations

4.1. Infrastructure Recommendations

To ensure the success of any National Broadband Plan, both the infrastructure (supply side) and factors related to awareness, affordability, and uptake (demand side) need to be addressed. It has become clear that the lack of telecommunications infrastructure especially outside major urban areas is a challenge to broadband universal access in Sierra Leone, as is the issue of affordability. Thus, numerous recommendations have been made to facilitate progress both on the supply and the demand side.

S/N	FOCUS AREAS	RECOMMENDED INITIATIVES	TARGET DATE	RESPONSIBLE	IMPACT
CRITICAL NATIONAL INFRASTRUCTURE PROTECTION					
I/1	**National Broadband Protection Guidelines**	Preparation of national readiness guidelines on the protection and resilience of broadband infrastructure.	30.12.2024	MoCTI, NC3	Improve broadband infrastructure protection and monitoring.
RURAL AREA INFRASTRUCTURE DEVELOPMENT					
I/2	**Broadband Infrastructure for Agricultural Areas**	NatCA/UADF shall perform a detailed analysis of the needs of all farms and agricultural areas that are in locations with limited network coverage. The analysis should consider the level of development and agricultural production of each agricultural area as assessed by MAFS. The findings of this evaluation should be used to prepare a request for proposal (RFP) for the provision of coverage for such an agricultural area, and bidders should be permitted to	30.06.2025	NatCA, MAFS, MLCA, UADF	Provision of broadband coverage for agricultural areas. Increased efficiency and sustainability, because of increased use of appropriate

		provide the most appropriate technological solution for each location. The developed infrastructure must be shared with other operators on nondiscriminatory, fair, and transparent terms and conditions. For farms located in commercial viable areas, the government should encourage the private sector to expand their network in those areas.			technological solutions, such as IoT.
I/3	**Provision of Broadband Services in Rural Areas**	Funding for the provision of broadband solutions in rural areas will come from the UADF and, if necessary, government grants. The developed infrastructure must be shared with other operators on nondiscriminatory, fair, and transparent terms and conditions. Partnerships with a variety of stakeholders should be formed to launch initiatives focused on connecting the unconnected and under-connected, such as by leveraging High Altitude Platform Stations (HAPS).	30.06.2028	UADF, MLGCA, MoCTI, LEONECOM,	Facilitation of affordable, fast, and flexible backhaul of broadband services. Creation of a key link to emergency communications in the aftermath of natural disasters. Increased internet access, mobile connectivity, individuals using the internet, and broadband coverage.
NATIONAL COMMUNICATION BACKBONE					

I/4	**Implement Transparent Open Access Model**	Open access with regards to infrastructure refers to the sharing of passive physical infrastructure, such as telecommunications towers, to users other than the owners for a premium. Implement and enforce Open Access model and incorporate pricing regulations on current and future fiber deployments. Where appropriate, the needed legal and regulatory framework has to be put in place to facilitate the implementation of infrastructure sharing.	**30.09.2024**	Major broadband stakeholders (e.g., CLS, METROs, Leonecom, MNOs, ISPs, UADF, NatCA)	Boosting competition. Reducing prices. Increasing affordability. Elimination of duplicate investments and overlaps. Attainment of the "Dig Once" Policy.
I/5	**Open Access Consortium**	The formation of an Open Access consortium will ensure that all stakeholders are sufficiently involved to guarantee that the objectives of the Open Access model are realized. To facilitate the creation of such a consortium, incentives such as Right of Way (RoW) waivers, fiber, and related electronics duty exemptions for new builds only, pioneer status, and tax waivers, may be offered.	**30.09.2024**	Telecom Operators, MNOs, ISPs, (Leonecom, Zoodlabs), NatCA, UADF, SLBC, MoCTI, MoE	Elimination of duplicate investments and overlaps. Attainment of the "Dig Once" Policy.
NATIONAL INTERGRATED INTERNET, INTERNET EXCHANGE INFRASTRUCTURE/LOCALISATION OF INTERNET TRAFFIC CLEARING HOUSE					
I/6	**Introduce New Internet Exchange Point**	According to the National Digital Transformation Roadmap (NDTR) draft, the Government of Sierra Leone is expected to create a second IXP by 2025.	**30.12.2024**	NatCA, Zoodlabs, ISPs, Leonecom	Traffic is exchanged locally. Reduce internet latency and cost.

		Introduce an additional IXP in a suitable location in the provincial regions. Localize 80% of Internet Traffic in Sierra Leone with the IXPs.			
I/7	**Operationalize and Improve Management of SLIX**	It is of greater importance to operationalize and improve the management of the Sierra Leone Internet Exchange Point (SLIX), which has been launched in Freetown in 2010.	**30.06.2025**	NatCA, Zoodlabs, LEONECOM, NC3	Traffic is exchanged locally. Reduce internet latency and cost. A more efficient operation and maintenance of an IXP could greatly improve the availability and cost-effectiveness of broadband services.
INTERNATIONAL SUBMARINE CABLE LANDING AND EXTENTION INCOUNTRY					
I/8	**Submarine Cable Landing Redundancy and Resilience**	Leverage excess fiber capacity along the transmission line of the West Africa Power Pool (WAPP) or install a second submarine cable to alleviate the lack of redundancy in submarine cable routing. Establish a Submarine Landing Station Regulation to address the challenges of cable redundancy and resilience. Each operator should have a plan for resiliency in the event of a fiber cut, including redundancy on competitor submarine cables.	**28.11.2025**	Zoodlabs, NatCA, MoCTI	Readiness at the national level for network disaster recovery.

		Create 100% Route redundancy for all Submarine cables landings in Sierra Leone. Create regulations to facilitate transparent Open Access sharing of submarine landing capacity in order to strengthen network resilience. Development of new landings for international submarine cables outside Freetown (e.g. Pujehun, Bonthe, Moyamba, Port Loko, Kambia, etc.) with funding support. Define the responsibilities of stakeholders for the shoreline protection of submarine cable routes. Government to work with global investors for establishment of additional landing cables.			
INTEGRATED NATIONAL SATELLITE INFRASTRUCTURE DEPLOYMENT					
I/9	**Provision of Service Using Satellite**	Satellite connectivity in Sierra Leone is only suited for remote areas and not for the mass market. In regions where the deployment of a terrestrial network is unfeasible, this technology could give solutions for certain use cases, such as commercial connections, Community Access Centers, ranches, lodges, and game reserves, etc. Thus, satellite broadband access should be supported by appropriate subsidies awarded on a case-by-case basis where no other solution offering the same service level is (or is expected to be) available.	**28.02.2028**	NatCA, MoCTI, UADF, PPP	Increase broadband penetration and ensure a rapid uniform rollout to rural and difficult to reach areas.

Table 5. Infrastructure Recommendations

4.2. Recommendations on Policy, Regulation and Taxation

For a successful deployment and adoption of broadband services, several policy and regulatory prescriptions must be developed. Such policies can ensure that the regulatory process becomes transparent, thereby encouraging existing and prospective service providers to invest. This setup is beneficial for all stakeholders: the government achieves its objectives, service providers enjoy a profitable business climate, and consumers can enjoy affordable and quality services.

S/N	FOCUS AREAS	RECOMMENDED INITIATIVES	TARGET DATE	RESPONSIBLE	IMPACT
RIGHT OF WAY					
P/1	**Implement National Standardized RoW Fees**	Implement RoW fees per linear meter in all 16 districts and develop a framework to encourage operators to collaborate and stay within the agreed RoW fees. Where appropriate, rural areas should have low standard RoW fees compared to urban areas or cities.	28.02.2025	MoCTI, MWR, MLHCP, MoE, NatCA, LEONECOM, MWPA, SALWACO, MLGCA, SLRA	Implementing national standardized RoW fees, will result in unimpeded fiber roll out in all districts.
P/2	**Centralized Policies**	Develop centralized policies to ensure smooth access to operators when it comes to right of way issues. Ensure coordination among the key stakeholders (MoW, SLRA, MoCTI) in granting access to RoW	28.02.2025	MoCTI, MWPA, SLRA	Smooth access to operators
INFRASTRUCTURE SHARING					

P/3	**Infrastructure Sharing**	Implement an infrastructure-sharing framework enabling the private sector to share each other's networks or the networks of Zoodlabs and Leonecom. The rapid expansion of independent tower firms and the search for new markets in Africa presents mobile operators in Sierra Leone with additional opportunities to decrease the cost of fiber deployment by infrastructure sharing. The government should eliminate restrictions on commercial fiber deployment, encourage operators to share infrastructure and give incentives for infrastructure sharing to reduce the cost of access. To guarantee that telecommunication operators share resources effectively, the government should oversee the efficient implementation of resource sharing.	28.02.2028	MoCTI, NatCA, Zoodlabs, Leonecom, ISPs, MNOs, METROs, UADF	Promotion of the prudent use of resources. Acceleration of network coverage expansion by drastically reducing costs. The cost of construction works accounts for around 70% of the entire cost of fiber deployment. Increased affordability of broadband services.
P/4	**Sharing of Government ICT Infrastructure**	Government-owned ICT infrastructure should be shared with the private sector in recognition of limited resources.	28.02.2028	MoCTI, MWPA, NatCA, ISPs. UADF	Promotion of effective economic collaboration between public and private sector to facilitate economic development. Acceleration of network coverage

					expansion by drastically reducing costs. Increased affordability of broadband services.
DUCTS DEPLOYMENT AND DIG ONCE POLICY					
P/5	**Dig Once Policy and Duct Network Development Policy**	Adopt the “Dig Once“ policy across the country, which will enable the delivery of broadband services to unserved and underserved areas. Develop a policy that would ensure the routine incorporation of ducts into road designs when doing road development and redevelopment work. Such a policy would entrench the “Dig Once” policy and guarantees that cables placed near roadways are better protected. Develop a strategy to urge State and Local Governments to construct/provide ducts along community roadways. Make use of extensions of the national grid and railroad (where available) as opportunities to put fiber in the ground.	28.02.2025	NatCA, MoCTI, MoE, MLGCA, MWR, MLHCP, MWPA, SLRA, Leonecom, Sierratel	Provision of broadband services to rural, un-served and underserved areas. Adoption of the "Dig Once" policy and improvement in the protection of cables placed along roadways. Increased affordability because of cost savings.
P/6	**Broadband Infrastructure as a Public Utility**	Classify broadband infrastructure as a public utility just like transport, energy, and water. The construction of all public buildings should have broadband facility as a requirement for building permit	30.09.2024	MLHCP, MoCTI MLHCP	Avert duplication. Broadband available to Public.

TOWER DEPLOYEMENT POLICIES					
P/7	**One-stop Shops**	Each District is required to establish a One-Stop Shop to expedite the site approval or permitting process and address any related challenges. With consultation, decentralize approval and permitting Authority to District officers of the relevant stakeholders.	28.02.2025	MoCTI, NatCA, SLRA, Local Councils, Local Government	Rapid deployment of broadband services.
LICENSING					
P/8	**Implementation of the National Communications Authority Act**	To enable technology neutrality, the current licensing structure must be updated. Thus, it is of key importance to implement the National Communications Authority Act (2022). Technology-neutral licenses may be especially valuable for expanding services to underserved communities, as operators will be able to employ any suitable and standardized last-mile technology.	28.02.2028 (ongoing)	MoCTI, NatCA, MLGCA, UADF	Enablement of technology neutrality. Shorter processes on new market entrants. Expanding services to underserved communities.
LOCAL CONTENT POLICY					
P/9	**Local Device Assembly and Manufacturing Policy**	Give pioneer status to reliable manufacturers, to stimulate the local assembly and production of devices. When feasible, promote local manufacturing and assembly of broadband enabled devices/equipment locally in the telecoms industry.	8.02.2028	MoCTI, NatCA, MWPA, MELSS, MoPED, MECC, EPA, MOF	Increased affordability of devices. Decreased capital flight.

		Improve e-waste management.			Creation of new jobs and capacity building. Assurance of good quality devices or components.
GOVERNANCE & MONITORING POLICY					
P/10	**Policy on Pre-Project Feasibility and Assessment Studies**	Establish a policy framework to perform comprehensive feasibility assessments for every planned broadband intervention.	28.02.2025	MoCTI, NatCA, UADF, SLRA, MWPA, LEONECOM	Improvement in coordination. Elimination of duplication. Ensure the sustainability of BB efforts.
P/11	**Introduce Broadband District Ranking Report**	Introduction of district rankings based on objective and measurable digitalization/broadband penetration indexes, as to encourage districts to improve on ICT, broadband coverage, and digital literacy. The reports are to be released each year. These indexes consist of: ● Percentage (%) of connected towers to fiber ● % of education institutions connected to fiber ● % of hospitals connected to fiber ● Low tariff on RoW	28.02.2025	MoCTI, MLGCA, MHS, MLHCP, MBSSE, NatCA, UADF	Encouraging districts to enhance their ICT and broadband coverage. Improvement of digital literacy levels.

		• Support for ICT innovation and entrepreneurship • Support for ICT local content.			
P/12	**Ensure Implementation of the NDDP and the NDDS**	MDAs cite their mandate, which grants them the authority to assume responsibility for their actions, as the reason to why they do not feel required to consult the MoCTI before making IT-related decisions. Thus, it is important to ensure the implementation of the NDDP and NDDS which creates a link between the MDAs and the MoCTI to ensure Whole-of-Government (WoG) objectives are harmonized and achieved.	28.02.2028	MoCTI, MDAs	Strengthened collaboration between MoCTI and MDAs. Harmonization of objectives and more efficiency in achieving them.
COMPETITION REGULATION AND ACT					
P/13	**Fostering Fair and Healthy Market Competition**	Policymakers and regulators play a crucial role in promoting healthy and fair market competition as well as affordable and reliable broadband internet access. As the policy climate has a great impact on market conditions and broadband development, the government must ensure that the regulator implements fair market regulations and agile competition policies. The regulatory agency NatCA plays a crucial role in promoting healthy and fair market competition. Develop policy and regulation to foster fair market competition among broadband service providers.	28.02.2025	NatCA	Fair and healthy market competition. Increased affordability of broadband services.

P/14	**Development of a Competition Act and Regulations**	The defacto monopoly and ineffective operation of the international gateway by state-owned SALCAB was one of the main hurdles to inexpensive broadband internet in Sierra Leone. The management of the CLS by Zoodlabs (through a PPP) has improved the situation a bit. Consequently, the development of a Competition Act is of the utmost importance to promote or preserve market competitiveness by controlling anticompetitive business behavior. Currently NatCA serves as the Competition Commission and tries to ensure fair play when awarding licenses. Expand on NatCa's mandate to include ensuring fair competition among broadband service providers.	28.02.2028	MoJ, MoCTI, NatCA	Healthy competition. Prevention of anticompetitive corporate activities to ensure consumers' access to high-quality services and products at affordable prices.
TAXATION					
P/15	**Ensure fair and Transparent Taxation Regime**	High surcharges on incoming international traffic and import levies on network equipment and mobile devices, raise the cost to customers and reduce investments in underserved regions. Thus, to increase affordability, import duties, taxes and fees on phones, devices, and equipment should be fair. Fair taxation on mobile services may also contribute to digital connectivity expansion and economic sustainability in the medium term. If possible, tax exemptions and other tax incentives can be provided depending on the situation.	28.02.2028	MoCTI, MoF, NatCA, NRA	Increased affordability and investments in underserved or unserved areas. Improved digital connectivity expansion and economic sustainability.

		Implement fair taxation on eCommerce and electronic transactions.			
P/16	**Develop policy and regulation to attract SMEs into the Digital Economy.**	Digital inclusion of SMEs has the potential to bring more businesses into the formal sector. This in turn will increase tax revenue. Provide incentives for SME's employing technology in their operation and service delivery	31.06.2026	MoCTI, MoF, NatCA, NRA	Increased accessibility to SMEs Expand on digital inclusion

Table 6. Policy, Regulation and Taxation Recommendations

4.3. Recommendations on Spectrum

S/N	FOCUS AREAS	RECOMMENDED INITIATIVES	TARGET DATE	RESPONSIBLE	IMPACT
S/1	**Re-farming and Repurposing of Spectrum**	A law and set of regulations that are more proactive, including provisions for spectrum re-farming and repurposing to suit new and emerging technologies, could aid in closing the connectivity gap in rural and underserved areas. Increasing the re-farming and repurposing of spectrum will make broadband available for high-speed data services. Digital Migration Roadmap to be fast-tracked in order to free more frequency for Broadband. Technology Neutrality license regime should be implemented	30.12.2025	NatCA, MoCTI	Broadband will become available for high-speed data services.

S/2	**Promote Efficient Use of Assigned Spectrum**	Maintain a strict “Use it or lose it” policy on spectrum and perform assessments quarterly. The “Use it or lose it” policy should be used in all circumstances when given spectrum is discovered to be underutilized or unused. The penalties should encompass: ● Forfeiture, which can either be partial, depending on uncovered areas and relevant to rollout responsibilities, or total if no rollout is conducted in accordance with the licensing obligations. ● The regulator may also impose a prohibition based on the NatCA ACT 2022 on spectrum applications following license revocation or extra penalties for noncompliance with licensing obligations.	31.12.2024	NatCA	Increased availability of spectrum. More efficient use of available spectrum. Improve digital penetration
S/3	**Active and Passive Infrastructure Sharing Framework Using Assigned Spectrum**	Implement Active Infrastructure Sharing regulatory framework while ensuring infrastructure deployment is neither delayed nor obstructed. Infrastructure that has been deployed, including active network components such as radios, cables, and core network elements, can be shared.	31.12.2023	NatCA, MNOs, ISP	More efficient use of available spectrum.
S/4	**National Roaming Framework and Implementation**	Roaming refers to a customer's ability to automatically make and receive phone calls, transmit and receive data, and access other services when traveling outside of his service provider's geographic coverage area by accessing the network of another service provider. Currently, consumers of one provider cannot use the ICT services of another provider within the country. Consequently, establishing a regulatory framework that enables users to have easy access and	30.06.2025	NatCA, MNOs	Access to broadband services in all network-covered locations, irrespective of the service provider.

		coverage regardless of their network. This will provide access to ICT services for everyone.			
S/5	**Number Portability Framework and Implementation**	Implement number portability (Mid- to long-term requirement) as a recognized method for reducing obstacles to competition by allowing customers of current networks to switch to newly licensed operators without changing their telephone number. Operators must collaborate.	31.12.2026	NatCA, MNOs	Increased affordability of broadband services. New operators can compete easier with existing ones. Prevention of monopolies. Enhanced service quality.
S/6	**Transparent Assignment of Spectrum**	The spectrum assignment and auction procedures in Sierra Leone can be enhance further by adopting more open and international best practices/processes/methodologies and giving public announcements on available and assigned spectrum resources.	31.12.2024	NatCA	More transparent practices in spectrum assignment. Investors have more trust and thus contribute more funding for broadband initiatives.
S/7	**Spectrum Pricing**	Adopt a flexible and innovative spectrum pricing framework that reduces the cost of last-mile and backhaul spectrum, for instance by eliminating a fraction of spectrum fees in exchange for a pledge to rollout in specific unserved or underserved areas.	31.12.2024	NatCA, MoCTI	Freed up financial resources for the development of infrastructure.

		Additionally, spread out spectrum fee payments over the duration of the license. Where appropriate, international best practices spectrum pricing capacity building and training should be provided to regulatory team.			Improve digital penetration.
S/8	**Clearance of 700 MHz, 800 MHz and 1.8, 2.1, 2.3, 2.6 GHz Frequency Bands**	Clear all other Operators like TVs from the 700MHz (5G), 800 MHz (4G) and 1.8, 2.1, 2.3, and 2.6GHz bands to aid digital migration The Government should provide the necessary funds to suspend licensees on the 700MHz and 1.8, 2.1, 2.3, 2.6 GHz frequency bands to deploy telecom infrastructure.	28.12.2025	NatCA, MoCTI	Substantial government revenue. More spectrum available for mobile broadband services.

Table 7. Spectrum Recommendations

4.4. Demand Driver Recommendations

Several challenges have been identified to the low internet use rate and the uptake of broadband services. These include the high cost of services and devices, low digital literacy levels, a lack of local content, a large gender gap, and many more. The effective use of broadband services necessitates devices such as smartphones, tablets, or computers. However, most of the population cannot afford these devices. Considering the preceding situation, it is of crucial importance for the government to improve the access to broadband services and the necessary devices by taking numerous steps, such as making them more affordable.

S/N	FOCUS AREAS	RECOMMENDED INITIATIVES	TARGET DATE	RESPONSIBLE	IMPACT

AFFORDABILITY					
D/1	**Incentivize Low-cost Smart Devices**	Incentivize low-cost smart devices by reducing or eliminating tariffs and providing other incentives.	28.02.2028	MoCTI, NatCA, MOF, MTI, NRA, Consumer Protection Authority, MNOs	Increased ownership of smart devices. Increased digital literacy levels. Increased demand.
D/2	**Implement Student Device Affordability Schemes** **Device Financing Schemes** **The Use of Refurbished Smart Devices**	Develop a school support mechanism to ensure primary and secondary school students' access to smart devices and tertiary students' ownership of smart devices. Introduce flexible payment scheme for smart devices in schools for students.Develop financing schemes, which aim at improving connectivity. The UADF can be used.Encourage the refurbishing of smart devices and the use of them.	28.02.2028	MoCTI, MBSSE, MTHE, MNOs, MoE, EPA, MoF	Increased digital literacy levels. Increased ownership of smart devices. Increased demand for broadband services. Increased use of broadband. Development of a talent pool of graduates who are prepared for the fourth industrial revolution.
DIGITAL LITERACY AND AWARENESS/ DIGITAL SKILLS					

D/3	**Digital Literacy**	Promote digital literacy at all levels of society, including schools, institutions, and communities.	28.02.2028	MoCTI, UADF, NatCA, MTHE, MBSSE, MLGCA in collaboration with major broadband providers.	Increased digital literacy levels.
D/4	**Training Centers and Awareness Campaigns**	Provide training centers for school students and community members to improve their digital literacy. Create nationwide campaigns to increase the awareness on the need of digital literacy skills.	28.02.2028	MoCTI, UADF, NatCA, MTHE, MBSSE in collaboration with major broadband providers. MLGCA	Increased digital literacy levels and demand.
D/5	**Local Content**	Ensure policy formulation to support the development of digital content in local languages to increase digital literacy among indigenous people and empower them to make use of the opportunities offered by Broadband. Government to establish partnership with giant media platforms like youtube/tictok/facebook to enable content creation to realise income	28.02.2028	MTI, Local Content Agency, MoCTI, MBSSE, MTHE	Increased digital literacy levels amongst indigenous population. Growth in demand across non-English-literate population.
D/6	**Digital Literacy Program**	As part of the rollout of broadband, a mass-scale, systematic Digital Literacy program should be established and implemented.	28.02.2028	MBSSE, MTHE, MoCTI, MSW, MGCA, MELSS,	Increased digital literacy levels and demand.

		The delivery of the program should be through a public private partnership model as well as the support from NGOs.		MoYA, MLGCA, SMEs, NGOs	
D/7	**Support of the SLREN**	Support the Sierra Leone National Research and Education Network (SLREN).	28.02.2028	MBSSE, MTHE, MoCTI	Advancement of academic work. Enhancement of its members' competence in creating and administering e-learning systems for their constituents. Increased digital literacy levels and demand.
D/8	**E-Government Services**	Digitalization of government services and other services, such as e-agriculture, e-health, e-learning, etc., as to attract citizens to use broadband services more.	28.02.2028	MoCTI	Encouragement of broadband usage for e-Government services. Improved efficiency and transparency. Creation of job opportunities.

D/9	**PPPs for Digitals Skills**	In the absence of sufficient technical expertise in public institutions, public-private partnerships for the provision of digital skills training can be explored.	28.02.2028	MDAs, Private Organizations, SMEs	Improved digital skills.
GENDER GAPS					
D/10	**Addressing the Gender Gap**	Ensure and encourage equitable access to internet amongst women and men.	31.06.2025	MGCA, MoCTI, UADF, NatCA, ZOODLABS, LEONECOM, NCPD	Increased broadband penetration. Increased demand.
D/11	**Making Use of UADF to Bridge the Gap**	To reduce the widening gender gap in internet usage, at least fifty percent of the funding should be allocated to projects aimed at bringing women online. Clear targets should be established to ensure a timely disbursement of the funds. Ensure that UADF projects include women's perspectives and engage with mobile network operators and other stakeholders to make sure that internet services meet the needs of both women and men.	31.06.2025	UADF, NatCA MSW, MGCA, MoCTI, NCPD	Reduced gender gap in internet usage. Both women's and men's needs are met. Improved affordability as a result of increased use of broadband services.
PERSONS WITH DISABILITIES					
D/12	**Provision of Access to Broadband Services for PWD**	Ensure persons with disabilities (PWD) have access to broadband services. When doing so one can use already existing standards, work with other organizations, such as the World Wide Web Consortium (W3C), and include PWDs perspectives when initiating any projects.	28.02.2028	NatCA, MSW, MGCA, MoCTI, UADF, NCPD	Increased demand. Provision of broadband services to PWDs.

		Ensure and encourage that any services provided by other parties comply with the chosen standards.			
D/13	**Provision of Affordable Broadband Tariffs**	As people with disabilities tend to have lower incomes, ensure that they have access to affordable broadband tariffs. Clear targets should be established to ensure a timely disbursement of the funds. The Government could limit the price of the tariffs, cover some costs, or ensure that part of the cost if covered through different funds available, such as the UADF.	28.02.2028	UADF, NatCA, MSW, MoCTI, ZOODLABS, NCPD	Increased demand. Increased affordability. Provision of broadband services to PWDs.
D/14	**Making Use of the UADF to Ease Access to Broadband Services**	The UADF could allocate a fixed percentage of the funding towards projects aiming to improve the accessibility to broadband services and technology. Ensure that UADF projects include PWDs perspectives and engage with mobile network operators and other stakeholders to make sure that broadband services meet the needs.	28.02.2028	UADF, MoCTI, MSW, NCPD	Provision of broadband services to PWDs. Inclusion of PWDs perspective.
D/15	**"Next Generation" Text Relay Service**	Provide access to an approved "next generation" text relay service for calls to and from people with hearing or speech impairments, with special tariffs to reimburse disabled customers for the extra time these calls require. The next generation of text relay should be accessible via PCs, tablets, and smartphones in addition to textphones.	28.02.2028	NatCA, MSW, MoCTI, NCPA	Provision of broadband services to people with hearing or speech impairments.
D/16	**Provision of Free Access to Emergency SMS**	Provide free access to emergency SMS (mobile only) for those with hearing or speech impairments who need to contact emergency services.	28.02.2028	NatCA, MSW, MoCTI, NCPD	Improved accessibility to broadband services in emergency situations for PWDs.

		Ensure that this group registers for this service via text message beforehand so that it can be utilized quickly, once needed.			
D/17	**Prioritization of Repairs of Faulty Landline and Broadband Devices**	Ensure that people with health conditions or impairments receive prioritization of repairs of faulty landline and broadband devices and equipment. The fee for the repair cannot exceed the provider's standard fee for a fault repair.	28.02.2028	NatCA, MSW, MoCTI	Assurance of continuous access to broadband services.
D/18	**Provision of Communications in a Particular Format**	If a customer with a disability requests a particular format, such as large print or Braille, communications pertaining to communications services must be provided in a format that is deemed to be reasonably acceptable.	28.02.2028	NatCA, MSW, MoCTI	Provision of broadband services to PWDs. Improved accessibility for PWDs to broadband services.
D/19	**Development of Technologies that Improve Accessibility for PWDs**	Encourage the development and production of technologies that improve the accessibility for PWDs.	28.02.2028	NatCA, MSW, MoCTI	Improved accessibility for PWDs to broadband services.
CONNECTIVITY					
D/20	**Improving Connectivity for Educational Institutions**	The lack of devices, internet connectivity, affordable pricing for services, and digital content presents the greatest barrier to the integration of digital skills into school and university curriculums. Through a pairing of regulatory reforms and investment programs developed in collaboration with the private sector, government policy can foster advancement in each of these fields. Given the cost burden in Sierra Leone, a financing strategy involving the utilization	31.12.2028	MoCTI, MBSSE, MTHE, Private Organizations, UADF, Leonecom, MNOs	Enough devices. Improved internet connectivity. Affordable services and digital content.

		of the UADF to facilitate access to schools and universities should be prioritized. The government could consider providing free broadband services to educational institutions, especially in rural areas.			Increased digital skills and digital literacy levels.
D/21	**Increasing % of Individuals Using the Internet**	Increasing the percentage of individuals using the internet through: ● Provision of computers with internet connectivity and access at post offices, public libraries, schools, and health centers. ● Provision of internet connectivity and access should be subsidized through the UADF in public libraries and schools. ● The provision of internet connectivity and access to libraries, schools, and healthcare institutions should be provided at affordable rates.	28.02.2028	MoCTI, UADF, NatCA	Increased % of individuals using the internet. Improved affordability. Increased digital literacy levels. Improved healthcare.

Table 8. Demand Driver Recommendations

4.5. Funding and Incentives Recommendations

When implementing National Broadband Plans, funding has proven to be a significant challenge. Thus, special care should be taken to ensure that sufficient funding is available for all endeavors. Moreover, to promote the growth of local production and assembly as well as to sustain innovation, the government of Sierra Leone should implement numerous incentives.

S/N	FOCUS AREAS	RECOMMENDED INITIATIVES	TARGET DATE	RESPONSIBLE	IMPACT
LOCAL PRODUCTION, ASSEMBLY, AND INNOVATION					

F/1	**Incentivize Local Production and Assembly of Devices and Equipment**	Encourage local production and assembly of telecommunication and ICT equipment and devices by reducing or eliminating import tariffs on materials, components, etc. Award pioneer status for the production and assembly of telecommunication and ICT equipment and devices to investors. Reduced or waived tariffs, taxes, and other fees on telecommunications and ICT devices, parts, and equipment. Ensure that the devices produced fit a wide range of users, including those with disabilities.	28.02.2026	MoCTI, MoF, DSTI, NatCA, MoYA, NRA	Increased affordability and demand. New job opportunities.
F/2	**Funding Innovation**	Establish funds to promote innovation and the creation of new technologies.	30.06.2025	MoCTI, NatCA, DSTI	New job opportunities. Increased demand for broadband.
UADF					
F/3	**Empower the Management of UADFs and Provision of Financial and Human Resources to the UADF**	Empower UADF, with human and financial resources. The government must establish specific guidelines based on the Communications Act 2022 for the calculation and collection of levies, as well as the use of the generated funds. To reassure contributors about the proper management and application of funds, a formal public reporting procedure would need to be established. Given the scale of the rural access gap and the	28.02.2026	UADF, MoF, Telecom Operators	Improved disbursement of UADF funds. Improved operation of the UADF. Improved provision of broadband services to

		limited financial and human resources, the government would need to identify further financing sources, encourage greater financial contributions from operators, and offer external technical assistance. Ensure that all fund financing, disbursements, and operations are transparent and made available to the public in an open data format. Where appropriate, the base of the contributors to the fund should be expanded to include other digital economy beneficiaries such as financial institutions, mobile money providers and over-the-top (OTT) players. This may call for the amendment of the law of the fund.			rural, un-served and underserved areas.

Table 9. Funding and Incentives Recommendations

4.6. Cybersecurity and Data Protection Recommendations

With the enactment of the Data Protection and Privacy Bill and the continued enforcement of the Cybersecurity and Crime Act , the government of Sierra Leone will continue to address numerous cybersecurity challenges and concerns. As the cybersecurity environment evolves rapidly, with new threats and risks emerging daily and numerous new technologies and digital services being introduced in such a short period of time, it is more important than ever to take counter measures.

S/N	FOCUS AREAS	RECOMMENDED INITIATIVES	TARGET DATE	RESPONSIBLE	IMPACT
C/1	**Implementation of the Cybersecurity and Crime Act and the enactment of**	The Government must ensure the implementation of the Cybersecurity and Crime Act and the ratification of Data Protection and Privacy Bill to guarantee the security of the upcoming deployment of broadband networks.	30.03.2025	MDAs, NC3, MoCTI, Law Officers Department,	Safe cybersecurity environment.

	the Data Protection and Privacy Bill	A minimum compliance standard to be enforced.		Parliament, NatCA, Service Providers	Guaranteed cybersecurity of upcoming deployment of broadband networks.
C/2	**Mechanism for Disclosure of Vulnerabilities**	Establish a mechanism for the frequent disclosure of vulnerabilities and sharing of information between the public and private sector.	15.11.2024	MoCTI, NCAC, NC3	Increased resilience against attacks and threats. Effective response to threats, attacks, and risks.
C/3	**Ensure that the NCIRT is Cooperating with Global, Regional and Sectoral CIRTS**	The National Cyber Incident Response Team (NCIRT) should communicate with regional and global Computer Incident Response Teams (CIRTs) to effectively respond to threats and attacks and share information about new threats and risks.	26.12.2024	NC3, NCAC, MoCTI, NatCA	Increased resilience against attacks and threats. Effective response to threats, attacks, and risks.
C/4	**Introduction of a CIRT for NatCA**	To be able to deal with any broadband related cybersecurity issues NatCA should introduce a CIRT.	15.10.2024	NatCA, NCIRT, NCAC, NC3, MoCTI	Improved management of cybersecurity broadband incidences.
C/5	**Classify Broadband Infrastructure as CII**	The Government needs to classify broadband infrastructure as Critical Information Infrastructure (CII).	24.04.2024	NatCA, NC3, NCIRT, NCAC, MoCTI	Improved protection of broadband infrastructure.

Table 10. Cybersecurity and Data Protection Recommendations

4.7. Environmental Sustainability Recommendations

When developing new and existing broadband infrastructure, one must always ensure that the provided solutions are sustainable and will secure the future of coming generations.

S/N	FOCUS AREAS	RECOMMENDED INITIATIVES	TARGET DATE	RESPONSIBLE	IMPACT
E/1	**Promote Use Renewable Energy Sources.**	Encourage the use of renewable energy sources, such as solar, geothermal and wind power. Provide incentives to large enterprises and SMEs for good sustainability practices or reaching previously determined targets.	28.02.2025	MECA, EPA, MoE	Reduced greenhouse gas (GHGs) emissions. Reduced pollution.
E/2	**Recycling of E-waste.**	Promote the recycling of e-waste through different incentives.	28.02.2025	MECA, EPA	Increased recycling of technological devices.

Table 11. Environmental Sustainability Recommendations

4.8. Financing Opportunities and Challenges

The scale and scope of the broadband interventions and initiatives to be undertaken requires investment by both the public and private sectors. The Universal Access Development Fund will be used for initiatives that are not commercially viable. Certain projects may demand the use of government funds, either directly or indirectly, to support the Universal Access Development Fund. In most circumstances, a direct government subsidy would entail a direct provision of public funding for certain initiatives. Broadband initiatives and projects will be required of operators in places where they are commercially viable.

4.8.1. Commercial Funding

Commercially viable broadband development might only be possible in high-income, heavily inhabited locations. Therefore, widespread adoption will undoubtedly require government support. Private carriers, especially telecommunications companies, might choose investing in urban centers over rural ones. For the construction of telecommunications infrastructure in areas where commercial carriers were not expected to enter the market, the government may provide municipal governments and commercial carriers with subsidies. In regions where installing broadband infrastructure is commercially viable, it should be done without subsidies. In this circumstance, the private operator acquires total control of the business, including all equity and, in some cases, some debt.

4.8.2. Public Funding

Even though commercial funding comes with its own benefits, sometimes public funds may be used for broadband investments. For instance, public funds are typically used to build and operate research and education networks as well as networks in rural or underdeveloped areas because doing so can save public organizations money compared to renting capacity from privately owned networks, it is not profitable enough for private investors, or alternatively, public authorities want to provide a connection service for free.

Sierra Leone may be able to use public funds in the areas that are not commercially viable. Authorities should carefully assess how to ensure the optimum allocation of subsidies without diminishing the incentives for private firms to invest when they are granted. Public funds should be unbiased in terms of technology to guarantee that businesses always opt for the most effective and economical method of delivering Internet access. Public finance sources frequently implement national blanket coverage strategies, typically focusing on giving funds to

open access business models, driven by policies pushing toward encouraging broadband rollouts. Additionally, the home nations of equipment suppliers frequently help through Export Credit Agencies and Development Finance Institutions, which do so by way of equity investments, debt, grants, and assistance with risk reduction.

In Japan, the government implemented policies to encourage private sector investment in broadband technology. These actions were not meant for any region. However, private carriers tended to prioritize investing in urban rather than rural areas. After urban penetration rates reached extremely prominent levels, the government gave localities incentives to build out telecommunications infrastructure in places where the entry of private carriers into the market was unlikely.

4.8.3. Public Private Partnership

Partnerships between the public and private sectors are known as PPPs. These funding options incorporate at least a substantial amount of private investment. Typically, the public actor's function in a partnership is to identify goals and oversee monitoring, with private partners handling implementation. Furthermore, at least a portion of the financial risk is taken on by private actors. PPP can be implemented by establishing a new legal company with shared ownership or on a purely contractual basis between public and private parties.

One means of unlocking capital and potentially lowering risk for Sierra Leone is to partner with a trusted entity to build a network. At some point, broadband investments can be very expensive, or sometimes the fixed costs tend to be troublesome. PPPs can nonetheless spread a project's costs across the partners. A PPP financing model requires investors (construction companies, banks, pension funds, infrastructure funds, etc.) and lenders (private sector project finance banks, etc.). Not only infrastructure building, but PPP’s can also be helpful in the financing of digital skills training and programs that address increasing digital literacy throughout the nation.

4.8.4. Localized Funding

To oversee a chosen area on a smaller scale, localized funding approaches are typically used. For instance, local governments can finance the installation of fiber in their area and lease it to service providers. Most of the time, the funding is at the lowest levels, just enough to pay for fiber cable and duct installation. The service is then provided to end customers by other operators that rent these infrastructures. In some locations, property developers may also lease ducts and fiber to operators after installing them during the servicing of plots.
Since some local authorities have established investment companies, they should be permitted to contemplate installing broadband access fiber in their council regions. If local governments

and real estate developers want to construct broadband infrastructure in their localized areas, the licensing framework should enable or permit public private partnerships funding.

4.8.5. Universal Access Development Fund (UADF)

The Telecommunications Act of 2006 established the UADF to advance universal service and access to information and telecommunication services for every person in Sierra Leone. It is recommended to use the Universal Access Development Fund as a means of financing the expansion of the communications industry. The Fund should be used to speed up the deployment of broadband services in places were doing so is not economically feasible. Consequently, UADF is effective at addressing the unserved and the underserved areas of the country.

4.9. Public Education and Awareness

The ICT sector is highly technical, dynamic, and rapidly evolving. To ensure that the public is aware of the different services available and products on offer and, more importantly, how to access them, communication is critical. For the public to make informed and rational decisions, it is therefore crucial that relevant information on products, services, and associated tariffs is disseminated in a coordinated and coherent way.

The National Communications Authority (NatCA), mandates that Service Providers publish information about their products, services, and associated charges, and the Authority is responsible for ensuring that they comply. Additionally, the regulatory authority and operators need to run public education awareness campaigns to inform and educate the public about the available broadband products and services.

The government through the MoCTI and NatCA shall facilitate an awareness campaign to highlight and educate citizens on the benefits of broadband access as a means of enhancing productivity and national competitiveness while supporting individual self-improvement in addressing everyday basic life challenges. The campaign will have a nationwide reach aiming to promote and enhance broadband adoption across the country and strengthen the Authority's position as a crucial broadband regulator. The proposed awareness campaign theme is **Broadband for Sustainable Development**. This theme, which will be propagated throughout the campaign will be consistent with the Authority's objective of bringing affordable and reliable broadband access everywhere to anyone at any time to promote socio-economic growth.

The campaign will also advance digital literacy through educational initiatives which will necessitates embedding programs at all levels in the formal education system, and as well targeting non-formal initiatives tailored to meet the needs of all groups of the population, such as the elderly, disabled, underprivileged, and underserved locations or the rural population; etc.; with particular emphasis on those at risk of exclusion. By educating users through

awareness campaigns under digital literacy programs, the government hopes to help in driving adoption to a broader user base while educating citizens at the same time. Such a program may even become more important as improvement in adoption rates will create the need to ensure that digital divide will not creep up in the country.

Moreover, the campaign will also focus on the adoption of mass and digital media usage to promote internet safety, media literacy and cyber hygiene, making the public more aware of digital opportunities and challenges. In doing so, it will focus on a wide range of highly topical issues including fake news, cyberbullying, privacy concerns, sexting, exposure to harmful or disturbing content, and online grooming.

The table below addresses the goal of enhancing the understanding and capabilities of the public in the use of broadband and ICTs, to simulate demand and promote more valuable deployment of ICT resources.

Sub-Focus Area (s)	Strategic Objectives	Expected Outcome	Targets	Key Performance Indicators	Lead Implementing Agency and Responsibility	Assumptions	Flagship Projects	Possible Funding Sources and Mechanisms
Public Education and Awareness	Enhanced the adoption of Broadband uptake through public awareness and education campaign programmes	Improved awareness on the availability of broadband technologies, services and applications, as well as the potential benefits, capacity building programs initiatives, support and so on. Improved demand for the usage of	By 2028, 75% of the Sierra Leone population will be made aware, on a continuous/periodic basis, of the availability of broadband technologies, services and applications, potential benefits, capacity building initiatives, support, and so on.	Survey results regarding impact of the awareness campaign % growth in population, business, gender, and youth across all ages utilizing broadband	MoCTI undertake public awareness raising campaign NatCA undertake public awareness raising campaigns as do other Governmental departments/ agencies Operators undertake	Cooperation of public and consumer groups	Public Awareness Campaign on Broadband	NatCA and MOF increase budget in broadband ecosystem Private Sector, Operators Banks, venture capital Universal Access Development Fund Corporate Social Responsibility

		broadband devices and encourage consumption of digital services and applications.			public awareness raising campaigns on their broadband products and services. Civil Society and Consumer Groups use grants from various sources to carryout broadband initiatives that are under their scope.			
Capacity Building and Awareness	Conduct survey on the status of the level of digital literacy. Develop and or enhance	Digital literate citizens to participate in a knowledgeable society and help	Coordination of capacity building initiatives between the public and private sectors	% of population that are digitally literate according to digital literacy index	MoCTI undertake public awareness raising campaigns. NatCA undertake	Cooperation of consumers, and consumer groups Cooperation of the	Development of ICT Curriculum, Technical Training and Capacity Building Programme	Private Sector, Banks, venture capital Tertiary Education Fund

	digital literacy skills of citizens across all ages, gender, and regions. Expand the digital literacy program for schools to include primary, junior and senior secondary schools, and tertiary institutions. Design and implement regional community ICT centers to include informal digital	raise awareness.	beginning 2023. Improved access to and awareness of digital literacy initiatives by 2026 Coordinated effort for capacity building for all tertiary institutions by 2024. 90% of capacity building for all schools by 2028 Design and implement regional community ICT training	(standardized measures) % of schools and teachers trained Number of implemented community ICT training centers. % of women and persons with disability that are digitally literate Number of programs delivered through the local languages. % of people engaged in digital	public awareness raising campaigns	Government, private sector, and other public bodies in the education sector	Digital Literacy Program Schools connectivity project Development of online Digital Literacy Portal	Universal Access Development Fund Universal Access and Service Fund

	literacy training. Delivery of the informal digital literacy programs in local languages		centers across the country by 2028. Increased digital literacy in women & persons with disability by 2025.	literacy capacity building programs annually				
e-Learning programs	Realign the curriculum for e-Learning - (digitization and instructional design). Develop the hosting infrastructur e and online	Incorporatio n of e-learning approaches in curriculum delivery at all levels	Realign the curriculum 100% by 2025	% of relevant courses and curriculum developed % growth of users of e-learners based on gender and age No. of sensitization	MoCTI and NatCA to Collaborate with the ministry of Ministry of Basic and Senior Secondary Education (MBSSE) MBSSE and MTHE	Interest and cooperation of MoCTI, NatCA, MBSSE and the Ministry of Education and other stakeholders Cooperation of the private	Broadband / ICT Curriculum Retool existing ICT graduates programm es Implement ICT technical	MoCTI, NatCA, Private Sector, MBSSE, MTHE Universities, Colleges, Research Institutions, technical and vocational training centers.

	content for e-Learning. Design targeted e-Learning programs for marginalized regions and groups Develop open shared national e Learning platforms. Review current curriculum to include digital literacy training.			programs held.	together with academic institutions in Sierra Leone coordinate the implementation of the strategy activities related to development of digital literacy, their progress and challenges. Universities and Training Institutions receive grants or use their CAPEX/OPEX budget to implement national broadband	sector, education sector, and other relevant public sector bodies	competency e-Learning & career development programs by industry. Develop incentives scheme for the private sector to have technical competency e-Learning programs & career development programs Awareness Campaign on Broadband	

					strategy related projects that fall within their purview such as contributing to the development of digital literacy.			

Table 12. Strategy for Awareness & Capacity Building Implementation

5. Socioeconomic Benefits Calculations

Broadband development in a country affects many different phenomena in society. The improvement of broadband yields changes in different activities across different sectors in the economy. Therefore, these broadband related investments have positive economic impacts, which in return create a cycle of benefits for the national development as it is also mentioned in the Broadband in the Context of National Development Chapter. Apart from its impact on national development, Broadband investments have essential socioeconomic impacts.

Broadband investments create more efficient job opportunities that are empowered with state-of-the-art technology. New job opportunities create a workforce movement towards more efficient jobs in the market. Vertical efficiency is therefore attained at a better level. Naturally, it follows that the industry mix changes to an up-to-date version. Moreover, this attraction in business increases the number of people using broadband, which yields efficiency in various sectors. This reduces the costs and risks in private sector investments, and hence becomes more profitable for companies. In return, private sector finances can support broadband investments for a whole cycle.

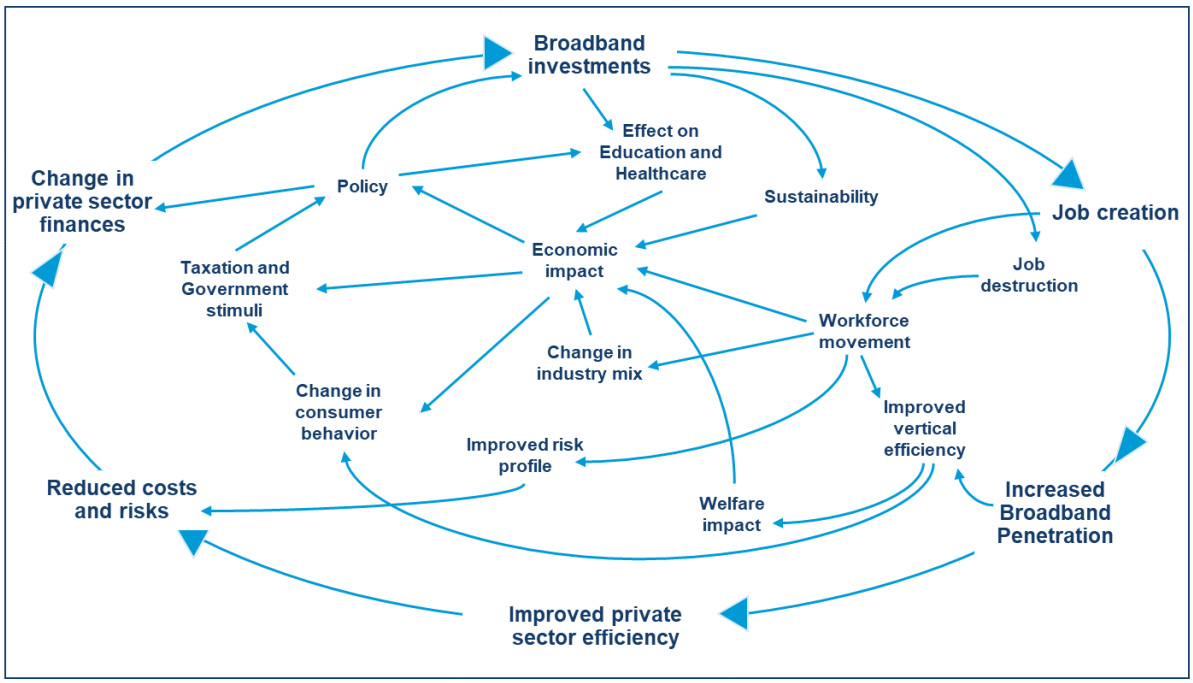


Figure 29. Scheme of interdependencies

Broadband also has impacts on sustainability, education, and healthcare. These impacts on the workforce and humanitarian areas, combined with the welfare of the citizens, provide positive economic impacts. Moreover, this changes consumer behavior, taxation, and policies so that both the supply and demand sides of broadband are suitable for further investments in broadband.

Considering the "S curve" defined in the Broadband in the Context of National Development Chapter, it is possible to estimate that for every 10 percent increase in broadband penetration will yield more than 1% increase in GDP. More precisely, according to a study conducted by ITU[16], the same level of increase in fixed broadband penetration is estimated to increase the GDP by around 2% for Least Developed Countries (LDC), Landlocked Developing Countries (LLDC) and Small Island Developing States (SIDS). Besides, a World Bank study[17] claims that for developing countries the same amount of increase yields around 1.38% in developing economies. Thus, every 10% increase in broadband penetration is expected to result in a GDP increase around 1.38% to 2% for Sierra Leone.

Broadband investments have a deep socioeconomic impact on society in many fields such as education, healthcare, and the job market. The investments create a cycle that brings welfare and essential benefits to the citizens of Sierra Leone.

[16] ITU (International Telecommunication Union). (n.d.). Economic impact of broadband in LDCs, LLDCs, and SIDS. Retrieved from https://www.itu.int/en/ITU-D/LDCs/Pages/Economic-impact-of-broadband-in-LDCs,-LLDCs-and-SIDS.aspx.

[17] Minges, M. (2016). Exploring the relationship between broadband and economic growth. World Development Report 2016: Digital Dividends, World Bank.

6. Implementation, Monitoring and Governance

6.1. Detailed Targets and Date

To track the progress of broadband implementation, it is prudent that targets be set and monitored at regular intervals to ascertain the progress being made. Table13 presents Sierra Leone's broadband goals for the year 2025.

Focus Areas	Strategic Objective	Action	Targets	Outcome/Remarks	Timeline
Building/Expanding broadband network Infrastructure.	Provision of broadband network infrastructure to the unserved areas	Implement additional Metro fiber cable infrastructure nationwide and incentivise roll-out of last-mile access infrastructure to homes, estates, and commercial premises.	90%	Nationwide broadband coverage to every region and local councils in Sierra Leone including less commercially viable areas.	2025
Connectivity	Interconnect government ministries department and agencies (MDAs), Universities, Colleges, Schools, Community access centers, and hospitals in Sierra Leone.	Upgrade and expand existing infrastructure to improve access to broadband network and services.	80%	Increased efficiency and fostered economic growth.	2025
Metro and Last Mile Sharing & Building Codes	Promote FTTX (x=building, curb, tower or home) network infrastructure sharing as last mile solution that adopts	FTTX (x=building, curb, tower or home) network infrastructure sharing as last mile solution	80%	Accelerate broadband penetration and encouraging market growth through service competition.	2025

	'dig-once' policy across the country				
Broadband devices	Ensure the Availability of affordable broadband devices	Make available affordable devices to access broadband network and services	80%	Improved affordability and increased the uptake of broadband devices and service penetration	2025
Establishment of Internet Exchange Points (IXPs)	Promote interconnectivity between internet service providers and localise internet traffic.	Establish an IXP presence at the fiber landing station and Localise internet traffic in Sierra Leone with the IXPs.	90%	Encourage expansion of the backbone link capacity between the IXPs, reduce cost and increased broadband access	2025
Promote local hosting of Sierra Leone websites, content application and innovation	Ensure creation and availability of relevant contents, e-applications and innovative services and hosting all Government Data Locally (Data Sovereignty)	Strengthen research and development, establish regional technology centers of excellence and encourage innovation and creation of local contents	100%	Promote local contents development, create jobs, improve digital literacy and protect sovereignty of the state.	2025
Wireless Broadband Infrastructure Upgrade and expansion	Upgrade existing earlier generation cell sites to 4G LTE and ensure all new cell sites to be 4G LTE compatible	Encouraging mobile network operators to improve on ICT and Broadband coverage.	70%	Spread 4G LTE to at least 70% of the population for high-speed broadband access	2025
Digital Literacy Training and Awareness	Campaign to raise awareness of Digital Literacy at national level.	Create a national awareness campaign and develop explicit Digital Literacy standards with coherent training.	100%	Highlight the value of digital literacy skills, increased usage and high demand.	2025
e-Government services.	Effective digitization of Government services to	Develop e-Government as well as other	80%	Promote broadband use for e-Government	2025

	harmonize processes and establish uniform framework.	services such as e-Agric, e-Health, e-Education, e-Commerce, etc. for greater public good as well as fostering economic growth		services increase efficiency, reduce leakages and promote transparency, and create job opportunities.	

Table 13. Detail Targets and Dates of Sierra Leone Broadband Goals

6.2. Responsibility Matrix (Institutional Responsibilities)

Broadband deployment necessitates a collaborative effort from various stakeholders, including governments, which play an important role in bridging the digital divide. Governments at various levels have a critical role to play in the drive to have pervasive broadband infrastructure across the country. It is recognized that some governments have taken steps to partner with telecommunications/ICT service providers to deploy necessary fiber and other electronic infrastructure for the benefit of their citizens. Governments have necessary roles to play in removing many bureaucratic difficulties and obstacles that hinder faster broadband rollout. The Government efforts are complemented by those of the private sector and civil society.

6.2.1. Roles of Stakeholders

In general, the national Broadband Strategy cuts across all Government ministries department and agencies (MDA), private sector and the public. The following are the roles and responsibilities of key stakeholders:

Stakeholder	Responsibility
Ministry of Communications, Technology and Innovation (MoCTI)	1. Putting in place approairte policy framework neccecsary to avert duplication of implementaion 2. Play an oversight role for the implementation of the policy 3. Create a platform where Broadband Infrastructure plans are shared across all actors. 4. Set up a Broadband Infrastructure implementation taskforce in view of the new dispensation 5. Collaboration with other stakeholders for right of way
National Communications Authority (NatCA)	1. Regulation 2. Provision of license to operators to promote Broadband access and penetration. 3. Prepare and issue detailed Broadband Infrastructure deployment guidelines with the aim of averting duplication

	4. Encourage and promote infrastructure sharing amongst licenses operators and to provide regulatory guidelines. 5. Continuously track the operators' territorial coverage and investment obligations of developing and expanding the necessary infrastructure and services 6. Ensure that broadband access programs are equitable to all parties and allow for quick and efficient dispute resolutions.
Ministry of Finance (MoF)	1. Budget and provide funds for the continuous implementation of the National Broadband Strategy 2. Ensure ICT facilitates national development, economy diversification, attracts foreign direct investment and contribute to the economy of the country 3. Facilitate an enabling environment for increased resource provisioning and prioritisation for the development and access to ICT infrastructure and services through the development and recurrent budgets.
Directorate of Science, Technology and Innovation country. (DSTI)	1. Support other broadband stakeholders in extending digital literacy and promoting content creation across the
National Digital Development Agency (NDiDA)	1. Implement the vision and mission of the National Broadband Strategy. 2. Coordinate with stakeholders in reporting broadband statistics and recommend areas of improvement.
The Cable Landing Station (Zoodlabs)	1. Ensure availability, affordability to broadband operators and redundancy to enable uninterrupted access.

Sierra Leone Internet Exchange (SLIX)	1. Ensure local hosting of Sierra Leonean content and website. 2. Promote the caching of local content to save on bandwidth and improve speed.
Metropolitan Fiber Infrastructure Companies (Base, Onlime, Metro)	1. Provide affordable open access broadband infrastructure in towns and cities across the country.
National Terrestrial Fiber Backbone Company (Leonecom)	1. Provide broadband access between towns and cities and terrestrial fiber connectivity in major and remote towns and Communities.
Mobile Network Operators regulator	1. Adhere to the new licensing regime as prescribed by the 2. Provide affordable broadband infrastructure and services to consumers. 3. Guarantee good quality of service in terms of network coverage and accurate billing of users. 4. Collaborate with all parties involved in the Broadband Infrastructure ecosystem to maximize consumer reach
Internet Service Providers	1. Provide affordable broadband infrastructure and services to consumers. 2. Support other stakeholders in the full implementation of the National Broadband Strategy
Universal Access Development Fund (UADF)	1. Extend Broadband penetration to remote and underserved areas. 2. Support the National Digital Development Agency (NDiDA) in its implementation of the National Broadband Strategy 3. Provide infrastructure access to broadband operators in remote and underserved locations.
Private Sector	1. Provide Communications infrastructure and services and its

of	associated investment in order to achieve digital inclusion. 2. Provide business expertise and know-how, and create the necessary employment to alleviate poverty and diversification . the economy. 3. Focus on delivering attractive products and services that meet customer needs and affordable services that are relevant to the low-income citizens.
Public	1. Assist with the cost recovery and development of a sustainable solution by paying for the services used. 2. To highlight areas without connectivity and also to point out weaknesses in implementation of the policy. 3. Assist both Government and Private Sector in averting vandalism of the deployed infrastructure.

Table 14. Roles and Responsibilities Matrix

6.3. Implementation, Monitoring and Evaluation, Critical success factors, KPI's Matrix

An implementation, monitoring and evaluation, critical success factors and KPI's matrix is developed and will be employed to ensure the proper execution of the National Broadband Plan by all stakeholders. The matrix identifies the critical success factors, key performance indicators, and benchmarks for achieving policy objectives. Each critical success factor is also assigned an entity that is accountable for ensuring that the target is met by the predefined target date or that the monitoring frequency is adhered to. The monitoring reports will be submitted to the responsible entity and reviewed to provide performance evaluations, as well as any necessary corrective actions, to ensure that policy objectives are being met and the plan remains on track. In addition, joint annual reviews will be conducted to facilitate a broader participation by all key stakeholders in discussions regarding future actions and developments.

Policy Objective	Critical Success Factors	Key Performance Indicators	Target	Monitoring Action	Monitoring Frequency	Entity Responsible	Target Date
Digital Infrastructure and Access	Provision of broadband services to rural, un-served and under-served areas	Infrastructure sub-index	42.39 infrastructure sub-index score	Reporting the calculated Infrastructure Sub-index of the country	Quarterly	MoCTI, UADF	31st of December 2028
	Providing accessible broadband connectivity	Access sub-index	53.49 access sub-index score	Reporting the calculated Access Sub-index of the country	Quarterly	MoCTI	31st of December 2028
	Providing fast fixed download speed	Fixed median download speed	30 MB fixed download speed	Reporting the recorded fixed median download speed	Quarterly	NatCA	31st of December 2026
	Providing an affordable broadband connectivity	Cost of 1 GB data (as % of GNI per capita)	Below 2% of GNI per capita	Reporting the cost of 1 GB data (as % of GNI per capita)	Semiannual	MoF	31st of December 2027

	Establish a Submarine Landing Station Regulation to address the challenges of cable redundancy and resilience	Number of operators have a plan for resiliency in the event of a fiber cut, including redundancy on competitor submarine cables	All operators having a plan for resiliency in the event of a fiber cut, including redundancy on competitor submarine cables	Reporting the progress of establishing a Submarine Landing Station Regulation and the number of operators that have a plan for resiliency in the event of a fiber cut	Monthly	NatCA	31st of December 2023
	Localize 80% of Internet Traffic in Sierra Leone with the IXPs	World Bank Assessment to precede implementation	31.12.24	Reporting the number of IXPs introduced	Semiannual	NatCA, Zoodlabs, ISP	31st of December 2023
	Provision of redundant broadband infrastructure	Number of redundant broadband infrastructure investments	100% Route redundancy for all Submarine cables landings in Sierra Leone	Reporting the number of redundant broadband infrastructure investments	Quarterly	MoCTI, MoF, Zoodlabs, Base, Onlime, Metro, Leonecom, MNOs,	31st of December 2024

						ISPs	
Access to affordable and high-quality broadband services	Affordable ICT devices including smartphones and tablets	Average ICT device prices in the country	Affordability of the cheapest smartphone to 33% of GNI per capita	Reporting the calculated average ICT device prices in the country	Semiannual	MoF, MoCTI	31st of December 2030
	Increased mobile connectivity	Mobile cellular subscription per 100 people	100 mobile cellular subscriptions per 100 people	Reporting the recorded mobile cellular subscription per 100 people	Quarterly	NatCA	1st of January 2024
	Increased broadband penetration	Broadband penetration rate	Median of West African countries	Reporting the broadband penetration rate in the country	Semiannual	NatCA, Leonecom, MNOs, ISPs, UADF	31st of December 2028
	Increased broadband coverage	Broadband coverage rate	30% broadband penetration across the population	Reporting the broadband coverage rate in the country	Semiannual	NatCA	31st of December 2023
	Increased percentage of individuals	Percentage of individuals	50% of individuals using the internet	Reporting the percentage of individuals	Semiannual	NatCA	31st of December 2028

	using the internet	using the internet		using the internet			
	Increased smartphone adoption	Percentage of individuals using smartphones	30% of individuals using smartphones	Reporting the percentage of individuals using smartphones	Semiannual	NatCA	31st of December 2025
	Establish a regulatory framework for number portability and assure implementation	Number of applications for number portability	Fully implemented number portability mechanism	Reporting the number of applications for number portability	Annually	MoCTI, NatCA, Operators	31st of December 2028
	Increased resource sharing	Number of reported projects of resource sharing	25% increase in resource sharing projects	Reporting the number of projects of resource sharing	Annually	NatCA, MoCTI	31st of December 2025
	Implementing an infrastructure-sharing framework enabling the private sector to share each	Average shared network of operators as percentage of their total network capacity.	25% increase in average shared network of operators as their total network capacity	Reporting the average shared network of operators as percentage of their total	Semiannual	MoCTI, NatCA, Zoodlabs, Leonecom, ISPs, MNOs, METROs	1st of January 2025

	other's networks			network capacity			
	Increased access to electricity	Percentage of population having access to electricity	50% of population having access to electricity	Reporting the percentage of the population having access to electricity	Semiannual	NatCA, MoCTI	31st of December 2028
	Increased use of hybrid energy sources	Percentage of hybrid energy sources used	25% use of hybrid energy sources	Reporting the percentage of hybrid energy sources used	Semiannual	NatCA, MoCTI	31st of December 2028
	Reduce High Taxes on Mobile Phone access and Services to increase mobile broadband connectivity	Percentage of mobile broadband connections in all connections	25% increase in the Percentage of mobile broadband connections in all connections	Percentage of mobile broadband connections in all connections	Semiannual	MoCTI, MoF, NatCA, NRA	1st of January 2025
	Increased secure internet servers (per 1 million people)	Number of secure internet servers (per 1 million people)	800 secure internet servers (per 1 million people)	Reporting the number of secure internet servers	Semiannual	NatCA, MoCTI	31st of December 2028
E-government Services	Enhanced coverage and connection to	Percentage of government offices with	25% increase in the percentage of	Reporting the percentage of government	Semiannual	MoCTI	1st of January 2025

	government offices	broadband access	government offices with broadband access	offices with broadband access			
	Enhanced coverage and connection to public institutions, including schools, hospitals, and MDAs	Percentage of public institutions, including schools, hospitals, and MDAs. with broadband access	25% increase in Percentage of public institutions, including schools, hospitals, and MDAs. with broadband access	Reporting the percentage of public institutions, including schools, hospitals, and MDAs. with broadband access	Quarterly	NatCA	1st of January 2025
	Promoting digital literacy across all levels of society; schools, institutions, and communities	The number of schools and public connection points with broadband access	25% increase in the number of schools and public connection points with broadband access	Reporting the number of schools and public connection points with broadband access	Quarterly	MoCTI, NatCA, MBSSE, MTHE	1st of January 2025
	Providing training centers for school students and community members to	Number of training centers provided	25% increase in the Number of training centers provided	Reporting the number of training centers provided	Semiannual	NatCA, Zoodlabs, Base, Onlime, Metro, Leonecom,	1st of January 2025

	improve their digital literacy					MNOs, ISPs, UADF	
Regulation and Standards	Enabling policy formulation to support affordability of ICT devices	Cost of 1 GB data (as % of GNI per capita)	Below 2% of GNI per capita	Reporting the cost of 1 GB data (as % of GNI per capita)	Quarterly	MoCTI, MoF	31st of December 2027
	Creation of local content development in local languages to extend digital literacy to indigenous people	Percentage of local content among all accessed content in a month	50% increase in the Percentage of local content among all accessed content in a month	Reporting the Percentage of local content among all accessed content in a month	Quarterly	MoCTI, MBSSE, MTHE	31st of December 2025
	Minimum levies on equipment importation on service providers for broadband deployments in rural areas	Rural broadband coverage rate	50% increase in the Rural broadband coverage rate	Reporting the broadband coverage rate	Semiannual	NatCA, NRA	31st of December 2028
	Providing favorable licensing	The number of service providers	25% increase in the number of service	Reporting the number of service	Annually	NatCA	31st of December 2028

	conditions to encourage service providers	operating in the country	providers operating in the country	providers operating in the country			
	Ensuring open access to infrastructure for all broadband operators and consumers	The number of broadband operators benefiting open access	100% open access granted to all Operators and Service Providers across the country	Reporting the number of broadband operators benefiting open access	Annually	CLS, Metros, NTFB, ISPs, UADF, MNOs, etc.	TBD
Gender Mainstreaming and E-accessibility	Decreased gender gap in access to the internet	Internet access rate difference between genders	50% decrease in Internet access rate difference between genders	Reporting the internet access rate difference between genders	Quarterly	NatCA, MGCA	31st of December 2026
	Extending e-learning in schools and other institutions	Number of schools and other institutions having e-learning	25% increase in the number of schools and other institutions having e-learning	Reporting the number of schools and other institutions having e-learning	Semiannual	MoCTI, MTHE, MBSSE, DSTI ICT stakeholders	31st of December 2027
Cybersecurity	Enhanced cooperation on cybersecurity	Number of cyber incidents and	25% increase in number of cyber incidents and cybercrimes reported	Reporting the number of cyber-attacks	Quarterly	NC3, CID, NatCA, MoCTI	31st of December 2024

	crimes, threats, and risks and data protection measures	cybercrimes reported		on broadband infrastructure			

Table 15. Implementation, Monitoring and Evaluation, Critical Success Factors and KPI's Matrix

6.3.1. Frequency of Measurement and Reporting

The Ministry Communication, Technology and Infrastructure will handle the M&E function. The M&E framework will guarantee successful delivery of the national broadband strategy by ensuring that the target outcomes are achieved through:

- Monthly updates from the implementing agencies
- Quarterly project implementation status
- Yearly program implementation status, and stakeholder forums
- Midterm review at the conclusion of Year 2.5 for each thematic area achievement
- End-of-term review in Year 5, where the whole national broadband strategy review will be undertaken and the plan for the next five-year cycle will be initiated.

An instituted performance management approach to broadband implementation will be implemented.

6.4. Risk and Mitigation Matrix

Risks	Likelihood	Impact	Mitigation
Low affordability slows the use of broadband services	High	High	• Work on all affordability drivers as outlined in the affordability report from A4AI (2021)
Insufficient funding in rural areas	High	High	• Full use of UADF in rural settings
Lack of enforcement of adequate legislation	High	High	• Ensure proper enforcement of combined legislation in telecommunications, competition, cybersecurity, and data protection & privacy. • Enhance international collaboration
High cost of implementation and duplication of infrastructure / High cost of civil engineering works	High	High	• Encourage network sharing and shared access policies on a non-discriminatory basis. Allow multiple operators to share passive network infrastructure. • Dig Once policy and encourage use of ducts
Slow adaptation and uptake of BB services	High	Medium	• Increase ICT literacy and awareness
No access to the power grid	Medium to High	High	• Prioritize power grid rollout. • Use of solar power and hybrid energy sources
Insufficient spectrum availability	Medium	High	• Expediting frequency re-farming exercise • Provide spectrum for 5G
Industry and market domination by Significant Market Players only and high	Medium	Medium to High	• Avoid significant dominance by ensuring Communication Commission/Authority/Committee enforcement of existing provisions in the Telecommunications Act

barriers to entry for smaller players			• Ensure the separation of accounts and make sure the elimination of cross-subsidy in the vertical market is implemented. • Involve Competition & Consumer Protection Commission/Authority/Ministry in ensuring fair competition and in assuring consumer protection against anti-competitive acts
Protection of investors rights when license obligations are fulfilled	Medium	Medium to High	• Ensure investors are protected when obligations are fulfilled and enable enforcement when not fulfilled. • Consult/issue public notices in advance of issuing licenses to ensure matters arising are comprehensively dealt with before issuance
Insufficient cross-border connectivity	Medium	Medium	• Leverage excess fiber capacity along the transmission line of the WAPP • Activate cross-border fiber connections and install remaining cross-border terrestrial fiber connections. • Install a second submarine cable (PPPs or private companies) to alleviate the lack of redundancy in submarine cable routing
Unreliability of Internet and DNS outages	Medium	Medium to Low	• Think more locally. • Proactive monitoring of DNS • Have redundancies built into Internet infrastructure

Table 16. Risk and Mitigation Matrix

Appendices

Appendix 1: Broadband Operators (MNOs + ISPs) Table

List of Operators and Internet Bandwidth (Mbps) per Operator (Assigned and Used Bandwidth)			
Customer Name	**Assigned Capacity**	**Average Utilization**	**Maximum Utilization**
MNOs			
Africell	10,000	7,219	10,609
Orange	18,000	10,813	16,599
Qcell	7,800	6,144	7,823
Sierratel	1,000	433	721
ISPs			
Access Africa Investment	50	10	37
Afcom	2,000	350	930
AI Networks	490	233	477
Broadconnect	250	5	140
CEE DEE Investment Co. Ltd	300	105	287
Diakem Investment SL Limited	250	71	188
Digitalle	250	7	24
K3 Telecom	2,100	1,628	2,130
Onlime	1,700	810	1,567
Michcom	1,100	607	1,096

PCS Holdings (IPTEL)	500	208	484
Sintell Solutions	600	177	490
SISCO	90	7	78
Fast-Net	250	16	68
Datum	123	65	123
Yotta	809	795	1188
Signature-Connect SL Ltd	266	22	64

Appendix 2: Summary/Key Points of the Relevant Policies

Sierra Leone's Medium-Term National Development Plan, 2019–2023

The Government of Sierra Leone's MTNDP 2019–2023 is founded on a strong legislative commitment to deliver development results that would improve the welfare of Sierra Leone's citizens. Four key national goals were identified – emerging from the consultative process and grounded in the developmental state model – one of which is "A competitive economy with a well-developed infrastructure". One of the key policy actions to achieve the above goal is to expand ICT coverage in Sierra Leone (increase current Internet broadband penetration and raise mobile penetration for the population).

Mobile broadband subscriptions per 100 inhabitants was 20.4 in 2019 and one of the key targets is to have 30% broadband penetration by 2023.

National Digital Development Policy (NDDP)

Digital technology is increasingly becoming an important factor reshaping how nations develop. The new economy has proven to be a major contributing factor to broadening access to high-quality goods and services, enhancing wealth creation, expanding job opportunities, achieving innovation, and encouraging socio-economic transformation. The digital era offers Sierra Leone a unique opportunity to accelerate its development. Embarking on digitally driven development is pivotal to tapping the country's potential. But if these changes are not supported by an enabling policy environment, they can increase the gaps in the country, subregion, region, and continent. In 2020, only 27% of the population had access to mobile Internet, and only 12% had access to broadband Internet. The Internet users represented less than a third of the population in 2021.

Some of the policy objectives detailed in this document are:

Digital Infrastructure and Access – To incentivize the delivery of broadband connectivity to both unserved and underserved areas, as well as disadvantaged populations.

Affordability – To promote initiatives that increase the affordability of broadband and technology to citizens, such as tax waivers and the review of interest rates on credits.

Regulation and Standards – To develop a framework for the rapid development and implementation of broadband connectivity.

E-government Services – To drive efficient resource utilization and planning and ensure all MDAs are provided with broadband Internet through e-government platforms.

Gender Mainstreaming and E-Accessibility – The empirical evidence shows that there is a digital gender gap in education and business, with fewer women studying Science, Technology, Engineering and Mathematics (STEM) and taking up ICT-related jobs. Moreover, female participation, leadership, and investment in the digital sector are still low. This could be for many reasons, including cultural norms and lack of access to broadband Internet in rural areas.

National Digital Development Strategy (NDDS)

This document which stemmed from the National Digital Development Policy includes two action points relating to broadband:

1. Develop a National Broadband Strategy and implement hard and soft tools to properly assign and monitor spectrum for more technology generations (e.g., 4G, 5G).
2. Extend broadband access to all government institutions nationwide, including local councils, schools, hospitals, and libraries within five years.

The Telecommunications Act, 2006

Being an Act to establish the National Telecommunications Commission (now NatCA) and to provide for the licensing and regulation of telecommunications operators and for the promotion of universal access to basic telecommunication services, fair competition for the benefit of investors in, and the users of telecommunication networks and services, to improve the national, regional and global integration of Sierra Leone in telecommunications and to provide for other related matters.

Part III, Functions of the Commission, Section 9 (1): The object for which the Commission is established is to license and regulate the activities of telecommunications operators so as to promote efficiency and fair competition, and the expansion of investment in the telecommunications sector; the protection of the users or consumers of telecommunications networks and services and the progressive development of the telecommunications industry and technology in Sierra Leone.

The National Communications Authority Act, 2022

Part III, Functions of the Authority, Section 11:

Subsection (1): The object for which the Authority is established is to regulate and monitor communications services.

Subsection (2): Notwithstanding the generality of Subsection (1), the Authority shall perform the following functions:

a) Progressively foster the development of information and telecommunications technology.
b) Grant licenses for the provision of ICT services and ensure compliance with the terms and conditions of the licenses.
c) Monitor and supervise the international communications gateways or appoint a third-party agent to monitor and manage all international communications gateways in Sierra Leone.
d) Regulate and monitor the ICT sector in Sierra Leone.
e) Establish the protection of data on computer files and their transmission and to safeguard the secrecy of electronic communications in collaboration with all operators and service providers.
f) Coordinate the protection of essential ICT active and passive infrastructure facilities in Sierra Leone.
g) Ensure fair competition amongst licensees, operators of communications networks and service providers of public communications.
h) Investigate and resolve disputes-
    i. Relating to harmful interference with radio frequency.
    ii. Amongst operators and end-users relating to rates, billings, services provided and to facilitate relief where needed amongst the users and service providers or operators;
    iii. With respect to facilities sharing, interconnection, co-location of passive and active infrastructure; and
    iv. In cases where further redress is lacking for disputing licensed operators or service providers of public communications service.
i) Establish quality of service indicators and reporting requirements for service providers and operators.
j) Establish the national numbering plan and assign numbers to operators of communications networks and service providers of public communications.
k) Support the implementation of the Universal Access Policy.
l) Ensure access, interconnection, and interoperability of public communication networks.
m) Maintain a register of operators.
n) Maintain a database of subscribers.
o) Ensure operators' obligations for the expansion of coverage of electronic communications services.
p) Issue general rules on the determination of applicable rates and charges.
q) Ensure the safety and quality of all electronic communications services and goods, and for that purpose, determine technical standards for electronic communications networks

and the connection of consumer equipment to electronic communications networks and health issues, such as the exposure to electromagnetic radiations.

r) Maintain standards for electronic communication equipment and establish procedures for type approval regime to grant approval for equipment and to ensure that type approval procedures are adhered to.
s) Develop and manage the national frequency allocation plan.
t) Protect the interests of consumers, purchasers, and other users of electronic communications services.
u) Establish training standards for communications operators and service providers and monitor the implementation of the training standards.
v) Ensure compliance with national and international communications standards and obligations laid down by international communications agreements and treaties to which Sierra Leone is a party, and issuing certificates of compliance in relation thereto; and
w) Undertaking all necessary measures to perform the functions of the Authority specified in the Act.

PART XIII - UNIFIED LICENCE, Section 69:

Subsection (1): The Authority shall issue a unified license to successful applicants operating any type of public electronic communications networks.

Subsection (2): The unified licensee providing the service shall utilize any type of equipment and product that meets the relevant standards set by international standardization bodies recognized by the Authority.

Subsection (3): A unified licensee shall have the right to operate all services detailed under individual and class licenses.

Subsection (4): A unified licensee shall in addition to the other services provide the following services.

a) Internet services
b) Internet telephony
c) Internet protocol television (IPTV)
d) Broadband services
e) Triple play; and
f) Quad play.

Telecommunications Licensing Regulations, 2020

Scope of Applications, Section 2 (1): These Regulations shall apply to the following processes:

a) Granting business licenses and authorizations for telecommunications, broadband communications, and ancillary services in Sierra Leone.
b) Enforcement of license conditions of telecommunications operators or broadband service providers; and
c) Use and operation of networks, systems, equipment or apparatus and the provision of telecommunications and broadband services.

Types of Licenses

Section 3: Subject to the Act and these Regulations, the Commission shall issue the following licenses to approved licensees: - (a) Individual License; (b) Class License; and (c) Unified License.

Draft Competition Regulations, 2021

Section 2: Scope and Objectives: These Regulations are made to provide a regulatory framework for the promotion of fair competition in the telecommunications sector, infrastructure sharing and protection against the misuse of market power or other anti-competitive practices, pursuant to Part VII of the Act and all matters related thereto.

Section 18: Infrastructure Sharing:

a) The Commission shall encourage infrastructure sharing and ensure that sharing between the operators of public telecommunication networks takes place under conditions of fairness, non-discrimination and equality of access.
b) The Commission, in consultation with other stakeholders, shall elaborate a procedure for handling relations between the operators of public networks in the matter of the conditions and the sharing of infrastructure, in particular lead-times and access to the information needed to put it into place.
c) The Commission shall encourage infrastructure sharing between the incumbent and new entrants concerning in particular towers, posts, ducts, cables and elevated points to be made available mutually on a commercial basis, where there is limited access to such resources through natural or structural obstacles.
d) The Commission shall encourage access to alternative infrastructure on the basis of commercial negotiations, in order to foster and entrench competition as rapidly as possible and shall ensure that such access is provided under conditions of fairness, non-discrimination and equality of access.

Appendix 3: Remaining Figures from Global and African Benchmarks

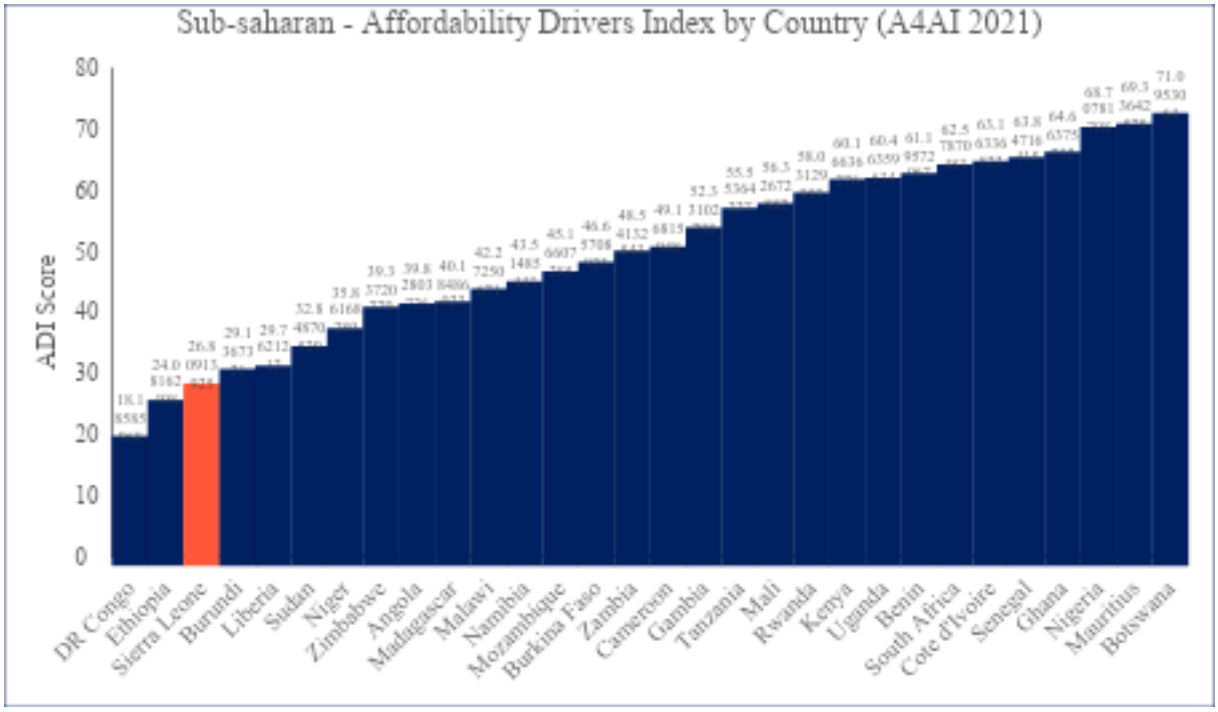


Figure 30. Sub-Saharan - Affordability Drivers Index by Country

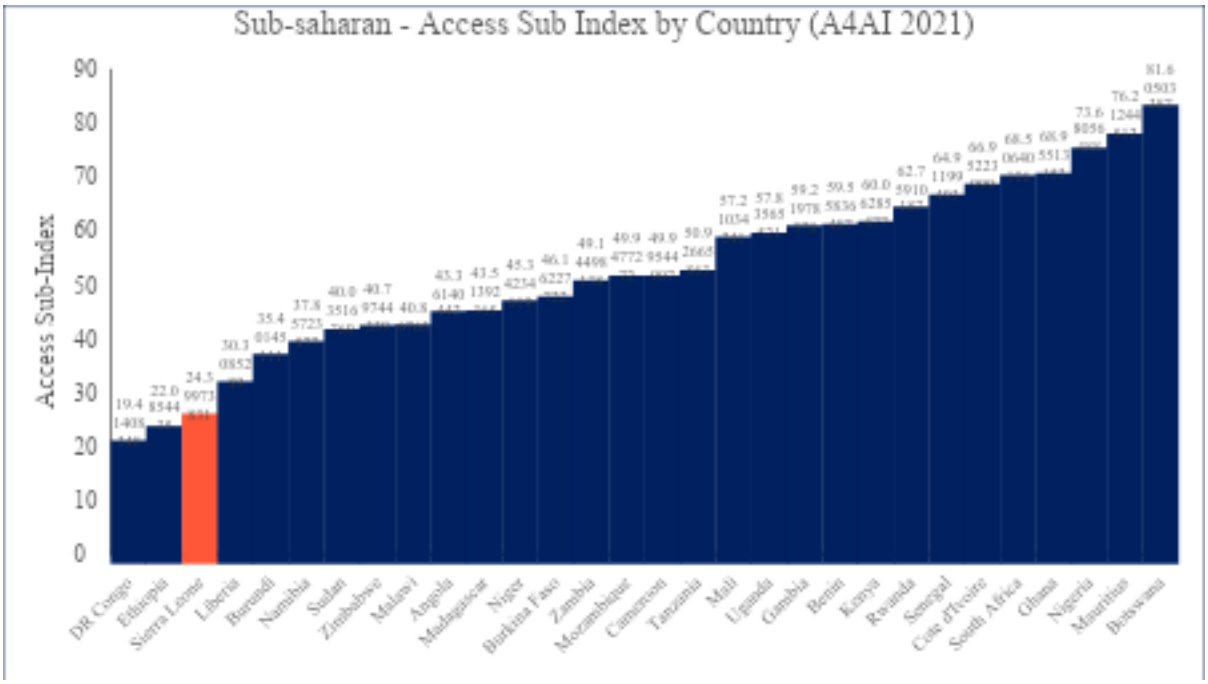


Figure 31. Sub-Saharan - Access Sub Index by Country

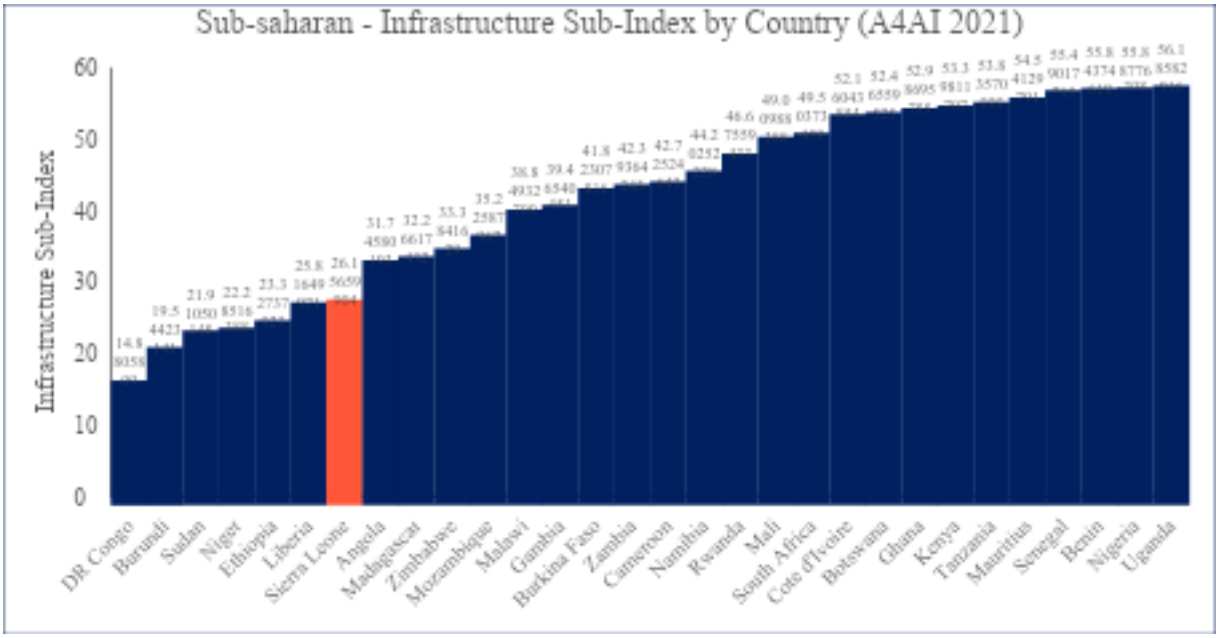


Figure 32. Sub-Saharan – Infrastructure Sub-Index by Country

In Sub-Sahara, Mauritius has the cheapest 1 GB of Data, its cost being 0.89% of the GNI per capita. Central African Republic has the most expensive data among all Sub-Saharan countries, with a cost of 25% of the GNI per capita.

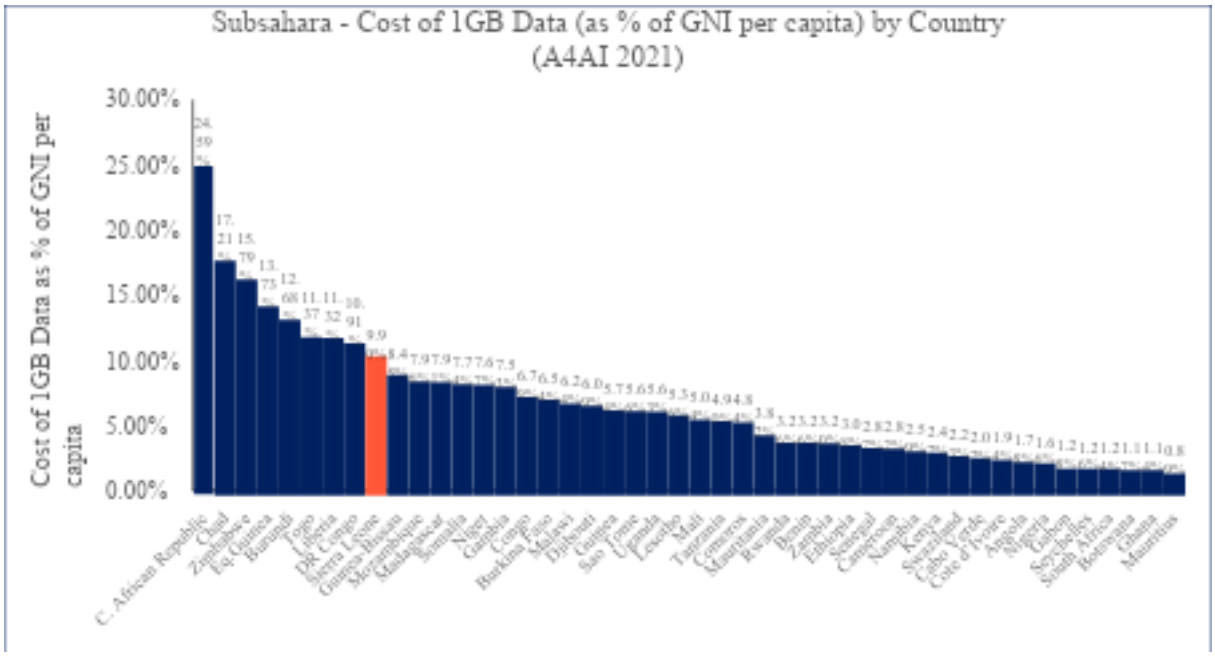


Figure 33. Sub-Saharan - Cost of 1GB Data (as % of GNI per capita) by Country

In Sub-Saharan Africa, Gabon has the most median fixed broadband internet speed with 40.58 Mbps in August 2022. Sierra Leone ranks 20th among Sub-Saharan peers, being greater than the median value.

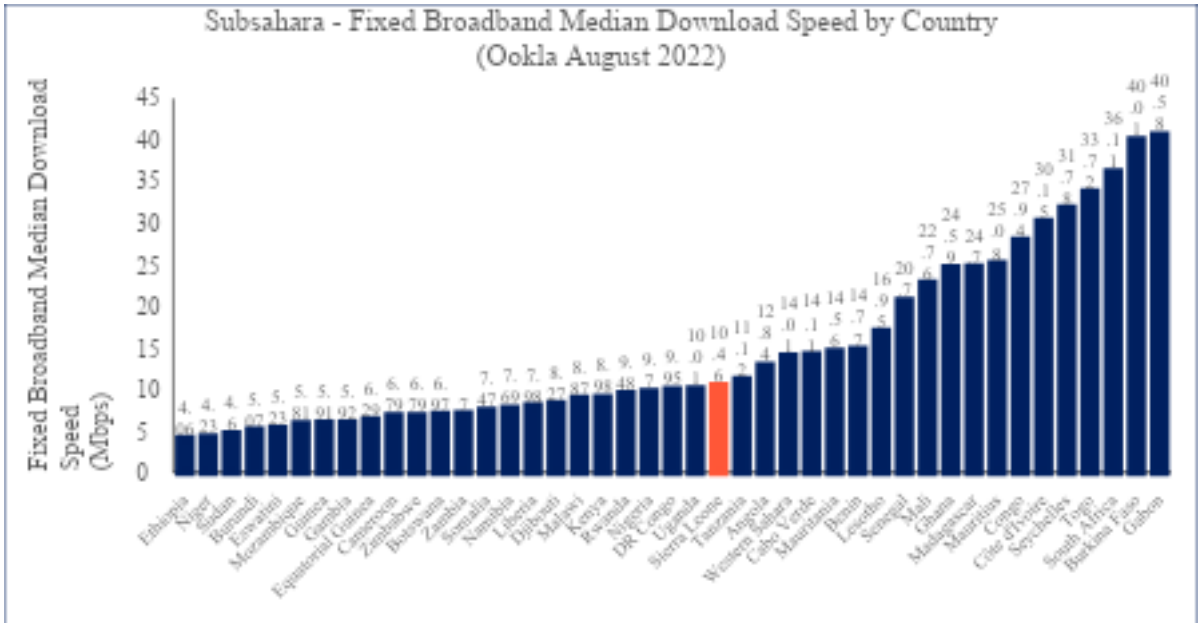


Figure 34. Sub-Saharan - Fixed Broadband Median Download Speed by Country

Considering only sub-Saharan Africa, Sierra Leone ranks 21st out of 42 countries, with a mobile connectivity index score of 42.01.

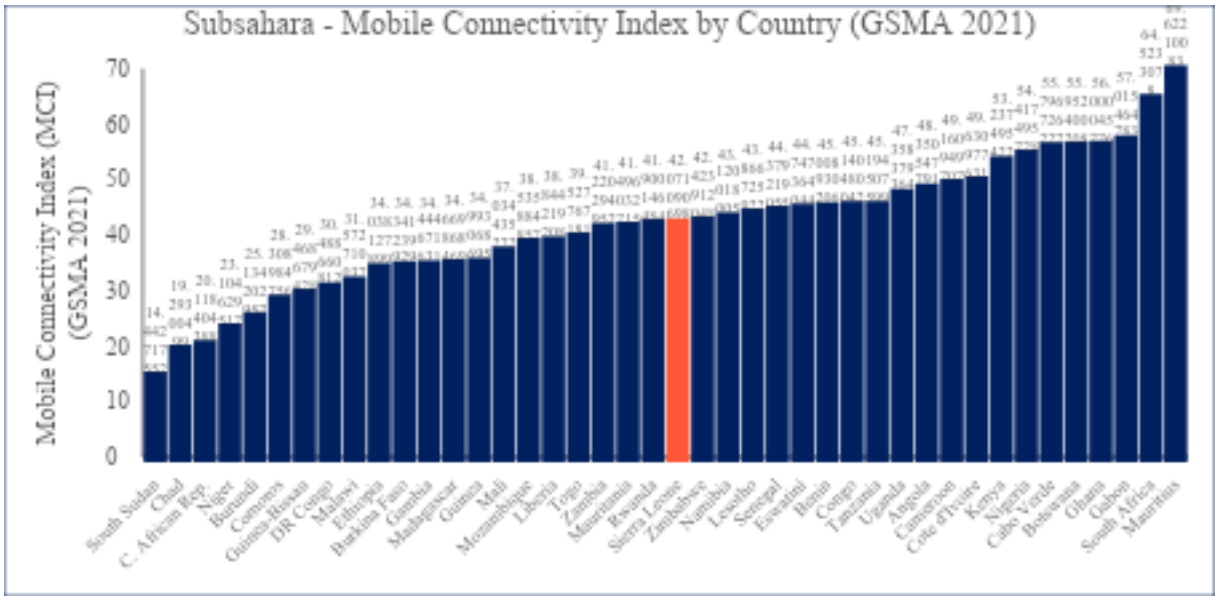


Figure 35. Sub-Saharan - Mobile Connectivity Index by Country (GSMA 2021)

Among sub-Saharan peers, Sierra Leone ranks 26th among 46 countries with 86 cellular subscriptions per 100 people.

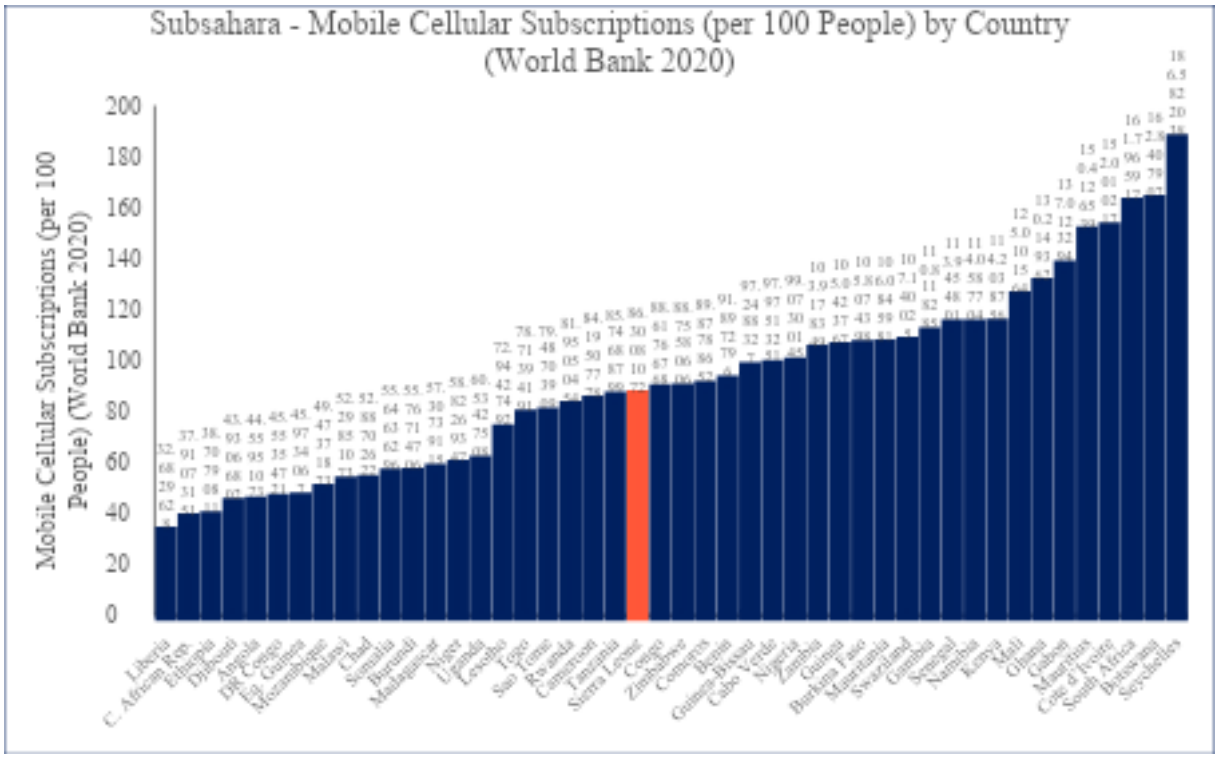


Figure 36. Sub-Saharan - Mobile Cellular Subscriptions (per 100 People) by Country (World Bank 2020)