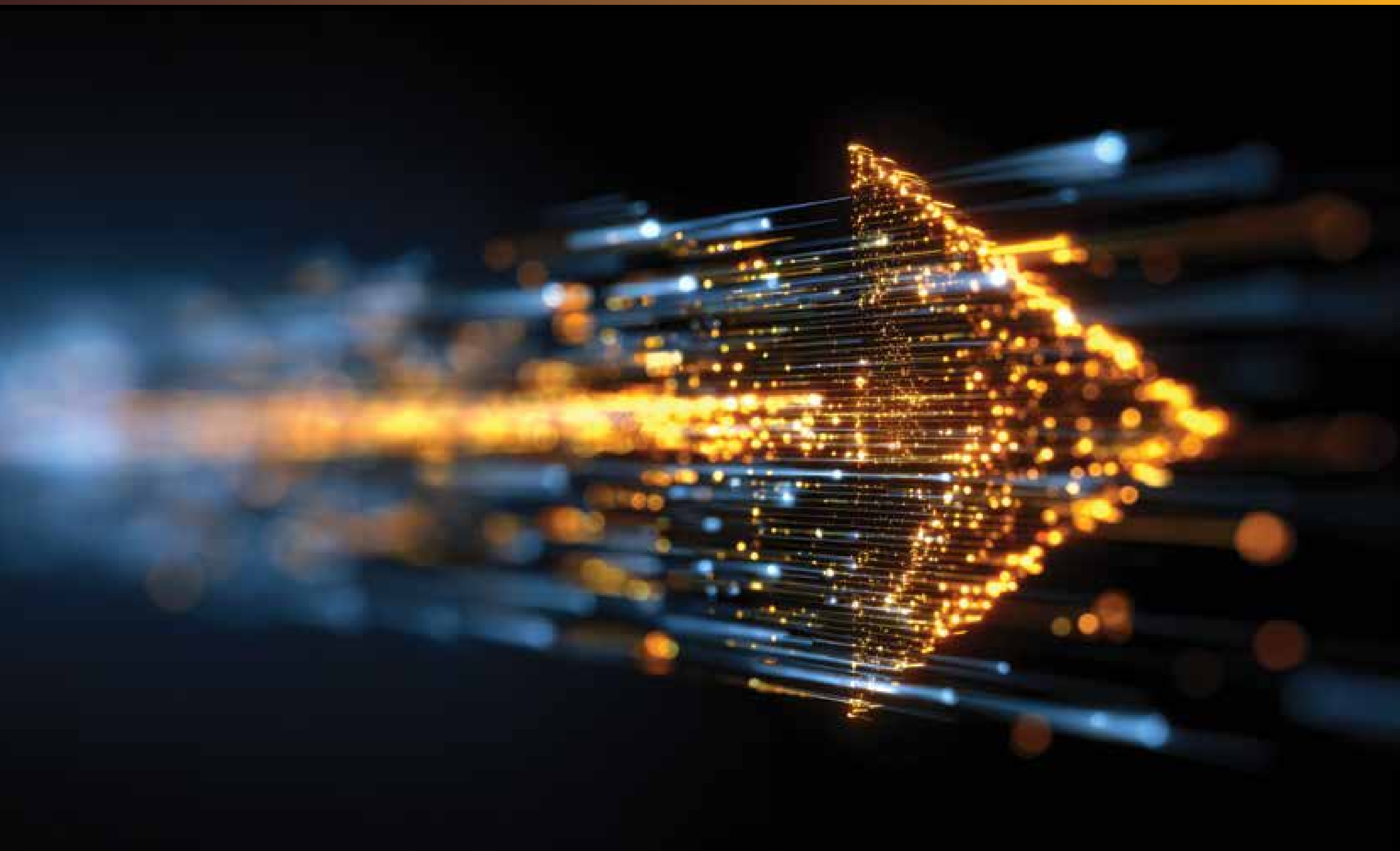

South Africa's Digital Infrastructure Investment Study

2025

2030 NDP

national planning commission
Department: The Presidency
REPUBLIC OF SOUTH AFRICA

DBSA
DEVELOPMENT BANK OF SOUTHERN AFRICA
Building Africa's Prosperity

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GLOSSARY

2G/3G	2nd/3rd Generation Mobile Technologies
4G/5G	4th/5th Generation Mobile Technologies
ACT	Association of Communication Technologies
ADC	Africa Data Centres
AI	Artificial Intelligence
AWS	Amazon Web Services
BBI	Broadband Infraco
BtG	Beyond the Gap
CAGR	Compound Annual Growth Rate
CEO	Chief Executive Officer
CPE	Customer Premises Equipment
DBE	Department of Basic Education
DBSA	Development Bank of Southern Africa
DCA	Digital Council Africa
DCDT	Department of Communications and Digital Technologies
DCI	Digital Connectivity Infrastructure
DDCF	Digital Development Challenge Fund
DHET	Department of Higher Education and Training
DIOSS	Digital Infrastructure One Stop Shop
DL	Download
DPI	Digital Public Infrastructure
DPME	Department of Planning, Monitoring and Evaluation
DPWI	Department of Public Works and Infrastructure
DSMI	Data Services Market Inquiry
DTIC	Department of Trade Industry and Competition
EASSy	East Africa Submarine System
ECNS	Electronic Communications Network Service
ECS	Electronic Communications Service
EIPP	Equity Equivalent Investment Programme
FBDA	Free Basic Data Allowance
FNO	Fibre Network Operator
FOSAD	Forum of South African Directors-General
FPB	Film and Publication Board
FTTB/H/P/S	Fibre-to-the-Business / Home / Premises / Site
FWA	Fixed Wireless Access
Gbps	Gigabit(s) per Second
GDP	Gross Domestic Product
GIS	Geographic Information System
GNI	Gross National Income
GPON	Gigabit Passive Optical Network
GPUs	Graphic Processing Units
GSMA	Global System for Mobile Communications Association
HVAC	Heating, Ventilation, and Air Conditioning
ICASA	Independent Communications Authority of South Africa
ICT	Information and Communication Technologies
IECNS	Individual Electronic Communications Network Service
IECS	Individual Electronic Communications Service
IoT	Internet of Things
ISP	Internet Services Providers
ISPA	Internet Services Providers' Association
IT	Information Technology
ITU	International Communication Union
IXP	Internet Exchange Point
km	Kilometre
MBB	Mobile Broadband
Mbps	Megabit(s) per second
MCDT	Ministry of Communications and Digital Technologies
MNO	Mobile Network Operator
MOCN	Multi-Operator Core Network
MORAN	Multi-Operator Radio Access Network
MVNO	Mobile Virtual Network Operator
NDP	National Development Plan
NEMISA	National Electronic Media Institute of South Africa
NIP2050	National Infrastructure Plan 2050
NLD	National Long Distance
NPC	National Planning Commission
O&M	Operation and Maintenance
OADC	Open Access Data Centres
OLT	Optical Line Terminal
OTDR	Optical Time Domain Reflectometer
PIR	Policy Institutional and Regulatory
PMO	Project Management Office
POPIA	Protection of Personal Information Act

PPP	Public-Private Partnership(s)
PSI	Public Service Institution
RAN	Radio Access Network
RDCC	Rapid Deployment Coordination Centre
RDNCC	Rapid Deployment National Coordinating Committee
SA	South Africa
SAFE	South Africa – Far East (subsea cable)
SALGA	South African Local Government Association
SDG	Sustainable Development Goal(s)
SDIC	State Digital Infrastructure Company
SETA	State Education and Training Authority
SIP	Strategic Infrastructure Project
SITA	State Information Technology Agency
SMRs	Small Modular Reactors
SOC/E	State-Owned Company / Enterprise
SRD	Social Relief of Distress
STEM	Science, Technology, Engineering and Mathematics
Tbps	Terabits per Second
UL	Upload
UN	United Nations
UMC	Universal Meaningful Connectivity
USAASA	Universal Service and Access Agency of South Africa
USAF	Universal Service Access Fund
USAID	US Agency for International Development
USAOs	Universal Service and Access Obligations
Wi-Fi	Wireless Fidelity

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Public sector institutions consulted during the study included the Department of Basic Education, the Competition Commission, the Department of Communications and Digital Technologies, the Independent Communications Authority of South Africa, National Treasury, the National Electronic Media Institute of South Africa, and The Presidency.

Industry associations that provided insights and engagement included the Association for Communications Technologies, Digital Council Africa, the Internet Service Providers' Association, and the Wireless Access Providers' Association.

The study also benefited from discussions with a broad range of industry stakeholders, including mobile network operators, fibre network operators, tower companies, major data centre operators, financial institutions providing both equity and debt financing, and organisations supporting digital transformation and innovation across the South African economy.

The authors gratefully acknowledge the time, insights and contributions of all stakeholders who participated in consultations and provided inputs that helped to strengthen the analysis presented in this report.

FOREWORD

South Africa stands at a defining moment in its digital transformation journey. The rapid expansion of global digital technologies – from artificial intelligence and cloud computing to digital public services and advanced connectivity – has made digital infrastructure one of the most critical foundations of economic growth and social inclusion. The ability to deploy resilient and inclusive digital infrastructure will increasingly determine the country's competitiveness, productivity and long-term development trajectory. Ensuring that all South Africans have access to, and can meaningfully use, high-quality, affordable broadband connectivity is therefore no longer simply a technological objective; it is a national development imperative.

This report, The South Africa Digital Infrastructure Investment Study, provides an important assessment of the scale of investment required to achieve this ambition. Commissioned through a partnership between the Development Bank of Southern Africa and the National Planning Commission, the study evaluates South Africa's digital connectivity infrastructure and the investments required to achieve universal, meaningful broadband access in line with the National Development Plan 2030, SA Connect, and the National Infrastructure Plan 2050.

The analysis draws on digital infrastructure and market data available as of 2025, providing the most recent consolidated view of South Africa's connectivity landscape. It combines geospatial infrastructure mapping, market analysis, and technology-specific cost modelling to estimate the investment required to achieve universal broadband connectivity.

South Africa has made substantial progress in expanding connectivity over the past decade. Mobile broadband networks now cover most of the population, and fibre networks have expanded rapidly in metropolitan areas. However, a significant connectivity gap remains. While urban areas increasingly benefit from high-capacity fibre networks and emerging 5G services, many rural and peri-urban communities continue to rely primarily on mobile connectivity and remain underserved by high-speed fixed broadband. Affordability constraints and limited digital capabilities also prevent many households from fully participating in the digital economy.

The analysis shows that achieving universal high-speed broadband will require substantial additional investment over the coming decade. Using the World Bank's Beyond the Gap (BtG) methodology, the study models alternative investment pathways reflecting different growth scenarios and deployment strategies. The results indicate that connecting all South African households to high-speed broadband will require investment ranging from approximately R140 billion under least-cost deployment scenarios to well above R200 billion under more ambitious fibre-led infrastructure pathways through 2035.

Bridging this connectivity gap will require sustained investment from both the public and private sectors, supported by innovative financing mechanisms and an enabling regulatory environment.

A key finding of the study is that no single technology can deliver universal connectivity across South Africa's diverse geography. Instead, the country's digital infrastructure strategy must rely on a complementary mix of technologies.

Fibre networks will remain the backbone of the digital economy, delivering the high-capacity infrastructure required for data-intensive applications, cloud computing, digital public services, and emerging technologies such as artificial intelligence. Fibre-to-the-home and fibre-to-the-business deployments will continue expanding in dense urban and peri-urban areas where commercial investment is viable.

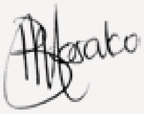
Mobile broadband and fixed wireless access – enabled by widespread 4G coverage and expanding 5G networks – will play a critical role in extending high-speed connectivity across suburban, peri-urban and rural areas. These wireless platforms provide a cost-efficient means of delivering broadband to millions of households while leveraging existing tower infrastructure and spectrum assets.

Satellite connectivity will provide an essential complementary solution in remote and sparsely populated areas where fibre or mobile expansion is not economically viable. Together, this multi-technology architecture – combining fibre backbones, wireless access networks and satellite coverage – offers the most practical and fiscally sustainable pathway toward universal connectivity in South Africa.

Beyond infrastructure deployment, the study highlights the importance of affordability, digital skills and institutional coordination. Connectivity alone does not guarantee meaningful participation in the digital economy, particularly where macroeconomic constraints limit households' ability to afford devices and broadband services. Future policy design must therefore focus on reducing affordability barriers, ensuring reliable networks, and equipping citizens with the digital skills required to participate in an increasingly digital society.

As policymakers, investors and industry stakeholders engage with the findings of this study, the choices made today will shape South Africa's digital future for decades to come. While the scale of investment required is substantial, the cost of inaction would be far greater. Expanding digital connectivity can stimulate economic growth, improve service delivery, foster innovation, and strengthen South Africa's competitiveness in the global digital economy.

We commend this study to policymakers, investors, industry leaders and civil society as both a strategic roadmap and a catalyst for coordinated national action. By aligning infrastructure investment, regulatory reform, and digital inclusion policies with credible financing strategies and effective implementation, South Africa can close the connectivity gap and unlock the full economic and social potential of a digitally enabled society.



Boitumelo Mosako
CEO

Mark Swilling
NPC Commissioner

EXECUTIVE SUMMARY

Introduction

This report presents a comprehensive diagnostic of South Africa's digital connectivity infrastructure, developed under the mandate of the National Planning Commission (NPC) and the Development Bank of Southern Africa (DBSA), and structured around the World Bank's Beyond the Gap (BtG) infrastructure investment framework.

The study pursues the following high-level objectives:

- To quantify the investments that are required between now and 2030, and extended to 2035, in both new capital and operations and maintenance (O&M), which will make it possible to achieve the broadband connectivity targets as specified in the National Development Plan (NDP), the National Infrastructure Plan 2050 (NIP2050), the Sustainable Development Goals (SDGs), and other key national policies.
- Set out key uncertainties and strategic policy options required to achieve NIP2050, NDP and SDG ambitions, along with recommendations, taking into account the various costs/funding, and the economic and social impacts of critical policy choices.
- Identify investment barriers and financing gaps and highlight connectivity infrastructure cost drivers and the implications of different policy choices.
- Engage policymakers and other key stakeholders, to the extent possible, to work through the implications of policy choices and their trade-offs, in terms of costs, access and service levels.
- Position the study within the context of the need for South Africa to increase its digital readiness, outlining the high-level policy and investment prerequisites for the country to achieve appropriate levels of digital transformation.

The analysis is underpinned by a geospatial infrastructure mapping exercise using a 0.76 km^2 hexagonal grid, providing a granular spatial representation of broadband supply relative to household distribution. This georeferenced demand-supply mapping enables location-specific investment cost estimations and informs technology-specific deployment strategies.

All modelling outputs, policy recommendations, and financing strategies have been developed through iterative stakeholder engagement across national and provincial government, network operators, ISPs, infrastructure financiers, and civil society. These engagements validated model assumptions, stress-tested policy scenarios, and anchored recommendations in South Africa's institutional and market realities.

This BtG-aligned approach ensures that the report provides a technically robust, fiscally realistic, and policy-responsive roadmap for accelerating inclusive digital infrastructure investment in South Africa through 2035.

Access to high-speed broadband will benefit all South Africans

Increasing broadband penetration has improved economic growth around the world. The investment in new broadband networks creates job opportunities in the construction and network maintenance and management, while the increase in penetration gives South African businesses, entrepreneurs and individuals an opportunity to enter and capture the opportunities of the Digital Society. The economic modelling shows that the South African economy may return to an annual growth rate of 3% per year:

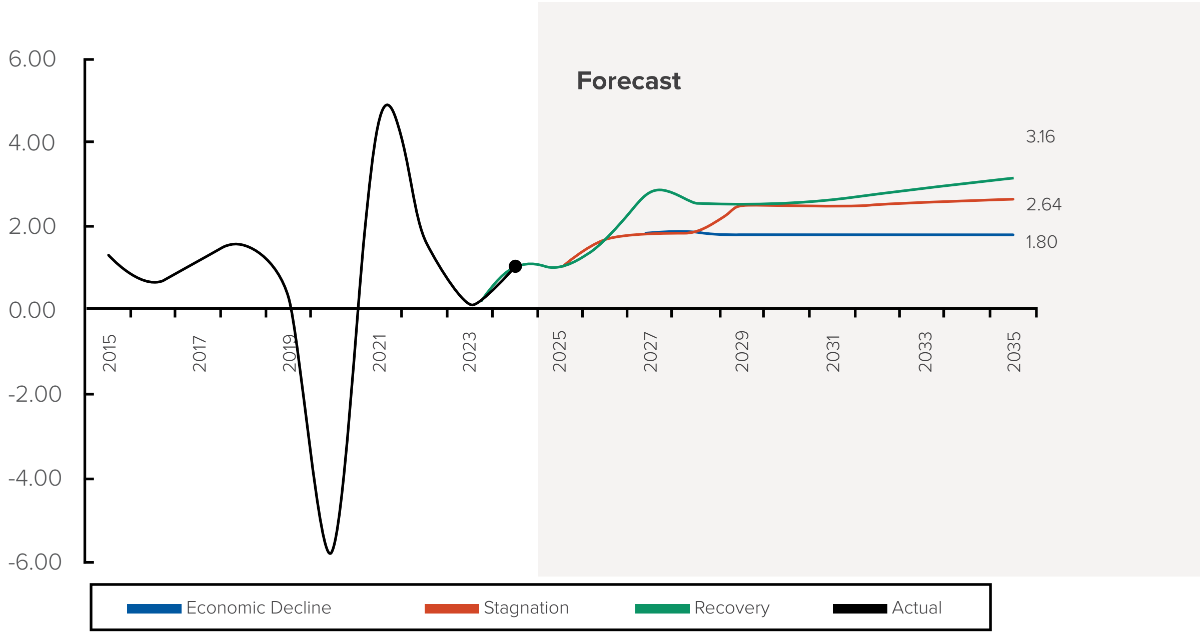


Figure I: Increased high-speed broadband may support a return to economic growth

Source: Africa Analysis 2025

However, achieving this economic growth requires South Africa to adopt:

1. A coordinated investment, policy and regulatory environment that fosters the experience and investment appetite of the private sector for last mile connectivity;
2. Leveraging of state-owned city to city networks;
3. Improved monitoring and evaluation of all government broadband-related activities; and
4. Significant improvement in Digital Literacy and Digital Readiness.

The principle of universal and meaningful connectivity

The United Nations (UN) and the International Telecommunication Union (ITU) introduced the principle of Universal and Meaningful Connectivity in 2020 to reflect that access and use of a broadband connection consists of various factors, illustrated in Figure II.

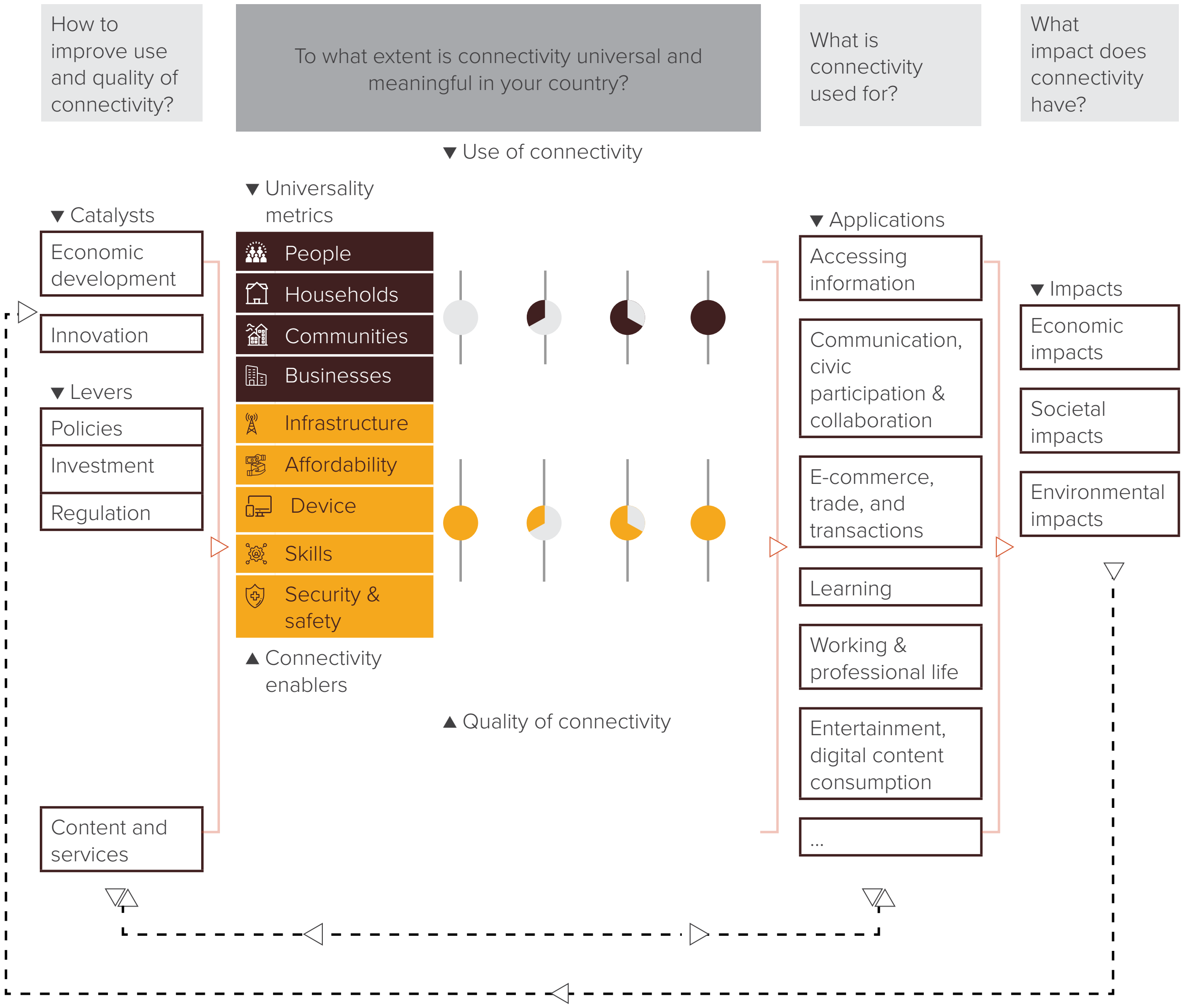


Figure II: The framework of Universal and Meaningful Connectivity

Source: United Nations, 2022

Within the UMC (Universal Meaningful Connectivity) framework, universal connectivity is defined as "connectivity for all", while meaningful connectivity introduces qualitative dimensions, referring to "a level of connectivity that allows users to have a safe, satisfying, enriching, and productive online experience at an affordable cost" (UN, 2022).

The UMC framework measures six interdependent variables:

1. Availability for use;
2. Quality of service;
3. Affordability of services;
4. Affordability of devices;
5. Skills; and
6. Safety and security.

The first two variables, availability for use and quality of service, directly reflect the presence and performance of digital connectivity infrastructure (DCI). The remaining four variables address broader enablers of meaningful connectivity, encompassing economic, human capital and trust dimensions.

This investigation focuses primarily on DCI, with an exploratory analysis of the affordability of services and devices in South Africa, as well as preliminary insights into the state of the national digital skills pipeline.

South Africa's progress towards achieving the 2030 UMC goals is illustrated in the following table:

Table I: South Africa's achievements towards Universal and Meaningful Connectivity

Indicator	Status	Progress Score Target=100
Internet users: Individuals aged 15+ using the Internet %	Advanced	75
Homes connected: Households with Internet access at home %	Advanced	78
Mobile phone ownership: Individuals who own a mobile cellular telephone %	Advanced	89
High-speed fixed broadband: Equal to or above 10 Mbit/s % fixed broadband subscriptions	Target met	95
Fixed broadband cost: Fixed-broadband Internet basket % GNI per capita - target of retail cost not exceeding 2% of monthly GNI per capita	Advanced	91
Mobile broadband cost: Data-only mobile broadband basket % GNI per capita - target of retail cost not exceeding 2% of monthly GNI per capita	Target met	95
Primary schools connected: Primary schools connected to the Internet %	No data	---
Lower-secondary schools connected: Lower-secondary schools connected to the Internet %	No data	---
Upper-secondary schools connected: Upper-secondary schools connected to the Internet %	No data	---
Secondary schools connected: Secondary schools connected to the Internet %	No data	---
Businesses (0+ staff) connected: Business with 0+ staff using the Internet %	No data	---
Business (10+ staff) connected: Business with 10+ staff using the Internet %	No data	---
Internet use gender parity	No data	---
Internet use gender parity %	No data	---
Mobile phone use gender parity: The target is met if the gender parity score - defined as the percentage of women using a mobile phone divided by the percentage of men using a mobile phone - is at least 0.98	No data	---
Mobile phone ownership gender parity: The target is met if the gender parity score - defined as the percentage of women owning a mobile phone divided by the percentage of men owning a mobile phone - is at least 0.98	Target met	100

Source: ITU, 2025

The UMC dashboard shows that South Africa has met the universality targets for end-user broadband access. However, it highlights a critical data gap regarding the connectivity status of businesses and government facilities. Additionally, while the dashboard indicates that mobile and fixed broadband prices are within 2% of GNI, a standard benchmark for affordability, this metric does not capture the pronounced income disparities characteristic of South Africa's socio-economic landscape.

Critically, the UMC framework positions South Africa as a globally competitive destination to live, invest and innovate. It offers a structured lens through which to evaluate the country's progress toward the objectives of the NDP and related policy frameworks, while also serving as an evidence-based foundation for the development of targeted policy recommendations.

The true access gap in South Africa

South Africa's policy goals of connecting the country to high-speed broadband are explicitly stated in the SA Connect broadband policy. These targets are reproduced in Table II:

Table II: SA Connect targets to 2030

Target	Penetration Measure	By 2020	By 2030
Broadband access in Mbps per user	**% of population**	90% at 5 Mbps 50% at 100 Mbps	100% at 10 Mbps 80% at 100 Mbps
Schools	**% of schools**	100% at 10 Mbps 80% at 100 Mbps	100% at 1 Gbps
Health facilities	**% of health facilities**	100% at 10 Mbps 80% at 100 Mbps	100% at 1 Gbps
Government facilities	**% of government offices**	100% at 10 Mbps 80% at 100 Mbps	100% at 100 Mbps

The following figure compares South Africa's mean download speed to comparator countries and illustrates that a lot is still to be achieved if all South Africans are expected to have access to a 100 Mbps connection:

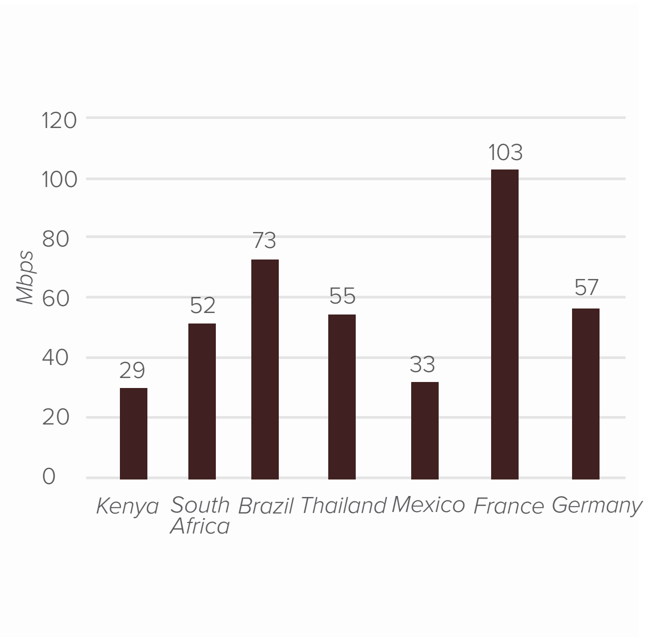


Figure III: Comparing South Africa's mean download speed to comparator countries

Source: Ookla, May 2025

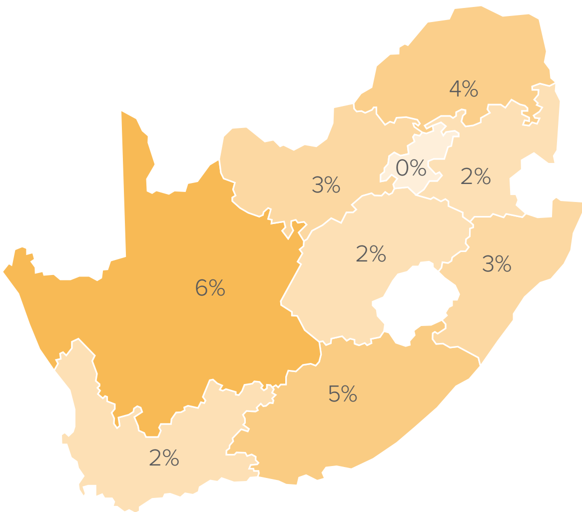


Figure IV: Share of households that do not have 4G/5G coverage in South Africa

Source: StatsSA Census data, ICASA and Africa Analysis

However, the detailed geographic information system (GIS) analysis undertaken during this study shows that the true network access gap in South Africa is approximately 400 000 homes, or 2.2% of the total number of households in South Africa.

This level of coverage indicates that although there is still room for improvement, South Africa's core concerns are not related to Universal Connectivity but more related to Meaningful Use, including product price affordability, device penetration and digital literacy.

Universal connectivity at 100 Mbps

Despite the SA Connect policy ambition of achieving universal access to broadband connections of at least 100 Mbps by 2030, very few households in South Africa currently enjoy such service levels.

This report applies the BtG methodology – developed by the World Bank – to assess the most efficient pathways to bridge this digital divide. The BtG framework provides a structured, evidence-based approach to defining service-level targets, estimating capital and recurrent costs, and evaluating policy and financing strategies across infrastructure sectors.

When applied to South Africa's digital infrastructure landscape, BtG enables a rigorous alignment between investment needs, developmental priorities and fiscal realities. The methodology integrates cost benchmarking, scenario modelling and efficiency metrics to quantify the gap between current network performance and national digital objectives articulated in SA Connect and the NDP 2030.

Crucially, it supports the development of differentiated investment trajectories – from baseline (status quo) to transformative (ambitious) scenarios – each reflecting varying levels of public policy reform, sectoral efficiency and fiscal effort. This enables stakeholders to compare trade-offs and identify fiscally sustainable yet impactful pathways to achieving UMC.

The role of GIS analysis

Understanding the spatial distribution of where people live, work and access services is critical for effective broadband network planning and service delivery. It enables more targeted infrastructure investment and supports coordination among stakeholders across the digital connectivity ecosystem.

To support this, the ITU has promoted the use of distance banding, categorising households by their proximity to a fibre node, as a global practice to assess the scale and geography of the digital divide.

As part of this investigation, a GIS-based analysis was conducted to classify South African households into distance bands relative to the nearest fibre node, representing the closest potential point of access to high-speed broadband. The analysis reveals that over 50% of households are located within five kilometres of a fibre node, providing a strong foundation for last-mile expansion and hybrid network planning.

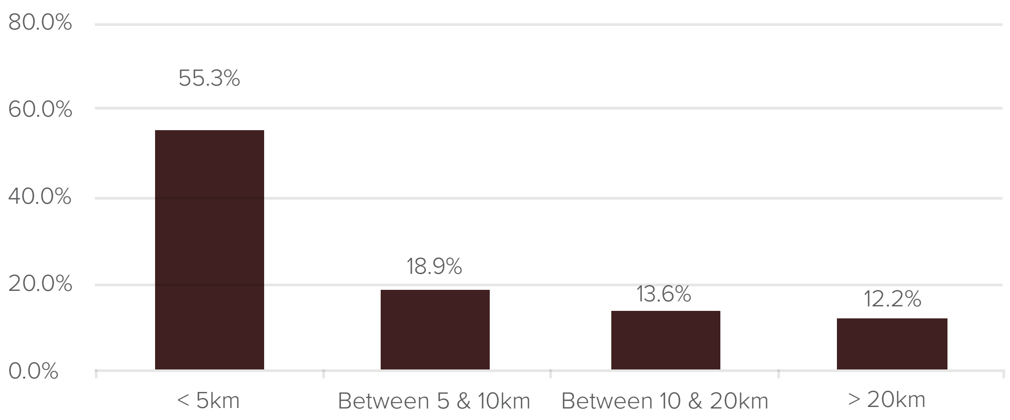


Figure V: Share of households that live within a distance band of a fibre node (2025)

Source: StatsSA Census data, ICASA and Africa Analysis

This GIS analysis has also been applied to government facilities, summarised in Table III:

Table III: Proximity of government facilities to a fibre node

	<5 km	Betw 5 &10 km	Betw 10 & 25 km	Betw 25 & 50 km	Betw 50 & 100 km
Public schools	2 963	2 584	6 791	3 246	192
Health clinics	1 650	482	1 024	557	50
Libraries	286	55	107	74	6
Traditional Authority offices	84	113	455	215	7

Source: Africa Analysis calculations, ICASA Universal Service Obligations data

These results illustrate the importance of developing and maintaining a suitable GIS map of location of facilities and network infrastructure. This GIS analysis forms the basis of the BtG investment analysis.

The investment scenarios

Three discrete infrastructure investment scenarios have been formulated to estimate the capital and recurrent expenditure required to achieve UMC under varying conditions.

Each scenario provides a differentiated lens through which the scale, pace and composition of digital infrastructure investment can be understood – ranging from conservative baseline extensions to ambitious national-scale transformation.

Table IV: Investment scenarios for DCI, 2026-2035

BtG Scenario 1	BtG Scenario 2	BtG Scenario 3
Economic Decline	**Economic Stagnation**	**Economic Recovery**
• Deployment of least-cost technology. • End users may experience contention in the use of network infrastructure.	• Deployment of a blend of least-cost and high-cost technologies. • End users may experience difference in levels of contention based on their geographic location. • Reliance on lower cost / lower quality connections in areas of low population density.	• Deployment of high-cost high-throughput guaranteed high-quality broadband connections. • Reliance on lower cost / lower quality connections in areas of low population density.
Mobile-centric wireless connectivity dominated with limited roll-out of additional fibre network roll-out.	Combination of mobile + fixed wireless access dominated connectivity with limited roll-out of fibre network infrastructure.	Fibre connectivity-dominated mix of technologies.
• Likely limited further investment in expansion of wireline (fibre) networks. • Capacity enhancements for broadband connectivity to be served by further deployment in 4G and 5G technologies. • Availability of 5G connectivity will be commercially determined considering specific universal service obligations incurred under spectrum auctions. • Income constraints will limit take-up of high-speed fixed wireless access (FWA) services in areas where it could be offered. • Satellite is planned to provide services in those areas where population density levels do not commercially support either fixed or mobile infrastructure roll-out.	• Fibre network operators (FNOs) will continue to seek innovative broadband deployment models to serve dense lower-income urban and peri-urban areas. • Access technology mix will be a blend of fibre (increased from current) in urban areas and FWA / mobile broadband in all areas by 2035. • Satellite is planned to provide services in those areas where population density levels do not commercially support either fixed or mobile infrastructure roll-out.	• Likely significant spend on current fibre network expansion; in poorer (and deeper rural) areas. • Access technology mix will be predominantly fibre with limited FWA / mobile broadband in a few areas by 2030. • Satellite is planned to provide services in those areas where population density levels do not commercially support either fixed or mobile infrastructure roll-out.

Source: Africa Analysis 2025

The investment range to connect all South African households to high-speed broadband

The BtG investment modelling framework imposes key constraints on the choice of different investment inputs to explore the different possible investment scenarios to achieve a social objective. The different investment scenarios impose the following constraints on the technology used to connect South African households to high-speed broadband:

Table V: Economic scenario dictates likely types of infrastructure investment

Investment Scenario	< 5 km	Between 5 & 10 km	Between 10 & 20 km	Greater than 20 km	Totals
Scenario 1: Economic Decline	**42.25**	**33.65**	**31.68**	**34.4**	**141.98**
Mobile BB	0.29	1.87	9.59	15.02	26.77
FWA BB	-	31.78	22.09	19.38	73.25
Fibre BB	41.96	-	-	-	41.96
Scenario 2: Economic Stagnation	**39.8**	**20.73**	**21.91**	**25.85**	**108.29**
Mobile BB	0.29	1.88	9.62	15.07	26.86
FWA BB	-	-	12.29	10.78	23.07
Fibre BB	39.51	18.85	-	-	58.36
Scenario 3: Economic Recovery	**39.09**	**20.4**	**30.85**	**24.4**	**114.74**
Mobile BB	0.29	1.85	9.49	14.87	26.5
FWA BB	-	-	-	9.53	9.53
Fibre BB	38.8	18.55	21.36	-	78.71

Source: Africa Analysis 2025

The following table illustrates that based on the technical scenarios, South Africa will need to invest (in 2025 real terms) between R108 billion (Economic Stagnation) and R142 billion (Economic Decline) to connect all households to high-speed broadband.

However, the total investment quantum required to connect all households to high-speed broadband is driven starkly by specific cost drivers, particularly distance (for fixed network infrastructure) and the expected minimum download speed (for wireless technologies).

Table VI: Total cumulative investment costs to connect all South Africans to high-speed broadband by 2035 (R billions)

Scenario	New Build	Replacement Capex	Opex	Total
Economic Growth Scenario	**66.88**	**6.01**	**41.84**	**114.73**
Fibre	48.28	6.01	24.41	78.70
Wireless technologies	18.60	-	17.43	36.03
Economic Stagnation Scenario	**59.04**	**4.46**	**44.78**	**108.28**
Fibre	33.37	4.46	20.52	58.35
Wireless technologies	25.67	-	24.26	49.93
Economic Decline Scenario	**73.13**	**3.03**	**65.78**	**141.94**
Fibre	21.46	3.03	17.43	41.92
Wireless technologies	51.67	-	48.35	100.02

Source: Africa Analysis calculations, ICASA Universal Service Obligations data, 2025

Key cost drivers

Distance is the single most significant cost driver in fibre network deployment. The cost of connecting households within five kilometres of a fibre node is substantially lower than for those located 20 kilometres or more away. This cost gradient underscores a critical area where the State can play a catalytic role in reducing the cost to communicate – particularly by addressing middle-mile infrastructure gaps. Key state-owned entities (SOEs), including Broadband Infraco, Sentech, Transnet, PRASA, SANRAL and Eskom, hold extensive network assets along strategic corridors. These middle-mile assets could be competitively leveraged to lower fibre deployment costs through coordinated access, infrastructure sharing and open-access frameworks.

Such an approach would not only reduce capital expenditure for network operators but also accelerate broadband expansion into underserved and high-cost areas.

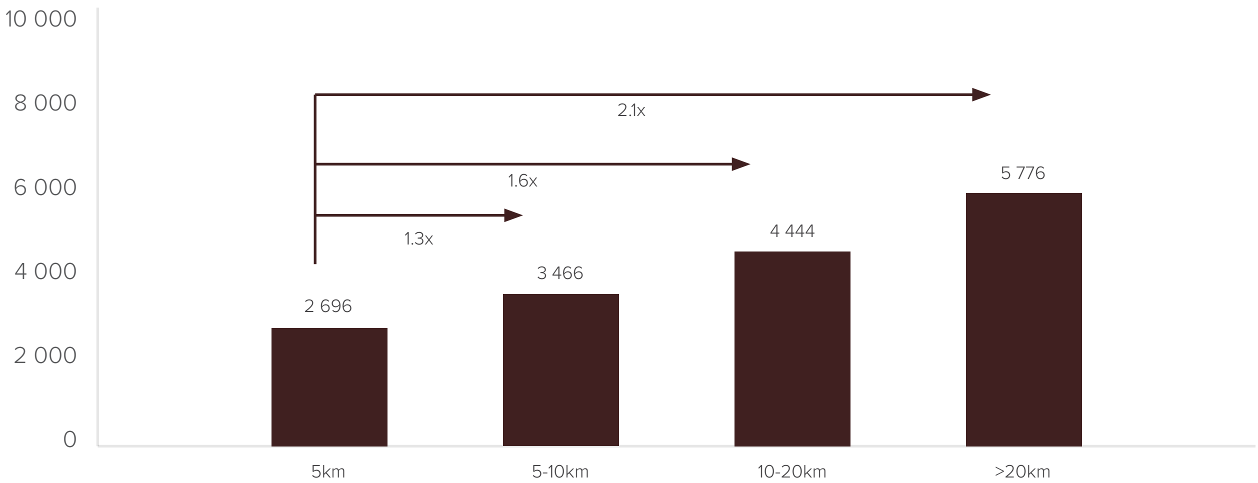


Figure VI: Fibre-to-the-home (FTTH) capex cost per home per distance band (2025 figures)

Source: Africa Analysis with Stakeholder Input 2025

The key cost driver in the wireless network infrastructure environment is the target download speed. The following figure shows that increasing the minimum mobile download speed substantially increases the total investment costs:

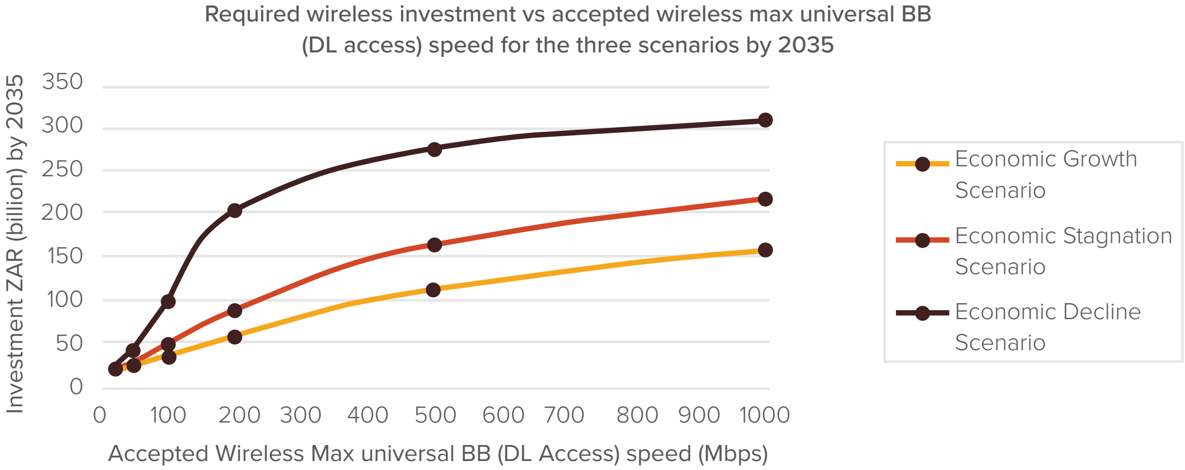


Figure VII: How service access speed drives investment requirements over the forecast period (in 2025 real R values)

Source: Africa Analysis mobile investment model, 2025

Meaningful connectivity

Meaningful connectivity, within this investigation, focuses on affordability of services and devices as well as the level of digital literacy and digital readiness in the country. The UMC dashboard indicates that South Africa's product pricing is within the 2% of monthly GNI metric. This report explores household affordability at different income and expenditure levels to identify how the three investment scenarios impact on broadband penetration in the home. This investigation goes further to explore the current level of digital literacy and digital skills in South Africa.

Are households able to afford high-speed broadband services?

The ITU reports that South Africa's data-only mobile product price (of 2 GB per month) is less than 2% of monthly GNI per capita, i.e. South Africa's prices meet the UMC target. However, it is important to note that countries with a higher GNI per capita are paying significantly less per month for access to high-speed broadband.

On the surface, it appears that South African households can afford the retail product prices of the most pervasive broadband technology (mobile broadband):

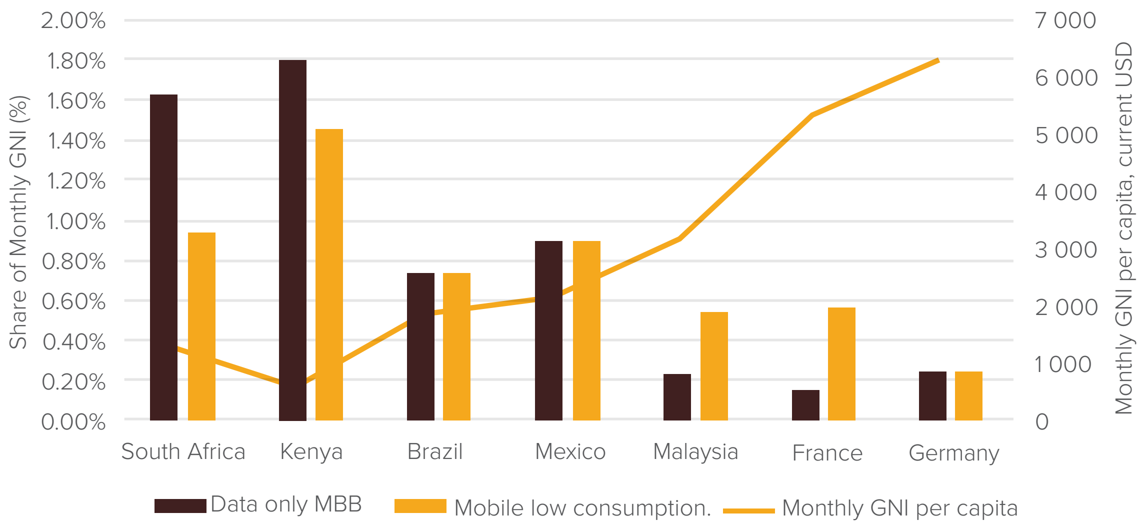


Figure VIII: Do South Africa's prices meet the UMC target of 2% of monthly gross national income (2024)?

Source: ITU, 2025

However, applying a granular analysis to household expenditure data reflects a starkly different picture, where only those households in expenditure decile five and above can afford to purchase a monthly service of R300 a month (relying solely on StatsSA income survey data).

Table VII: Retail prices at different shares of household expenditure (2024 South African rand)

Decile	Monthly total household expenditure (IES 2023 data in constant 2024 values)	Share of household expenditure			
		2%* @ R300.00	4.50%** @ R300.00	2%* @ R90.00	4.50%** @ R90.00
Lower	2 151.00	43.03	96.81	43.03	96.81
2	3 481.00	69.63	156.66	69.63	156.66
3	4 544.00	90.88	204.48	90.88	204.48
4	5 653.00	113.07	254.40	113.07	254.40
5	6 943.00	138.86	312.44	138.86	312.44
6	8 615.00	172.29	387.65	172.29	387.65
7	10 983.00	219.67	494.25	219.67	494.25
8	15 002.00	300.04	675.09	300.04	675.09
9	22 900.00	458.00	1 030.50	458.00	1 030.50
Upper	53 056.00	1 061.12	2 387.51	1 061.12	2 387.51
Average	2 151.00	266.69	600.05	266.69	600.05

Source: Africa Analysis 2025 calculations. World Development Indicators
*UMC indicator ** Aggregate StatsSA household expenditure on ICT services

Leveraging a nationally representative GIS-based Household Affordability Model, this report demonstrates that current income and expenditure patterns significantly constrain the ability of South African households to afford always-on, high-speed broadband services. Under baseline conditions, the model reveals that at a price point of R300 per month, more than 50% of households would be unable to afford such connectivity in a scenario characterised by economic decline.

Even under Scenario 3 (Economic Recovery), which assumes improved macroeconomic performance and household income growth, affordability remains a critical constraint. The model projects that up to 40% of households would still be priced out of high-speed broadband at the R300 threshold.

These findings highlight the urgent need for targeted affordability interventions, differentiated pricing strategies, and progressive subsidy mechanisms to ensure inclusive digital access across all socio-economic segments.

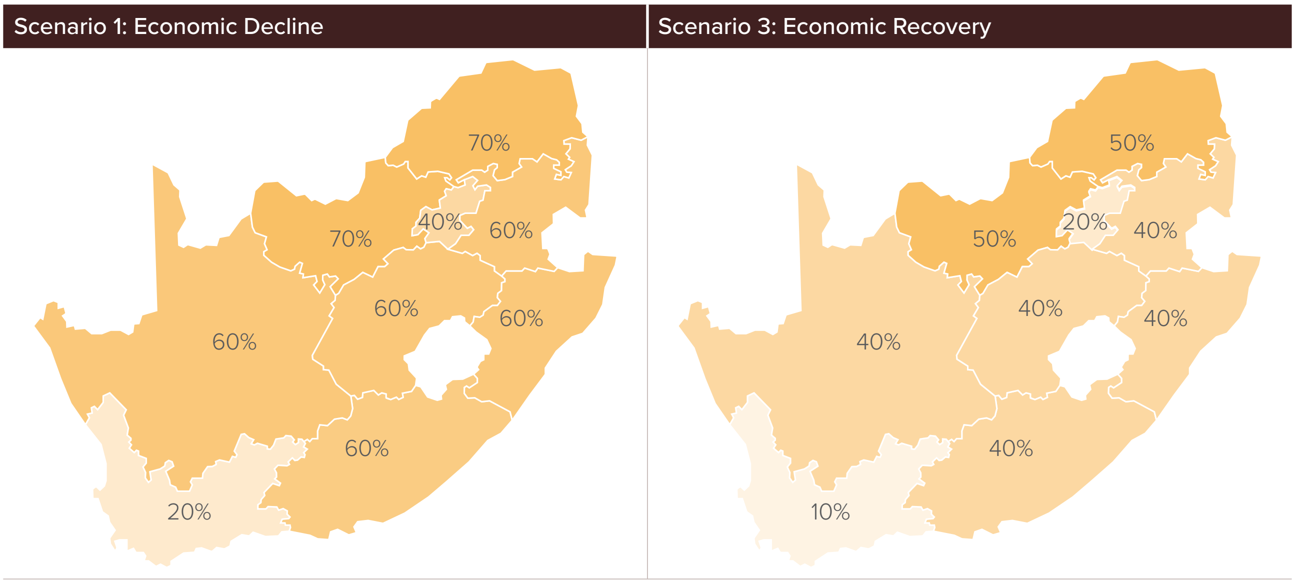


Figure IX: Share of households that cannot afford a broadband connection at R300, indexed to 2035

Source: Africa Analysis Household Affordability Model 2025

Importantly, pricing models in South Africa's broadband market are evolving. Operators are increasingly introducing low-cost, limited-speed packages – some priced as low as R90 per month with uncapped data consumption. At this affordability threshold, the GIS-based affordability model suggests that broadband access becomes attainable for nearly all households, irrespective of the prevailing economic scenario.

Key insights from this household affordability analysis include:

- Structural income inequality continues to limit access to high-speed broadband for lower-income households. This is a macroeconomic constraint beyond the remedial scope of broadband service providers.
- Private sector innovation – including time-of-use data bundles, service differentiation by quality tiers and hybrid technology solutions – is actively driving affordability gains, particularly at the lower end of the market.
- To unlock the full potential of these emerging models, the policy, regulatory, and institutional framework must be recalibrated to create a more enabling investment environment. This includes streamlining regulatory approvals, supporting infrastructure deployment, and reducing administrative burdens that inhibit rapid market expansion of low-cost offerings.

This underscores the imperative for government to shift from direct market intervention to market enablement, catalysing inclusive digital access through a smart blend of regulation, fiscal instruments, and public-private coordination.

Does South Africa have a suitable pipeline of digital skills?

Multiple government strategies and initiatives are targeting employment opportunities within the digital economy as well as trying to address a significant dearth of digitally ready graduates and school-leavers. South Africa ranks poorly on the international stage in the availability of digital skills, ranked as 54th out of 67 countries in 2024 (IMD, 2025).

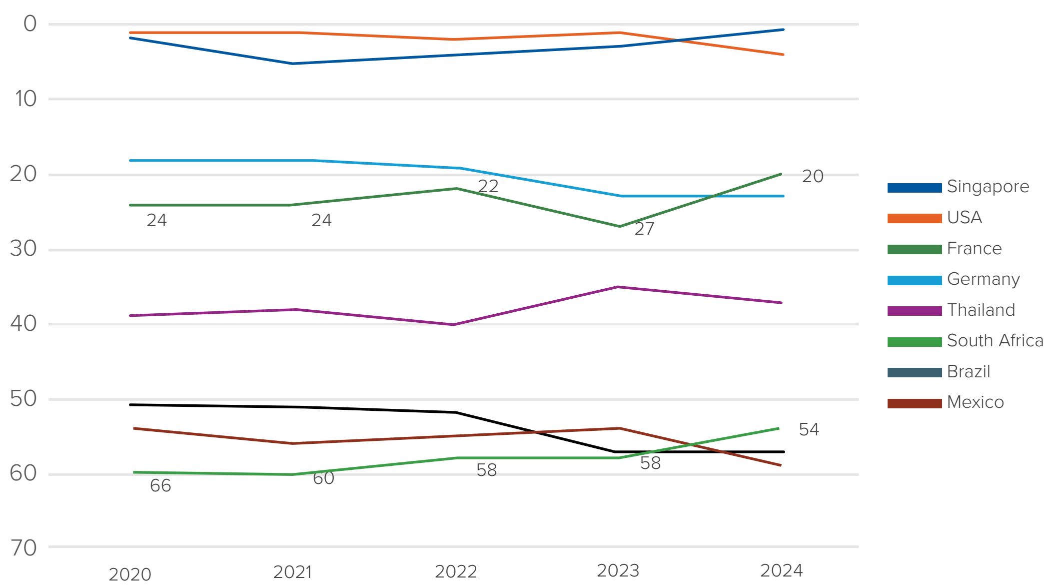


Figure X: South Africa's digital competitiveness compared to benchmark countries, 2020 - 2025

Source: IMD, 2025

The Digital Skills Employment Readiness Index, developed specifically for this study, reveals a critical disjuncture in South Africa's digital skills pipeline. While approximately 50% of school-leavers possess the foundational capabilities to acquire digital literacy, fewer than half of university graduates exhibit the advanced digital competencies required to meaningfully participate in the modern digital economy at a graduate level.

These findings present a stark warning regarding the structural weaknesses in South Africa's digital skills development ecosystem. Despite commendable efforts and substantial resource commitments by both public and private sector stakeholders, the current approach lacks the systemic depth and long-term vision required to produce a digitally competitive workforce.

What is urgently needed is a revitalised digital skills development framework, anchored in strategic, multi-decade planning. South Africa must transition from fragmented short-term initiatives to a coherent national strategy that embeds digital skills development across the education system – from early childhood to foundational learning, and tertiary and vocational qualifications, micro-credentials and access to lifelong digital learning.

Historical global precedents underscore the importance of such foresight. India's sustained investments in science, technology, engineering and mathematics (STEM) education and technical institutions during the 1970s and 1980s laid the foundation for its emergence as a global digital services powerhouse. South Africa must similarly institutionalise digital competencies across the educational value chain to future-proof its human capital and close the gap between connectivity, employability and inclusive growth.

The policy, institutional and regulatory environment

South Africa's digital infrastructure policy environment is shaped by a combination of progressive ambitions and persistent execution challenges. Key policy frameworks – SA Connect, the NDP 2030, and the Digital and Future Skills Strategy – outline the national vision for inclusive digital connectivity and economic transformation. However, implementation has been uneven due to institutional fragmentation, limited regulatory agility and overlapping mandates.

Policy frameworks and strategic vision

SA Connect remains the government's flagship broadband policy, aiming to achieve universal access to high-speed broadband by 2030. The policy sets ambitious targets aligned with the SDGs and the African Union Digital Transformation Strategy. However, current household connectivity levels and affordability constraints indicate a growing disconnect between targets and practical delivery, requiring a policy refresh anchored in the UMC framework.

Institutional coordination and capacity constraints

The digital infrastructure ecosystem spans multiple stakeholders – led by the Department of Communications and Digital Technologies (DCDT), the Independent Communications Authority of South Africa (ICASA), and various SOEs including SITA, Sentech and BBI. However, a lack of coherent coordination mechanisms and fragmented mandates impedes execution.

The protracted disestablishment of the Universal Service and Access Agency of South Africa (USAASA) and the Universal Service and Access Fund (USAF), and the pending creation of the Digital Development Challenge Fund (DDCF), illustrate institutional drift that undermines public investment effectiveness and investor confidence.

There is also a critical need to enhance local government capabilities in broadband planning, permitting and project delivery – especially as municipalities become increasingly central to last-mile connectivity deployment.

Regulatory framework and market dynamics

The regulatory regime, overseen by ICASA, has made notable progress in spectrum licensing and infrastructure-sharing provisions. Yet, significant gaps remain in:

- Updating definitions of underserviced areas;
- Enforcing pro-competitive measures in wholesale access;
- Regulating new market models such as mobile virtual network operators (MVNOs) and neutral host networks; and
- Enabling rapid deployment through harmonised national guidelines.

Private sector operators are leading innovation in pricing and network models, yet face delays in rights-of-way approvals, inconsistent municipal regulations, and infrastructure vandalism – all of which raise deployment costs and slow service expansion.

Proposed recommendations

To achieve South Africa's digital transformation ambitions and meet the targets for UMC by 2035, this report recommends an integrated suite of institutional, policy, regulatory and programmatic interventions. These recommendations are structured around four priority pillars:

Adoption of the UMC framework and target reset towards 2035

The current national connectivity targets are outdated, fragmented, and lack coherence across institutions. We recommend the adoption of the UMC framework as the basis for a national digital inclusion strategy, underpinned by a consultative process to establish new, evidence-based targets for 2035. These targets should be harmonised across government departments, aligned with international benchmarks, and embedded within a centralised, publicly accessible dashboard maintained by the DCDT.

Strengthening institutional capabilities and governance

Accelerated progress requires a recalibration of institutional mandates and improved intergovernmental coordination. Key institutional actions include:

- Fast-tracking the disestablishment of USAASA and the establishment of a DDCF to support targeted interventions.
- Operationalising a Digital Infrastructure One Stop Shop (DIOSS) to streamline infrastructure deployment approvals.
- Establishing a Municipal Broadband Support Unit to assist local governments with technical, legal and financial expertise.
- Enhancing ICASA's regulatory and enforcement capacity while accelerating its regulatory reform agenda (e.g. updated licensing, facilities leasing, spectrum access).

Optimising infrastructure availability and affordability

South Africa must unlock infrastructure investment through data transparency, cost-reduction measures and competitive reform. We recommend:

- Prioritising the completion and operationalisation of a National DCI GIS Database with broad stakeholder data contributions.
- Implementing a national 'Dig Once' and infrastructure-sharing policy at all levels of government.
- Rationalising state-owned digital infrastructure under a State Digital Infrastructure Company, governed through legislation and high-level political oversight.
- Updating regulations defining underserviced areas, ensuring more precise and equitable targeting of public subsidies and universal service obligations.

Ensuring affordability, access and inclusion

To bridge the affordability gap, the following interventions are proposed:

- Implementing a free basic data allowance for indigent households via a digital voucher system linked to existing government grants.
- Scaling public free Wi-Fi and reviving enforcement of the e-Rate discount for public service institutions.
- Formalising zero-rated content frameworks with expanded licensee obligations and third-party oversight.
- Amending ICASA's regulations to enable full MVNO participation and extend competitive pressures in mobile markets.

These recommendations represent a cohesive process to unlock systemic reform, catalyse private and public investment, and achieve equitable, sustainable and meaningful digital access for all South Africans. They are designed to leverage existing policies and institutional structures while addressing key bottlenecks and aligning with South Africa's global digital commitments, including its G20 presidency focus on UMC.

1 INTRODUCTION

South Africa's digital infrastructure ecosystem is at a critical juncture – poised between remarkable growth and persistent inequality. Over the past decade, rapid advancements in metropolitan connectivity, increased private-sector participation, and targeted public investment have laid a foundation for digital transformation. Yet, stark disparities remain while urban centres benefit from growing fibre broadband access and emerging 5G services, rural and peri-urban areas continue to face a dependence on mobile network infrastructure, fragmented last-mile networks, and limited open-access infrastructure.

At the end of 2024, national 4G coverage reached 99.07% and 5G coverage reached 46.64% of the population, with these broadband networks covering 84.10% of the country (ICASA, 2025). The roll-out of 5G infrastructure has to date been in urban centres, but this rollout is expected to extend to the peri-urban and rural areas of South Africa over the next five years. However, StatsSA reports that only 17.4% of households have access to the Internet at home (StatsSA, 2025).

The NDP, the NIP2050 and SA Connect all set the goal of connecting all South Africans to high-speed broadband by 2030. The real question, however, is: will we achieve these goals and if not, what will it cost to deploy and operate the necessary infrastructure to do so? Associated with infrastructure investment, what demand-side interventions need to be in place?

Although an estimated R63.5 billion was invested in DCI between 2018 and 2023, this investment, being funded by private sector entities, has mostly targeted commercially viable regions. The objective of the South Africa Digital Infrastructure Investment Project is to estimate the investment required to deploy and maintain the DCI as well as identify the necessary affordability, usability and governance dimensions of digital access to achieve UMC for all households in South Africa.

By using highly disaggregated spatial supply and demand data, this study diagnoses the DCI gap and outlines strategic policy and financing options, supporting the Government of South Africa's goal of leveraging digital connectivity as a driver of inclusive economic growth, improved service delivery, and national resilience.

1.1 Project background

The NPC has a mandate to develop a long-term vision and strategic plan for South Africa. The main objective of the NPC is to rally the nation around a common set of objectives and priorities to drive development over the longer term. The first NDP was completed in 2011, setting key objectives for a range of sectors of the economy.

In 2022, the NPC partnered with the DBSA to assess the progress made and to identify South Africa's future investment requirements to achieve the 2011 goals. This partnership has to date conducted detailed assessments of the basic education, electricity and water sectors.

In late 2023, the NPC and the DBSA initiated the South Africa Digital Infrastructure Investment Project to assess progress towards the objective that "all individuals will be able to use a core of ICT services and enjoy access to a wide range of entertainment, information and educational services" (NPC, 2011: 178).

Africa Analysis was appointed to undertake this study in April 2024.

1.2 Scope of the project

The scope of this study is to assess the digital infrastructure investments required between now and 2035 to achieve the targets as specified in the NDP, the SDGs, NIP2050 and other national policies. The specific objectives of the project are:

1. To quantify the investments that are required between now and 2030, and extended to 2035, in terms of both new capital and O&M, which will make it possible to achieve the broadband connectivity targets as specified in the NDP, NIP2050, the SDGs and other key national policies.
2. Set out key uncertainties and strategic policy options required to achieve NIP2050, NDP and SDG ambitions, along with recommendations, taking into account the various costs/funding, and the economic and social impacts of critical policy choices.
3. Identify investment barriers and financing gaps and highlight connectivity infrastructure cost drivers and the implications of different policy choices.
4. Engage policymakers and other key stakeholders, to the extent possible, to work through the implications of policy choices and their trade-offs, in terms of costs, access and service levels.
5. Position the study within the context of the need for South Africa to increase its digital readiness, outlining the high-level policy and investment prerequisites for the country to achieve appropriate levels of digital transformation.

The assessment is structured using the BtG methodology, integrating:

1. Scenario-based planning (baseline, core, aspirational trajectories);
2. Investment efficiency diagnostics; and
3. Macro-fiscal considerations to ensure proposed investments are realistic, cost-effective, and fiscally aligned.

This holistic approach provides a clear, evidence-driven foundation for prioritising investments, identifying reform levers, and mobilising both public and private capital to close the digital divide.

1.3 Report objectives

This report responds to the challenge of connecting all end users to high-speed broadband by offering a structured, evidence-based framework to:

- Quantify South Africa's DCI investment needs;
- Evaluate the scale of the financing gap relative to national targets; and
- Propose scalable, inclusive investment pathways aligned with the SA Connect Phase II strategy and the broader goals of the NDP 2030.

The overarching objective is to guide government and stakeholders in designing a fiscally sustainable, socially equitable and operationally feasible roadmap for digital infrastructure investment and digital inclusion.

To this end, this report seeks to answer four central policy and planning questions:

1. What is the current infrastructure and service availability landscape in South Africa?

2. What is the size and nature of the digital infrastructure investment gap based on national development goals?

3. How can South Africa structure financing and policy levers to optimise the delivery of digital infrastructure and services?

4. How can South Africa structure demand-side interventions to ensure high levels of take-up of broadband services?

Through this analysis, the report aims to support the government's efforts to prioritise investments, mobilise blended finance, and ensure that no community is left behind in the digital transition.

2 APPROACH AND METHODOLOGY

This chapter outlines the conceptual and analytical foundation of the study. At its core, the study adopts the UMC framework developed by the ITU. The UMC framework expands the debate beyond mere access to digital infrastructure to ensuring that end users have connectivity that is affordable, safe, enriching and productive.

Unlike earlier notions of universal service, which focused solely on infrastructure availability, the UMC framework emphasises both universal reach and the functional utility of connectivity, particularly for underserved populations. It also recognises the importance of catalysts – such as innovation, education, and economic growth; and policy levers, such as fiscal incentives, spectrum management, and regulatory reforms – as drivers of improved connectivity outcomes.

Building on this framework, the study applies the BtG methodology developed by the World Bank. The BtG methodology combines cost benchmarking, scenario-based gap analysis, and investment efficiency diagnostics to assess infrastructure shortfalls and estimate the public and private capital required to close them. It integrates macro-fiscal considerations to ensure that proposed investment trajectories are aligned with South Africa's broader development and fiscal frameworks.

The BtG methodology fully recognises that connectivity consists of many component parts, where the DCI stack encompasses international connectivity, national and metro backbone networks, data centres, last mile access and critical inputs to efficient development and use of this infrastructure such as spectrum systems and digital readiness (focusing on human capital, institutional capability and governance).

To contextualise South Africa's progress, the study uses international benchmarking against peer and aspirational countries – including Brazil and Malaysia – across indicators such as affordability, broadband uptake and digital competitiveness.

Together, these methodological pillars provide a robust framework for identifying not just how much to invest, but also where, how and under what conditions to drive inclusive digital development in South Africa.

2.1 Our approach: Universal and Meaningful Connectivity

The ITU, as an arm of the UN, has been driving universal service-oriented strategies and policies since its inception in 1865. As telecommunications and now digital/broadband network roll-out and use has evolved, the ITU has adopted different definitions and strategies towards ensuring that all individuals are connected to ICT services.

Definitions of universal service in the 1990s focused almost exclusively on the availability of access to network infrastructure (ITU, 1998), maturing to a detailed focus on the quality of access as well as the ability for end users to functionally utilise the opportunities that arise from access to network infrastructure.

The 2022 definition refers to UMC, where:

- Universal connectivity refers to "connectivity for all"; and
- Meaningful connectivity refers to "a level of connectivity that allows users to have a safe, satisfying, enriching and productive online experience at an affordable cost" (UN, 2022).

The following figure outlines the structure of the UMC measurement methodology:

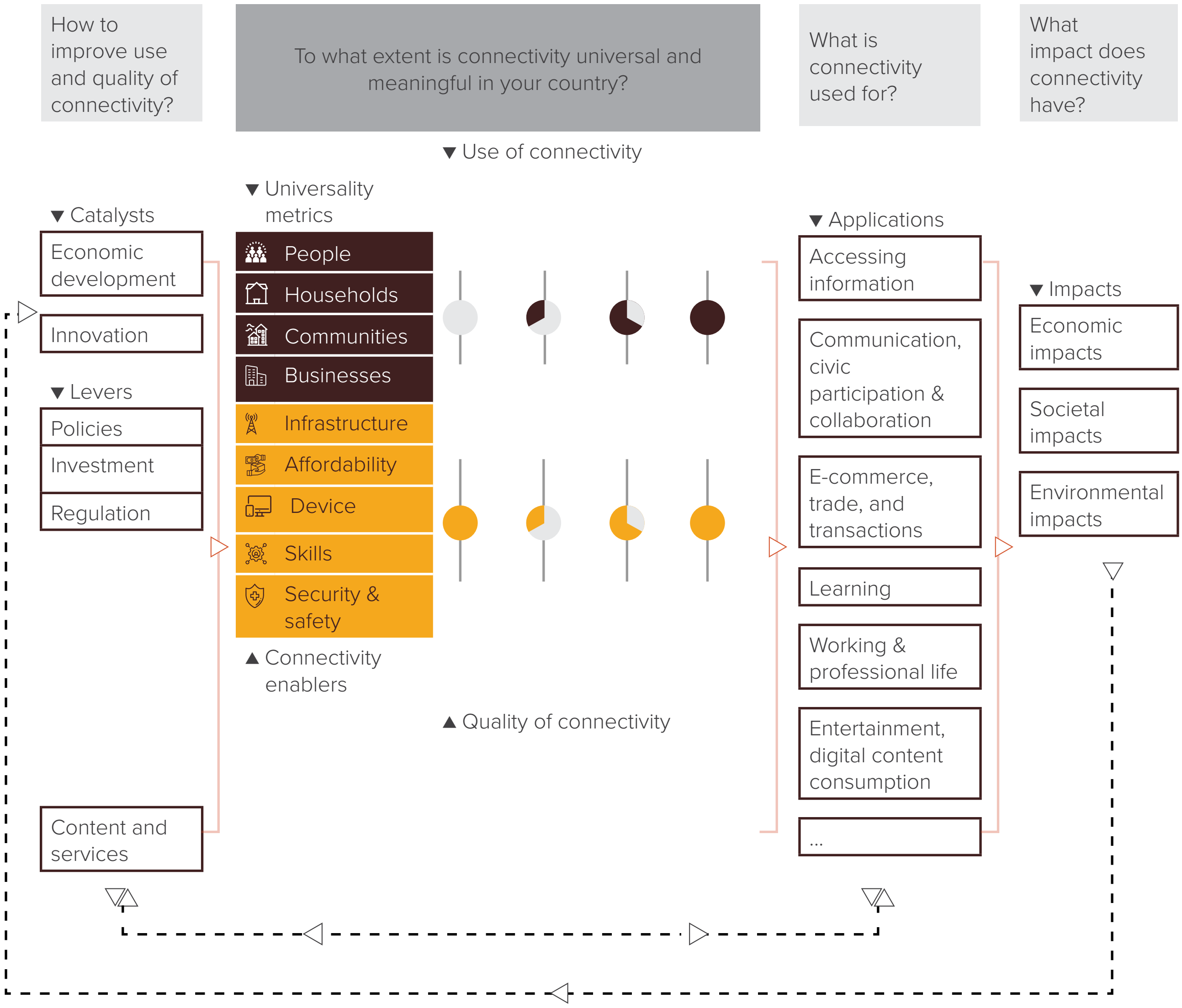


Figure 2-1: The framework of universal and meaningful connectivity

Source: United Nations, 2022

UMC has emerged as a critical policy objective globally, representing a holistic approach to connecting the world. The ITU, through its UMC Project, identifies six interdependent elements of UMC:

- Availability for use;
- Quality of the connection;
- Affordability of services;
- Affordability of devices;
- Skills; and
- Safety and security.

This definition reflects the multidimensionality of connectivity and makes it clear that targeting universal service is not enough: Before a person or household or institution can be said to be 'connected', all six elements of the definition must be met.

The UMC model promoted by the ITU does not prescribe specific interventions (e.g. specific types of policies, regulations or investment) necessary to achieve UMC. Rather, the UMC model is a measurement framework to be used as a flexible tool that can evolve and incorporate new concepts and indicators to ensure continued relevance through 2030.

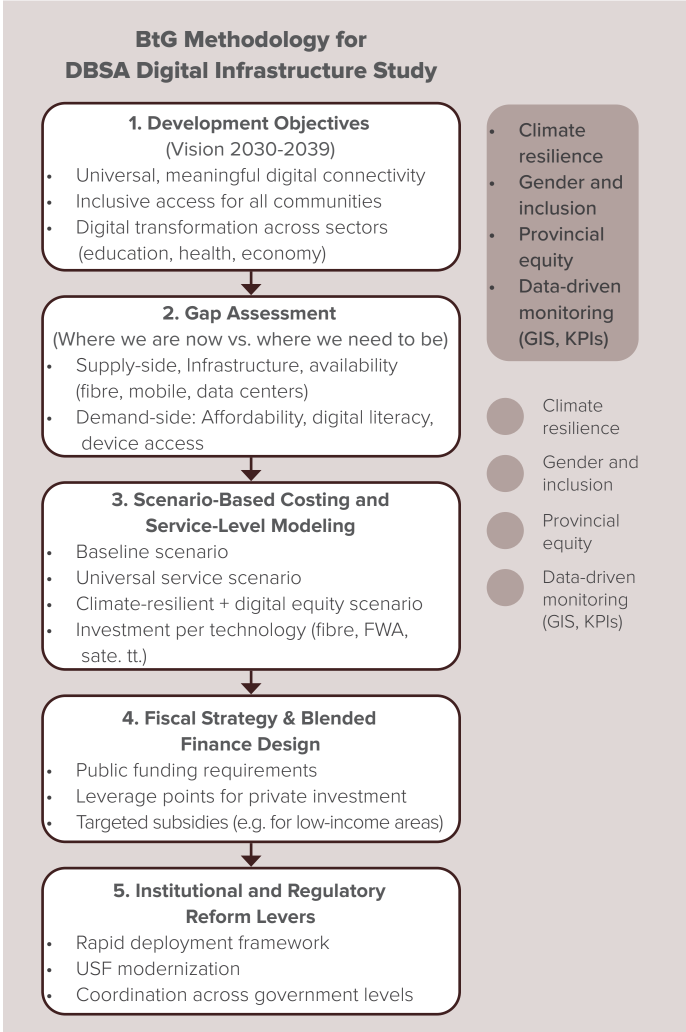
2.2 Project methodology

2.2.1 The Beyond the Gap methodology

The BtG methodology, developed by the World Bank, provides a structured framework for identifying service-level targets, estimating investment needs and evaluating policy and financing options across infrastructure sectors. Applied to South Africa's digital infrastructure context, BtG offers a comprehensive, evidence-based approach to aligning investment with development goals, fiscal constraints and efficiency imperatives.

The methodology combines cost benchmarking, scenario analysis, and investment efficiency metrics to estimate the gap between current service levels and national targets – such as those articulated in SA Connect and the NDP 2030. It enables the formulation of multiple investment trajectories, ranging from baseline (status quo) to transformative (aspirational), each tied to different levels of ambition, policy reform and fiscal effort.

A key feature of BtG is its focus on investment efficiency – assessing not only how much is needed, but also how effectively resources are used. This includes evaluating unit costs of infrastructure components, identifying cost drivers (e.g. geography, density, procurement models), and simulating outcomes under different implementation modalities.



Source: Adapted from World Bank BtG Framework & DBSA/NPC digital investment methodology

In addition, BtG integrates macro-fiscal diagnostics, ensuring that investment plans are grounded in the broader realities of public finance. This includes assessing fiscal space, affordability constraints, and the potential for leveraging private capital through instruments such as blended finance or public-private partnerships (PPPs).

By combining these elements, the BtG methodology provides policymakers with a transparent, comparable and policy-relevant framework for prioritising investments, mobilising funding and closing infrastructure service gaps – with a strong emphasis on equity, sustainability and value for money.

The logic of the BtG analysis is presented in Figure 2-2:

Figure 2-2: BtG analytical framework

Source: World Bank and DBSA, 2024

This methodology provides a systematic approach to estimating the infrastructure funding needed to close service gaps. Through different scenario analysis, it can also illustrate how funding requirements depend on key policy choices in pursuing developmental goals. By using the UMC lens and the relevant metrics to measure and monitor sector services, future investments can focus on the correct objectives to achieve set policy goals. The BtG analytical framework also allows for the identification of the roles that different public and private parties may play in bringing the required investments to fruition.

2.2.2 Defining digital infrastructure and the digital infrastructure stack

Digital infrastructure consists of many elements with multiple different investment and user requirements. To date, no national policy defines digital infrastructure in terms of both end users and the infrastructure underpinning this use.

A broad definition of digital infrastructure as provided by the UK government is where, at a general level, digital infrastructure "underpins the digital, cultural and social infrastructures to develop places where people want to live, work and visit" (UK Department for Digital, Culture, Media & Sport, 2019).

As the World Bank outlines, the digital infrastructure ecosystem has both physical (hardware) and non-physical elements (software), which work together, where services and applications used by end users (real or virtual) on terminals and devices interact with connectivity, transportation, storage and processing systems (World Bank, 2024).

As we see in South Africa, this digital infrastructure can be owned by both public and private parties, be open and accessible to multiple parties (open-access) or operated in a closed system (vertically integrated). Systems and data on these networks may be interoperable in a shared and open format (e.g. data available from StatsSA) or proprietary, incurring fees for access (e.g. access to the Home Affairs Identification Documentation database).

The focus of this study is on DCI, a subset of digital infrastructure, consisting of hard infrastructure. For the purposes of this report, DCI concerns "that portion of digital infrastructure that is used for voice, data and video communications between individuals (one to one), using digital technologies, such as fibre optic cables, cellular mobile communications, microwave or satellite communications, and includes data centres, but excludes computer services and one-to many communications such as broadcast radio or TV" (adjusted from World Bank, 2024).

This study excludes the necessary computer servers and systems required to support digital public infrastructure (DPI).[1]

The following figure illustrates the key elements of the DCI value chain and the supporting infrastructure types.

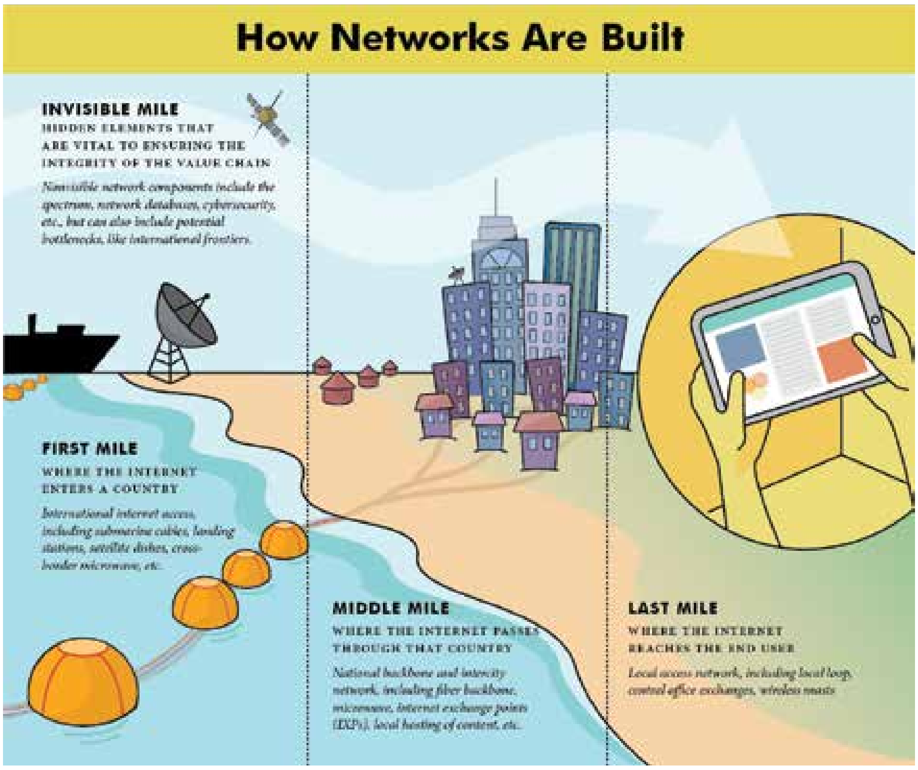


Figure 2-3: Three miles of Internet connectivity

Source: USAID, 2020

[1] DPI may be defined as "a set of shared digital systems which are secure and interoperable, built on open standards, and specifications to deliver and provide equitable access to public and/ or private services at societal scale and are governed by enabling rules to drive development, inclusion, innovation, trust, and competition and respect human rights and fundamental freedoms" United UN, 2023: 6). Examples of DPI include electronic national ID systems, government e-procurement systems, digital dashboards and public orchestration of public governance and accountability. DPI relies of DCI to be delivered to citizens but requires a different set of hard computing assets to that of DCI.

As Figure 2-3 illustrates, DCI consists of the following infrastructure domains:

- **The first mile:** Including international high-capacity undersea cables and the associated cable landing stations that bring this capacity onto South Africa's shores.
- **The middle mile:** The national and regional traffic routes of data flows and storage within a country, consisting of:
  - National and metropolitan backbone infrastructure: High-capacity fibre routes and long-haul links that connect regions, provinces and rural districts to the national and global Internet.
  - Data centres and Internet exchange points (IXPs): Traditionally, data centres (DCs) and IXPs were located at specific points where large volumes of traffic were aggregated before onward transmission to the national and international Internet, supporting data storage, cloud computing, and efficient traffic routing for public and private sector applications. While this still remains the case for the large majority of locations for this type of infrastructure, there is growing investment in Edge DCs, located close to the origin of generation of significant traffic volumes or at the location where high volumes of data demand exist.[2]
- The **last mile:** The last mile consists of the different technologies available to end users to access the Internet and consists of a host of different technologies, including:
  - Fixed networks dominated by FTTH; and
  - Wireless broadband networks, consisting of:
    - 4G/5G mobile coverage;
    - FWA technology solutions;
    - Wi-Fi, and
    - Satellite services.

2.2.3 Benchmarking

Every country has its own set of unique characteristics that drive its development path. However, experience in other countries, their achievements and failures, provide valuable input to the future development of investment plans and policy mechanisms to drive digital adoption in South Africa. This study compares South Africa's level of DCI development and digital readiness to middle-income economies (such as Brazil) as well as those countries that represent aspirational achievements. This benchmarking exercise focuses on comparing and contrasting different UMC and related indices rankings across comparator countries.

2.2.4 Infrastructure assessment

Knowing who has access and where access to high-speed broadband is available in South Africa is a critical starting point for the assessment of existing, and the consideration of any future, investment and policy strategies for South Africa. This study develops the first publicly available last mile DCI map of coverage of different last mile technologies, including fibre networks, towers, IXPs and fixed wireless access points. This spatial analysis is then used to identify unserved and underserved geographic areas and supports the estimation of investment gaps by geography and population segment.

[2] Edge DCs are the next step after international and national caching of content.

2.2.5 Digital readiness assessment

Take-up and use of DCI is the key impact component of the UMC lens, where productive use of the Internet is the key driver of socio-economic driver of infrastructure investment. This study provides a high-level assessment of South Africa's digital readiness in terms of:

- Digital skills within the population and public sector;
- Institutional capacity to plan and manage digital investments; and
- Policy and regulatory frameworks governing competition, affordability and innovation.

This assessment feeds into South Africa's readiness for the introduction of 4IR technologies (artificial intelligence, machine learning, big data analysis, automation, connected vehicles). The concluding assessment will include certain considerations that government departments may build into their digital transformation planning.

This Digital Readiness Assessment includes the introduction of the Employment Readiness Index, a tool to measure the digital capability of South Africa's school-leavers. This tool is in its infancy and is to be reviewed and revised as South Africa develops its digital society roadmap.

2.2.6 Development of recommendations for South Africa

This assessment of DCI in South Africa concludes by developing a set of recommendations. These recommendations explore a 'whole-of-government' implementation framework, where required, as well as line-function department and regulatory bodies.

3 SOUTH AFRICA'S STANDING IN DCI COMPARED TO THE REST OF THE WORLD

This chapter compares South Africa's standing against DCI competitors in Africa (e.g. Kenya), middle-income economies (such as Brazil), as well as those countries that represent aspirational achievements (e.g. Thailand and France). The UMC lens provides the starting point for the assessment of the state of DCI in South Africa. This cross-country analysis then delves into the realm of product pricing, digital competitiveness and digital readiness.

3.1 South Africa's level of achievement towards universal and meaningful connectivity

The UMC lens, as captured by the ITU, measures individual countries against a set of aspirational targets to be achieved by 2030. The targets represent the goals that South Africa aims to achieve as per the NDP, NIP2050, and the SA Connect policies. The UMC metrics[3] are generated annually based on information provided by ITU member countries. South Africa provides information on the UMC metrics through data collected by ICASA.

Using the UMC lens, South Africa has clearly achieved much, with 75% of the population older than 15 years using the Internet, as well as 78% of homes with access to the Internet.[4] The retail price of products is close to meeting the objective of 2% of monthly GNI, but this measure cannot account for the significant income disparities in South Africa.

The following table reports South Africa's achievements towards universal and meaningful connectivity.

Table 3-1: South Africa's achievements towards universal and meaningful connectivity

Indicator	Status	Progress Score Target=100
Internet users: Individuals aged 15+ using the Internet %	Advanced	75
Homes connected: Households with Internet access at home %	Advanced	78
Mobile phone ownership: Individuals who own a mobile cellular telephone %	Advanced	89
High-speed fixed broadband: Equal to or above 10 Mbit/s % fixed broadband subscriptions	Target met	95
Fixed broadband cost: Fixed-broadband Internet basket % GNI per capita - target of retail cost not exceeding 2% of monthly GNI per capita	Advanced	91
Mobile broadband cost: Data-only mobile broadband basket % GNI per capita - target of retail cost not exceeding 2% of monthly GNI per capita	Target met	95
Primary schools connected: Primary schools connected to the Internet %	No data	---
Lower-secondary schools connected: Lower-secondary schools connected to the Internet %	No data	---
Upper-secondary schools connected: Upper-secondary schools connected to the Internet %	No data	---
Secondary schools connected: Secondary schools connected to the Internet %	No data	---
Businesses (0+ staff) connected: Business with 0+ staff using the Internet %	No data	---
Business (10+ staff) connected: Business with 10+ staff using the Internet %	No data	---
Internet use gender parity	No data	---
Internet use gender parity %	No data	---
Mobile phone use gender parity: The target is met if the gender parity score - defined as the percentage of women using a mobile phone divided by the percentage of men using a mobile phone - is at least 0.98	No data	---
Mobile phone ownership gender parity: The target is met if the gender parity score - defined as the percentage of women owning a mobile phone divided by the percentage of men owning a mobile phone - is at least 0.98	Target met	100

Source: ITU, 2025

[3] South Africa provides information on the UMC metrics through data collected by ICASA.

[4] The ITU utilises the measure of the number of households who have individuals using the Internet, be it through fixed line, mobile, Wi-Fi or other connectivity technology. This metric does not assess whether households are able to utilise access to the Internet.

South Africa has achieved significant network rollout, particularly in the mobile segment. As of 2024, 4G population coverage stands at nearly 99%, making mobile broadband the dominant means of connectivity across the country. This extensive rollout has been driven by competitive investment from mobile network operators, regulatory support for spectrum release, and the natural economics of wireless deployment in a geographically diverse country.

Furthermore, 5G coverage is expanding rapidly, especially in major metropolitan areas, with operators reporting 5G availability in over 50% of urban population centres. The widespread deployment of 4G and growing footprint of 5G reflect the strength of South Africa's mobile infrastructure ecosystem – one of the most advanced on the continent.

This infrastructure backbone underpins not only consumer connectivity but also serves as the foundation for FWA solutions in areas where fibre roll-out is not yet economically viable. It is also an enabler of broader digital transformation initiatives, including government service delivery, fintech expansion, and e-commerce uptake.

However, despite this progress, South Africa does not yet report data to the ITU on school or business connectivity – a critical omission. These indicators are essential to understanding the socio-economic impact of digital infrastructure and ensuring that connectivity translates into real opportunity. Future policy developments must therefore prioritise standardised, disaggregated data collection – particularly for education and enterprise connectivity – to inform targeted investments and measure progress toward UMC.

3.2 Comparing South Africa's achievements to the rest of the world

Benchmarking is a useful tool to support the policy development process and to develop aspirational targets. Benchmarking is particularly useful when comparing the state of infrastructure in different countries but becomes less effective as a tool when comparing price-related elements.[5] The following table compares the chosen benchmark countries according to socio-economic status and population density.

Table 3-2: Country benchmark socio-economic status

Country name	Income category	Population density (people per sq. km of land area)	Monthly gross national income per capita (current USD)	GINI rank (relative country ranking)
South Africa	Upper-middle-income	51	1 706	63
Brazil	Upper-middle-income	25	2 947	52
Mexico	Upper-middle-income	66	517	43.5
Kenya	Lower-middle-income	95	1 249	38.7
Thailand	Upper-middle-income	140	2 014	34.9
France	High-income	124	5 908	31.5
Germany	High-income	240	4 923	32.4

Source: World Development Indicators database

Table 3-2, sorted against population density[6], provides a cross-section of comparator countries across geographies, political systems and earnings.

[5] The dynamics of price-setting and cost structures in one country are typically significantly different to those in another country.
[6] Note, that for this sample, monthly income increases and the GINI coefficient reduces as population density increases

3.2.1 Universal and meaningful connectivity

The following table compares the same countries on their relative ranking towards achieving UMC, where Kenya has the lowest levels of UMC, while Thailand has the highest of the sample group. Kuwait, with a population density of 254 people per square kilometre, is the best-performing country in achieving UMC.

Table 3-3: South Africa's relative ranking in the ITU's ICT Development Index

Country	Universal connectivity	Meaningful connectivity	ICT Development Index
South Africa	62	95	80
Kenya	137	127	134
Mexico	96	79	90
Brazil	88	90	85
Germany	50	70	57
France	54	18	44
Thailand	37	53	37
Kuwait	1	1	1

Source: ICT Development Index 2024, ITU 2024, and Africa Analysis calculations

Disaggregating this performance further into actual network availability, network speeds and access pricing further illustrates where South Africa needs to improve performance to rise in the global rankings.

While the UMC dashboard reports that South Africa has achieved the goal of mobile prices being less than 2% of monthly GNI, an alternative metric that more effectively measures affordability is the share of household expenditure on ICT, illustrated in Figure 3-1.

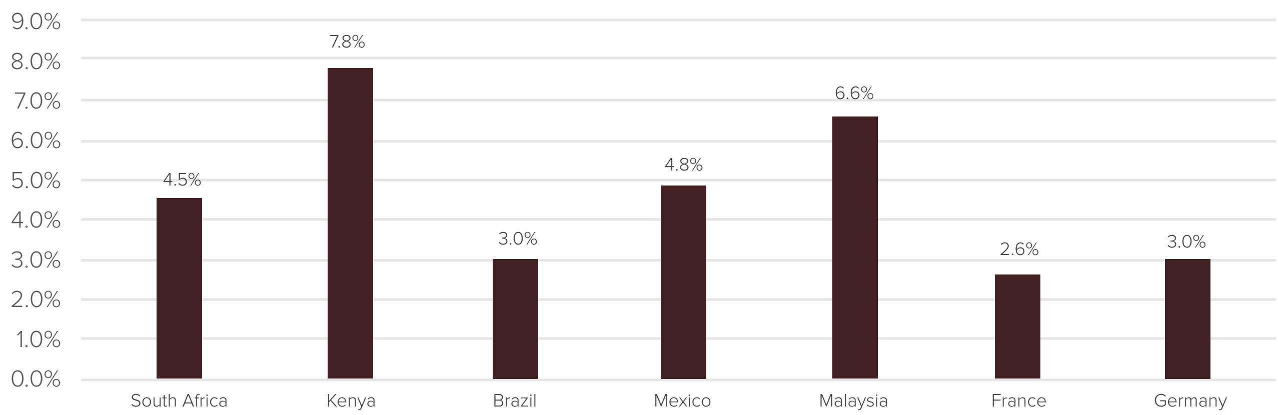


Figure 3-1: ICT share of household expenditure in comparator countries[7]

Source: Kenya: Statista, 2025; Brazil: Instituto Brasileiro de Geografi a e Estatística, 2020. Mexico: own estimate. Malaysia: Department of Statistics, Malaysia, 2022 France: INSEE 2024. Germany: Eurostat, 2025.

South African households are currently spending an average of 4.5% of household expenditure on ICT services and equipment, an indication that pricing may still not be at a level deemed to be affordable for all.

Key to understanding this level of expenditure is to understand what households are paying for, i.e. are households obtaining value for money? One metric to consider is the average download speed of Internet connections in a country. The Table 3-4 compares South African average Internet download speeds to the same comparator countries. Although South Africa reports the fastest mean download speed in Africa, it is ranked only 111th in the world.

[7] The comparison data are extracted from income and expenditure surveys of each respective country. Although prices may have shifted since some of these surveys were conducted, the overall trend in share of household expenditure remains relevant.

Table 3-4: Monthly GNI per capita versus mean download speeds, 2024

	Monthly GNI per capita	Population density (people per sq. km)	Median FBB	Median MBB	Mean	Country ranking
Iceland	6 474.17	3.79	214	0	280	1
France	4 922.50	124.31	224	103	177	9
Brazil	1 705.83	25.16	170	73	93	47
Germany	5 908.33	239.86	91	57	88	49
Thailand	1 911.67	140.41	232	55	68	66
Mexico	2 014.17	66.16	79	33	45	107
South Africa	1 249.17	51.42	47	52	42	111
Kenya	516.67	95.32	12	29	14	167

Source: Ookla Global Index (December 2024)

The two previous tables show that Kenyan households spend 1.7 times more on ICT connectivity for slower connectivity speeds than South Africans, and consume less mobile data. Households in Malaysia spend 1.45 times more than South African households and benefit from significantly higher download speeds, while households in France and Germany spend 3% per month or less on ICT connectivity, yet benefit from the highest download speeds and highest level of penetration of fixed-line connectivity.

Importantly, of the benchmark countries, South Africa has one of the reportedly worst-performing USAF/social obligations framework (GSMA, 2023), which has an overall impact on the level of digital readiness of end users. Despite Kenya's low UMC and affordability ranking, the Kenyan Universal Service Fund is viewed as a good example of both a visible entity in deployment network infrastructure and providing access to handsets, as well as in the design and use of reverse auctions for the private sector to extend services to under-serviced areas.

3.2.2 Affordability

Direct benchmark comparisons represent a price point at a point in time under specific circumstances within a specific country – in other words, direct comparisons between prices in different countries provide a useful broad indicator but fail to consider any particular cost-drivers or social usage patterns that drive pricing dynamics. A unique metric developed for this report was to compare the cost of services to the national minimum wage in each country. The following figure illustrates the reality that the cost of a device may be the single largest constraint to end users adopting high-speed broadband services: A low-cost smartphone represents over 40% of the monthly minimum wage in Kenya, almost 25% in Thailand and 18.4% in South Africa. The retail price of a fixed broadband connection is equivalent to between 7.5% and 8.5% of the monthly minimum wage in South Africa, Brazil, Mexico and Thailand, while being prohibitively expensive in Kenya.

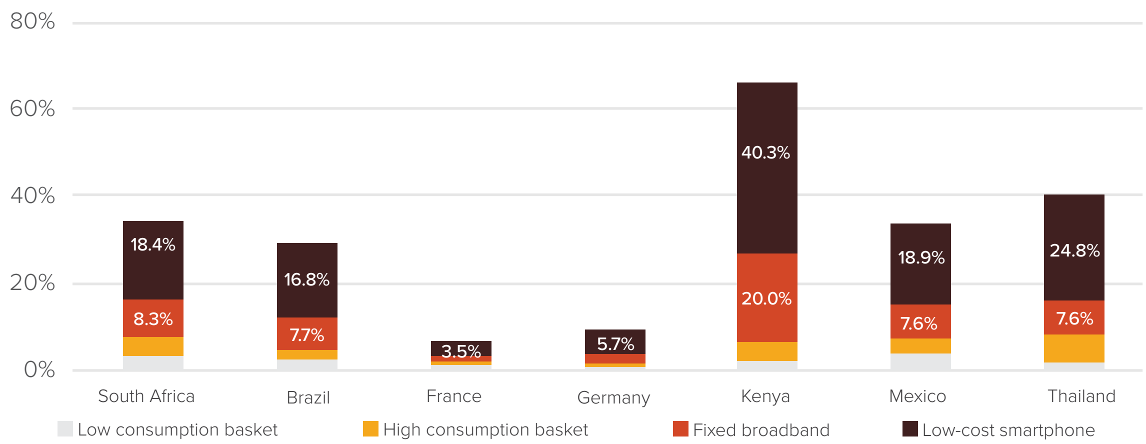


Figure 3-2: Retail services and device cost compared to the minimum wage

Source: ICT Development Index 2024, ITU 2024, and Africa Analysis calculations

Turning towards direct comparisons, the ITU price basket methodology is a standardised toolkit to use for direct comparisons between countries. Regarding low consumption and high consumption mobile products, South African retail prices are between 3% and 4.7% of the minimum wage. Kenya has the lowest-cost low-consumption basket at 2.2%, other than France and Germany.

The following table provides more detail on the comparison provided in Figure 3-2.

Table 3-5: Comparing the minimum wage (in nominal USD) to the cost of services and products

Country	Minimum wage, 2023	Average income, 2023	Minimum wage share of avg. income	Service / product share of minimum wage			
				Low consumption basket	High consumption basket	Fixed Broadband	Low-cost smartphone
South Africa	**242.99**	**562.50**	**43.2%**	**3.0%**	**4.8%**	**8.3%**	**18.4%**
Brazil	260.69	755.83	34.5%	2.3%	2.3%	7.7%	16.8%
France	1 889.19	3 755.83	50.3%	1.2%	0.7%	1.4%	3.5%
Germany	2 159.29	4 497.50	48.0%	0.7%	1.0%	1.9%	5.7%
Kenya	109.12	175.83	62.1%	2.2%	4.3%	20.0%	40.3%
Mexico	257.56	1 008.33	25.5%	3.7%	3.7%	7.6%	18.9%
Thailand	243.18	598.33	40.6%	1.7%	6.5%	7.6%	24.8%

ICT Development Index 2024, ITU 2024, and Africa Analysis calculations

In general, South Africa's prices of services and handsets appear higher than direct comparator countries. The affordability of services is a key metric under the UMC framework, where high prices are a key constraint to broadband uptake.

4 DIGITAL READINESS AND DIGITAL COMPETITIVENESS

This section of the report explores the digital readiness of South Africa to capture the potential benefits of the digital society. A digital society can be defined as an ICT-dependent society, where the creation, distribution, use, integration and manipulation of information become the main economic, political and cultural activities (Kennedy, 2019). This is a society characterised by information flowing through global networks at unprecedented speeds (Redshaw, 2019). Essentially, in a digital society, every facet of a person's life is impacted by new information and communication technologies, and to be a fully functioning member of the society, one needs to have uninterrupted access to high quality broadband (Internet) connectivity and be continuously connected.

The digital society consists of both supply-side and demand-side attributes. Supply-side attributes incorporate all policy, regulatory, institutional, investment and licensing frameworks so as to achieve universal access, otherwise summarised as all those factors that impact on the deployment and operation of network infrastructure.

Demand-side attributes are more complex and involve the ability for individuals to pay for services, their ability to utilise digital services as well as the related implications of such services. Some of these demand-side attributes include significant changes to the way society is now valued, interacts with institutions as well as a host of other issues, such as:

- Datafication where digital information has led to the quantification and monetisation of human life.
- Data privacy and security concerns where digital connectivity has created "forms of interaction that are no longer defined by physical presence: personal information or pictures become potentially accessible for a worldwide audience, data "is easy and cheap to store" and becomes permanent in digital records" (Katzenbach & Bächle, 2019).
- Algorithmic systems and governance, where algorithms govern the interaction of society, between individuals, content and geographies.
- Platformisation of data and services, as these become the dominant mode of economic and social organisation. Access to platform services is now a key element of the digital divide (Katzenbach & Bächle, 2019).

The definition of a 'digital society' and what it comprises will continue to grow over time as elements such as automation, smart technologies and smart cities become the norm. Leveraging the potential offered by the digital society no longer depends on the mere availability of infrastructure but crucially on whether society or country has/is generating the ability to leverage this potential, i.e. the level of digital readiness of a country to adapt, adopt and productively use digital technologies. This section of the report explores South Africa's relative standing on various digital readiness indicators.

4.1 South Africa's digital readiness compared to benchmark countries

There are numerous global indices that track country performance on a country's ability to compete in the digital society. The principal objective of the various indices is to provide a value to the following three elements:

- The **ability of the current labour force** to utilise digital tools;
- The **future direction/trajectory** of the skills base; and
- Whether the **prevailing legislative and regulatory environment supports** investment into digital infrastructure, ensure effective data and privacy governance and provide robust cybersecurity protections and mitigating actions.

South Africa's performance in both the World Digital Competitiveness Index (WDCI) and the Network Readiness Index are discussed further:

4.1.1 World Digital Competitiveness Index

The WDCI has been providing a global digital competitiveness ranking of participating countries since 2017, with three focus areas:

- Knowledge: Knowhow necessary to discover, understand and build new technologies.
- Technology: Overall context that enables the development of digital technologies.
- Future readiness: Level of country preparedness to exploit digital transformation.

The following figure indicates that South Africa is ranked as 54th out of 67 countries in 2024 (IMD, 2025), which represents a slight improvement from the ranking in 2020 of 60th in 2020.

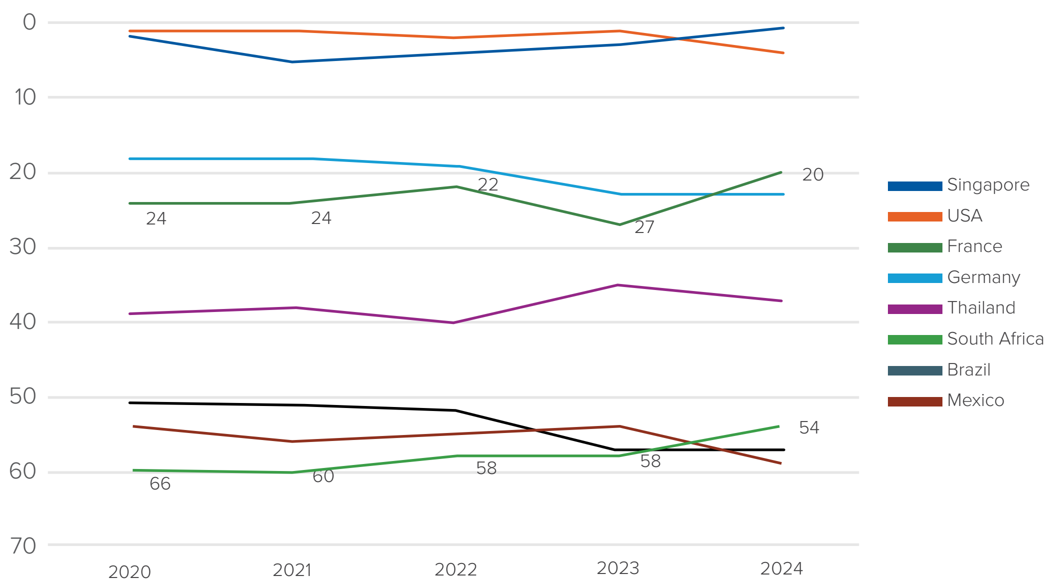


Figure 4-1: South Africa's digital competitiveness compared to benchmark countries, 2020 - 2025

Source: IMD, 2025

A more detailed assessment of progress between the 2020 and 2024 period is provided in the following table:

Table 4-1: Areas of South Africa's decline in digital competitiveness over the period 2019 to 2023

Country	Overall	Knowledge	Technology	Future readiness
Singapore	1	0	1	11
USA	-3	-3	2	-6
France	4	-2	4	8
Germany	-5	-8	-9	-3
Thailand	2	3	17	4
South Africa	**6**	**6**	**0**	**7**
Brazil	-6	1	-4	-10

Source: IMD, 2025

When comparing progress made during the period 2019 to 2024, South Africa has improved its ranking compared to the benchmark countries, except for its ability to leverage digital technologies. Both Germany and France (high-income countries) report mixed performance. France reports a large increase in future readiness, while Germany has dropped the most out of all countries across all categories. Singapore has jumped 11 positions in its ability to exploit digital transformation, the area of improvement that bested the United States.

Despite Thailand reporting a substantial increase in technology capability, this only led to an improvement of two positions in the overall ranking. Despite Germany's drop in the country rankings, it still reports a highly capable and competitive digital capability, with an overall ranking of 23rd in the world.

The limited change in overall rankings over time illustrates two realities:

- Countries that have previously successfully executed digital policies to stimulate are likely to retain their level of digital competitiveness.
- Improving a country's future readiness takes time and relies on education and training programmes being successfully implemented over decades rather than years (See Appendix J: the 1970 IT strategy of India).

The following figure outlines South Africa's 2024 ranking for each of the sub-indices.

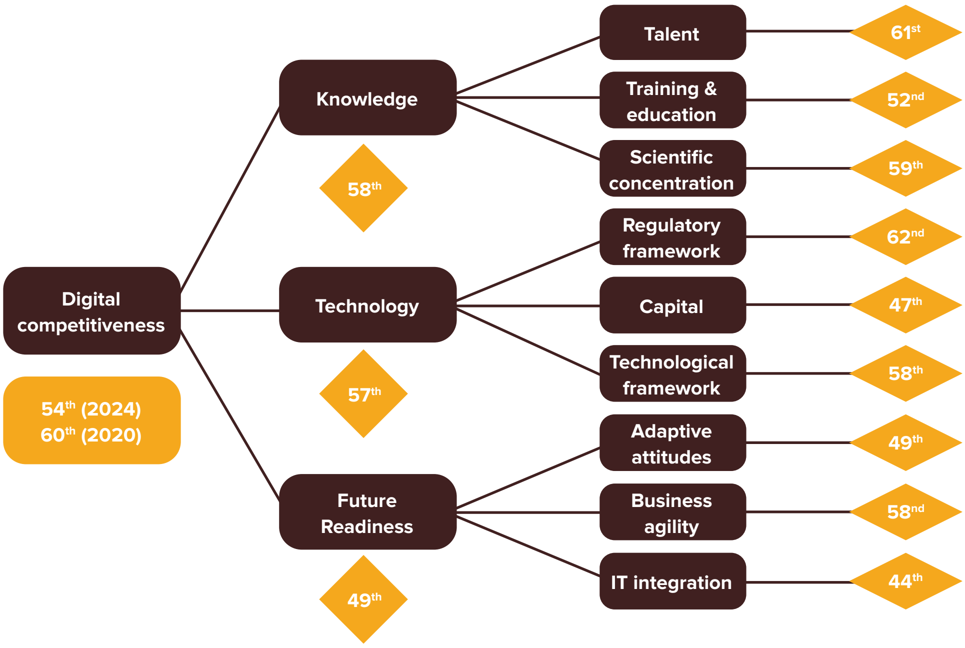


Figure 4-2: South Africa's overall digital competitiveness ranking per focus area

Source: IMD, 2025[8]

Knowledge

As the scoring per sub-index reveals, South Africa performs worst in the Training and Education category (60th) and the Regulatory Framework for Digital Competitiveness (62nd). Concerningly, South Africa consistently ranks second based on the share of the national budget allocated to education. This high ranking is weighed down by indicators for the quality of education outcomes (for example, where South Africa is ranked 61st out of 67 countries for higher education achievement and 56th out of 67 countries for the number of graduates in the sciences). To further explore South Africa's ability to participate in the digital society, this report introduces a new measure to assess the digital maturity of education outcomes.

Technology

South Africa performs most poorly in the Regulatory Framework category (62nd). This ranking is a result of poor rankings in the general business environment of red tape to start a business and to bring in high-demand skills. The technological framework rating, which is poor, is generated based on end-user statistics for access to broadband.[9]

[8] Note that this report is developed in partnership with Productivity SA.

[9] The existence of missing data from the UMC dashboard as well as South Africa's failure to meet standard ITU reporting requirements is an indication that an improvement in ICT statistics collection could potentially lead to an improvement in South Africa's rating in this metric.

Future readiness

South Africa's low ranking in Future Readiness, of 50th out of 67 countries, reflects the significant scope that exists to develop the use of the Internet for increased communication and commerce. South Africa's adoption of digital payment platforms and e-commerce services is commendable, but the growth in this arena is constrained the limited penetration of smart devices (particularly tablets and PCs) as well as risks regarding cybersecurity, particularly government's capacity to monitor, prevent and react to cybersecurity risks.

The affordability of devices is a key barrier to entry for many low-income users, whereas described above, the cost of a low-end smartphone may cost close to 20% of the national monthly minimum wage.

Improving the state's capacity regarding cybersecurity is a core element of the Digital Mzansi DPI.

4.1.2 Network Readiness Index

The Network Readiness Index (NRI) ranks countries according to four criteria, illustrated in Figure 4-3.

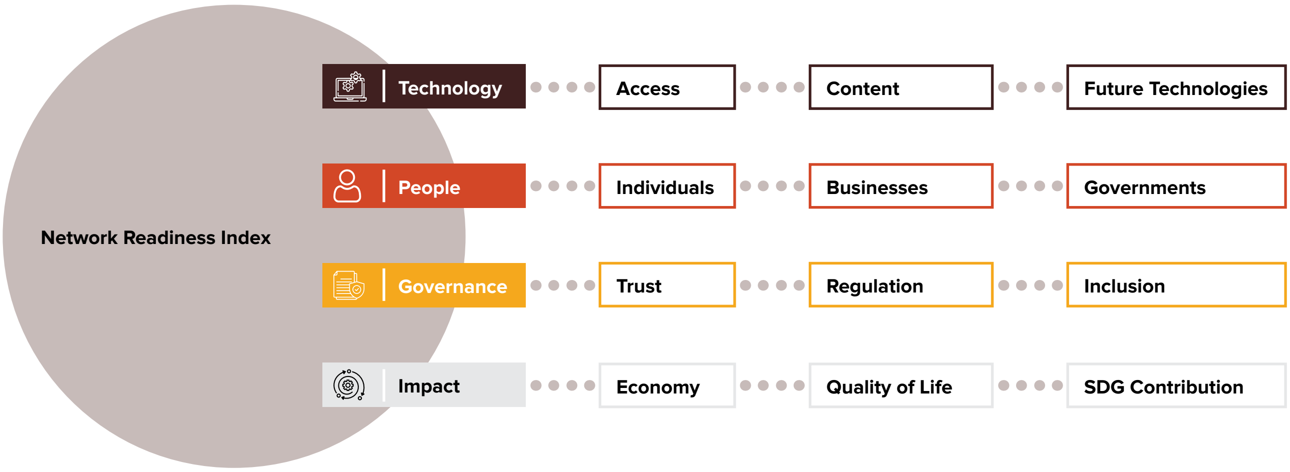


Figure 4-3: Structure of the Network Readiness Index

Source: Portulans Institute, 2024

The NRI includes the key component of the impact of society's participation in the connected society. This is a key measure that assesses whether a country is capable of capturing the socio-economic externalities for technology adoption, the supply of skills and managing the regulatory framework to support new business development.

Table 4-2: South Africa's standing in the Network Readiness Index

Country	NRI ranking	Technology	People	Governance	Impact
United States of America	1	1	2	9	11
Germany	9	4	8	16	9
France	16	13	14	25	18
Thailand	40	48	32	42	60
Brazil	44	45	49	39	64
Mexico	62	80	50	65	48
South Africa	**72**	**59**	**73**	**60**	**105**
Kenya	73	73	89	68	82

Source: Source: Dutta, 2024

South Africa is ranked 72nd out of 133 countries in the NRI, largely due to the very low result in the impact measurement. The index reports that South Africa's networked economy consists of significant disparities. Although businesses are digitising, adopting new technologies and investing significant amounts of capital into fixed and mobile infrastructure, adoption of digital services (especially digital payment systems) by end users is lower and slower than expected, given the size of the economy. South Africa is ranked poorly in developing digital skills among Individuals (105th) and enhancing Quality of Life (118th).

4.1.3 Measuring the education system's digital readiness outputs

In developing this report, the NPC developed a new experimental index, the Digital Employment Readiness Index. While international digital readiness metrics often focus on higher-education outputs, this metric focuses on both secondary and higher education outputs as many school-leavers in South Africa enter the labour market directly after completing their matric year.

This indicator includes three variables being:

- Employability measures the likelihood of a member of the youth cohort aged 15 to 24 years holding a qualification that allows entry into the digital economy labour market.
- Soft-skills acquisition measures the likelihood of the youth cohort aged 15 to 24 years to continue seeking employment despite significant hardships.
- Challenges measure the scale of economic challenges in concluding secondary education through comparing the number of students registered in Grade 10 versus Grade 12.

The first set of results for this new indicator are presented in Table 4-3.

Table 4-3: Digital Employment Readiness Index for South Africans <25

Country	Employability		Soft Skills	Challenges
	Entry[10]	Advanced Entry[11]		
2017	0.45	0.39	0.70	0.50
2018	0.44	0.37	0.69	0.50
2019	0.46	0.38	0.68	0.52
2020	0.55	0.39	0.70	0.61
2021	0.53	0.38	0.67	0.60
2022	0.73	0.40	0.66	0.77
2023	0.74	0.37	0.67	0.80
Average	0.56	0.38	0.68	0.61

Source: Africa Analysis 2025

The results of the digital economy ERI indicate that the population grouping of the 18 to 24 years age group has the soft skills to keep seeking improvements in their situation by seeking employment, just over 50% of school-leavers have the necessary skills base to obtain digital literacy skills, but less than 50% of graduates appear to have the digital skills necessary to enter the digital world of work at a graduate level.

These results align with the results of the international comparisons, even though using a different set of metrics for index construction. These results also align with the viewpoints expressed across all stakeholders consulted (network operators, retail sector ICT directors, senior members of financial services IT teams, training providers,etc.)

[10] National Senior Certificate (Matric)
[11] SAQA Level 5 qualification.

4.2 Digital public infrastructure and e-government

The United Nations defines DPI as "a set of shared digital systems which are secure and interoperable, built on open standards and specifications to deliver and provide equitable access to public and/or private services at societal scale and are governed by enabling rules to drive development, inclusion, innovation, trust, and competition and respect human rights and fundamental freedoms" (UN 2023: 6). Examples of DPI include electronic national ID systems, government e-procurement systems, digital dashboards, and public orchestration of public governance and accountability.

The South African Government has launched 'MyMzansi', a roadmap for its digital transformation. The vision of MyMzansi is articulated in the following figure.

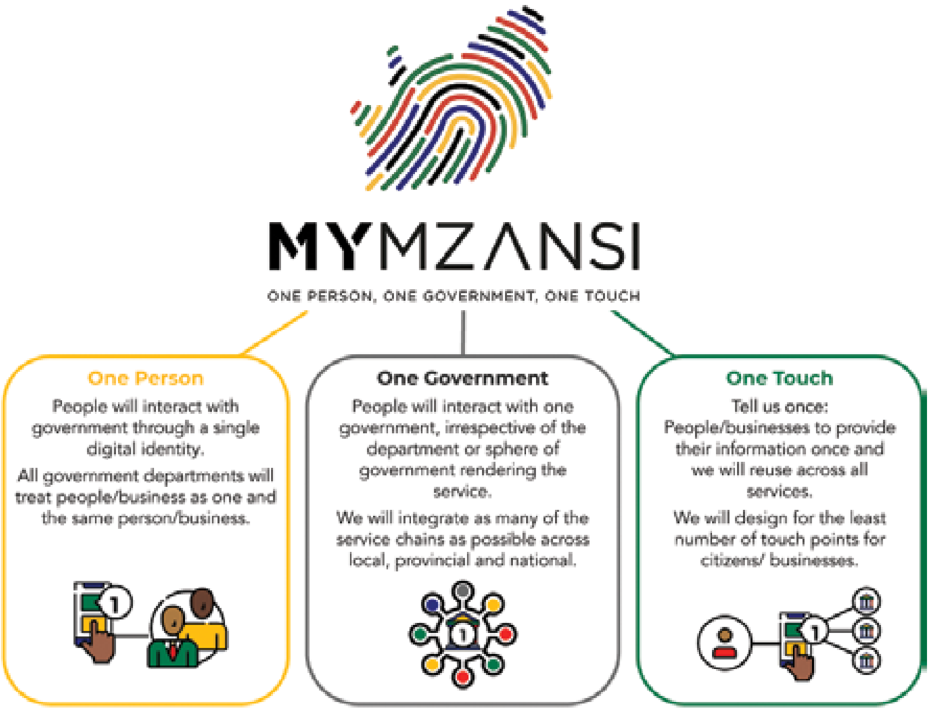


Figure 4-4: The MyMzansi vision

Source: https://www.mymzansi.org.za/roadmap/vision

Achieving the vision of MyMzansi depends on meeting the following minimum needs for end users and DPI service providers:

- End users must have/be:
  - Access to DPI that provides a suitable quality of service and meets the minimum requirements of any DPI application/website;
  - Access to a device that can run the DPI applications and services;
  - Suitably digitally ready to utilise the DPI services;
  - Trust in the use of digital technologies for information sharing, digital payment and digital transactions; and
  - Able to afford the data cost of utilising DPI services, or that the data cost of utilising DPI services is borne by other parties.
- DPI service providers must:
  - Design their services in line with the minimum Internet access speeds and device capabilities of end users; and
  - Have suitable DCI between all physical branches so that end users can access DPI services at existing service locations.

The vision of MyMzansi is dependent on achieving the goals of UMC. Particularly, in this case, all regional/citizen-facing government facilities needs suitable Internet connectivity to both access DPI services as well as to offer DPI services to the public.

All DPI initiatives, including DPI structures or e-government structures, must ensure that suitable information technology (IT) and security protocols are in place. In the South African environment, these mean a substantial improvement of government's approach to governing IT systems.[12]

The Auditor-General, who assesses the performance of South African state institutions, has consistently raised concerns about the lack of suitable IT governance in state institutions. The digital migration of the state necessitates an emphasis on the necessary core competencies that state institutions require.

This study, with its primary focus on infrastructure, does not include a detailed assessment and discussion of DPI.

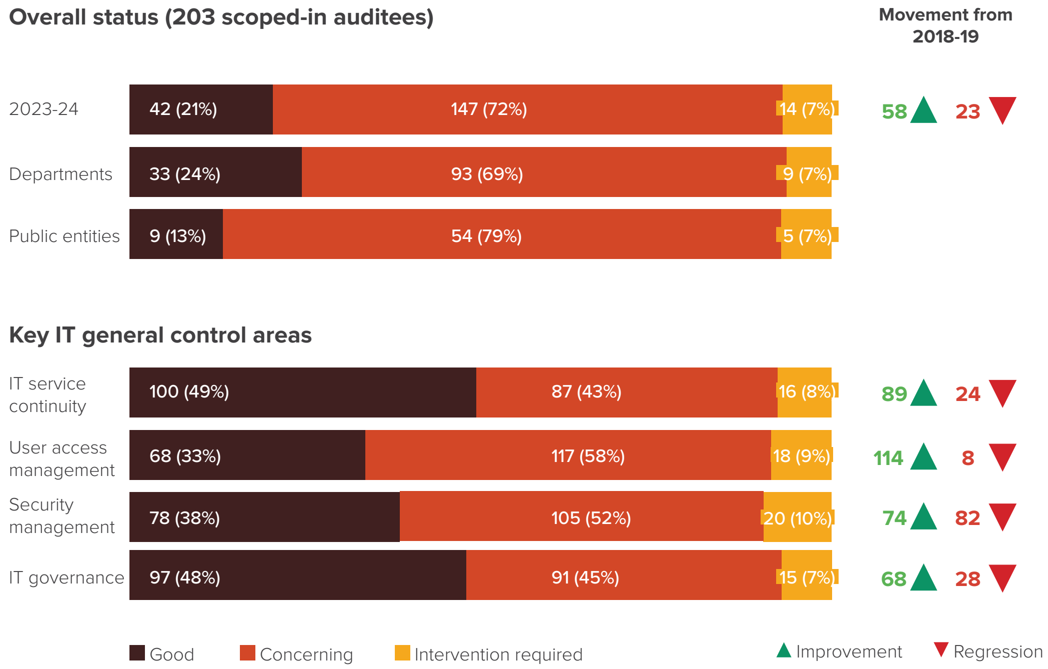


Figure 4-5: Status of IT quality controls in national departments and public entities

Source: Auditor-General, 2025

4.2.1 Conclusion on South Africa's digital readiness and competitiveness

International indices expose a significant weakness in South Africa's future global ranking in digital competitiveness. Our own self-developed metric as well as consultation with stakeholders, confirm what South African policy documents have been calling for: significant investment in programmes to enhance digital literacy and digital readiness.

[12] Every Auditor-General report for the past five years indicates that fewer than 25% of all national and provincial entities have suitable IT governance practices in place. See (Auditor-General, 2025)

5 UNIVERSAL CONNECTIVITY: IS SOUTH AFRICA'S DCI READY FOR LAUNCHING INTO THE DIGITAL SOCIETY?

Understanding South Africa's achievements in access to broadband services provides the starting point for any future plans to capture the benefits of the digital society. This chapter provides the baseline that South Africa can utilise to develop its future digital economy plans.

This section of the report is structured as follows:

- Section 5.1 focuses on the scale of the first mile serving South Africa.
- Section 5.2 focuses on the national backbone and middle mile network infrastructure.
- Section 5.3 focuses on the investment expectations for data centres in South Africa.
- Section 5.4 outlines the scale and scope of last mile access infrastructure.
- Section 5.5 provides an assessment of the connectivity requirements of public facilities.
- Section 5.6 identifies the challenge of state participation in the middle mile and last mile segments of connectivity

5.1 The first mile

The first mile consists of international connectivity, connecting global regions and countries. It consists of terrestrial (subsea cable systems) and satellite infrastructure. The vast majority of communications takes place via the subsea cable systems. These cables are the large 'pipes' that carry all data (including the Internet) and voice traffic between countries around the world. This infrastructure plays a key role in connectivity and consists of the following main components:

- The international subsea cable system spur coming into South African shores.
- The landing station and associated passive network infrastructure to land the subsea cable in the country.
- The related networking equipment necessary for managing the interconnection points between land-based networks (e.g. those of MTN, Telkom Openserve, SEACOM, Vodacom etc.) and the international cable network.

South Africa is served by 10 international undersea cables connecting to seven different landing stations (some with duplicate connections) with a total design capacity of over 400 Tbps. The total lit capacity (which could be potentially used) on the subsea cables landing in South Africa was estimated to be 8.3 Tbps in 2023, having grown seven times since 2014. The purchased capacity (actually servicing South African demand) was estimated to be 3.2 Tbps in 2024 (ICASA, 2025). For South Africa to exhaust the design capacity on the existing subsea cables by 2035, international traffic (in and out of South Africa) would need to grow by more than 50% every year. This is an unlikely scenario, given that increasingly more traffic remains local (within the country). Furthermore, as available capacity is exhausted, subsea cable owners often plan to expand the design capacity and/or new cables are built.

Competition between numerous operators offering capacity on these various cables has also resulted in a significant decrease in the price of international bandwidth over the past 15 years.

The key conclusion to be drawn from the above is that South Africa's international connectivity needs are well-catered for by both the total available capacity, the design capacity, as well as the number of cables necessary to provide for redundant international connectivity.

The multitude of subsea cable systems connecting South Africa, and the numerous operators with capacity on these cables, has resulted in a significant decrease in the price of international bandwidth through competition over the past 15 years. Therefore, there is no need to consider the first mile in the stack of ICT infrastructure, as it is provisioned to satisfy South Africa's international capacity requirements at least until 2035.[13]

[13] Note that South Africa is represented on the International Cable Protection Committee and the International Advisory Body for Submarine Cable Resilience by representatives from the Department of Communications and Digital Technologies.

5.2 The middle mile – national long distance and middle mile network infrastructure

The network infrastructure highways that carry Internet traffic between South Africa's metropolitan areas, towns and rural areas are a critical element in the provision of high-speed broadband connectivity to end users. Limited capacity/quality infrastructure in this element will limit the ability for impacted end users to participate in the digital economy.

5.2.1 Are South Africa's network infrastructure highways sufficient?

South Africa's backbone network infrastructure, connecting hamlets, towns and cities to the global Internet is well-established. Access to these highways, as measured by proximity to a fibre node, is outlined in the following table.

Table 5-1: Proximity to a fibre node across South Africa

Province	Total no. of main places	<5 km	5 - 10 km	10km to 25 km	>25 km	Ave diff if >25
EC	597	124	85	282	106	48.3
WC	385	147	32	137	69	32.5
KZN	347	104	51	148	44	30.4
LIM	335	42	25	88	180	46.2
FS	319	105	24	151	39	34.9
NC	299	69	19	67	144	58.1
NW	258	40	17	94	107	39.9
MP	163	54	14	40	55	36.9
GT	128	92	21	14	1	40.0
Total	**2 831**	**777**	**288**	**1 021**	**745**	
Share		27%	10%	36%	26%	

Source: Africa Analysis calculations

Table 5-1 shows that only 26% of main places may be greater than 25 km from a national long-distance network. These results are generated utilising information available for this project (provided by three licensees). It is expected that these results would improve substantially should additional network mapping exercises take place (as is recommended).

While stakeholders indicate that South Africa's high-capacity links between major metropolitan centres (often categorised as national long-distance transmission) have sufficient capacity to serve South Africa's requirements, the information in the table clearly illustrates the need for increased levels of investment in middle mile network infrastructure that connects towns and central business districts to other towns is required to bring high-speed broadband access to every home. The cost of installing and maintaining this additional network infrastructure is estimated in Sections 9 and 10 of this report.

5.2.2 Middle mile network infrastructure: Where public and private players play

The middle-mile market is probably the single area where government and private sector infrastructure compete directly. Private sector players include Openserve, Dark Fibre Africa, MTN, Vodacom, Liquid Technologies, Seacom and SAS Networks. National public sector entities include SANRAL, PRASA, Transnet, Eskom, Sentech and Broadband Infraco. Provincial public network operators include the Gauteng Broadband Network, Limpopo Broadband, and the Eastern Cape and Western Cape broadband networks. Some of these provincial networks rely purely on lit capacity from private sector operators. Others are a combination of direct asset ownership and/or purchasing lit capacity from private sector operators.

The following figure provides an illustration of the overlap of middle-mile network infrastructure owned by the national state entities.

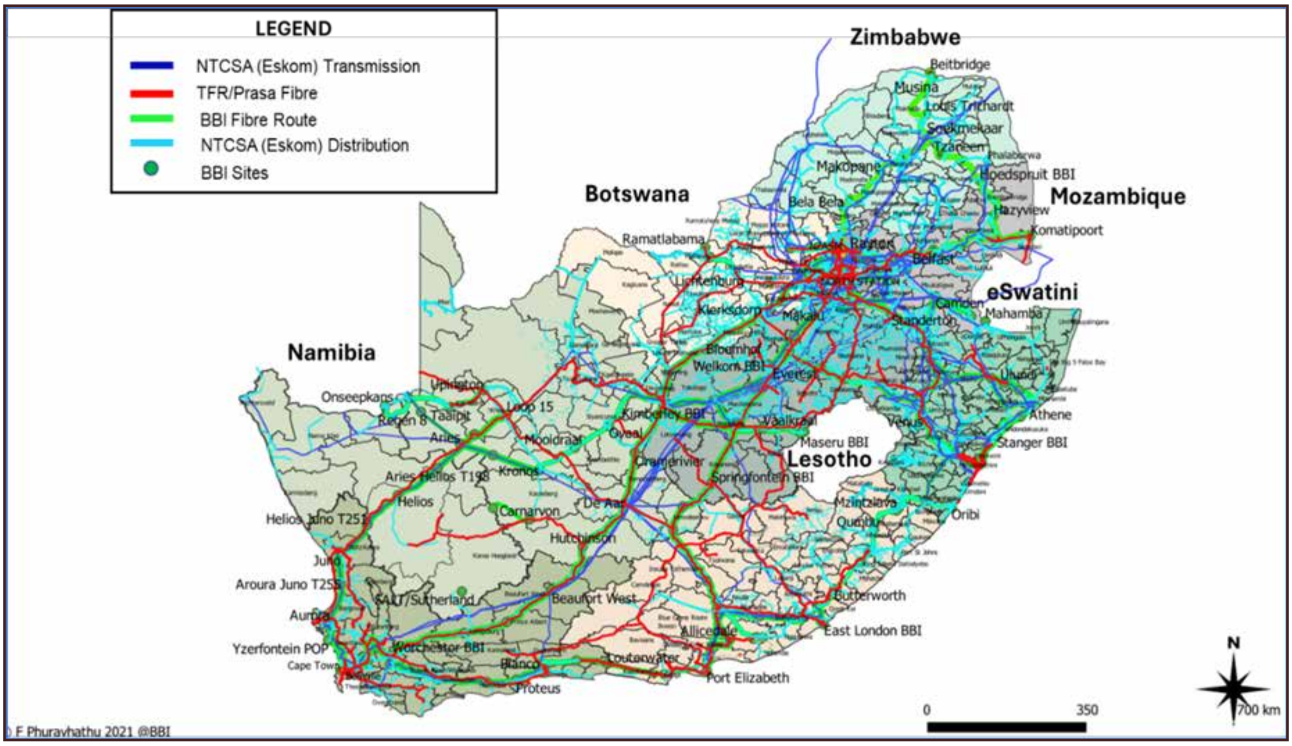


Figure 5-1: Complementary and duplicate public sector network infrastructure

Source: Eskom and Broadband Infraco

Many stakeholders have queried the role the state intends to play in the national long distance and metro-connectivity networks. Both Eskom's and Transnet's history explain the rationale for these networks. However, stakeholders question the feasibility of SANRAL's participation in the national long-distance market, especially given that the SANRAL 'network' is a result of private sector capital investment.

5.3 The middle mile – data centre infrastructure

The South African data centre market is the largest in Africa, with 55 of the 121 data centres on the continent located here. The local market is expected to have a total of 68 data centre facilities by the end of 2025 – 55 already existing and 13 either in development or planned. A significant majority of data centres are situated in Johannesburg and Cape Town. Johannesburg has the third-most favourable land prices globally and, together with good telecommunications infrastructure and the presence of global hyperscalers, offers an attractive proposition for data centre construction. Cape Town is also considered one of the top 10 global locations for future data centres, underpinned by its geographic coastal location and robust infrastructure, including several subsea cable systems.

This section of the report introduces the existing players in the data centre market before projecting the forecast need for additional data centre investment in South Africa and the likely investment pathway over the forecast period.

5.3.1 Participants in the South African data centre market

South Africa's largest data centre operator is Teraco, acquired by Digital Realty. Teraco was the first to offer carrier-neutral services in sub-Saharan Africa and has several data large centre facilities in Cape Town, Durban and Johannesburg, which also serve as on-ramps for Amazon Web Services (AWS), Google, and Microsoft's Azure cloud services. Teraco hosts one of Africa's largest Internet exchanges, NAPAfrica.

Other key participants include Africa Data Centres (ADC), a business of Cassava Technologies which also owns Liquid Intelligent Technologies; BCX (owned by Telkom SA); Digital Parks Africa; Equinix; MTN Business, which operates both enterprise and co-location data centres; NTT Data (formerly Dimension Data); Open Access Data Centres (OADC), part of the WIOCC group; Vantage Data Centres and Vodacom Business.

Given the strong demand for data and cloud services, the comparatively good utility infrastructure and a strategic location in southern Africa (with multiple subsea cable international connectivity), South Africa has become an attractive destination for global hyperscalers (data centre operators and cloud services providers). Over the past several years, many of the hyperscalers have established cloud regions – full-stack data centres – in Gauteng province and Cape Town. Most of the hyperscalers lease halls in the large data centres in the country (some follow the build-to-suit model), while AWS followed its strategy of building its own brick-and-mortar data centre facilities.

Figure 5-2: Data centre market participants in SA

5.3.2 How many and where does South Africa need more data centres?

The South African data centre market is top-heavy, with over 70% market share (based on IT load) controlled by two operators, Teraco and ADC. The country's top five data centre operators – Teraco, ADC, Equinix, OADC and NTT Data – account for an estimated 90% of the overall IT load capacity, over 80% of estimated occupancy and 90% of rack capacity.

The country's data centre facilities located in the large metros (Johannesburg, Cape Town and Durban) focus mainly on cloud hyperscalers as customers are sufficient for the current demand and are projected to continue expanding. However, regional and edge data centre facilities in many smaller cities across the country lack the capacity to meet projected long-term demand.

The provinces and towns/cities that are either adequately served or underserved are listed in Table 5-2.

Table 5-2: Where further data centre investment is required

Provinces and cities adequately served	Underserved cities	Underserved provinces
Gauteng (Johannesburg, Ekurhuleni)	Pretoria (north, west and east)	Eastern Cape
KwaZulu-Natal (Durban)	Bloemfontein	Free State
Western Cape (Cape Town)	Polokwane, Louis Trichardt	Limpopo
	East London	Northern Cape
	Kimberley	North West
	Rustenburg, Mafikeng	Mpumalanga
	Witbank, Nelspruit	

Source: Stakeholder interviews

To meet the demand over the next five years, it is estimated that South Africa needs (a) four to five regional data centres at 1 MW IT capacity each, powering close to 200 racks, and (b) about 20 to 30 edge data centres across underserved areas.

5.3.3 Edge data centre environment

Edge data centres are small data centres located near the edge of the communications network or close to end users and devices (see Figure 5-3), playing an important role in providing cached content, cloud computing resources and sophisticated analytics capabilities. They enable lower latency by reducing the round-trip time in data processing (from the device to the data computing / processing facility and back).

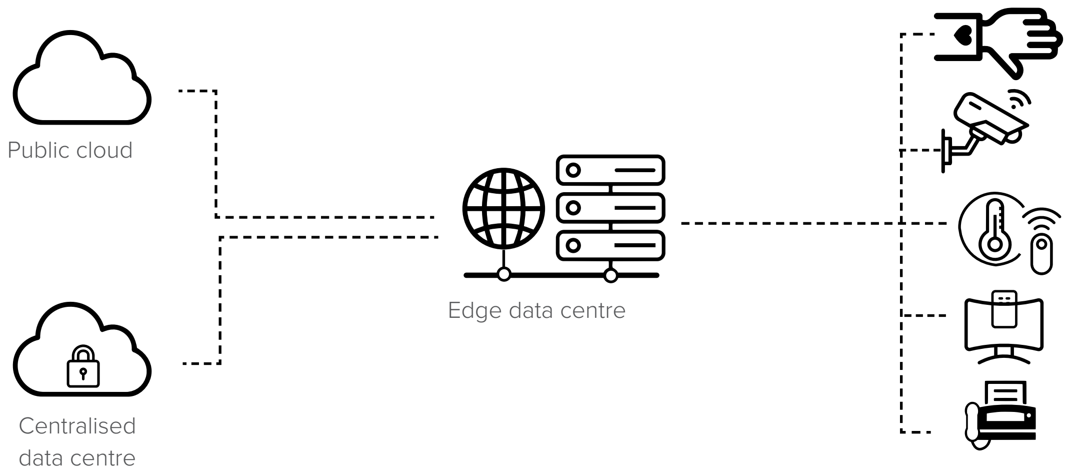


Figure 5-3: Stylistic location of edge data centres

This is increasingly critical for modern applications and improves the overall performance of services.

Edge data centre operators have implemented several use cases targeting industries that initially benefit from lower latency, accessing data closer to the source where it was generated, and the ability to do real-time analytics. These industries include agriculture, banking/financial, healthcare, logistics/inventory, military, manufacturing and mining, as well as telecommunications operators and content delivery networks.

In South Africa, the edge data centre environment is still at the initial stage of development. The key drivers and constraints in the deployment of edge data centres in the country, as well as the challenges they face, are summarised in Table 5-3.

Table 5-3: Edge data centre drivers, constraints and challenges

Drivers	Constraints	Challenges
• 5G network expansion, enabling real-time apps, Internet of Things (IoT) through scalable and flexible connectivity. • IoT use growth, with large data quantities needed to be processed close to the source. • Demand for low latency by applications for optimal performance. • Requirement for real-time data processing, including for real-time analytics and insights. • Digital transformation by organisations, with edge computing as an enabler. • Sustainability and energy efficiency requirements through reduced use of large central data centres (which consume a lot of energy) and transmission of large data quantities across networks.	• Compliance with data governance and requirements and industry standards becomes more difficult as data are processed and stored at the edge. • Limited network infrastructure in more remote/underserved locations, which defeats the purpose of edge data centres. • Energy and water supply shortages, particularly outside of the large urban environment, can be a detractor to edge data centre development in some locations.	• Network traffic patterns change with increased use of edge computing (and data centres), and quicker network scalability is required. This will need to be addressed in the access network. • Edge data centres represent another layer of vulnerability which needs to be addressed in terms of physical and cybersecurity. • Development of edge data centres places further pressure on skills shortages in the market (although these shortages can be alleviated in the medium to long term).

Source: Africa Analysis 2025

Several operators have been deploying edge data centres in South Africa, including Liquid C2, MTN, Vodacom and OADC. Typically, these operators use their existing network switching centres or aggregation nodes to repurpose them as edge data centres.

OADC has the most extensive footprint of edge data centres in South Africa. OADC has built four core facilities in key urban centres in the country (Gauteng province, Durban and two in Cape Town) and over 30 edge facilities in various urban locations, along core network routes. The edge data centres are interlinked with high-speed (100 Gbps or higher) network connections.

A summary of edge data centre presence for some of the operators follows.

Table 5-4: Location of existing edge data centres

Operator	Edge data centre locations	Comment
Liquid C2 (a Cassava Technologies subsidiary)	Bloemfontein, Cape Town, Durban, East London, Johannesburg	The edge data centres are at the core of the network.
MTN Business	Cape Town and Johannesburg	MTN's strategy is to deploy edge data centres where it is deploying 5G infrastructure (some of the sites). Gauteng province is the first to be addressed, followed by other metropolitan areas such as Cape Town, Durban and East London.
OADC	Claims to have over 30 edge data centres in all the provinces of South Africa except the Northern Cape.	OADC plans to build 100 edge data centres in South Africa. The OADC edge environment consolidates edge computing, edge data centres and hyperscale connectivity within a single ecosystem. At present, these edge data centres act as hubs for telecoms operators, hosting their network equipment.

Source: Africa Analysis 2025

5.3.4 Forecast investment in data centres

In 2023, total investment in data centre infrastructure stood at over R39 billion and is projected to reach R68 billion by 2029; this is a compound annual growth rate (CAGR) of 9.7%. The annual investment value is expected to grow to USD3.7 billion by 2029, from USD2.1 billion in 2023. Apart from the local data centre operators, South Africa has also attracted investments from large global data centre operators, such as Alibaba, AWS, Google, Huawei and Microsoft.

The following figure and table present the historical and forecast investment in the South African data centre market (including investment commitments).

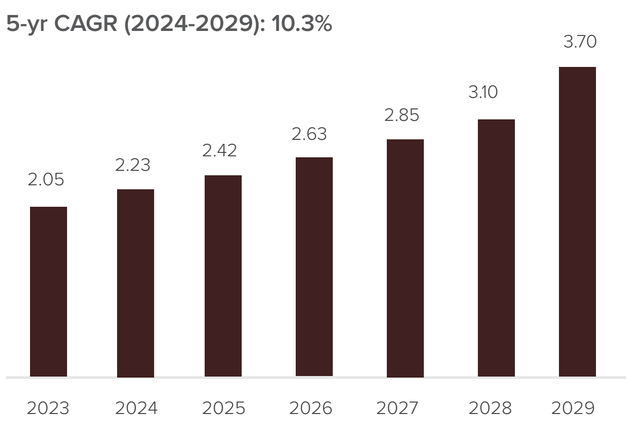


Figure 5-4: Data centre investment, 2024 - 2029 (USD billion)

Table 5-5: Recent key investments in data centres

DC operator	Amount (R billion) & year	Comment
ADC	9.2 (2024)	Various DCs, including SA
AWS	30.6 (2023)	Cloud infrastructure in SA by 2029
NTT	16.5 (2020)	12 MW, 6 000 m² DC in Johannesburg
Teraco	3.6 (2022)	80 MW DC in Johannesburg
Vantage	15.0 (2022)	80 MW DC campus in Johannesburg

Source: Arizton, Bloomberg, Business Wire, Africa Analysis 2025

Some of the major investors are ADC, DPA, Equinix, NTT Global Data Centres, OADC, Teraco (Digital Realty), and Vantage Data Centres. Additionally, global hyperscalers, such as Alibaba, AWS, Google, Huawei, Microsoft and Oracle, have also been investing in the South African market. Some of these investments are undertaken more broadly, across Africa, e.g. Huawei (USD300 million) or Google (USD1 billion), to drive digital transformation. This level of investment growth indicates that the middle mile infrastructure of data centre infrastructure will be supported by private sector investment. Further, this increase in capacity also supports the government's position under the National Data and Cloud Policy that the private sector will have the capacity to provide cloud services.

The following table identifies the growth drivers and constraints that may restrict this forecast investment amount:

Table 5-6: Data centre market growth drivers and constraints

Growth drivers	Constraints
Adoption of cloud services: Driven by startups, local businesses pursuing digital transformation, and multinationals wanting to replicate what they have in other countries where they operate.	**Costs:** Data centres require substantial upfront investment and ongoing operational expenses. These include construction, equipment, cooling systems and maintenance.
Increasing population and urbanisation: This, coupled with growing Internet penetration, are significantly contributing to the rapid growth of data centres to meet the escalating demand.	**Power grid unreliability**: Unreliable power supply from the state-owned power company, Eskom, poses a serious operational challenge to the data centre operators. Despite this, data centre investments continue to be committed.
Emerging technologies: Emerging technologies, including big data analytics, IoT, AI and many cloud solutions, are fuelling demand for data centres.	**Water scarcity:** Data centres consume large volumes of water for electricity generation if sites are independently powered, as well as for cooling servers. Water scarcity potentially threatens the continued expansion of data centres.
Data sovereignty: The Protection of Personal Information Act (POPIA) has contributed to the expansion of data centre facilities to help businesses comply with data sovereignty regulations.	**Access to land:** Data centres are difficult to construct as they require a combination of hard-to-obtain inputs such as several thousand square metres of land located close to business districts. Such land can be expensive to acquire, especially when there is no support from the government.
Digital skills training: The South African Government's initiative for digital skills training at institutions of learning is helping to enable advancement towards a digital economy, which requires an expanded data centre environment.	**Lack of digital skills:** A lack of sufficient ICT skills in the country is an impediment to the wider uptake of Internet services, which ultimately translates into lower demand for data centre capacity. A dearth of digital skills also restrains the growth of the digital economy.

Source: Africa Analysis 2025

5.4 The last mile

5.4.1 An overview of access to the last mile in South Africa

South Africa is a country dominated by mobile connectivity, although the deployment of fixed-line technologies in recent years has seen a significant uptick in subscribers. According to ICASA, 99.07% of the population has access to 4G/LTE services, with 82% of the country's landmass covered by broadband access (ICASA, 2025). This level of population and geographic coverage is one of the highest levels globally and is an indication of the importance of mobile network investment in South Africa's economy.

Be that as it may, the absolute number of active fixed broadband connections and household penetration remains low in relation to many of South Africa's peer countries globally, and in comparison, to mobile broadband subscriptions.

The following figures illustrate the growth of fixed and mobile broadband. Note that the fixed broadband connections include non-household connections (enterprises, governmental and non-governmental organisations). Furthermore, some of the households may have more than one fixed broadband connection, e.g. FTTH and fixed 4G/5G, although the incidence of such homes is probably low. Therefore, the household penetration is lower than it may appear at face value, at approximately 24% (2024). This is largely concentrated in the more affluent segment of the residential market, which has access to a variety of good quality fixed and mobile broadband products, from a physical access and an affordability perspective. Although the same is not true for low-income households and remote/rural geographic areas, this picture is changing.

The recent development of nomadic fibre-Wi-Fi access solutions, where end users connect to fibre via Wi-Fi hotspots, is taking off in the country and providing traditionally mobile-dependent end users with a choice of connectivity solutions.

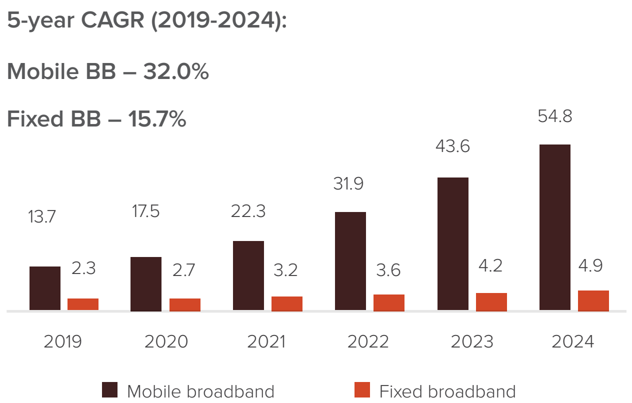


Figure 5-5: Fixed broadband technology use (% share of total), 2014 to 2024

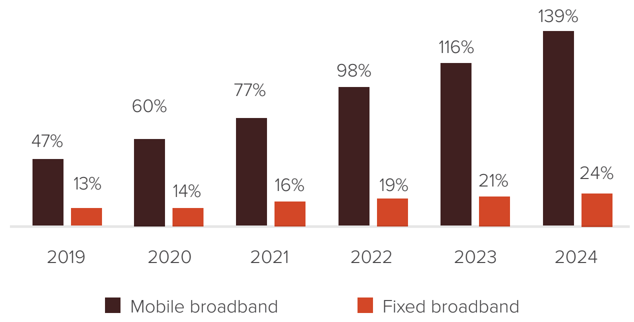


Figure 5-6: Access of fibre connectivity to residential and commercial locations

Notes:

- Fixed line includes both fixed wireline and FWA connections (including fixed 4G and fixed 5G).
- Mobile broadband includes full mobility 4G and 5G subscriptions only. It excludes fixed 4G and 5G products and all 3G products.
- Includes connections to consumer residences, businesses and other organisations.

Source: Africa Analysis research and modelling 2025

Fixed broadband connectivity has evolved over the years, not only in terms of the number of connections but also in terms of the different access technologies. The market has moved from using predominantly DSL (ADSL and VDSL) to a mixture of mainly fibre and FWA. Satellite contributes a very small component to the overall mix of access technologies currently used.

As a 'sunset' technology, DSL will ultimately be phased out by Openserve (a Telkom group company). DSL customers are being migrated to other technologies, mainly fibre and fixed 4G or fixed 5G. The mix of fixed broadband technologies varies by market segment, with the residential market figuring greater use of fibre vs. fixed wireless access, and the business market using more FWA than fibre products, especially among the smaller companies. However, fixed 4G and 5G connectivity is likely to play a greater role in the future.

Year-on-year (YoY) growth in both residential (FTTH) and business (FTTB) markets has been declining, although much more so in the business market. Whereas FTTH growth remains at over 20% YoY, in the business market, it is now in mid-single digits. Note that while households typically have a single fibre connection, businesses may have more than one fibre connection to the premises, especially larger businesses. Also, 'business' includes organisations other than commercial enterprises and government entities.

5.4.2 Expected quality of service available in South Africa

Do South Africans have access to a suitable quality of service to access high-speed broadband services? The first point to consider when answering this question is whether South Africans have the requisite devices to support high-speed broadband services (i.e. suitable smartphones). ICASA reports that smartphone penetration has reached over 70% in 2024 (ICASA, 2025), while mobile network operators report a slightly higher level. Only once all end users utilise a smartphone can it be said that all South Africans have access to high-speed broadband (excluding the possibility for device sharing between different family members).

The policy position for mobile network operators to shut down their 2G and 3G networks, as well as the introduction of cut-price smartphones, will support the achievement of this goal. Low-cost devices are continually being introduced into the South African market, including innovative funding models. It is expected that full smartphone penetration will be achieved through market and consumer forces over the study timeframe of 2025 to 2035.

However, having devices that are capable of accessing high-speed broadband is only as valuable as the quality of the connection available. The following figure compares South Africa's mean mobile download speeds against comparator countries.

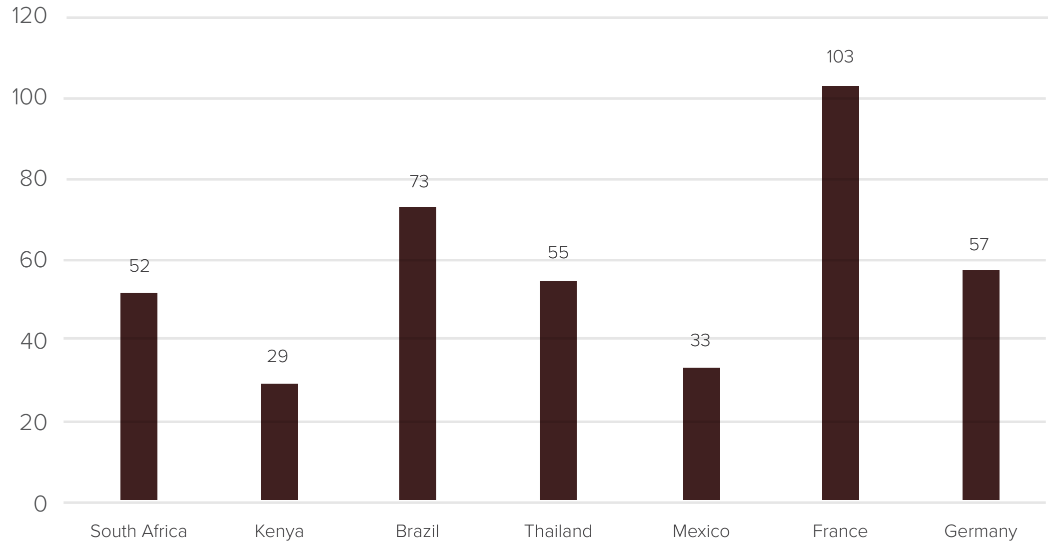


Figure 5-7: Comparing South Africa's mean download speed to comparator countries

Source: Ookla, May 2025

Figure 5-7 compares the most ubiquitous access technologies across the comparator countries, where South Africa's mean mobile download speed is 52 Mbps. This speed is significantly less than the target of 100 Mbps for 80% of the population to be achieved by 2030, according to the SA Connect targets. However, the target of access to 10 Mbps appears mostly to have been achieved.

However, this figure does not consider geographic differences in the level of access to high-speed broadband, which is the key goal of UMC. This is the next topic of discussion.

5.4.3 The scale of the last-mile access constraint

This section of the report addresses the question of geographic differences in the level of access to high-speed broadband. The following table indicates the purported level of household coverage by mobile network infrastructure in South Africa.

Table 5-7: How many households in South Africa do not have access to 4G or above?

Province	No. of households	No. of households with no 4G/5G coverage	Share of households with no MBB coverage
EC	1 838 959.68	87 340.29	4.7%
WC	2 264 032.03	33 870.24	1.5%
KZN	2 853 740.77	94 347.35	3.3%
LIM	1 811 565.01	77 536.77	4.3%
FS	845 250.42	18 817.06	2.2%
NC	333 553.39	20 798.50	6.2%
NW	1 141 283.72	30 952.54	2.7%
MP	1 421 720.69	26 809.86	1.9%
GT	5 318 672.48	5 524.97	0.1%
Total	17 828 778.19	395 997.58	2.2%

Source: Census 2022, ICASA anonymised data, Africa Analysis calculations

Only 2.2% of households are not covered by mobile 4G network infrastructure. The average reported download speed using mobile networks is over 40 Mbps (MyBroadband, 2025). This small share of total households, combined with the reported average download speed of greater than 10 Mbps, purportedly shows that the country has mostly achieved the SA Connect 2030 objective of all South Africans having access to broadband at 10 Mbps (the minimum objective).

However, from a geographic technology penetration perspective, 5G connectivity remains confined to high-income urban centres, driven largely by market dynamics and commercial return considerations. In contrast, only 4.3% of deep rural areas have any form of 5G access, underscoring the current exclusion of low-density and economically marginalised regions from next-generation mobile services. The obligations imposed on the 2022 spectrum awards are designed to counter this current trend. The Medium-Term Development Plan (MTDP) also targets over 90% population coverage by 5G services by 2029, ensuring that the current geographic divide is closed.

To fully consider the UMC question of availability, policymakers must assess not what is available but who has access and where. The remainder of this section provides a quantitative GIS-based assessment of broadband availability.

5.4.4 Who has access to high-speed broadband and where?

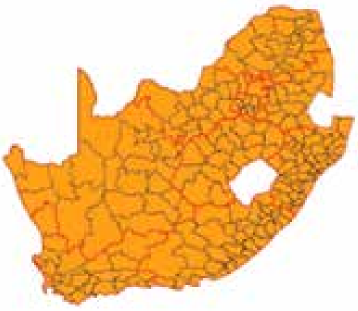
South Africa has previously constructed a broadband map for the development of the SA Connect broadband policy. However, there is no publicly available and/or current database constructed/utilised by the government for policy planning purposes.[14]

This mapping exercise is the first iteration of a last-mile broadband access map utilised to identify underserved areas as well as to estimate the cost to connect all South Africans to high-speed broadband. This map should be viewed as an iterative tool to be built on continuously as a future element of work.[15]

The GIS mapping exercise is built on its integration with the H3 hexagonal grid system, a geospatial indexing system developed by Uber.[16] The first step in the development of the map imposes the Resolution Level 8 onto the entire surface area of South Africa, breaking down South Africa into hexagons of 0.7 km^2 units.

[14] ICASA itself has the legal authority to obtain the necessary GIS data from licensees. However, at the time of developing this report, ICASA only captured information from mobile network operators.
[15] Network infrastructure data were sourced from ICASA and public sources.
[16] Uber. (2023). H3: A Hexagonal Hierarchical Geospatial Indexing System. https://h3geo.org

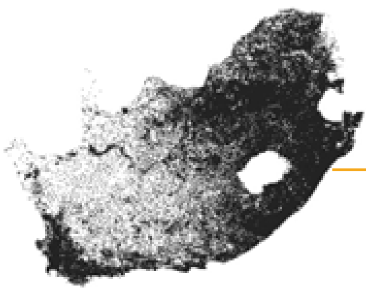
Table 5-8: Hexagon grid generation process

Step 1: Use local municipality boundary layer extent	Step 2: Use H3 APIs to generate 1 571 682 hexagon cells	Step 3: Hexagons covering municipal boundaries
		

Source: Africa Analysis calculations, MDB 2018 local municipality boundary layer, Uber H3 API

The second step is to generate population and household locations in each of these hexagons. This process is illustrated in the following table.

Table 5-9: Population and household estimate deviation process

Step 1: Generate H3 hexagon grid for South Africa	Step 2: Assign hexagons to local municipality boundaries
	
Step 3 to 6	
Join the Kontur population estimates with the derived Uber H3 hexagon municipality layer to obtain Kontur population estimates per local municipality. Calculate Kontur population weights. Weight Stats SA Census 2022 municipality population by Kontur population weights to estimate population per H3 hexagon.	
Kontur population estimates	Derived Kontur population per municipality
	

Source: Africa Analysis 2025

The third step is to overlay last-mile broadband infrastructure over the population and household distribution. The last-mile broadband infrastructure data were obtained from ICASA and include responses by three licensees to a request for information made by the NPC to over 20 operators, as well as public sources.

The last mile network information includes:

- Coverage of different mobile technologies;
- Fixed wireless access coverage (both 4G/5G and some unlicensed spectrum use); and
- Fibre network deployment, where household proximity to fibre nodes is separated into distance bands. Band 1 (within 5 km), Band 2 (between 5 and 10 km), Band 3 (between 10 and 25 km) and Band 4 (>25 km).

Using the GIS mapping information, every municipality has been ranked according to a 'broadband access score'. This score is the weighted average of the following three metrics:

- Percentage of households within 25 km of fibre nodes – 80% weight: Proximity to a fibre node measures the future scalability of high-speed broadband services and indicates the technical likelihood of households accessing 100 Mbps.
- Percentage of households within mobile 4G and 5G coverage – 13% weight: Coverage of existing 4G and 5G technologies indicates that households already have access to high-speed broadband services (but actual capacity may not be sufficient to provide high-speed broadband at 100 Mbps).
- Percentage of households within 25 km of wireless access nodes – 7% weight: Coverage by wireless access nodes represents availability of lower-cost unlicensed spectrum service providers but may not have the network capacity to reach 100 Mbps.

Each of the 213 municipalities has been assigned a broadband access score. The following figure illustrates the location of the top and bottom-ranked municipalities in South Africa.

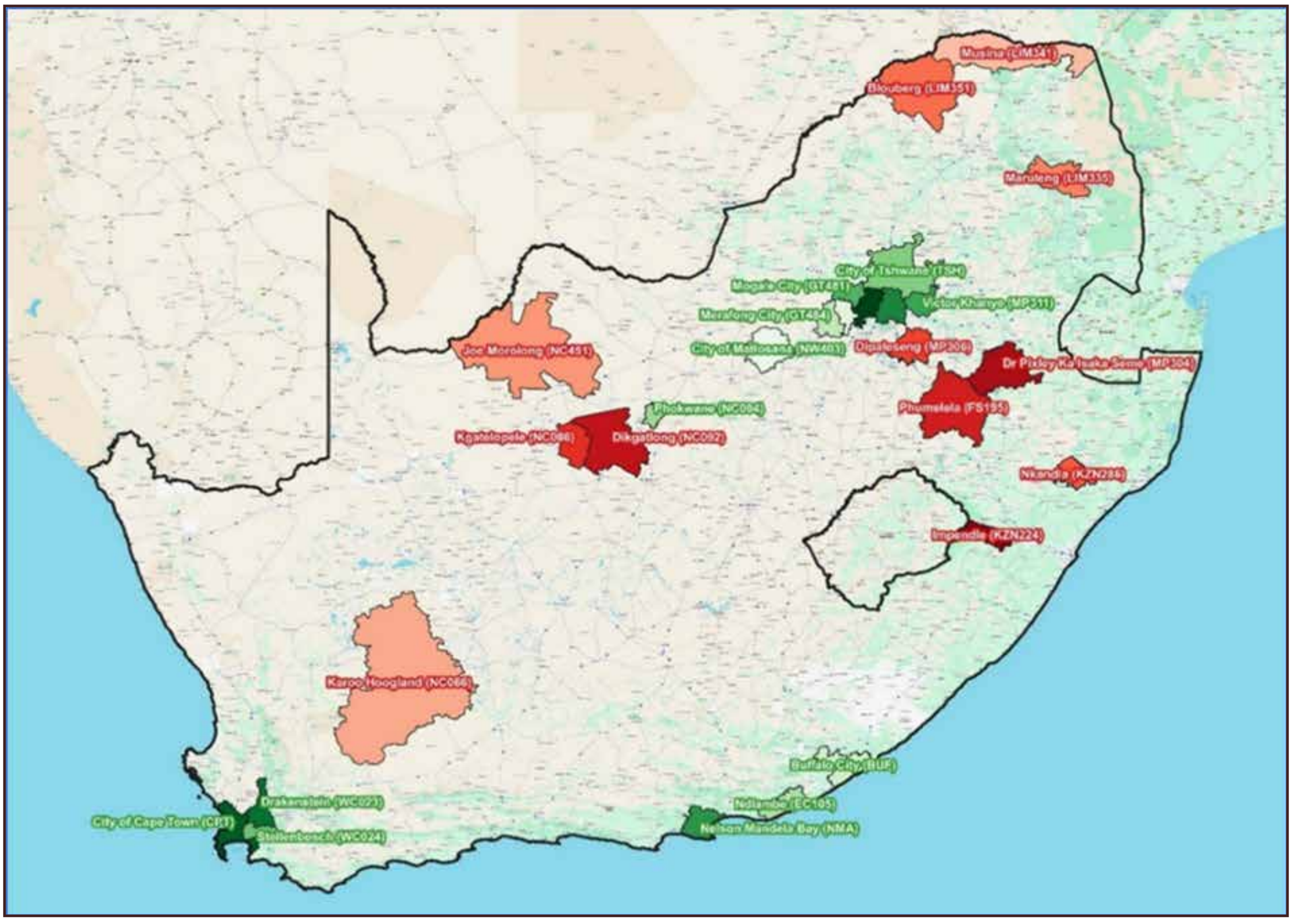


Figure 5-8: Top and bottom-ranked municipalities in broadband infrastructure coverage

Source: Africa Analysis calculations, ICASA anonymised mobile broadband layer, anonymised fibre broadband layer, and Google Maps

The broadband access score may be used as an early indicator of municipalities for focus in universal service programmes.

5.4.5 Identifying underserved areas

The GIS analysis shows that a significant number of key locations in South Africa are more than 10 km from a fibre node. Further disaggregation within municipal boundaries is critical to more effectively identify areas where universal service-type interventions may be required.

Adopting a technology-focused approach, where fibre network infrastructure is viewed as the most scalable, high-capacity product[17], we have categorised households per municipality into four different areas based on distance bands, as follows:

- **Band 1:** Households within 5 km of a fibre node – in all likelihood, all of these households already have access to last-mile fibre infrastructure. Private sector players will already be established in these areas.
- **Band 2:** Households between 5 km and 10 km of a fibre node – last-mile fibre infrastructure may already pass these houses, or they may be served by fibre in the near future. Private sector players are most likely already established in these areas.
- **Band 3:** Households between 10 km and 25 km of a fibre node – these households are unlikely to be served by last-mile fibre infrastructure at present. These areas may be served by a host of technologies as their primary connectivity solution, including mobile services, Wi-Fi or fixed wireless access.
- **Band 4:** Households beyond 25 km of a fibre node – these households are extremely unlikely to be ever served by fibre. These areas may be served by a host of technologies as their primary connectivity solution, depending on the level of densification of households. More dense areas may receive services from mobile, FWA and Wi-Fi services. Low-density areas are likely to be dependent on mobile connectivity.

The outcome of this banding of households per distance band is presented in the following two tables. Table 5-10 reports on those municipalities with the greatest level of access to fibre nodes. Table 5-11 reports the same for the 15 municipalities with the lowest level of access to fibre nodes.

[17] Although fibre, at the point of installation, has the greatest capacity, many stakeholders have indicated that Wi-Fi networks are highly scalable at low cost, where the constraint is access to stable, reliable fibre backhaul.

Table 5-10: Top 15 municipalities ranked according to fibre node coverage

Rank	Municipality	Province	Total households (HH)	Last-mile fibre probably passes the house		Last-mile fibre may pass the house / soon be served by fibre		Households unlikely to be served by fibre		Households assumed to never have access to last mile fibre	
				% HH within 5 km of a fibre node	No. of HH within 5 km of a fibre node	% HH between 5 km & 10 km of a fibre node	No. of HH between 5 km & 10 km of a fibre node	% HH between 10 km & 25 km of a fibre node	No. of HH between 10 km & 25 km of a fibre node	% households beyond 25 km of a fibre node	No. of households beyond 25 km of a fibre node
1	City of Johannesburg (JHB)	Gauteng	1 841 917	24.5%	451 270	29.8%	548 891	43.3%	797 550	2.4%	44 206
2	City of Cape Town (CPT)	Western Cape	1 452 845	62.6%	909 481	33.8%	491 062	3.6%	52 302	0.0%	0
3	Drakenstein (WC023)	Western Cape	76 776	44.0%	33 781	44.6%	34 242	8.0%	6 142	3.4%	2 610
4	Ekurhuleni (EKU)	Gauteng	1 421 003	13.9%	197 519	31.6%	449 037	54.5%	774 447	0.0%	0
5	Nelson Mandela Bay (NMA)	Eastern Cape	307 931	49.1%	151 194	38.3%	117 938	12.6%	38 799	0.0%	0
6	Victor Khanye (MP311)	Mpumalanga	33 786	50.3%	16 994	31.6%	10 676	18.1%	6 115	0.0%	0
7	Mogale City (GT481)	Gauteng	150 787	0.2%	302	0.5%	754	99.2%	149 581	0.1%	151
8	Stellenbosch (WC024)	Western Cape	59 626	66.4%	39 592	13.7%	8 169	19.9%	11 866	0.0%	0
9	City of Tshwane (TSH)	Gauteng	1 322 252	49.5%	654 515	31.4%	415 187	18.4%	243 294	0.7%	9 256
10	Phokwane (NC094)	Northern Cape	19 599	51.1%	10 015	6.2%	1 215	42.7%	8 369	0.0%	0
11	Ndlambe (EC105)	Eastern Cape	32 440	59.6%	19 334	0.8%	260	39.6%	12 846	0.0%	0
12	Merafong City (GT484)	Gauteng	77 599	29.6%	22 969	51.3%	39 808	19.1%	14 821	0.0%	0
13	Buffalo City (BUF)	Eastern Cape	268 438	48.0%	128 850	16.4%0000	44 024	35.6%	95 564	0.0%	0
14	Rand West City (GT485)	Gauteng	128 144	0.0%	0	0.3%	384	21.9%	28 064	77.8%	99 696
15	City of Matlosana (NW403)	North West	128 359	39.8%	51 087	25.1%	32 218	34.2%	43 899	0.9%	1 155

Source: Africa Analysis calculations based on Stats SA Census 2022, ICASA anonymised mobile broadband coverage, anonymised fibre and wireless access coverage, and ITU data

Table 5-11: Bottom 15 municipalities according to fibre node coverage ranking

Rank	Municipality	Province	Total households (HH)	Last-mile fibre probably passes the house		Last-mile fibre may pass the house / soon be served by fibre		Households unlikely to be served by fibre		Households assumed to never have access to last mile fibre	
				% HH within 5 km of a fibre node	No. of HH within 5 km of a fibre node	% HH between 5 km & 10 km of a fibre node	No. HH between 5 km & 10 km of a fibre node	% HH between 10 km & 25 km of a fibre node	No. of HH between 10 km & 25 km of a fibre node	% households beyond 25 km of a fibre node	No. of households beyond 25 km of a fibre node
199	Mafube (FS205)	Free State	61 150	0.0%	0	0.0%	0	0.2%	34	99.8%	16 862
200	Nkomazi (MP324)	Mpumalanga	591 928	7.2%	9 658	1.9%	2 549	29.5%	39 572	61.4%	82 364
201	Khai-Ma (NC067)	Northern Cape	8 510	38.1%	738	1.0%	19	9.0%	174	51.9%	1 006
202	Musina (LIM341)	Limpopo	130 899	33.5%	15 388	0.8%	367	5.0%	2 297	60.7%	27 882
203	Karoo Hoogland (NC066)	Northern Cape	11 691	40.2%	1 160	1.0%	29	5.4%	156	53.4%	1 541
204	Joe Morolong (NC451)	Northern Cape	125 420	4.3%	1 141	1.7%	451	26.9%	7 138	67.1%	17 806
205	Maruleng (LIM335)	Limpopo	128 137	13.3%	4 252	1.9%	607	8.2%	2 621	76.6%	24 487
206	Blouberg (LIM351)	Limpopo	192 109	0.4%	230	0.4%	230	27.1%	15 603	72.1%	41 512
207	Nkandla (KZN286)	KwaZulu-Natal	108 896	0.0%	0	0.0%	0	20.9%	3 397	79.1%	12 857
208	Dipaleseng (MP306)	Mpumalanga	35 980	0.0%	0	0.0%	0	1.1%	144	98.9%	12 985
209	Kgatelopele (NC086)	Northern Cape	19 854	0.0%	0	0.0%	0	0.0%	0	100.0%	5 286
210	Phumelela (FS195)	Free State	52 224	0.0%	0	0.0%	0	0.6%	94	99.4%	15 511
211	Dikgatlong (NC092)	Northern Cape	56 967	0.0%	0	0.0%	0	0.2%	29	99.8%	14 377
212	Dr Pixley Ka Isaka Seme (MP304)	Mpumalanga	115 304	0.0%	0	0.0%	0	0.1%	33	99.9%	32 939
213	Impendle (KZN224)	KwaZulu-Natal	36 648	0.0%	0	0.0%	0	10.7%	766	89.3%	6 389

Source: Africa Analysis calculations based on Stats SA Census 2022, ICASA anonymised mobile broadband coverage, anonymised fibre and wireless access coverage, and ITU data

South Africa's fibre infrastructure is heavily concentrated in metropolitan areas, with over 80% of urban households located within 5 km of a key fibre node. However, deployment remains sparse and uneven in provinces such as the Eastern Cape, Limpopo and parts of Mpumalanga, where geographic and economic barriers limit private investment.

5.5 Connectivity of government facilities

South Africa's introduction of DPI, discussed earlier, is substantively dependent on the ability for government facilities to be connected to high-speed broadband. The SA Connect objective is to connect all government facilities to high-speed broadband by 2030, according to the following weightings:

- Schools: 100% at 1 Gbps;
- Health facilities: 100% at 1 Gbps; and
- Government facilities: 100% at 100 Mbps.

These targets are immediately challenging to achieve because different facilities have different functional and technical requirements. For example, connecting a school to 1 Gbps when there are only 200 learners equates to 100 Mbps per learner. The cost of connecting such a school to such a connection would be exorbitant, especially given the reality that a learner, under instruction, will not be consuming 100 Mbps at school. This same argument applies to health and government facilities. Not all clinics will need 1 Gbps, yet certain high-demand, high-volume Home Affairs offices and tertiary healthcare facilities may require in excess of a 1 Gbps connection by 2030.

This section of the report evaluates the ICASA connectivity obligations on spectrum awards in the 2022 spectrum auction. Licensees holding the 2022 spectrum are obliged to provide a 10 Mbps connection to the following:

- 1 600 health facilities (clinics);
- Over 16 000 schools;
- 570 libraries; and
- 937 traditional authority facilities.

Following this assessment, SITA information is analysed as an indication of the number of government facilities that are actually connected to high-speed broadband. However, it must be noted that there is no single database that reports the location of government facilities, the speed of connection and the type of connection. This is a significant shortcoming both for this report and the government's ability to effectively plan the rollout of the DPI programmes.

5.5.1 Health facilities

The following table compares the location of targeted health facilities to a fibre node. The table shows that 57% of these facilities are in a location that should ideally be served by last-mile fibre network infrastructure and therefore have access to significantly higher broadband speeds.

Table 5-12: Recommended connectivity technology for unconnected health facilities

Province	No. of health facilities in different distance bands from a fibre node				
Preferred technology	Fibre-based connectivity		Fixed wireless access		Fixed wireless access / satellite
	<5 km	Betw 5 & 10 km	Betw 10 & 25 km	Betw 25 & 50 km	Betw 50 & 100 km
EC	274	84	269	84	4
FS	209	33	14	24	4
GT	279	84	20	0	0
KZN	187	79	252	90	0
LIM	107	60	202	179	16
MP	117	50	87	62	4
NC	89	17	19	27	12
NW	92	37	116	75	9
WC	296	38	45	16	1
Total	**1 650**	**482**	**1 024**	**557**	**50**
Share of facilities	44%	13%	28%	15%	1%

Source: ICASA 2022 Universal Service Obligation data and Africa Analysis calculations

The first feature to note is that there are over 3 200 public health facilities in operation in South Africa (various sources), whilst ICASA and SITA data provided to this project account for 2 377. The 'missing' clinics may receive connections via different arms of government or may not be included in the total number of facilities that requires connectivity.

Secondly, SITA data indicates that 40 health facilities are connected at a speed slower than 10 Mbps. These services are legacy connections (most likely a copper-based DSL service) and are being phased out.

Thirdly, and most importantly, SITA data illustrates that health facilities in different provinces experience vastly different connection speeds the representing a stark digital divide between government health facilities. This digital divide is a result of government implementation and planning at different levels, without clear coordination.[18]

[18] In many cases, free connections from service providers have been turned down due to bureaucratic processes at provincial government level.

5.5.2 Public Schools

The following table shows that 36% of the target schools are in a location that should ideally be served by last mile fibre network infrastructure. The data also shows that only seven schools are 100 km or further away from a fibre node, all being located in the Northern Cape.

Table 5-13: Recommended connectivity technology for unconnected public schools

Province	No. of health facilities in different distance bands from a fibre node					
Preferred technology	Fibre-based connectivity		Fixed wireless access		Fixed wireless access / satellite	Total
	<5 km	Betw 5 & 10 km	Betw 10 & 25 km	Betw 25 & 50 km	Betw 50 & 100 km	
EC	505	635	1 970	683	17	3 810
FS	366	119	76	54	4	619
GT	230	104	31	1	0	366
KZN	459	719	2 182	802	0	4 162
LIM	302	350	1 343	1 073	85	3 153
MP	358	258	448	268	13	1 345
NC	169	47	83	95	51	452
NW	204	111	400	258	21	994
WC	370	241	258	12	1	882
Total	2 963	2 584	6 791	3 246	192	15 783
Share of facilities	18.8%	16.4%	43.0%	20.6%	1.2%	

Source: ICASA 2022 Universal Service Obligation data and Africa Analysis calculations

A wrinkle in the implementation of these obligations is that the Western Cape, Eastern Cape and Gauteng Provinces have indicated their intention to not participate in these obligations because the obligatory speed is not sufficient for teaching and learning.

A review of SITA data again illustrates a stark provincial digital divide. Schools connected in the SITA 'NGN' network were provided with a 10 Mbps connection under the SA Connect programme. In comparison, the Eastern Cape reports connecting just under 1 400 schools to 100 Mbps, also under a government programme. There is no clear explanation for this difference especially when the government target for school connectivity is set at 1 Gbps. This is another example of how government policy implementations mechanisms fail to be in step with each other.[19]

[19] N.B. Many smaller operators, who do not have specific obligations, provide free broadband connections to schools in their network areas.

For comparison purposes, the following table illustrates the different school connectivity speed requirements in different countries:

Table 5-14: Comparing the 10 Mbps school connectivity obligation to the rest of the world

Country	Connectivity metric	Year of introduction	Comment
USA	100 Mbps per 1 000 students (other organisations report a need for 1 Mbps per student)	2015[20]	The US has a website where schools can directly apply for e-Rate applications etc. (i.e. a decentralised approach to connectivity)
Online Teaching services	At least 20 Mbps per classroom	2025[21]	Online teaching is an increasingly global solution. Many institutions require teachers who provide online learning to confirm their available minimum download and upload bandwidths available. Most institutions require such teachers to have access to a 20 Mbps connection.
United Kingdom	• Primary Schools: 100/30 Mbps • Secondary: 1/1 Gbps	2022[22]	The United Kingdom follows a tiered approach, where less direct online teaching material is to take place in primary schools, but where secondary schools become increasingly reliant on very high-speed connectivity.
France	• >100 Mbps	2013[23]	France's baseline target is a tenth of South Africa's target. South Africa's 2013 targets may have been viewed as technically possible but not based on a clear needs-based assessment.
Germany	• Up to 1 Gbps	2020 [24]	The same comment above applies.
Brazil	• 20 Mbps for schools with 15 to 199 learners; • 50 Mbps for schools with 200 to 499 learners; and • 100 Mbps for schools with 500 or more learners.	2022[25]	Brazil's approach represents a needs-based assessment per facility. This approach is recommended for implementation in South Africa.
Thailand	99% of schools have access to the Internet for administration and pedagogical use[26]		Thailand reports that 7 out of every 10 schools has access to the Internet via fibre technologies. This is achievable given Thailand's high density population characteristics.

Source: various

20 https://www.fcc.gov/general/summary-e-rate-modernization-order
21 https://www.vipkid.com/teach/technical-requirements
22 https://www.gov.uk/guidance/meeting-digital-and-technology-standards-in-schools-and-colleges/broadband-internet-standards-for-schools-and-colleges
23 https://www.strategie-plan.gouv.fr/en/publications/digital-infrastructures-and-spatial-planning-economic-and-social-impacts-france
24 https://ec.europa.eu/commission/presscorner/detail/hu/ip_20_2132
25 https://sei.anatel.gov.br/sei/modulos/pesquisa/md_pesq_documento_consulta_externa.php?eEP-wqk1skrd8hSlk5Z3rN4EVg9uLJqrLYJw_9lNcO4wtcgs__ICys2KCs2b9lykyVaBiL7AIW7OPY3-wBlcSXBPiyzPnAA_CDouy0p7SzR7Rlg59ATGV5qqAD2t-eKp
26 https://thailand.un.org/sites/default/files/2022-09/21-00630_E-learning-Thailand-Mapping-digital-divide%5B74%5D.pdf

5.5.3 Libraries

The following table compares the location of unconnected libraries to a fibre node and indicates that over 50% of these facilities could be served by last mile fibre network infrastructure. The data also shows that only 7 schools are 100 km or further away from a fibre node, all located in the Northern Cape.

Table 5-15: Recommended connectivity technology for unconnected libraries

Province	No. of health facilities in different distance bands from a fibre node					
Preferred technology	Fibre-based connectivity		Fixed wireless access		Fixed wireless access / satellite	Total
	<5 km	Betw 5 & 10 km	Betw 10 & 25 km	Betw 25 & 50 km	Betw 50 & 100 km	
EC	67	14	26	5	0	112
FS	0	0	0	2	0	2
GT	6	7	16	0	0	29
KZN	81	28	37	13	0	159
LIM	43	6	28	30	4	111
MP	55	11	25	17	0	108
NC	15	2	4	2	3	26
NW	0	0	0	0	0	0
WC	5	7	9	2	0	23
Total	67	14	26	5	7	570
Share of facilities	47.7%	13.2%	25.4%	12.5%		

Source: ICASA 2022 Universal Service Obligation data and Africa Analysis calculations

Similar to the analysis provided for health facilities and schools, there are significant disparities between the connection speeds for the same type of facility across the SITA NGN, Eastern Cape and Western Cape broadband networks.

5.5.4 Traditional authority facilities

The 2022 spectrum licence holders are also obliged to connect 937 traditional authority facilities. The following table indicates that these facilities are the furthest away from existing fibre node infrastructure and the most effective technology mix to connect these facilities is the use of wireless technologies.

Table 5-16: Recommended connectivity technology for unconnected traditional authority facilities

Province	No. of traditional authority offices in different distance bands from a fibre node					
Preferred technology	Fibre-based connectivity		Fixed wireless access		Fixed wireless access / satellite	Total
	<5 km	Betw 5 & 10 km	Betw 10 & 25 km	Betw 25 & 50 km	Betw 50 & 100 km	
EC	21	32	103	34	0	190
FS	2	4	2	0	0	8
GT	0	0	0	0	0	0
KZN	33	63	243	101	0	440
LIM	12	21	102	44	3	182
MP	13	11	9	8	0	41
NC	0	1	2	5	0	8
NW	10	2	33	20	3	68
WC	0	0	0	0	0	0
Total	91	134	494	212	6	937
Share of facilities	9.7%	14.3%	52.7%	22.6%	0.6%	

Source: ICASA 2022 Universal Service Obligation data and Africa Analysis calculations

5.5.5 Connectivity fees paid by government departments

The DPI initiative currently underway, as discussed earlier, is not only dependent on whether government facilities are connected but also on the affordability of the fees that government departments pay. Although there are several provincial networks that currently connect provincial and local government facilities, almost all national government facilities obtain their Internet connectivity as a Layer 3 service purchased from SITA. Information from this research indicates that the gap between the fee charged to SITA for connectivity and the fee SITA levies to government departments is a critical area for future exploration.

The following table provides a breakdown of the service providers who actually connect the South African Government to broadband.

Table 5-17: Who actually connects government to the Internet?

Layer 2 Service provider	No. of connections	Share of total links
Broadband Infraco	675	20%
Private Sector players	2 621	80%
Total	3 296	100%

Source: SITA NGN database

Table 5-17 illustrates that private sector operators are the primary connectivity service provider to national government.

Another example that illustrates the need for a review of government-to-government pricing is the fees levied by BBI on schools. The Department of Basic Education (DBE) reports that although BBI has connected 599 schools (the majority of which are non-fee paying), BBI levies a monthly fee of R16 000.00 for the 'privilege' of using this connection under the SA Connect project. Non-fee-paying schools cannot afford this fee and therefore do not have access to the Internet.

Table 5-18: BBI monthly charges to schools under the SA Connect programme

Provinces	Districts	Connected	Monthly fee	Estimated monthly cost
EC	OR Tambo	138	R16 000.00	R2 208 000.00
FS	Thabo Mofutsanyane	99	R16 000.00	R1 584 000.00
KZN	uMgungundlovu	78	R16 000.00	R1 248 000.00
KZN	uMzinyathi	32	R16 000.00	R512 000.00
LIM	Vhembe	46	R16 000.00	R736 000.00
MP	Gert Sibande	64	R16 000.00	R1 024 000.00
NC	Pixley Ka Seme	39	R16 000.00	R624 000.00
NC	Dr Kenneth Kaunda	103	R16 000.00	R1 648 000.00
Total		**599**	**R16 000.00**	**R9 584 000.00**

Source: DBE presentation to Parliament, 2025

5.5.6 Recognising the strengths and weaknesses of SOEs in the middle and last mile

The state's strength, as illustrated earlier, is the existence of infrastructure in the middle mile. Public sector entities are beginning to compete against each other[27] in efforts to provide middle-mile services to last-mile service providers. This development is positive as it will drive public sector providers to become more efficient network operators.

State participation in last-mile network infrastructure, however, is a different question. While it is clear that state networks may assist in addressing some of the constraints discussed earlier, the business case for expanding beyond these existing assets depends on both the efficient provision of middle-mile services and the stimulation and capturing of latent last-mile demand.

The future of BBI in the middle-mile and last-mile market segments has been questioned by stakeholders and independent analysis alike. Although BBI was established by the state in 2007 to disrupt the national long-distance market (specifically by partnering on the EASSY international undersea cable), the entity effectively represents a commercial consolidation of existing network infrastructure owned by Eskom and Transnet. In other words, BBI was a new face of existing network infrastructure but includes a new 'middle-man' markup in prices. To date, "BBI is still dependent on the infrastructure and servitudes of Eskom and Transnet, and the fibre of Liquid Telecom", for its operations (DCDT, 2025) and fully controls (just) less than 50% of the fibre network that it uses. In addition, BBI has also been declared technically insolvent, with the Auditor-General not being able to complete independent audits for the years 2022/24 and 2023/24. The BBI 2025/2026-2029/2030 corporate plan itself may also warrant further interrogation prior to additional financial commitments being made.[28]

Further, most private sector last-mile network operators clearly stated that they do not ever intend to utilise BBI services because of the poor quality of service and network reliability.[29] Section 5 illustrates that the private sector dominates the provision of last-mile connectivity not only to the mass market but also to government facilities, while the scale of government entity provision of last-mile connectivity appears to be highly inflated.

5.6 The role of ancillary infrastructure

Both end users and network operators depend on the secure and constant availability of certain infrastructure and services. This section of the report defines and explores the availability of these services and infrastructure in South Africa.

5.6.1 Ancillary services and infrastructure for end users

End-user devices[30] all depend on a single ancillary service: the availability of an affordable, always-available power supply. This demand for a power supply may be for the charging of a feature phone in a low-density population area or for supporting an entire local area network within an office park in the middle of the Johannesburg central business district.

[27] See, for example, the goals of TRANSNET's Private Sector Participation tender issued in December 2024.

[28] For example, the BBI Corporate Plan forecasts a significant increase in sales revenue from operators, yet stakeholders have clearly informed their intention not to use BBI services. See: BBI (2025): pg. 102. BBI also forecasts that it may only return to an EBIT+ state in 2029 if the sales targets are achieved. See BBI (2025): pg. 119.

[29] According to stakeholder input, BBI's poor quality network failure response times is one reason why a public Wi-Fi network in Makhado, serving the township community, failed.

[30] E.g. cellphones, optical network terminals, wireless routers etc.

An always-available supply of power is not guaranteed with the risks of loadshedding[31] and load reduction[32]. Due to the inelastic demand for power, end users are also highly exposed to price increases, as illustrated in Figure 5-9. Annual increases in Eskom's average energy tariff have been greater than the Consumer Price Index (CPI) for every year since before 2010. Only in the years 2018 and 2020 did the change in energy tariffs almost match annual changes in CPI (but remained higher).

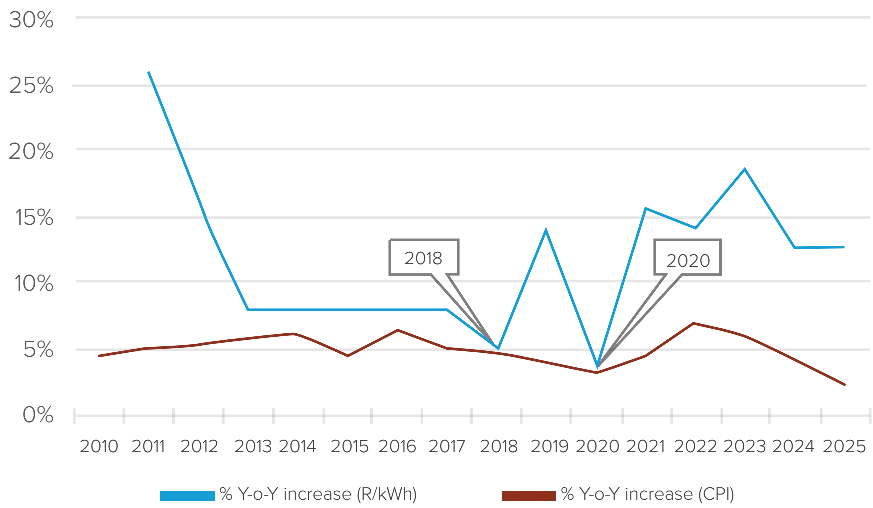


Figure 5-9: Annual change in Eskom's energy tariffs versus CPI, 2010 - 2025

Source: MyBroadband; TechCentral, NERSA

End users may source alternative power supplies,[33] but the cost of these additional investments/acquisitions has a disproportionately negative effect on lower-income households.

5.6.2 Ancillary services and infrastructure for network operators and data centres

Network operators and data centres rely on a wide range of ancillary services and infrastructure to maintain reliable service delivery. This supporting infrastructure may be owned by the network operator itself, by a service provider, or by the landowner/municipality.

Table 5-19 outlines the types of ancillary infrastructure that network operators depend on and highlights those services that are typically provided by the state in South Africa.

[31] Loadshedding is the practice of a power utility turning off electricity supply to specific geographic regions of a city/province for a defined time-period. During loadshedding, end users have no access to power and therefore cannot charge devices or utilise devices that depend on a continuous power supply.

[32] Load reduction is a less restrictive form of loadshedding, where the power utility reduces the total maximum power available to a specific geographic region for a defined period of time.

[33] E.g. generators, solar generation systems or small solar panels to charge cellphones.

Table 5-19: List of ancillary infrastructure that network operators depend on to provide services

Type of network operator	Ancillary infrastructure within site boundary	Ancillary infrastructure next to site boundary	Ancillary services/ infrastructure provided by the state
Mobile networks	• Towers • Shelters • Generators • Solar panel arrays • Battery storage units • Fencing • Security infrastructure	• Access roads, • Single and/or three phase electricity connection • Utility poles	• Rights of way / wayleave approvals • Access rights to utility poles • Access rights to sites (e.g. water towers, municipal land) • Always-available, electricity supply • Crime prevention • Access roads (where not on private property)
Fibre networks	• Ducts • Handholes • Battery storage units • Manholes • Back-up generators	• Single and/or three phase electricity connection • Utility poles	
Satellite ground stations	• Power systems • Shelters • Back-up generators	• Access roads • Three phase or high voltage electricity connection	
Data centres	• Backup generators	• Access roads • Three phase or high voltage electricity connection	

Source: Africa Analysis 2025

5.6.2.1 Availability of a secure and stable power supply

Like end users, network operators are exposed to fluctuations in electricity prices and risks associated with power supply interruptions. The extended periods of loadshedding from 2020 to 2022 prompted significant investment in alternative power solutions, including generators, solar power systems and even independent power plants[34].

Figure 5-10 illustrates that the mobile network operators (MNOs) invested more than R5 billion in battery storage alone during the period 2022 - 2024.[35]

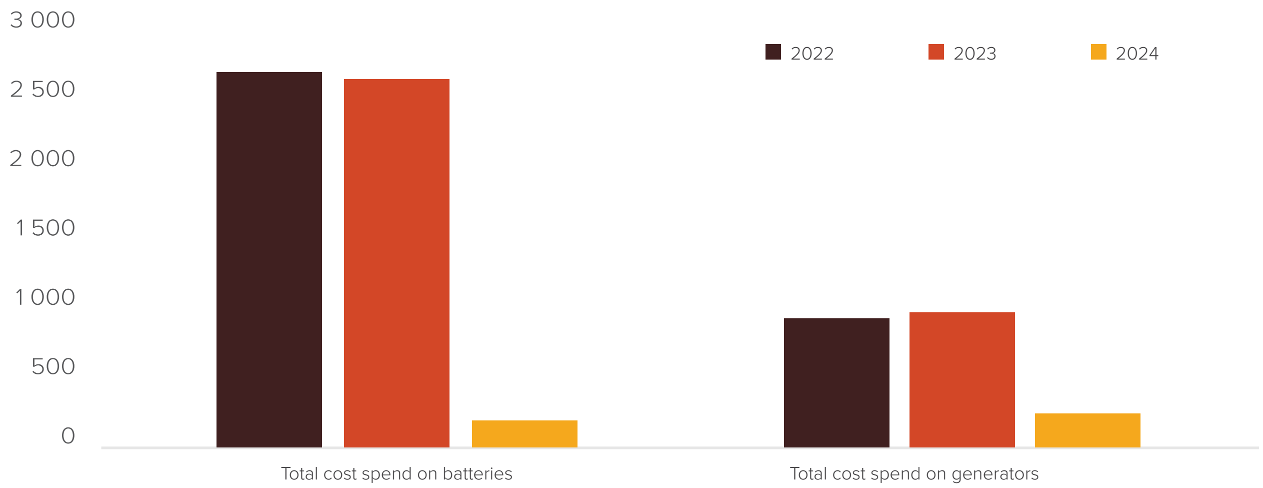


Figure 5-10: Mobile network operators' annual investment in alternative power supplies, 2022 to 2024

Source: ICASA, 2025

[34] MTN announced in 2023 that it intended to invest in a 4.5 MW multi-technology power plant at its head office. Both Vodacom and Telkom SA have significant solar panel arrays providing power to their network operating centres.

[35] To give context to this value: Volkswagen SA intends to invest R4 billion to increase the productive capacity of its Keriega plant for the production of new vehicle models.

The availability of affordable, secure electricity is not only a concern for MNOs and FNOs but also for data centre operators. While mobile and fibre networks can rely on batteries and generators for limited operations, data centres have far greater and more sustained power demands (see Appendix I).

Although data centres invest in redundant power systems such as generators, these are neither sufficient nor cost-effective for long-term operation. A key determinant of data centre investment decisions, as outlined in Section 5.3, is the cost and transparency of electricity tariffs.

South Africa's electricity tariffs are not transparent to the investor. For example, both Eskom and City Power provide power in the Midrand area in Gauteng – yet two data centres located opposite each other receive power from different providers and pay different electricity tariffs.

As a result, the retail price of electricity has become a competitive constraint across regions. Data centre representatives are engaging with Eskom and the Energy Intensive User Group to obtain preferential, lower tariffs. Town planners and city officials should note that, unlike mining or agriculture, data centre location decisions are driven by electricity costs and reliability and not by geographic proximity to natural resources. Operators will seek locations offering the best combination of land availability and power pricing.

5.6.2.2 Vandalism and theft

Network operators also depend on the state's ability to prevent and mitigate criminal activity targeting network infrastructure. MNOs continue to report that the cost of criminal activity (both theft and vandalism) has a direct cost of over R100 million per year for each network operator.

According to COMRIC (Communications Risk Information Centre, 2025), operators are increasingly 'hardening' sites – for example, encasing batteries in concrete bunkers. However, this raises the cost of tower deployment in less densely populated areas, worsening the digital divide.

Theft is not limited to mobile base stations. Network deployment contractors also report frequent theft of testing and repair equipment. In response, members of the Digital Council Africa have begun publishing serial numbers of stolen devices to discourage resale.

COMRIC and the Digital Council Africa have developed collaborative partnerships with law enforcement, yielding positive outcomes. Nonetheless, the overall cost remains substantial: MNOs reported R737.9 million in direct revenue losses in the 2024/25 financial year, alongside up to R1.5 billion in additional security expenditure.

Category of cost	Estimated financial impact
Diesel theft loss	R250 - R350 million
Generator repairs/damage	R150 - R250 million
Security costs	R1.2 billion - R1.5 billion
SLA penalties	R100 million - R250 million
Customer churn impact	R200 - R 400 million
Insurance premiums	R50 - R100 million
Direct revenue loss	R737.9 million

Figure 5-11: Scale of the cost of theft and vandalism on MNO infrastructure, 2024/25 period

Source: COMRIC, 2025

5.6.2.3 Access to state-owned land and infrastructure

Access to state-owned land, infrastructure and wayleaves is a critical factor influencing network deployment timelines and costs. This topic, including the procedures for wayleave applications, is discussed further in Section 13.3.3.

6 MEANINGFUL CONNECTIVITY

Households will only be able to enjoy meaningful use of the Internet if devices and services are affordable and the quality of access is suitable. This raises three questions:

- Do macroeconomic conditions support ongoing growth in the incomes of households? In other words, does the state of the economy support sustained employment and economic growth that bolster wage increases?
- Are digital devices affordable? Household device requirements follow a tiered structure, commencing with basic Internet access via a smartphone to more meaningful use through a tablet, SMART TV and a computer/laptop. This fourth-tier device represents (at least currently) the true ability to participate and contribute to the digital economy. Importantly, the price of devices depends on both sectoral and macroeconomic dynamics.
- Are digital services affordable? Access to the Internet is not productive if the household cannot afford a sufficient volume of data for the meaningful use of the Internet.

This section of the report explores the household's ability to afford meaningful use of the Internet by:

1. Exploring international benchmarks on pricing, including the UMC target.
2. Reviewing the trends of household expenditure on communications/ICT services.
3. Forecasting the likely future household expenditure on communications/ICT services.
4. Providing a forecast on the household broadband affordability to 2035.

6.1 Definition of meaningful connectivity in this report

The United Nations defines meaningful connectivity as "a level of connectivity that allows users to have a safe, satisfying, enriching and productive online experience at an affordable cost" (UN, 2022). This section of the report focuses on the affordability component of this definition.

Numerous studies illustrate the socio-economic benefits of the different forms of Internet connectivity based on access location (e.g. at home or at work), who can access (i.e. is the connection used by a single user or shared with multiple users) and the speed of access (i.e. typically a measure of download and upload speeds).

While all studies illustrate that a single person will benefit socially and economically from access to the Internet, the largest socio-economic spillovers are achieved when access to the Internet is made available in the home where multiple end users can access the Internet simultaneously for work, educational and entertainment purposes. [36] [37]

To capture the greatest socio-economic spillovers, this report focuses on bringing an "affordable, fast and reliable, ubiquitous and available, safe and secure" connection for all users in the home. A home broadband connection can offer all the abilities that a mobile connection can offer discretely to a single end-user and provide high-speed connectivity for all other members of the household for home, work and play use. [38]

6.2 International benchmarking of affordability of services

International benchmarking is an indicative tool as to whether high-speed broadband prices are affordable in South Africa. The UMC target of a monthly broadband package costing no more than 2% of monthly gross national income provides a suitable starting point for this discussion.

[36] Example studies include: (Balfour, 2024), (Valentín-Sívico J, 2023)

[37] The objective of this study is to estimate the cost to connect all South Africans to high-speed broadband and therefore does not explore any of the potential negative side-effects of access to high-speed Internet.

[38] High-speed Internet access at home allows multiple end users to continue working, and access entertainment and educational services, all from a single point. This type of service meets the different use-case requirements of different generations/age groupings.

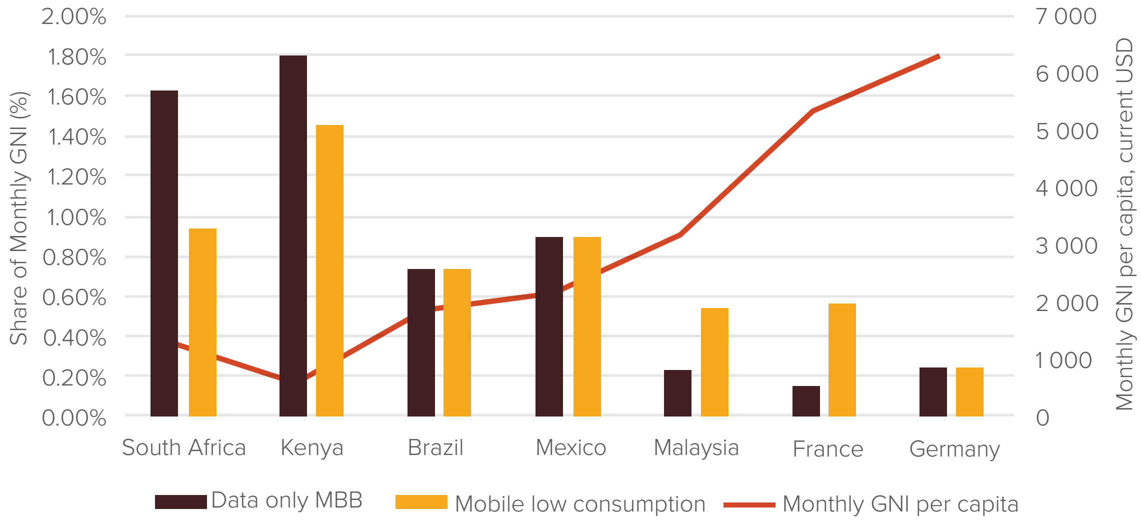


Figure 6-1: Do South Africa's prices meet the UMC target of 2% of monthly GNI (2024)?

The ITU reports that South Africa's data-only mobile product price (of 2 GB per month) is less than 2% of monthly GNI per capita, i.e. South Africa's prices meet the UMC target. However, it is important to note that countries with a higher GNI per capita are paying significantly less per month for access to high-speed broadband.

On the surface, it appears that South Africa's retail product prices of the most pervasive broadband technology is affordable.

6.3 Can households afford high-speed broadband services?

This section of the report explores the trends in household expenditure before comparing the UMC targets to different household expenditure deciles.

StatsSA provides information on household expenditure on communications/ICT devices and services through the Income and Expenditure Surveys and the Living Conditions Surveys.[39] The following table provides the average total household expenditure per month in South Africa.

Table 6-1: Monthly household expenditure per decile, 2005 - 2023 (real 2024 rand)

Decile	2005	2008	2011	2015	2023	% Δ 2005 - 2023
Lower	1 578	1 648	1 530	1 389	2 151	55%
2	2 310	2 672	2 675	2 383	3 481	51%
3	3 113	3 540	3 619	3 227	4 544	46%
4	3 940	4 457	4 670	4 149	5 653	43%
5	4 918	5 613	5 987	5 306	6 943	41%
6	6 264	7 238	7 843	6 910	8 615	38%
7	8 400	9 811	10 752	9 548	10 983	31%
8	12 698	14 564	16 488	14 315	15 002	18%
9	22 864	24 890	28 344	24 312	22 900	0%
Upper	66 600	61 442	72 073	63 378	53 056	-20%
Average	13 256	13 588	15 402	13 492	13 334	1%

Source: StatsSA own calculations

Table 6-1 shows that only the upper decile has experienced a decline in real monthly expenditure. The growth in household expenditure, particularly in the lower deciles, may well be a function of the increasing extension in social welfare grants.

[39] Statistical Release Series P0100 and P0310, respectively.

The following figure illustrates the growth in the share of households that receive a social grant in South Africa over the period 2003 to 2024:

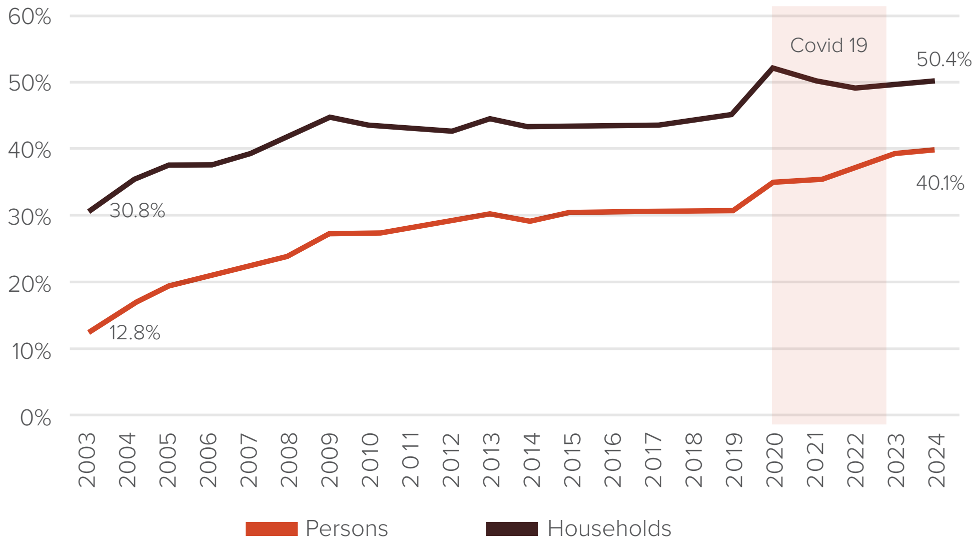


Figure 6-2: Percentage of households and individuals who have accessed social grants, 2003 - 2024

Source: StatsSA 2025. General Household Survey

Almost ten million homes received a social grant in 2024, compared to two-and-a-half million homes in 2003. The growth in real household expenditure in the lower deciles implies that either poorer households in 2024 are significantly more dependent on public funds than in 2003 or the South African social net has expanded substantially.

6.3.1 Breaking down the UMC measure of 2% of GNI per capita

The previous figure indicates how retail prices are determined: where only those who can afford services will purchase services at any specific point. The target price set by the principle of UMC is that households should not spend more than 2% of their monthly GNI per capita.

The following table compares this target in local currency values for comparator countries.

Table 6-2: Estimating the minimum value for a monthly high-speed broadband connection

Country	Currency	GNI per capita (current) 2023	GNI per capita monthly 2023	UMC target of 2% of monthly GNI per capita
South Africa	R	276 569	23 047	461
Kenya	KES	867 048	72 254	1 445
Malaysia	RM	161 264	13 439	269
Mexico	MXN	429 228	35 769	715
Brazil	BRL	102 235	8 520	170
Germany	EUR	65 571	5 464	109
France	EUR	5 4630	4 553	91

Source: Africa Analysis 2025 World Development Indicators

Using the UMC target, the estimated price for a suitable high-speed broadband product is R460.95 per month per capita. The following figure compares the share of household expenditure on ICT products across the same comparator countries.

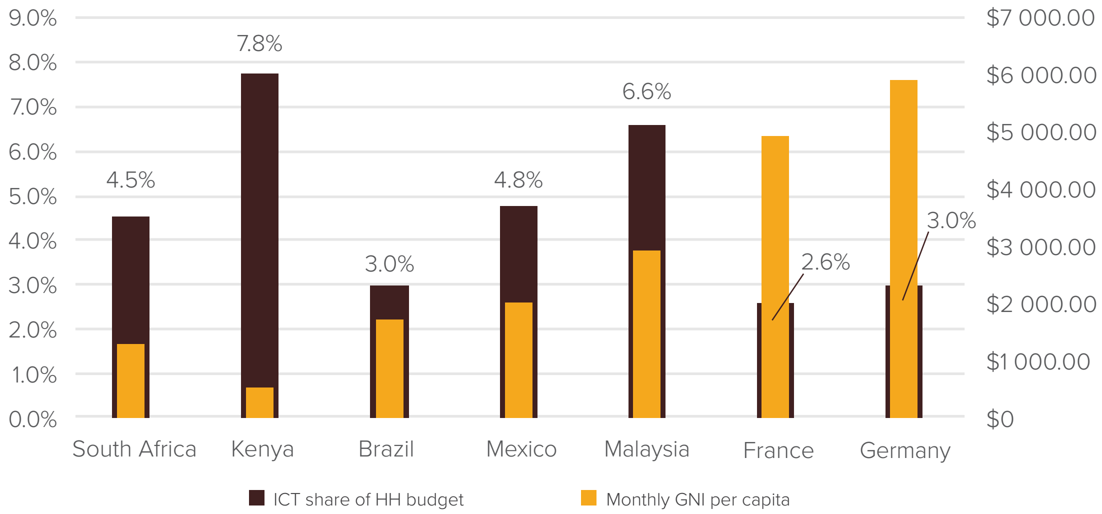


Figure 6-3: Share of household expenditure spent on communications

Source: Africa Analysis 2025; StatsSA; Statista 2025 (Kenya); Malaysia Dept. of Statistics (2022); Brazil IBGE (2020); Eurostat 2025 (Germany); INSEE 2024 (France)[40]

There is no direct correlation between GNI per capita and the share that households spend on ICT services. Brazil, Mexico and Malaysia (all middle-income countries like South Africa) have higher GNI per capita, but on an absolute basis, households spend more money on ICT services (the ICT share of household income is equivalent to or greater than that of South Africa). On the contrary, both France and Germany (high-income countries) have substantially larger GNI per capita, with ICT services consisting of a much smaller share of household expenditure. The important factors to consider in this comparison are the following:

- A greater share of the population with disposable income leads to lower retail prices (e.g. the unemployment rate in France and Germany is substantially lower than in Kenya and South Africa).
- The larger the population, the lower retail prices per user may be (capital and operations costs are spread across a larger subscriber base, reducing the price per product per user).
- High-cost network investments have in many cases already been made (i.e. countries do not have to expend significant capital on middle-mile infrastructure – the investment modelling assessment illustrates that the cost of deployment of middle-mile network infrastructure is a major cost driver).
- Potentially increased levels of competition and/or regulatory oversight.

[40] Data per country are not available for a single calendar year. Some household expenditure survey data from 2020, may not capture recent product pricing trends.

6.3.2 Can all South African households afford the UMC target?

The previous section introduces the baseline level of expenditure, illustrating that South African households should not be spending more than R461 per month for single-income households. The following table compares this figure to different expenditure thresholds.

Table 6-3: Retail prices as a share of household expenditure

Decile	Monthly total household expenditure (IES 2023 data in constant 2024 values)	Share of household expenditure		
		2%*	4.50%**	8.80%***
Lower	2 151	43.03	96.81	189.32
2	3 481	69.63	156.66	306.36
3	4 544	90.88	204.48	399.86
4	5 653	113.07	254.40	497.50
5	6 943	138.86	312.44	611.00
6	8 615	172.29	387.65	758.08
7	10 983	219.67	494.25	966.54
8	15 002	300.04	675.09	1 320.18
9	22 900	458.00	1 030.50	2 015.20
Upper	53 056	1 061.12	2 387.51	4 668.91
Average	2 151	266.69	600.05	1 173.42

Source: Africa Analysis 2025 World Development Indicators

*UMC indicator ** Aggregate StatsSA household expenditure on ICT services *** FinMark Trust 2023 where end users report spending 8.8% of income on communications

The data in the previous table shows that only Decile 7 and above can afford high-speed broadband at 4.5% of household expenditure and Decile 4 and above at 8.8%[41] of household expenditure. The results of the table indicate the importance of households' ability to purchase intermittent access to high-speed broadband.

However, this table does not consider recent pricing dynamics within the South African industry. The average price for a connection to the home (supporting multiple devices) is, currently, approximately R300 per month. Further, some operators offer a fixed connection to the home (with certain fair use policies) for only R99 per month.

[41] The 2023 FinMark Trust study reports that end users spend up to 8.8% of income on communications.

The following table outlines the ability of different deciles to afford high-speed broadband at these different price points. The table shows that at the current share of household expenditure, only Deciles 5 and upwards can afford a monthly package of R300. However, at R90 per month, all households can afford this type of service.

Table 6-4: Retail prices at different shares of household expenditure (2024 South African rand)

Decile	Monthly total household expenditure (IES 2023 data in constant 2024 values)	Share of household expenditure			
		2%* @ R300.00	4.50%** @ R300.00	2%* @ R90.00	4.50%** @ R90.00
Lower	2 151.00	43.03	96.81	43.03	96.81
2	3 481.00	69.63	156.66	69.63	156.66
3	4 544.00	90.88	204.48	90.88	204.48
4	5 653.00	113.07	254.40	113.07	254.40
5	6 943.00	138.86	312.44	138.86	312.44
6	8 615.00	172.29	387.65	172.29	387.65
7	10 983.00	219.67	494.25	219.67	494.25
8	15 002.00	300.04	675.09	300.04	675.09
9	22 900.00	458.00	1 030.50	458.00	1 030.50
Upper	53 056.00	1 061.12	2 387.51	1 061.12	2 387.51
Average	2 151.00	266.69	600.05	266.69	600.05

Source: Africa Analysis 2025 calculations. World Development Indicators

*UMC indicator ** Aggregate StatsSA household expenditure on ICT services

These results starkly indicate the ability of South African households to afford high-speed broadband. Current commercial product pricing is at levels where all households can afford an always-on connection, according to StatsSA data. This raises three key issues:

1. High-speed fibre broadband networks offering R90 per month are not ubiquitous and are typically deployed in high-density low-income areas where the cost to deploy network infrastructure is low. Such networks will not be deployed everywhere, and the Fibre Investment Model (Table 6-4) indicates the likely level of households to be connected to a fibre network. Importantly, however, is that such price points are generating substantial cross-technology competition between fibre, mobile and Wi-Fi products. Cross-technology/infrastructure competition is a significant stimulus to South Africa as it increases the amount of fixed investment into the country, as well as improves broadband access redundancy – a key criterion to ensure long-term UMC.
2. The R5-a-day per device Wi-Fi model espoused by BBI is an intermittent use product that supports end users with in-month cash flow constraints. End users who buy daily access will pay R450 a month per household (for three devices). This price point excludes many households from being able to afford always-on household connectivity.
3. Stakeholder engagement suggests that there is significant scope for Wi-Fi network rollout in the country, with retail prices expected to adjust dynamically downwards as end users adapt and take up the service.

6.4 The location of households that cannot afford high-speed broadband services

6.4.1 Introduction to the Household Affordability Model

The Household Affordability Model has been constructed to geographically estimate the ability of households to afford ICT devices and broadband services. The functioning of the model is described in detail in Appendix D.

This model consists of two stages:

1. Stage 1: Determining the number of households per expenditure decile per municipality for the forecast period of 2025 - 2035.
2. Stage 2: Identifying the location and number of households that cannot afford an always-on high-speed broadband connection.

The following figure explains the mechanics of Stage 1 of the model.

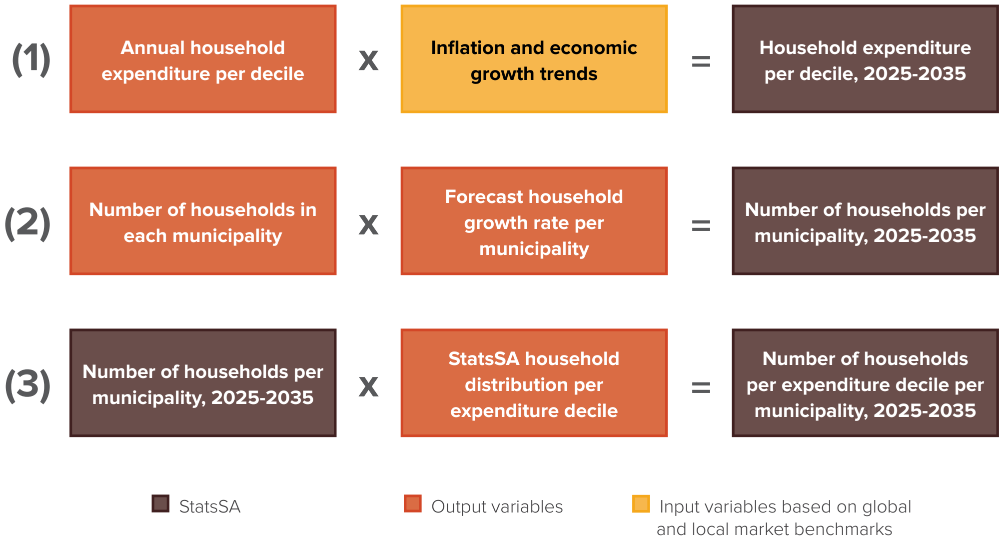


Figure 6-4: Stage 1 of the Household Affordability Model

Source: Africa Analysis 2025

The following figure explains Stage 2 of the model.

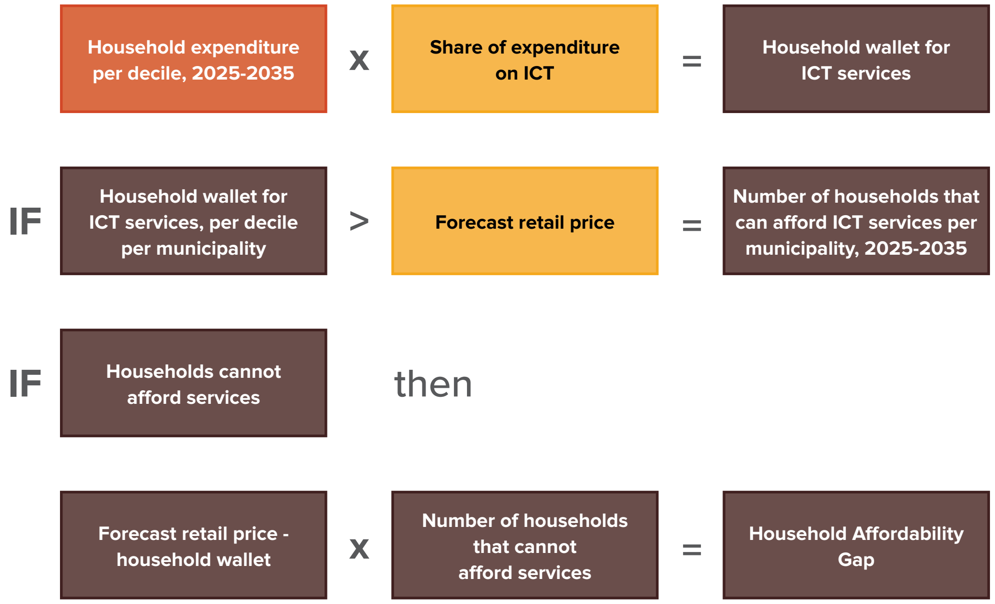


Figure 6-5: Stage 2 of the Household Affordability Model: Scenario planning

Source: Africa Analysis Household Affordability Model 2025

6.4.2 Household Affordability Model results

6.4.2.1 The share of household expenditure spent on ICT services

The model results depend on the following:

1. The level of accuracy of the household expenditure data available from StatsSA: Capturing income and expenditure data is a challenging task, with the response rate to such types of questions on a downward trend. While this model utilises the most current information available, it is important for StatsSA (and ICASA) to explore new avenues on how to collect income and expenditure trends. The ongoing adoption of digital financial services offers StatsSA an opportunity to gain a more detailed understanding of who earns and spends where. ICASA could capture more detailed ICT expenditure data by collecting location data of purchases and use (including the remittance of airtime[42] from urban areas to rural areas). The practice of data remittances may significantly reduce any affordability gap across income deciles at a household level.
2. The share of household expenditure allocated to purchasing broadband services: The StatsSA income and expenditure surveys show that households have spent a consistent amount on ICT services and products.

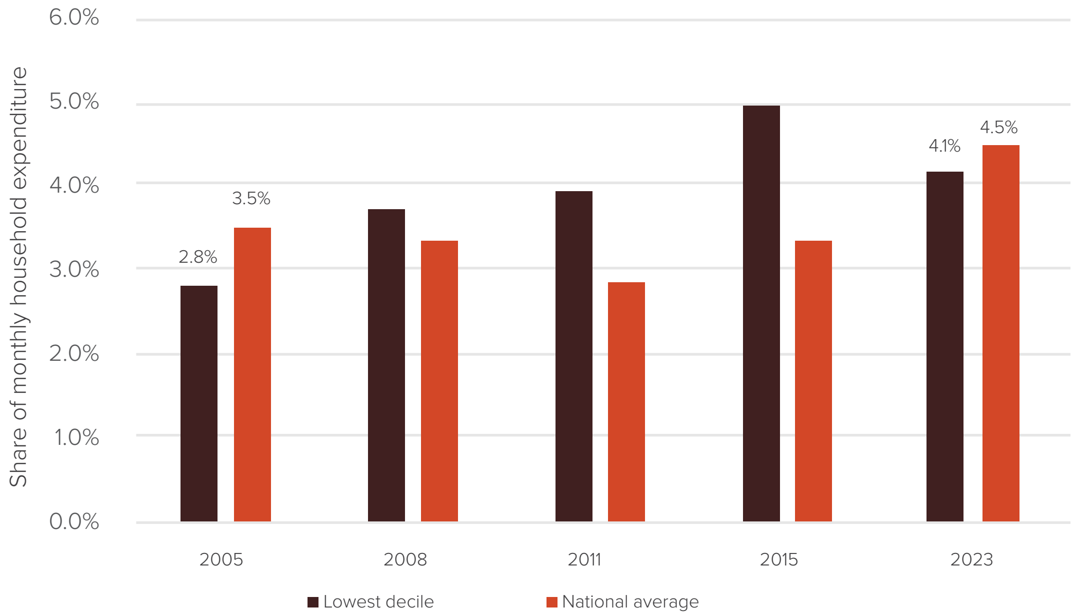


Figure 6-6: Share of total household expenditure on ICT services, 2005 - 2023 (rand, constant 2024)

Source: StatsSA, Africa Analysis calculations

Figure 6-6 shows that South African households are progressively consuming more ICT services, as the Internet increasingly becomes a part of daily life and retail prices being on a downward trend from 2005 to 2023. This trend reflects a greater penetration of data services, increased take-up and end users becoming more digitally connected.

It is a global trend that households are spending more on ICT services, especially as social media and gaming products become more mainstream. For this reason, the Household Affordability Model holds the share of household expenditure constant throughout the forecast period, at the national average of 4.1% (expenditure by the lowest decile).

[42] This model cannot account for the number of low-income households that gain access to data via friends and family. This form of access to high-speed broadband may be in the form of sharing broadband connections, friends and family sending data coupons and/or transferring data volumes. This is a globally under-explored avenue of broadband affordability, as it is entirely reliant on access to mobile network operator billing data.

6.4.2.2 Number of households that cannot afford broadband at R300 per month

The following table outlines the number of households that will not be able to afford high-speed broadband, when incurring a charge of R300 per month. This is the monthly average of low price, high-capacity products available.

Table 6-5: The share of total households that cannot afford broadband, 2025 - 2035 at R300 a month

Year	Total no. of households (millions)	Economic Decline	Economic Stagnation	Economic Recovery
2025	19.33	51.8%	51.8%	51.8%
2026	19.82	51.2%	51.2%	49.6%
2027	20.32	49.4%	49.4%	49.4%
2028	20.82	50.6%	50.6%	49.8%
2029	21.32	51.8%	51.8%	45.9%
2030	21.81	53.0%	52.1%	47.0%
2031	22.30	54.1%	53.2%	47.8%
2032	22.84	57.3%	54.5%	44.4%
2033	23.39	58.7%	55.7%	40.7%
2034	23.95	62.1%	51.4%	40.6%
2035	24.52	63.7%	52.6%	39.9%

Source: Africa Analysis Household Affordability Model 2025

Table 6-5 shows that over 12 million households, or over 60%, are unlikely to be able to afford high-speed broadband under the Economic Decline Scenario by 2035. This percentage drops to 40% of households under Scenario 3, Economic Recovery. Should South Africa's economic trajectory remain as is, over 50% of households will not be able to afford an always-on connection at current price levels and structures.

At this price level, lower-income households are obliged to adopt iterative consumption patterns of purchasing vouchers either on a time-of-use or data volume basis[43], depending on the type of available network.

Duration-use products, such as an uncapped R5 a day package, give end users more control over Internet access– there will be no high-data consumption shocks based on high-volume consuming emails, videos or messages. On the other hand, data-volume-based products (such as R16 for 500 MB to be consumed in a single day), expose the end user to the risk of data being consumed far more quickly than expected.

Government policy planners must recognise that this trend of affordability, and the nature of growth in data consumption, is not an indictment on sector pricing dynamics but rather illustrates the importance of ensuring that South Africa's economy returns to a high-growth path that generates employment and income opportunities. Regulation without investment stimulation will not resolve South Africa's affordability challenges.

[43] Prepaid access to broadband services may be purchased in three categories: 1) a purchase of a fixed amount of anytime data (i.e. no constraints on the type of network coverage available or time of use limitations); 2) a purchase of a fixed amount of data at a discounted rate for consumption at times that are dictated by the network operator and 3) the purchase of a voucher for access to a network for a specific duration (usually daily, weekly or monthly). The duration-based voucher has no cap on the total amount of data that the end-user may consume during the purchased duration of use.

6.4.2.3 Number of households that cannot afford broadband at R90 per month

However, this picture changes substantially if applying a R90 per month retail price (available in certain geographic areas), as illustrated in the following table.

Table 6-6: The share of total households that cannot afford broadband, 2025 - 2035 at R90 a month

Year	Total no. of households (millions)	Economic Decline	Economic Stagnation	Economic Recovery
2025	19.33	5.7%	5.7%	5.7%
2026	19.82	5.8%	5.8%	5.8%
2027	20.32	6.0%	6.0%	6.0%
2028	20.82	6.1%	6.1%	5.9%
2029	21.32	6.2%	6.2%	4.2%
2030	21.81	6.3%	6.1%	1.9%
2031	22.30	6.5%	4.4%	1.9%
2032	22.84	6.4%	3.5%	1.9%
2033	23.39	6.5%	3.6%	0.0%
2034	23.95	6.7%	2.0%	0.0%
2035	24.52	6.8%	2.1%	0.0%

Source: Africa Analysis Household Affordability Model 2025.

Note that the R90 retail price is indexed to inflation per scenario over the forecast period.

At R90 per month, all South African households can afford a high-speed broadband package by 2035 under the Economic Recovery Scenario, where economic growth supports income growth. A significantly smaller margin of households cannot afford high-speed broadband under the Economic Decline and Stagnation Scenarios, or 6.8% and 2.1%, respectively.

6.4.3 Household affordability of intermittent use connectivity

Intermittent use connectivity is the most likely manner in which low-income households will be able to afford connectivity for the foreseeable future in South Africa and globally. A detailed sensitivity analysis of the number of households that can afford different duration-of-use iterative usage patterns is provided in Appendix C3.3.

6.5 Conclusion on the affordability of meaningful connectivity

Although South Africa has achieved the UMC pricing benchmark of less than 2% of monthly GNI per capita, this figure masks the substantial income disparities of South African households. Adapting the GNI analysis to an assessment of household expenditure per decile provides a clear illustration that many lower decile households are not currently able to afford an always-on connection at 2% of monthly GNI.

The Household Affordability Model illustrates the dramatic difference between the number of households that can afford a broadband connection for all three scenarios. At R300 a month, always-on connections remain unaffordable for most households. However, at R90 a month, almost all households can afford an always-on connection.

The impact of duration-of-use versus volume-of-data-pricing is an outcome of different technologies. Fibre-based networks have a future-proof, inexhaustible level of capacity available, while wireless networks (including mobile, FWA and satellite) are constrained by the capacity over the radio network interface (both an investment and a spectrum-availability consideration).

The analysis of household affordability is clear: The core affordability constraint to achieving a digital society is much more a function of the level of income earned by households in South Africa than the price levels set by the network operators.

7 THE INVESTMENT REQUIREMENTS TO ACHIEVE UNIVERSAL AND MEANINGFUL ACCESS

Sections 5 and 6 of this report have illustrated the universal access gap, where almost 400 000 households currently do not have access to high-speed broadband, while an always-on meaningful connectivity connection is currently out of reach for most South African households. The gap illuminated in these two sections asks the question: What scale and structure of investment is required to achieve universal, affordable, and high-quality digital connectivity by 2030 – and how can these investments be sustainably financed? This chapter addresses that question by outlining the capital and operational expenditure needed across key digital infrastructure components, including broadband access networks, data centres, cloud infrastructure and digital public services.

Building on the BtG framework, the investment modelling reported in this chapter quantifies the gap between current infrastructure and the levels required to meet national development goals as articulated in the NDP, the NIP2050 and the SA Connect policy.

Given fiscal constraints and the limitations of current market dynamics, the chapter also examines a spectrum of funding models – from public financing and PPPs to innovative blended finance mechanisms. These are assessed in terms of their ability to mobilise capital, align incentives and ensure efficient delivery. Importantly, this chapter recognises that finance is not a neutral input – it must be structured to overcome market failures and drive inclusive outcomes, especially in areas with limited commercial viability.

The analysis provides a foundation for designing a fiscally feasible, socially inclusive, and economically efficient digital infrastructure investment roadmap. It also offers policymakers a practical menu of financing options and institutional arrangements required to unlock the necessary investment at national and subnational levels.

The structure of this section is as follows:

- Identifying the BtG sector-specific investment scenarios;
- Outlining the modelling methodology; and
- An estimate of the investment amounts required to achieve the policy goals.

7.1 Beyond the Gap scenarios for investment in DCI

Achieving universal, affordable and high-quality digital connectivity in South Africa by 2030 will require strategic choices about investment ambition, pace and coverage priorities. This chapter presents a structured set of investment scenarios and corresponding connectivity targets developed using the BtG framework, enabling policymakers to assess the trade-offs between fiscal effort, service outcomes and policy ambition.

Table 7-1 outlines three possible scenarios that will shape South Africa's ability to invest in DCI and therefore represent a different technology mix for access to high-speed broadband in South Africa.

Table 7-1: Investment scenarios for DCI, 2025 - 2035

Year	Total # of households	Economic Decline	Stagnation
	Economic Decline	**Economic Stagnation**	**Economic Recovery**
Principle	• Deployment of least-cost technology. • End users may experience contention in the use of network infrastructure.	• Deployment of a blend of least-cost and high-cost technologies. • End users may experience different levels of contention based on their geographic location. • Reliance on lower cost / lower quality connections in areas of low population density.	• Deployment of high-cost high throughput guaranteed high- quality broadband connections. • Reliance on lower cost / lower quality connections in areas of low population density.
Last-mile access	Mobile-centric wireless connectivity dominated with limited roll-out of additional fibre network roll-out.	Combination of mobile + fixed wireless access dominated connectivity with limited roll-out of fibre network infrastructure.	Fibre connectivity-dominated mix of technologies.
Sectoral trends	• Likely limited further investment in expansion of wireline (fibre) networks. • Capacity enhancements for broadband connectivity to be served by further deployment in 4G and 5G technologies. • Availability of 5G connectivity will be commercially determined considering specific universal service obligations incurred under spectrum auctions. • Income constraints will limit take-up of high-speed FWA services in areas where it could be offered. • Satellite is planned to provide services in those areas where population density levels do not commercially support either fixed or mobile infrastructure roll-out.	• Fibre network operators will continue to seek innovative broadband deployment models to serve dense lower-income urban and peri-urban areas. • Access technology mix will be a blend of fibre (increased from current) in urban areas and FWA / mobile broadband in all areas by 2035. • Satellite is planned to provide services in those areas where population density levels do not commercially support either fixed or mobile infrastructure roll-out.	• Likely significant spend on current fibre network expansion in poorer (and deeper rural) areas. • Access technology mix will be predominantly fibre with limited FWA / mobile broadband in a few areas by 2030. • Satellite is planned to provide services in those areas where population density levels do not commercially support either fixed or mobile infrastructure roll-out.

Source: Africa Analysis

7.2 Setting the connectivity and pricing targets

The SA Connect policy objective is for all South Africans to have access to 100 Mbps by 2030, while the MTDP sets the following goals:

Table 7-2: Connectivity targets of the Medium-Term Development Plan, 2024 - 2029

Metric	2029 goal	Comment
Population coverage of 5G networks	90% population coverage by 5G	• Expectation/focus on a specific technology coverage ignores the multiple ways in which end users may access high-speed broadband, including FWA and Wi-Fi technologies that are not reliant on exclusive use-spectrum. • It is also important to acknowledge the ongoing convergence of the quality of service available between fixed and wireless technologies. • Rather, it is more prudent for government targets to focus on a minimum quality of service (e.g. minimum download speed of 100 Mbps), where the final choice of type of connectivity (e.g. mobile, FWA, fixed line or satellite) is made by the household.
% households with fixed connectivity	>50% of households	
Percentage of 4G/5G smartphone adoption	>50%	This level has already been achieved, according to data from ICASA.

Source: (DPME, 2025)

The connectivity target set for the investment case is 100 Mbps, the same speed as proposed by SA Connect in 2013. The technology used to achieve this target depends on the particular BtG investment scenario. Although stakeholders indicated that this target is excessive, even for 2035, the scalability of network technologies (e.g. a combination of fibre, 5G/6G and Wi-Fi 6) means that although end users may not need such speed, it may be achievable.

Note that the goal of this report is to estimate the total cost to connect all South Africans to high-speed broadband (i.e. achieving universal access). The connectivity target is therefore independent of whether households can afford such connectivity. This approach has significant implications for the economic impact modelling that follows.

7.3 The modelling approach and methodology

Identifying the most affordable and effective technology mix to connect all South Africans to 100 Mbps necessitates the construction of the following models:

- A mobile technology model to ensure that all households and government facilities have access to 100 Mbps, in alignment with BtG Scenario 1.
- A mixed technology model that accounts for the deployment of mobile, FWA, Wi-Fi, satellite and fibre technologies, in alignment with BtG Scenario 2.
- A fibre technology model in alignment with BtG Scenario 3.

The results of these models are then compared to the Household Affordability Model. This model provides an indication of the likely monthly fee that households are likely to be able to afford over the period 2025 - 2035.

Each scenario model undergoes the following steps:

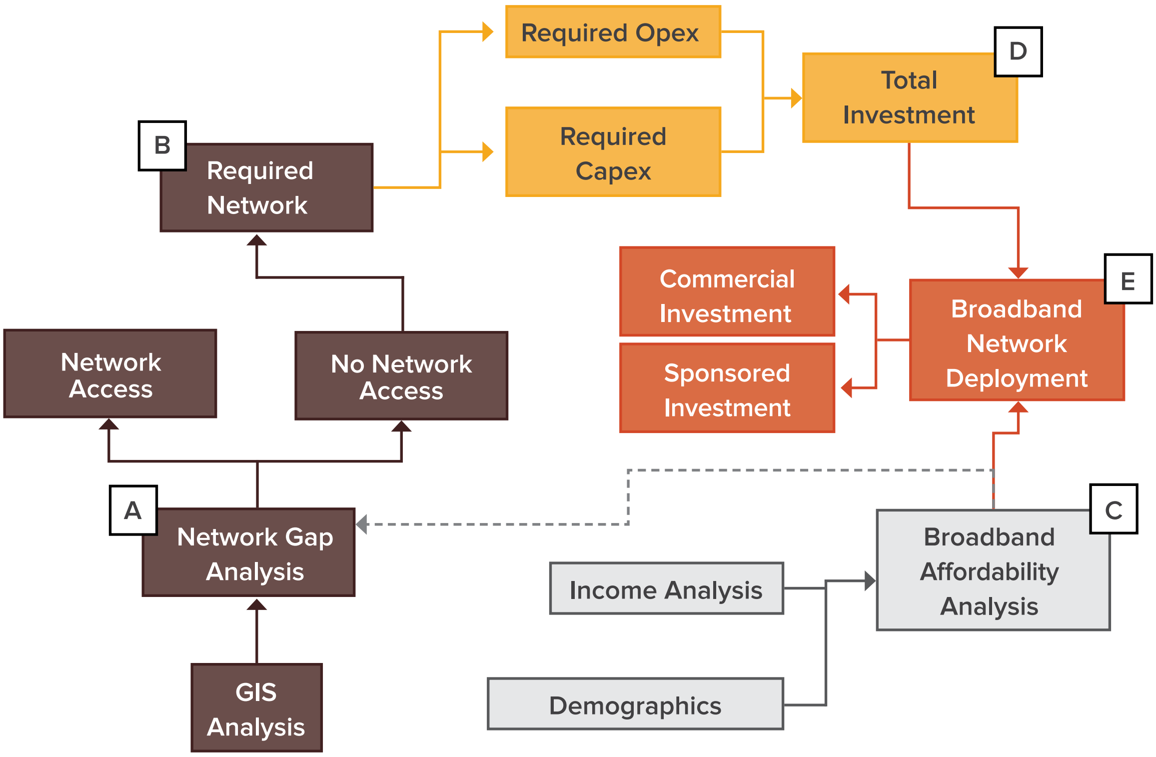


Figure 7-1: Network Identification and Costing Model

Source: Africa Analysis, 2025

The modelling structure consists of six interdependent steps:

- Step A: The crucial element of this investment assessment is the ability to identify where network infrastructure may need to be installed. The GIS analysis generated in Section 5 is the key input to this project.
- Step B: The output of the GIS assessment identifies the geographic locations that require further investment. This output feeds into the investment modelling per technology.
- Step C: The total investment is then shaped according to the three BtG scenarios to identify the optimal mix of technologies for South Africa.
- Step D: The investment cost analysis is independent of the ability of households to afford connectivity. However, Step D involves an assessment of South African households' ability to afford an always-on broadband connection.
- Step E: The final step in the investment cost assessment combines the findings of the investment costs and household affordability to identify the scale of investment required.
- Step F: This step looks at the possible scale of investment that will likely be sourced from the private sector, as well as any particular areas that may require sponsored investment support (e.g. through universal service obligations/funds, development finance options and/or PPPs).

Note that Steps A and B are represented by the findings in Chapter 5. Step D is represented by the findings in Chapter 6.

8 ESTIMATING THE INVESTMENT COSTS OF MOBILE BB AND 4G|5G BB FWA TECHNOLOGIES

This section outlines the modelling approach used to estimate the capital and operational expenditure required for deploying additional mobile BB (4G I LTE and 5G) infrastructure in those areas currently not covered, as well as the improvement in the current service to meet the expectations through capacity upgrades as part of the broader digital infrastructure investment strategy for South Africa. The methodology aligns with the BtG framework, focusing on infrastructure layers most directly linked to last-mile connectivity and access. As there are several existing players in the industry, it is a necessary assumption that these players will share active equipment to keep the required expenditure as efficient as possible, and hence, to keep costs at a reasonable level.

To do so requires a multi-operator core network (MOCN) or at least a multi-operator radio access network (MORAN) shared infrastructure, where, as far as possible, existing sites, towers and masts are used or reused. It is important to note that the 2G and 3G networks have been assumed to be decommissioned during the period of this study. Hence, it is these existing sites that have been repurposed for the broadband rollout using sub-1GHz spectrum, which needs to be re-farmed for 4G and 5G use.

The resulting architecture selected will deliver cost-efficient high-speed mobile and FWA broadband to cover both high-density urban and lower-density peri-urban areas for a range of applications, including mobile broadband apps, IoT, as well as traditional fixed applications.

The modelling framework disaggregates this network into two main cost layers: radio access network (RAN) active site infrastructure, and the passive site infrastructure and core network. The latter includes the backhaul transmission from mobile RAN sites to fibre nodes, and (excluded from BtG) national long distance (NLD) and interconnectivity with the first mile, other mobile core infrastructure, as well as other ICT operators and networks.

Each layer has distinct infrastructure components and cost drivers informed by stakeholder inputs, real-world operator practices and geographic variability in mobile network deployment.

Critically, the BtG-aligned methodology omits NLD costs under the assumption that backbone infrastructure either exists or is under shared-sector development. This allows for targeted investment planning that prioritises affordability, service coverage and fiscal efficiency in the access and distribution segments where the digital divide is most acute.

This chapter provides a detailed breakdown of the design parameters, capital expenditure elements, operating expenditure drivers and associated costs used in the mobile network modelling. It is intended to guide both policymakers and technical stakeholders in understanding the underlying assumptions and investment implications of the proposed shared mobile network expansion strategies.

8.1 Mobile BB and BB FWA network design: Shared RAN architecture

The mobile BB and BB FWA network in this model is based on a shared 4G I LTE and 5G RAN design, the only mobile BB as well as a highly efficient BB FWA high-performance broadband delivery to individual mobile users, as well as nomadic or fixed residential, IoT devices, government facilities and small business users.

8.1.1 Advantages of mobile BB and BB FWA for developing countries

Cost-efficiency (capex and opex)

- Shared infrastructure: A single passive site can serve more than two network operators, who then serve multiple customers. However, shared active network infrastructure may serve many mobile BB or FWA customers through the same 4G and 5G RAN infrastructure. This leads to both cost-efficiency and improved spectral efficiency. Such infrastructure sharing must follow the established MOCN or MORAN principles.
- Phased deployment: Supports incremental roll-out by deploying RAN capacity upgrades as and where needed.

Coverage and understanding

- Mobile networks have been around in South Africa for the past three decades, are well understood, and are extensive in terms of their existing coverage and reach, especially for the sub-1 GHz spectrum range, where many sites have been where they are located now, since the outset of mobile in South Africa.
- Allows for the quickest scalability in high-growth areas such as peri-urban zones or economic corridors through site up- or downgrades as traffic expectations fluctuate.

Mature ecosystem and vendor support

- 4G | LTE and 5G are well-established global standards with strong vendor competition and global economies of scale, resulting in lower equipment costs and widespread technical know-how.
- Reasonably good performance for all users, especially with the newer generation technologies.

Based on current tests across the country, mobile BB currently provides between 30 and 82 Mbps down-, and between 10 and 24 Mbps upload speeds (depending on the operator) for shared bandwidth, while for FWA users (households, IoT devices, government facilities and small businesses) the performance can be up to an order of magnitude higher.

8.1.2 4G | LTE and 5G architecture overview

Mobile BB uses a point-to-multipoint mobile wireless network with active cell handovers to ensure mobility when users are on the move. For fixed wireless users, the technology offers improved throughput rates over mobile BB through higher-gain antennas (usually directional) either integrated within the devices or external.

- **Site RAN equipment:** Transceivers and antennas make up the bulk of the equipment within the RAN; however, the RAN equipment interfaces with the backhaul via a radio resource unit (into which the transceivers are connected). Backhaul connectivity can be through a fibre transmission link from the site to a fibre node, a microwave link/hop to another site or to a fibre node or even a satellite link. Section 8.3 outlines the cost-estimation approach to backhaul upgrade requirements.
- **Customer premises equipment (CPE) and end-user devices:** Each user is assumed to have their own smartphone or tablet-type device for mobile BB connectivity. However, each BB FWA connected home, premise or facility is connected via an FWA device that would be available for purchase from any of the existing operator outlets or stores as an add on, or procured by the end user or customer as part of a contract agreement, and as such will not need to be provisioned specifically as CPE by the network due to the variety of such devices in the marketplace. As long as the SIM card is active on the network and inserted/attributed to the device (especially for virtual SIMs), and the device is registered on the network, it should function correctly.

8.1.3 Key design characteristics

- **Reach and coverage:** Mobile BB coverage range is determined by the associated spectrum band, and for sub-1 GHz spectrum, this can range up to 30 km. For higher-order spectrum, this range reduces significantly, and so it is important to use as much of this low spectrum as possible (the 700 MHz, 800 MHz and 900 MHz ICASA licensed bands being of particular importance here), allowing flexible deployment across urban, peri-urban and rural geographies. What is important to note is that where higher capacities are required, especially urban and peri-urban areas where densities of users are much higher, it is often necessary to move to a higher frequency band spectrum, and in places build new 'fill-in' sites to guarantee the required coverage. This is especially the case in areas with higher density of users, and/or where the required throughput rates are higher.
- **Scalability:** The architecture allows incremental deployment by upgrading sites with additional transceiver cards as well as the addition of MIMO antennas as and where necessary, as demand grows, facilitating phased investment planning.

8.1.4 Design implications for cost modelling

- **RAN or site:** Includes the active RAN infrastructure at the site and the upstream metro fibre or microwave link connection to the core network (either via a fibre node or via another site, where they can be 'daisy chained'). In addition, this includes the passive site infrastructure, with components such as a tower; container; heating, ventilation, and air conditioning (HVAC); and power supply infrastructure.
- **CPE costs:** Includes smartphone or tablet-type devices and routers which are typically bundled as part of a package contract, or purchased separately by a user, so not network owned, and hence not part of the required capital.
- **O&M considerations:** Preventative and corrective maintenance required at each site, and the ongoing radio planning and reconfiguration costs, are included as part of the O&M considerations for a mobile operator.

This mobile BB-based design is especially suitable for universal service goals due to its moderate operating cost profile, shared infrastructure model, and the ability to deliver high-speed broadband to multiple users with minimal environmental and energy impact.

8.2 Mobile BB and BB FWA network design

A mobile BB and BB FWA network is typically segmented into three major parts, each associated with specific infrastructure components and cost drivers:

1. Long-haul costs (NLD);
2. Transmission or backhaul costs – typically metro fibre or licensed microwave, and (in some cases) via satellite;
3. RAN costs; and
4. Mobile device / BB FWA device (premise, facility or home connection costs are not borne by the operator, so they are discounted here, and not included).

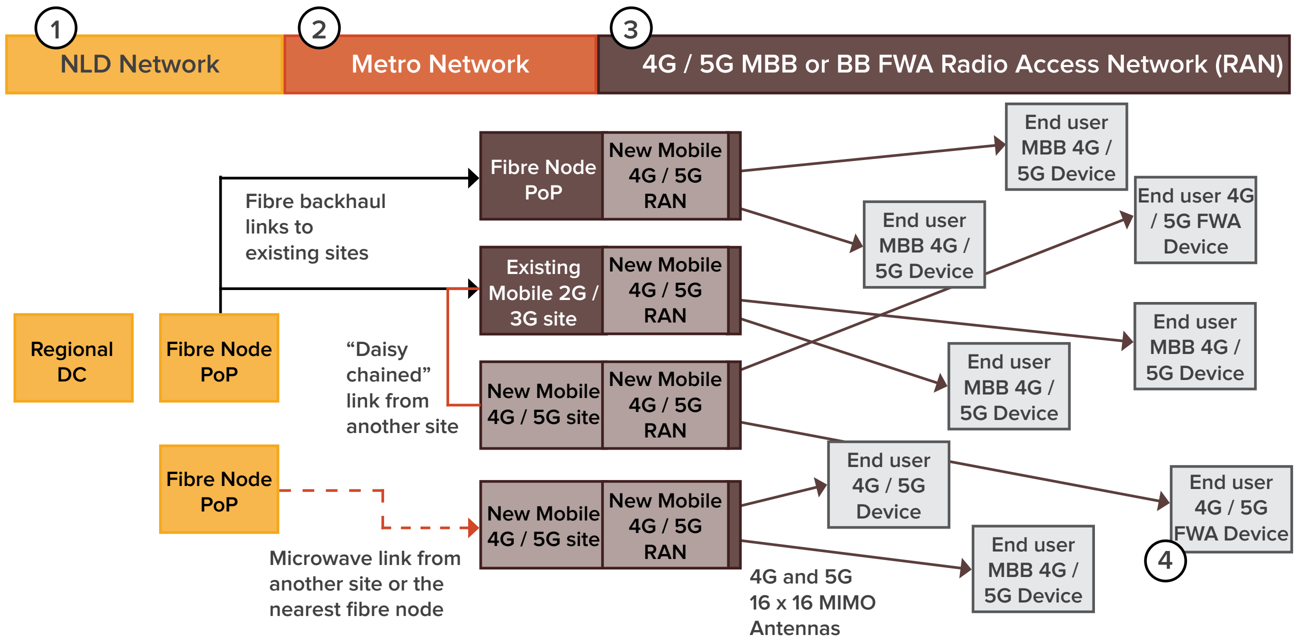


Figure 8-1: Mobile BB and BB FWA network design

Source: Africa Analysis 2025

8.3 Mobile BB and 4G | 5G BB FWA network modelling

As described earlier, for a mobile BB and 4G | 5G BB FWA network to function most efficiently, it will be necessary for all operators to share this capacity on an open access basis, and hence, the previous model assumes the active RAN sharing which comes with a MOCN or MORAN setup. Duplication of this infrastructure will not be cost-effective and will result in shortfalls due to the inherent costs involved. Due to the scarcity of spectrum, the MOCN model is preferred, but the MORAN model can be made to work if necessary.

A BB model needs to analyse the current and projected future South African BB market within the 213 local municipalities and metropolitan municipalities over a period of 11 years (2025 through to 2035). The original intention of modelling the country at the local & metropolitan municipal level was found to generate unrealistically high capex requirements due to the inherent averaging that this level of modelling necessitates.

As a result, a lower level of granularity modelling was necessary, and this was done at the H3 hex level, where the country was broken down into 333 459 hexagons. At this level, sufficient resolution was available to more accurately define the network, and hence capex requirements for the two major component BB models, namely the FTTH fibre network model, and the mobile BB and Mobile BB FWA network model. To achieve the objectives of providing the requisite access technology by the end of the modelled period (i.e. by 2035), it has been necessary to take stock of the current position and the projected market by 2035, and see what expansions per technology are required by that end date.

8.4 Defining broadband technology: Why 2G and 3G are insufficient

2G is not a broadband technology, as it is primarily designed for voice and low-speed data services (e.g. SMS, USSD, and basic mobile Internet at kilobits per second). Its existence or phase-out does not impact broadband availability and can largely be ignored.

3G, while offering improved data capabilities, does not meet modern broadband speed benchmarks. Most 3G networks deliver download speeds ranging from 2 Mbps to 10 Mbps, which is far below the 100 Mbps threshold often considered the minimum for next-generation broadband services. Even with enhanced 3G technologies like HSPA+ (42 Mbps peak speeds), real-world performance remains inconsistent and cannot effectively support high-bandwidth applications such as 4K streaming, cloud computing and emerging digital services.

4G (LTE-A) and 5G are the only current mobile/wireless technologies that should be classified as broadband-capable. LTE-Advanced, for instance, can exceed 100 Mbps in real-world conditions, while 5G significantly enhances capacity, reduces latency and improves spectral efficiency. In addition, upgrades to 5G-Advanced are expected to become increasingly commercially attractive in the next five years.

Newer technologies, such as 6G, are not considered relevant to this study due to the impact that they will have only really affecting the end few years of this study (2030 to 2035), where this technology is expected still to be in its infancy. In other words, as a technology, it will be barely out of the development/startup phase and only at the start of its commercial rollout and uptake by 2035.

8.5 The mobile and fixed wireless model

The following figure illustrates the structure of the mobile BB and BB FWA.

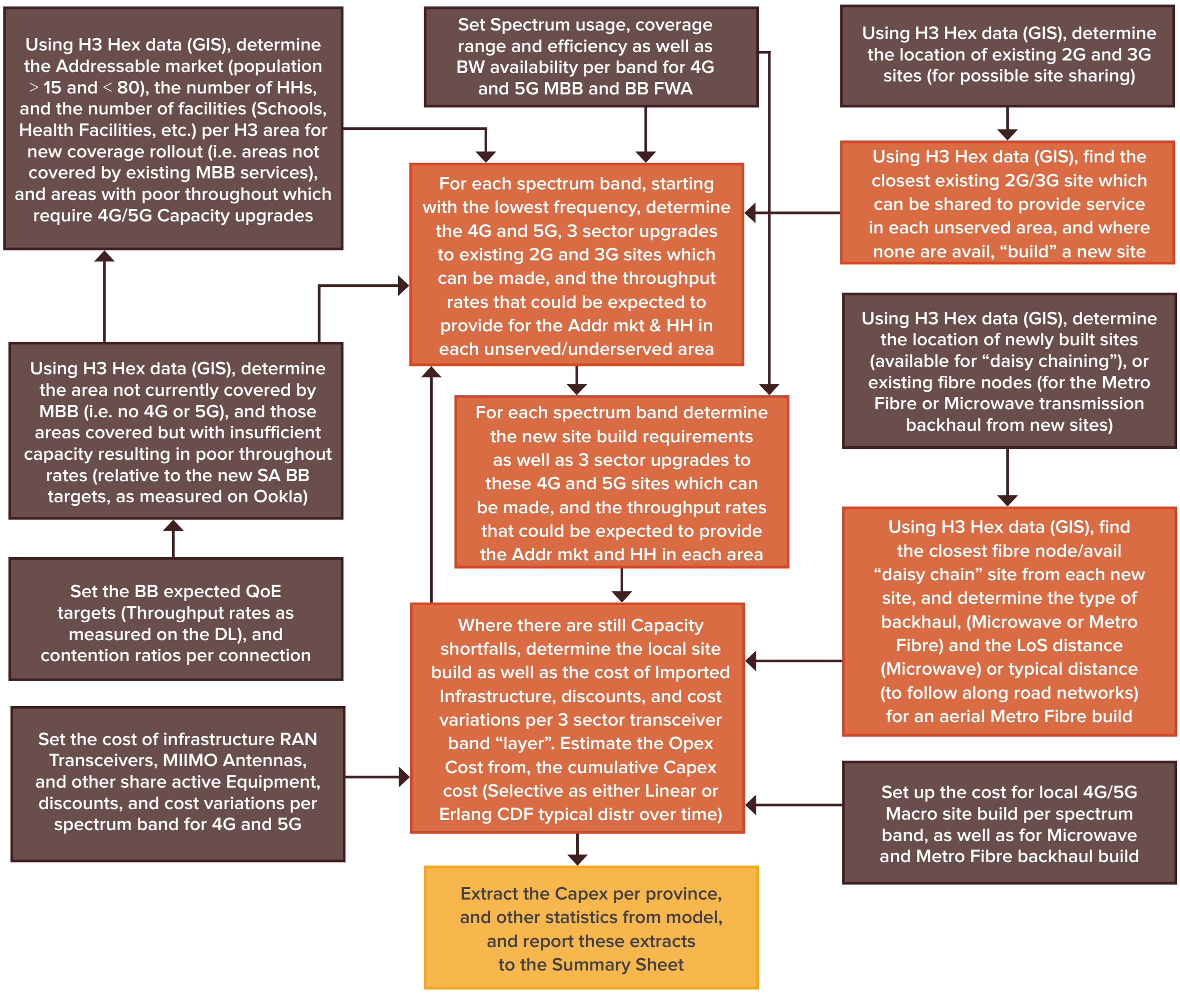


Figure 8-2: Mobile BB and BB FWA network modelling approach

Source: Africa Analysis 2025

The model has been run for different download access speeds, different contention ratios and different distance restrictions for each of the scenarios. The availability of accurate input data does constrain the accuracy of the data and therefore, all results should be conservative and indicative. These input data limitations include:

- Limited knowledge on the growth rate of households across municipal districts limits the efficacy and detailed level of accuracy necessary for low-level investment decision-making. (The total number of households in all three scenarios is still the forecasted figure for 2035 of 24 520 343, and has been assumed a constant for the purposes of this modelling.)
- No information is available to indicate the level of backhaul network upgrades necessary for mobile site infrastructure.

Limited information exists on the number, connectivity status and location of government facilities. This modelling exercise is limited to the number of schools, health facilities and traditional authority locations specified by ICASA in the 2022 auction proceedings. It is expected that 1) ICASA's number of facilities is not accurate, and 2) there is a much larger base of government facilities that require connectivity. However, as the mobile broadband model provides for coverage (rather than direct connections), it is expected that all government facilities will receive 4G/5G coverage.

Table 8-1: Modelling capex and opex requirements for mobile/FWA broadband services (2026 - 2035, real 2025 R millions)

(R millions)		20 Mbps	50 Mbps	100 Mbps	200 Mbps	500 Mbps	1 Gbps
Growing Economy Scenario	Capex	10 735.60	13 313.63	18 595.72	31 362.07	58 870.37	82 439.74
	Opex	10 063.72	12 480.40	17 431.92	29 398.34	55 145.51	77 109.34
	Total	**20 799.31**	**25 794.03**	**36 027.64**	**60 760.41**	**114 015.88**	**159 549.09**
Stagnating Economy Scenario	Capex	11 284.24	15 248.87	25 674.45	47 239.88	85 609.67	113 480.99
	Opex	10 661.11	14 406.80	24 256.66	44 622.63	80 811.74	106 940.57
	Total	**21 945.35**	**29 655.67**	**49 931.12**	**91 862.52**	**166 421.42**	**220 421.56**
Declining Economy Scenario	Capex	11 885.41	22 389.60	51 667.43	104 680.31	142 962.94	159 942.04
	Opex	11 122.73	20 952.86	48 351.64	97 946.17	133 691.56	149 392.54
	Total	**23 008.14**	**43 342.46**	**100 019.07**	**202 626.48**	**276 654.50**	**309 334.58**

Source: Africa Analysis 2025

9 ESTIMATING THE INVESTMENT COSTS OF FIBRE TECHNOLOGIES

A detailed model has been constructed to estimate the costs to connect all households in South Africa to 100 Mbps fibre connection. This modelling is grounded in the application of a Gigabit Passive Optical Network (GPON) architecture, which is most suited for delivering cost-efficient high-speed broadband in both high-density urban and lower-density peri-urban areas. GPON enables shared access through passive splitters, reducing the need for active equipment in the field and is thus particularly advantageous for developing markets with constrained fiscal and technical resources.

The modelling framework disaggregates the FTTH network into four main cost layers:

1. National long distance (NLD); [44]
2. Metro network access;
3. Last-mile access network; and
4. The network home connection.

These cost layers are illustrated in Figure 9-1:

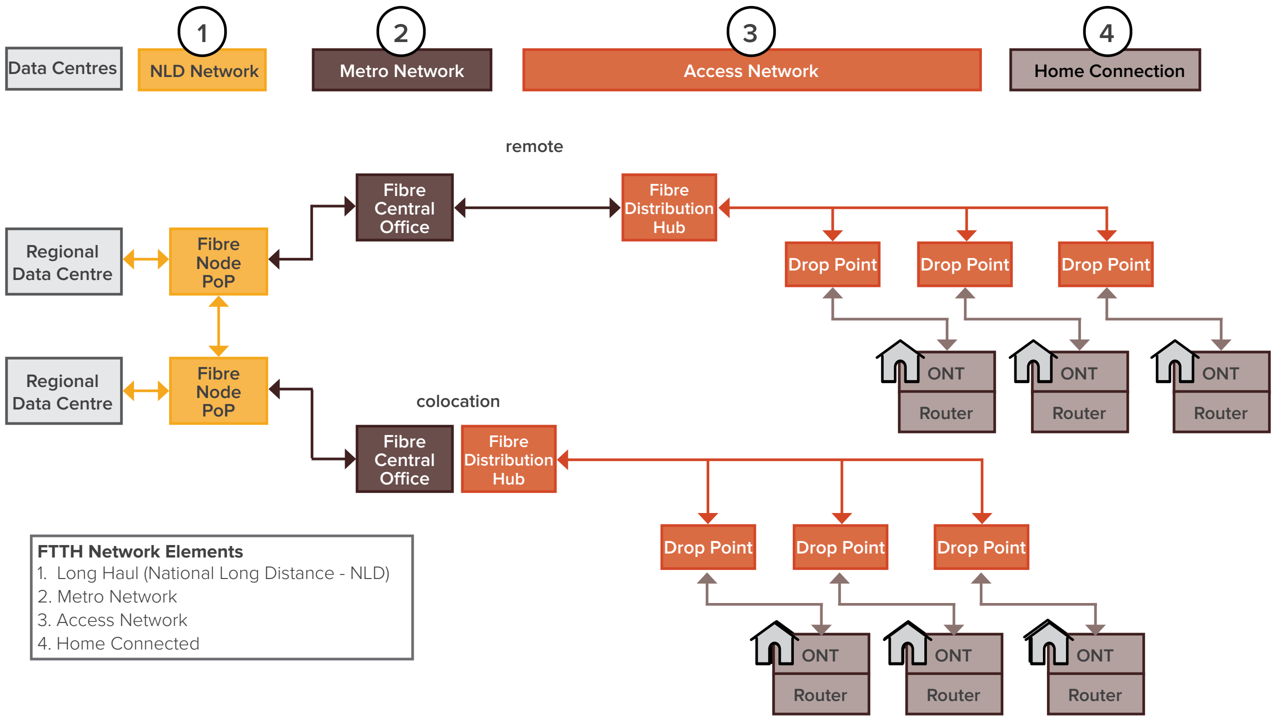


Figure 9-1: An illustration of the cost elements of a fibre network

Source: Africa Analysis with Stakeholder Input 2025

Each layer has distinct infrastructure components and cost drivers informed by stakeholder inputs, real-world operator practices and geographic variability in fibre deployment. The GPON-based design supports a phased and scalable investment approach with cost parameters adjusted for housing density deployment method (aerial vs. trenched) and service-level assumptions.

What follows in this section of the report are key investment cost considerations as well as policy-decision indicators. Appendix A provides a detailed description of the modelling process.

[44] There is no universally accepted delineation between national long-distance (NLD) and metropolitan (metro) network infrastructure. Stakeholder consultations revealed a high degree of terminological overlap, where some deployments classified as 'metro' may in fact serve long-distance functions, and vice versa.

9.1 Building for fibre connectivity means building for distance

Connecting a home to a fibre network means that a physical 'string' needs to be deployed from the current network node all the way to the home. When looking at Figure 9-1, this physical string has to be deployed from the fibre node point of presence all the way to the home. Costs escalate the further the home is from the access network, the metro network and the NLD network. In other words, it costs less to connect those homes situated in areas where network infrastructure is already installed.

The following figure shows the outcome of the GIS analysis in identifying the number of households in South Africa within certain distance bands of a fibre node. The figure shows that there are 10.7 million households within a 5 km radius of a fibre node. Within this radius, 5.6 million households are outside the FTTH coverage.

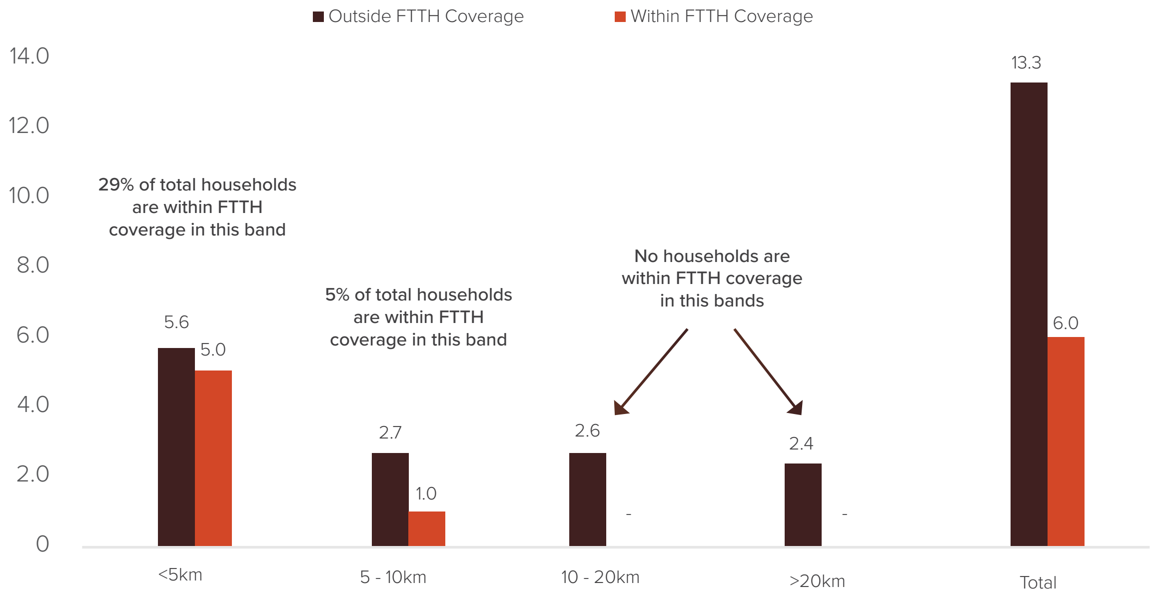


Figure 9-2: Number of households in South Africa by distance bands from a fibre node, 2025

Source: Africa Analysis 2025

The 2025 fibre reality shows a total of 13.3 million households outside FTTH coverage and 6 million within coverage. Without further investment, this fibre digital divide is expected to worsen to 16.8 million households outside FTTH coverage and 7.7 million within coverage by 2035.

The cost of distance is a significant factor in determining whether network deployment to new areas is sustainable.

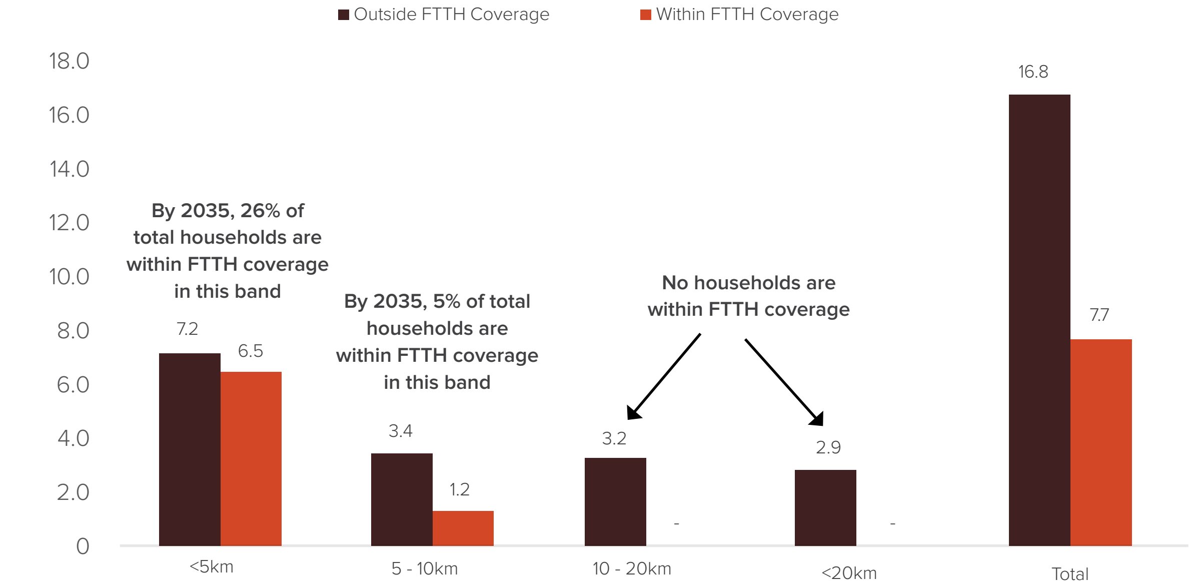


Figure 9-3: Households by distance bands for 2035

Source: Africa Analysis 2025 (this figure does not take into consideration new fibre coverage build)

The detailed fibre cost modelling, tested during the stakeholder consultation phase, illustrates a significant increase in cost in deployment based on distance. Figure 9-4 shows that there is a substantial cost difference between connecting a home that is already within 5 km of a fibre node and a home or a facility that is up to 20 km away from a fibre node.

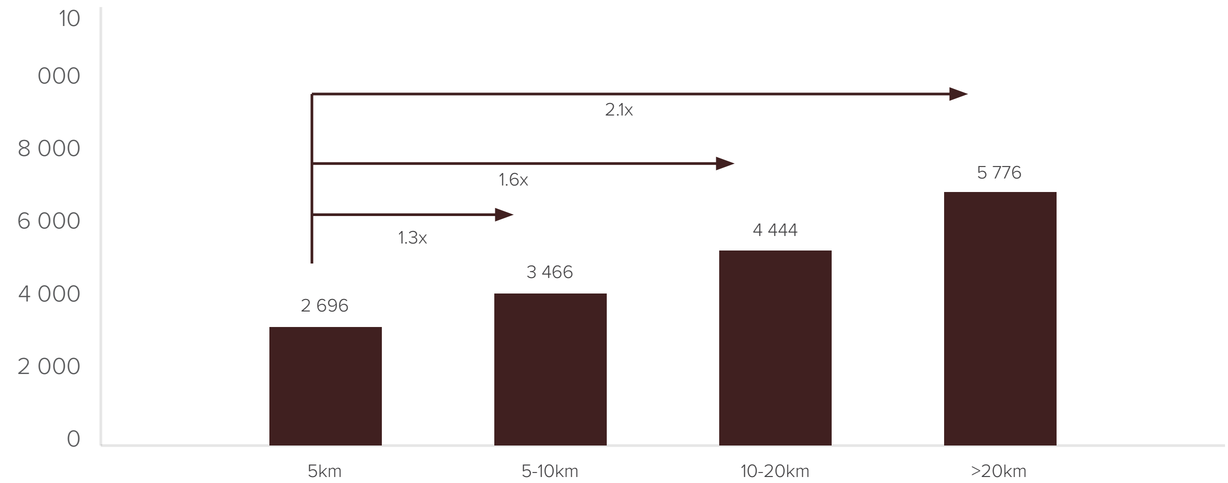


Figure 9-4: FTTH capex cost per home per distance band (2025 figures)

Source: Africa Analysis with Stakeholder Input 2025

The cost differential between distance bands provides clear indications for policy design and implementation, discussed in the following section.

9.1.1 Strong economies of proximity (< 5 km band)

At R2 696[45] per household, areas within 5 km of existing infrastructure represent the most cost-efficient deployment zones. These are typically urban or peri-urban zones where fibre backhaul is nearby, trenching costs are lower due to density and returns on investment are higher.

The private sector has and is targeting those areas where households are less than 5 km from a fibre node. Private sector investment may not cater for all areas due to low household density and/or low likelihood of a financial return. However, those areas that are excluded from fibre deployments are likely to receive alternative network access technologies that provide the same or similar service (e.g. mixed fibre/Wi-Fi technology deployments as well as mobile 5G.)

9.1.2 Rising costs with distance (5 - 20 km bands)

Capex per homes connected increases by 30% when the house migrates from the < 5 km band to the 5 - 10 km band (R3 466) and again rises when the house is in the 10 - 20 km band (R4 444). These zones often include semi-rural settlements where deployment requires more extensive civil works and where population density may not justify purely private investment.

Areas within 5 km and 10 km of an existing fibre node may receive interest from the private sector (as many investments are currently being made). These areas will also benefit from the proximity to fibre nodes for the deployment of 5G mobile as well as FWA and Wi-Fi access technologies. Depending on population density, these areas may also attract Wi-Fi networks.

Those areas between 10 km and 20 km represent high cost as well as potentially less dense/low income and may not experience any fibre network investment. These areas, however, can be suitably served by fixed wireless access, mobile 4G/5G as well as Wi-Fi solutions (depending on household density).

9.1.3 High-cost remote zones (>20 km)

At R5 776 per household, houses in areas more than 20 km from existing fibre nodes face the steepest cost burden. These are low-density rural or hard-to-reach areas where costs are dominated by the need for NLD/metro fibre extension. The cost per household in these regions is 2.1x higher than in urban-adjacent zones. An important network planning consideration is that these households also represent less than 12% of total households by 2035.

9.2 Estimating the cost to connect homes under the different BtG scenarios

The cost to connect a home per distance band provides a logical departure point to determine the future path of fibre investment in South Africa.

1. Decline Scenario: This represents a limited expansion of fibre infrastructure. Under this scenario, FTTH is deployed only to households located within 5 km of an existing fibre node. It reflects a future where macroeconomic trends diminish the return on investment, resulting in a stagnation or reversal of current infrastructure expansion efforts.
2. Stagnation Scenario: This scenario assumes FTTH rollout to households within 10 km of a fibre node. It reflects a continuation of current deployment trends without significant new policy or financial impetus to accelerate infrastructure rollout. Investment is incremental and primarily targets areas adjacent to existing fibre coverage.
3. Recovery Scenario: In this higher-coverage ambitious case, FTTH is extended to all households within 20 km of a fibre node.

[45] This capex per home connected is in line with the feedback from stakeholders.

9.2.1 The number of households connected to fibre per scenario

The following figure illustrates the share of households, per scenario, connected to the FTTH network under each of the three scenarios.

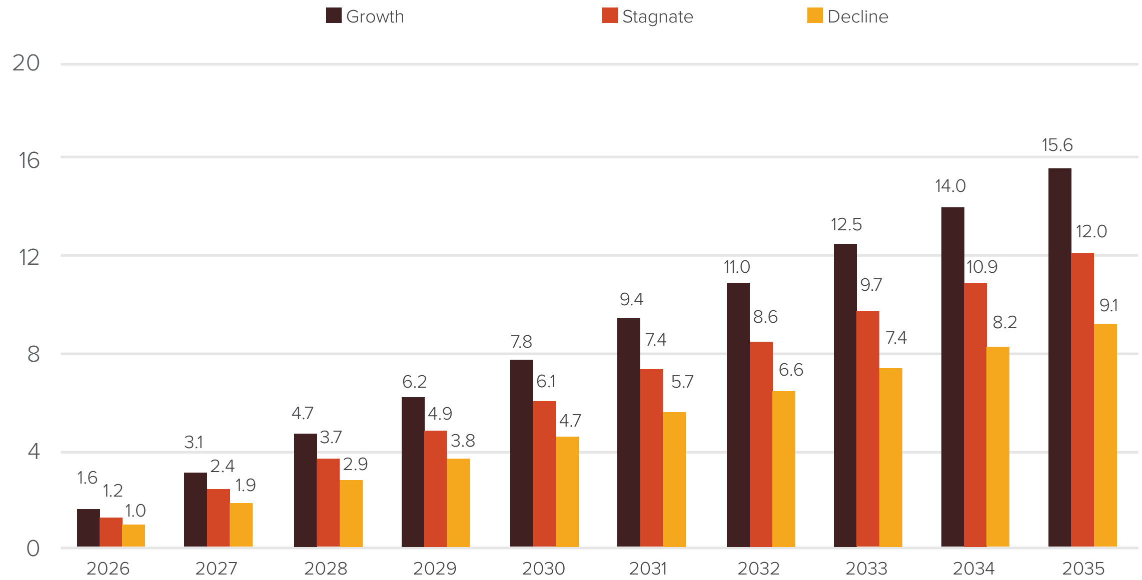


Figure 9-5: Total number of households connected over the 10-year horizon, per scenario (millions)

Source: Africa Analysis FTTH Network Model 2025

By 2030 and 2035, the following share of households are connected to fibre:

Table 9-1: Percentage total households connected to fibre per scenario

Scenario	2025	2030	2035
Growth	31.1%	63.7%	88.3%
Stagnate	31.1%	56.3%	75.1%
Decline	31.1%	48.6%	61.1%

Source: Africa Analysis FTTH Network Model 2025

By 2030, assuming new build FTTH capex is distributed evenly over a 10-year period, the number of households connected does not surpass the MTDP target of 65% coverage.

9.2.2 The total cost per scenario

The total network deployment cost, network equipment replacement cost and operational cost per scenario for Layer 2 services are estimated in the following tables.

The cumulative total new build capital expenditure is estimated to be R21 billion for the Decline Scenario and R48 billion for the Growth Scenario.

Table 9-2: Cumulative FTTH new build capex per scenario (R billion current pricing)

Scenario	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Growth	4.83	9.66	14.48	19.31	24.14	28.97	33.79	38.62	43.45	**48.28**
Stagnate	3.34	6.67	10.01	13.35	16.69	20.02	23.36	26.70	30.03	**33.37**
Decline	2.15	4.29	6.44	8.59	10.73	12.88	15.03	17.17	19.32	**21.46**

Source: Africa Analysis FTTH Network Model 2025

The cost of replacement capex is relatively minor, given the expected lifespan of fibre network assets, with an investment cost range of R3.03 billion to R6.01 billion over the forecast period.

Table 9-3: Cumulative FTTH replacement capex per scenario (R billion current pricing)

Scenario	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Growth	0.60	1.20	1.80	2.40	3.00	3.61	4.21	4.81	5.41	**6.01**
Stagnate	0.45	0.89	1.34	1.78	2.23	2.68	3.12	3.57	4.01	**4.46**
Decline	0.30	0.61	0.91	1.21	1.52	1.82	2.12	2.43	2.73	**3.03**

Source: Africa Analysis FTTH Network Model 2025

Total opex reaches between R17.4 billion and R24.4 billion over the period.

Table 9-4: Cumulative FTTH opex per scenario (R billion current pricing)

Scenario	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Growth	0.19	0.83	1.92	3.48	5.54	8.10	11.32	15.11	19.46	**24.41**
Stagnate	0.16	0.68	1.58	2.86	4.56	6.69	9.38	12.56	16.27	**20.52**
Decline	0.13	0.54	1.25	2.29	3.68	5.45	7.70	10.43	13.65	**17.43**

Source: Africa Analysis FTTH Network Model 2025

The cumulative total cost profile per scenario is provided in Table 9-5.

Table 9-5: Cumulative FTTH total cost per scenario (R billion current pricing)

Scenario	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Growth	5.62	11.69	18.20	25.20	32.68	40.67	49.32	58.54	68.32	**78.70**
Stagnate	3.94	8.25	12.93	18.00	23.48	29.39	35.86	42.83	50.31	**58.35**
Decline	2.58	5.44	8.60	12.09	15.92	20.14	24.85	30.02	35.70	**41.93**

Source: Africa Analysis FTTH Network Model 2025

The following table provides a comparison of the total number of homes connected to fibre versus the total cost.

Table 9-6: Total cost per scenario per number of homes connected

Scenario	No. of homes connected (millions)	Total cost (R billions)
Decline	9.1	41.93
Stagnation	12.0	58.35
Recovery	15.6	78.70

Source: Africa Analysis FTTH Network Model 2025

10 THE SOCIO-ECONOMIC IMPACT OF INVESTMENT IN BROADBAND INFRASTRUCTURE

The previous section has outlined the investment requirements to ensure that all South Africans have access to high-speed broadband services. These investment requirements identify both the spatial dynamics of where investment needs to be targeted and the value of investment needed to meet these requirements.

This section of the report provides an estimation of the impact of this increased investment on the South African economy and consists of the following sections:

1. International estimates of increased broadband penetration on economic growth;
2. The modelling framework and assumptions;
3. The impact of increased penetration on GDP growth;
4. Impact of increased penetration on South Africa's economic sectors; and
5. The direct, indirect and induced effects on GDP and employment.

10.1 International estimates of the impact of increased broadband penetration

10.1.1 The impact of broadband penetration on economic growth

Multiple studies have illustrated that increased broadband penetration drives an increase in overall economic growth. These studies have formed the basis for why governments globally have recognised the need and implemented policies and programmes to drive increased broadband penetration. The following figure reproduces the ITU estimates of a 10% increase in fixed broadband penetration, comparing the 2021 and 2023 studies.

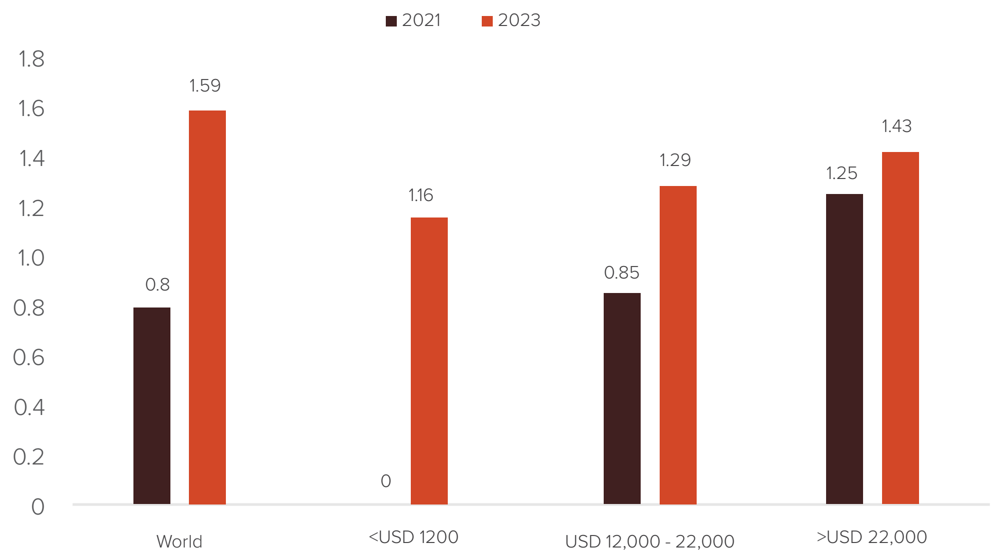


Figure 10-1: GDP growth impact of a 10% increase in fixed broadband penetration (2021 vs. 2023 studies)

Source: ITU, 2023

The ITU 2023 study shows that there is an increasing return to fixed broadband across all income categories, most noticeably an increase in the impact of fixed broadband penetration from 0.00 to 1.16 for countries with an annual GDP per capita of less than USD12 000. This increase in returns to fixed-line penetration is also reflected geographically, where fixed-line penetration makes a contribution to economic growth on the African continent for the first time. The positive result reflected on the African continent mirrors the increasing level of fixed-line investment and adoption.

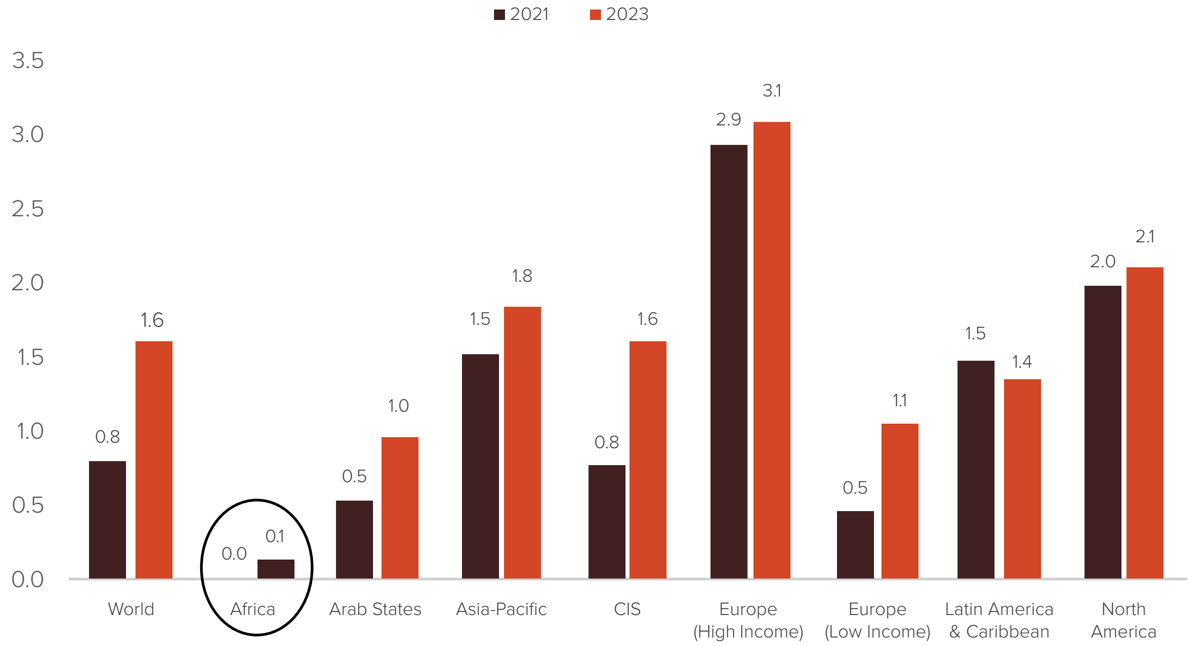


Figure 10-2: Regional GDP growth impact of a 10% increase in fixed broadband penetration (2021 vs. 2023 studies)

Source: ITU, 2023

10.1.2 The impact of an increase in mobile broadband penetration

The ITU study also shows an increased impact of mobile broadband penetration on GDP across all income bands, with a significant increase from 2.04 to 3.02 for countries with a GDP per capita of less than USD12 000. Interestingly, over the same period, the impact of mobile broadband increased from zero to 1.72 for those countries with a GDP of greater than USD22 000. The increase in the impact of mobile broadband in the <USD12 000 country category reflects the increasing coverage of 4G technologies and increased levels of penetration of smartphones. The increase in the elasticity for high-income countries is possibly a reflection of mobile connectivity being used interchangeably as mobile and fixed solutions.

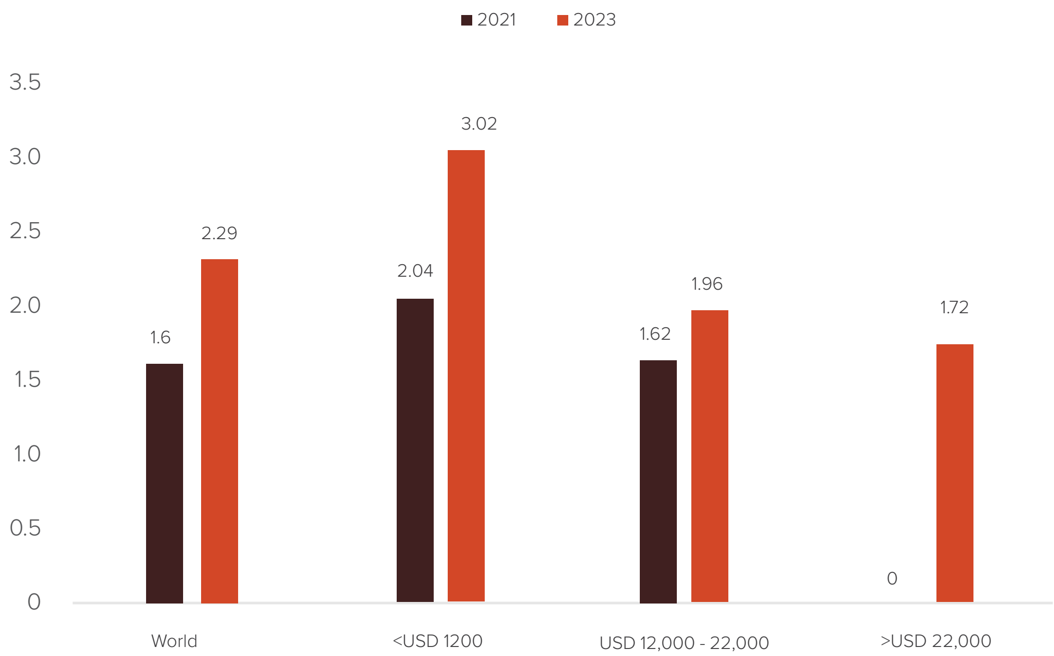


Figure 10-3: GDP growth impact of a 10% increase in mobile broadband penetration (2021 vs. 2023 studies)

Source: ITU, 2023

The impact of an increase in mobile broadband has also increased across the different geographic regions of the world, except for the Asia-Pacific and low-income European regions. While the impact of a 10% increase in mobile broadband penetration in Africa has increased from 2.6 to 3.16, a 10% increase in these regions has reduced from 1.06 to 0.85 and 1.89 to 1.69, respectively. Although the ITU does not provide a reason for these declines, it is possible that the declines are a result of countries achieving a saturation point for 4G and 5G coverage, a saturated smartphone market, as well as a migration from mobile services to fixed-wireless and fixed Wi-Fi services.

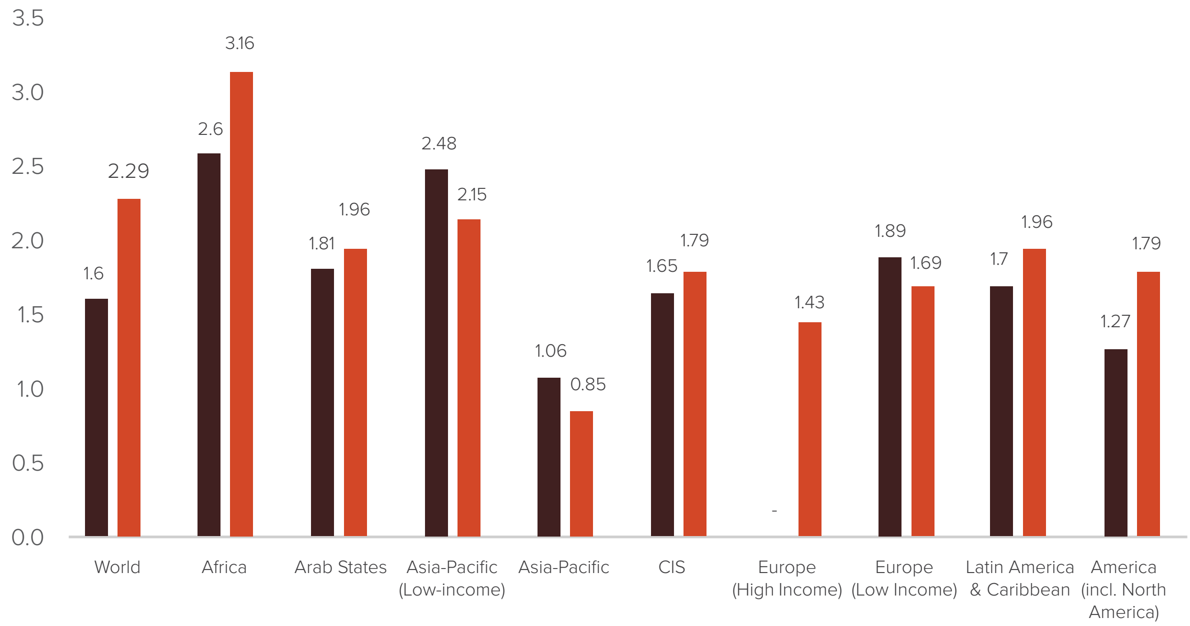


Figure 10-4: Regional GDP growth impact of a 10% increase in mobile-broadband penetration (2021 vs. 2023 studies)

Source: ITU, 2023

Stakeholders operating fixed-fibre Wi-Fi models are reporting that end users migrate their spend away from mobile services onto the fixed-fibre Wi-Fi model.

10.2 Factors affecting the economic impact of increased broadband penetration

South Africans today connect to the Internet using a multitude of devices, but more importantly, using a blend of connectivity options, ranging from absolute reliance on a mobile network through to being able to choose from a satellite, fibre, public Wi-Fi or private Wi-Fi connection. The ability to utilise different technologies to achieve the same function – access to the Internet – means that the functional use case of the technology may have different economic impacts.

For example, a household that is 100% reliant on a mobile connection for household use (e.g. an always-on, available Wi-Fi router using mobile connectivity) is functionally utilising the connection in a fixed location for an always-on connection for all household members to use. However, mobile connections can also be used by a single person for their own consumption and use both in a fixed location and when on the move, meaning that the economic benefit of the mobile connection is for both fixed location and mobile use.

The significantly higher impact of mobile broadband penetration in Africa compared to all other regions supports this logic: fixed-line penetration is very low, meaning that end users depend on mobile connectivity regardless of the use case. The advent of nomadic 5G services confuses the measurements even more – a 5G connection is typically captured as a mobile user, even if the functional use case is for use in a fixed location.

The BtG methodology applied in the earlier sections has estimated the following:

- The cost to provide high-speed mobile broadband coverage to all (regardless of use-case).
- The cost to connect households to a fixed-fibre connection at different penetration levels based on distance criteria.

The BtG investment methodology limitation is that it does not account for whether households (or end users) will utilise the connection. However, it is possible to apply the ITU fixed broadband model methodology by applying a take-up curve to the new connections being provided through the investment in infrastructure. The rate of take-up is determined by three factors: affordability of services and devices and digital literacy.

The impact of the take-up of broadband on GDP is reflected in responsiveness of GDP to the change in the penetration of broadband to a fixed location (the elasticity). As the ITU study shows, the responsiveness of GDP to a change in broadband penetration has increased between 2021 and 2023 but has also changed across regions.

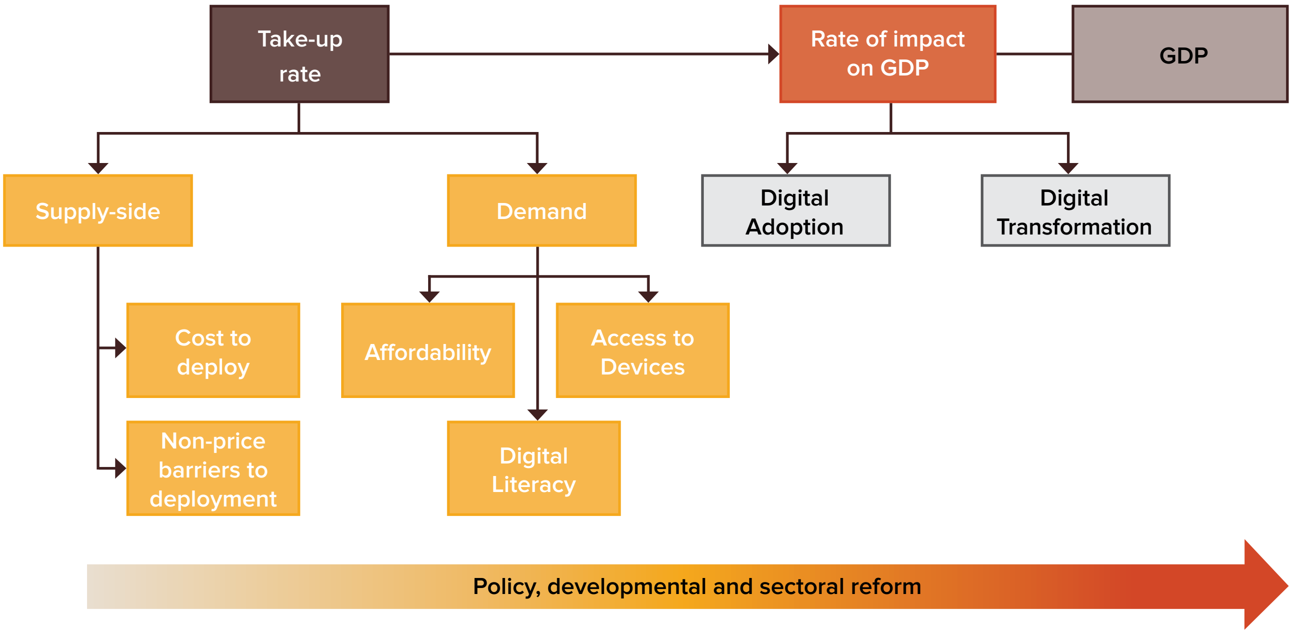


Figure 10-5: Input factors that determine the impact of increased broadband penetration on GDP

Source: Africa Analysis 2025

Figure 10-5 outlines the role of different factors that determine the economic impact of achieving high-speed broadband connectivity for all. All of these factors form part of the UMC framework, either as catalysts (the existing state of performance and development of the economy) or levers (the effectiveness of the policy regime in driving broadband adoption).

10.2.1 Findings from GIS analysis, affordability modelling, digital readiness assessment and stakeholder engagement

The GIS analysis illustrates that very few households do not have access to high-speed broadband. The affordability analysis illustrates that the ability of households to pay for broadband services is a constraint. This is not a result of retail prices in the South African market (alone) but rather a result of the high levels of unemployment and stunted economic growth.

The digital readiness analysis, through the Digital Employment Readiness Index, shows that there is substantial room for improvement in the education system, while South Africa's ranking in various international benchmark studies confirms the limited level of development in technology and digital readiness (relative to other countries). Stakeholders report frustrations with both the existing policy and, more particularly, the implementation framework for demand and supply-side policies. These findings and observations all have a determining impact as to whether increased broadband penetration will stimulate increased economic activity.

The following table exhibits the roles and responsibilities of the different stakeholders for each of the input factors.

Table 10-1: Roles and responsibilities in driving digital transformation

Government	Government and private sector	Private sector	Individuals and civil society
Non-price barriers to network deployment	Affordability	Digital adoption	Digital literacy
Digital literacy	Access to devices	Digital transformation	Digital adoption
(Government) Digital adoption and transformation		Network investment	
Network investment			

Source: Africa Analysis 2025

10.2.2 The distributional impact of increased investment in broadband infrastructure

Each scenario generates a different total expected investment in ICT network infrastructure. Using standard input-output analysis, this investment is expected to have the following types of impact:

- Direct impact: Increase in employment and income from the design, construction and commissioning of network infrastructure.
- Indirect impact: This is a supply chain effect, where the procurement of necessary equipment, tools and equipment to deploy the new infrastructure has a ripple effect through the entire supply-side of the economy.
- Induced impact: The direct and indirect impact filters through into the creation of new business opportunities across the economy (based on distributional shares/multipliers).

The following table provides estimates of the direct investment into broadband infrastructure in Brazil, Germany and France.

Table 10-2: Impact of increased penetration of broadband in various countries

Country	Result	Comment
Brazil [i]	• A 2018 study found that increased Internet access does not have a clear economy-wide benefit to society, with no positive net employment effects. Rather, increased broadband penetration causes a shift in employment away from wholesale and retail trade and public administration towards higher-skilled opportunities in finance, banking and high-value manufacturing.	• The study results bear a reflection of the level of digital literacy and digital transformation during the study timeframe. • Although more recent studies show that increasing broadband penetration does have an overall positive impact on GDP per capita, there still remains a question regarding the overall distributional impact of employment opportunities. • The results of the 2022 study represent a limited job creation outcome from digital infrastructure investment, and may be a result of Brazil's levels of digital literacy and digital readiness.
Germany [ii]	Total investment: EU27.9 billion between 2010 and 2020. Over the 10-year period, this investment created: • Direct jobs: 541 000 on network construction • Network externalities (both indirect and induced): 427 000 • Total jobs created: 968 000	• These calculations are based on a traditional input-output model. • The total investment equates to approximately EU29 000 per job created. • Increased broadband penetration had the largest impact on those economic sectors that have a high propensity to consume digital services and are also already utilising digital tools, with the largest benefits being found in the financial services sector.
France [iii, iv]	• The 'Plan France Très Haut Debit' total investment of EU20 billion over 10 years is estimated to have created over 40 000 direct job opportunities. • The official assessment of the plan suggests that the private sector increased total employment by 4.3% four years after the arrival of superfast broadband and 8% five years later (depending on the level of digital literacy and digital readiness of the region). • However, another study, also assessing the impact of the French national broadband plan, suggests that the investment created direct jobs in communications and the services sector, but losses in the manufacturing sector. This led to an overall neutral impact on total employment.	• The French broadband plan is one of the largest state-sponsored broadband plans in the world and also has the most stringent oversight structure. The programme involved both national, provincial and municipal governments, where all arms of government accepted the importance of broadband access and, crucially, did not institute competing projects (unlike in Brazil and South Africa). • The COVID pandemic of 2020 - 2022 substantially reduced any commercial impact the plan may have had.

Source: [i]Jung & López-Bazo (2017). [ii]Duso, T. & Schiersch, A. (2022); [iii]Houngbonon & Liang (2018); [iv]France Stratégie (2023)

The experience of different countries illustrate the importance of digital readiness: Countries with greater levels of digital readiness benefit from a greater return on investment in broadband infrastructure.

10.3 Impact of broadband penetration in South Africa

The BtG investment analysis has focused on providing a 100 Mbps connection to every household. This infrastructure is deployed so as to meet the goals of the NDP, SA Connect and the NIP2050.

The impact of this increased household penetration on the South African economy depends on the following factors:

1. The take-up rate, or the speed at which households utilise broadband access;
2. The ability for this increased broadband access to stimulate increased economic activity (the elasticity); and
3. The rate at which the benefits of increased investment in broadband infrastructure are distributed across the economy.

Each of these factors forms a matrix of assumptions that are applied to the three different BtG investment estimates.

10.3.1 Model scenarios

The following table outlines the scenarios under each BtG investment scenario.

Table 10-3: Economic impact input scenarios

Scenario	Economic Decline	Stagnation	Recovery
Take-up	• No change in the ability for the South African economy to leverage digital connectivity for productive use • Decline in household affordability • No change in sector or national economic and social policies • Declining economy-wide economic growth	• Marginal improvements in all input factors • Economic growth remains in current static pathway	• Significant improvements in all input factors • Significant and timeous policy decision-making and implementation • Overall economic performance responds to government reform programmes
	The number of households using high-speed broadband connectivity by 2035		
	45%	53%	60%
Ability for the economy to adopt and use high-speed broadband – impact of a 10% increase fixed broadband adoption on GDP			
	No sector-specific elasticity	**Policy implementation year:** 2029 Elasticity: 0.27% per every 10%-point increase in broadband penetration *(O'Connor et. al. 2020)	**Policy implementation year:** 2027 Elasticity: 2025: 0.27% 2035: 0.10%**

Source: Africa Analysis 2025

*O'Connor et. al. (2020) estimate the elasticity of increased broadband penetration on the South African economy. **This assumed elasticity matches the low-income European states.

10.3.2 Impact of increased take-up of broadband on GDP

Each scenario leads to an increase in the number of households that utilise an always-on broadband connection, where the Economic Recovery Scenario will see the number of households with an always-on broadband connection increasing by over 9 million homes over 10 years. The impact of this increase in household connectivity may increase total GDP over the forecast period by up to R1 388.13 billion over 10 years.

The South African economy could reach an annual economic growth rate of greater than 3% a year by focusing on the necessary policy reforms and a supportive environment for private sector investment. Leaving the situation as is, where private sector investment appetite declines as policy reforms take too long to be implemented, will still stimulate economic growth, but at a rate of lower than 2% a year.

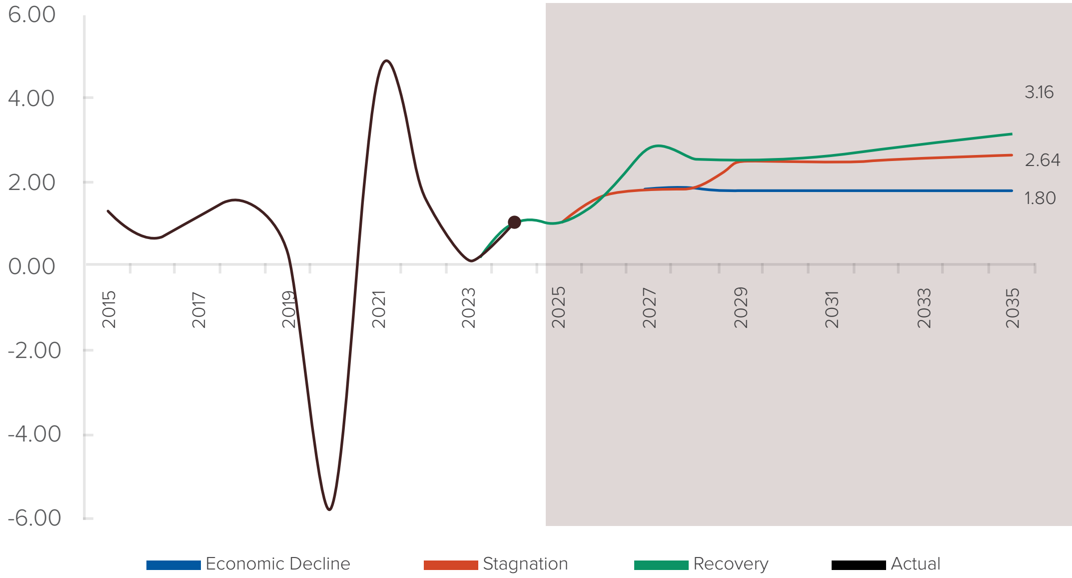


Figure 10-6: Real GDP growth (constant 2015 prices, annual %-change)

Source: Africa Analysis 2025

The annual rate of growth in the Economic Recovery Scenario, with policy and investment environment changes materialising by 2027, depends on a rapid and effective turnaround in state capacity to design, and develop and implement policy and regulation; an improvement in the education system that stimulates digital literacy and digital adoption, as well as a recovery in the overall performance of the South African economy. As the stakeholder consultation has indicated, private sector capital is focusing on the digital connectivity sector as an investment opportunity, but needs government to play its part in developing a digital skills development pipeline, from early-age development through to life-long learning.

The forecast economic contribution per sector depends on different levels of digital intensity within each sector. The sector expected to benefit the most for an increase in take-up of high-speed broadband in the home is financial services.

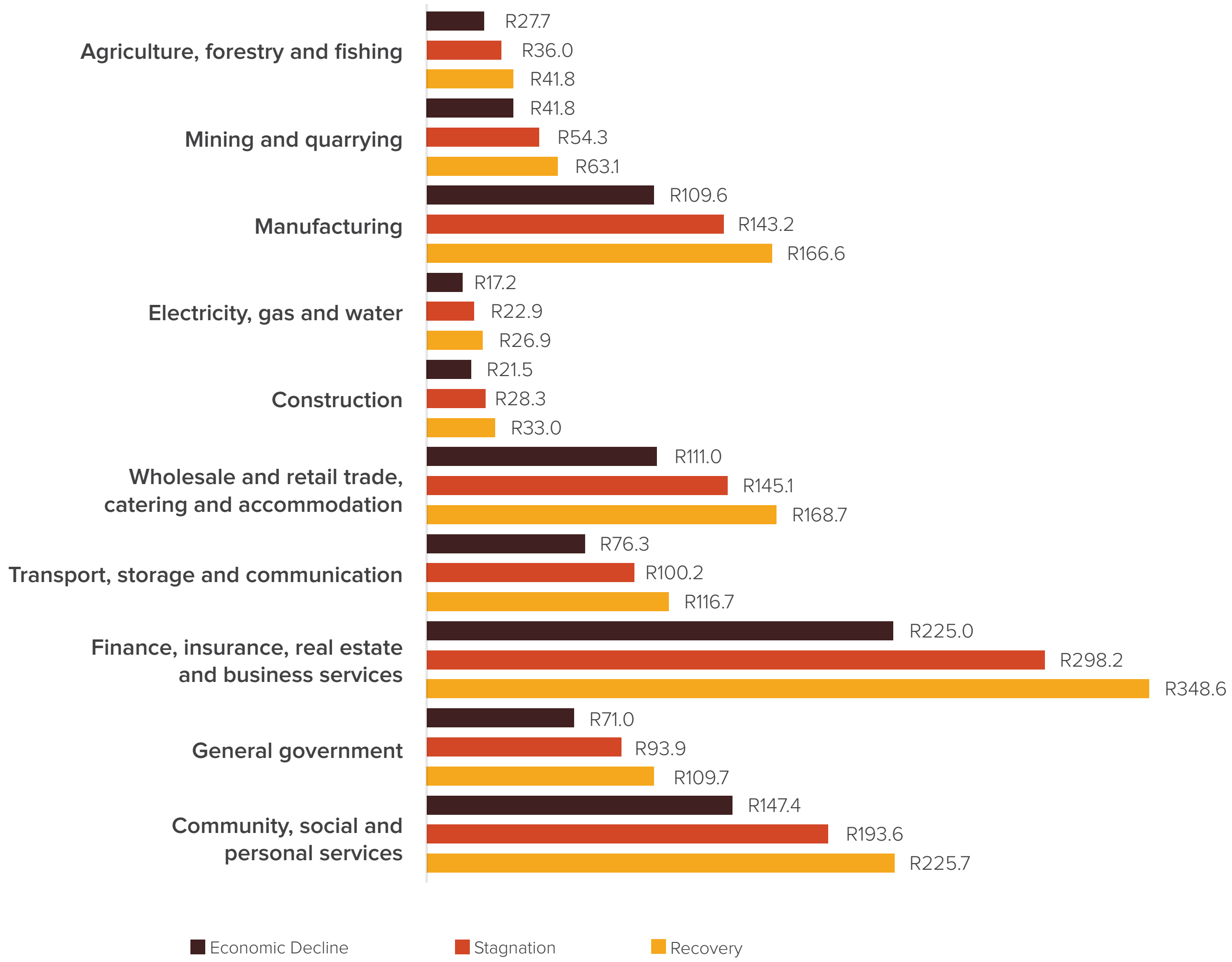


Figure 10-7: Cumulative increase in real gross value added for the period 2025–2035 (R billions, constant 2015 prices)

Source: Africa Analysis 2025

The Digital Mzansi project is one example of how government may increase its propensity to utilise digital tools to provide services to South Africans. However, the true benefit of such projects will only materialise if end users are suitably digitally literate and ready to transact with government using online portals.

10.3.3 The direct, indirect and induced effects on GDP and employment

The BtG investment estimates for the period 2026 to 2035 have been applied to an input-output model utilising the Social Accounting Matrix provided by StatsSA as well as estimates of the multiplier effect that increased investment may have on different sectors of the economy.

The impact of the forecast investment in Sections 8 and 9 of this report is estimated using the standard Input-Output methodology and is represented in Table 10-4.

Table 10-4: Increase in gross value added over the forecast period (R millions, real 2015 prices)

Scenario	Manufacturing	Construction	Transport, storage and communication	Total
Economic Decline	15 314.85	174 216.41	33 453.93	222 985.19
Economic Stagnation	12 776.55	137 383.59	26 381.11	176 541.25
Economic Recovery	14 467.57	141 013.41	27 078.12	182 559.10

Source: Africa Analysis 2025

10.3.3.1 Economic Decline

The previous table illustrates that constructing high-speed broadband access networks in the Economic Decline Scenario will cost more but will also generate more economic activity. This result does not align with the outcomes of the Household Affordability Model, where over 50% of households are unable to afford a broadband connection (at R300 a month). This result aligns with the limited economic growth recorded earlier in Figure 10-1.

In conclusion: The investment cost associated with the BtG methodology in the Economic Decline Scenario may generate economic activity, but the household population is not forecast to be able to afford services, and the economic return on increased broadband penetration is limited. In this scenario, it is crucial that government and other stakeholders resolve the bottlenecks to improving South Africa's digital literacy and digital readiness base.

Model results show a limited impact on direct employment over the 10-year investment period.

10.3.3.2 Economic Stagnation

The share of investment in fixed line increases to 56% of the investment made in wireless technologies, again because of the distance restrictions imposed on fibre network deployment. Under this scenario, households have a greater level of discretionary income, i.e. demand for services is more likely to match the supply of network infrastructure being constructed.

Similar to the Economic Decline Scenario, the employment impact of this increased investment is muted and does not show any significant impact.

10.3.3.3 Economic Recovery

The investment impact results for this scenario, although lower in terms of additional gross value added, are met with a greater ability for households to afford and consume services (from the Household Affordability Model). The model also does not account for the different propensities to consume local labour and/or import different levels of capital equipment. [46] At this point, it is important to recognise that investment into fibre network infrastructure is more labour consuming than deployment of mobile or other wireless infrastructure. Due to its longer period of deployment, fibre infrastructure also has a larger regional and localised impact on local economies. However, the model is not structured at the necessary level of granularity to explore these queries.

[46] These model results include a higher proportion of imported products for wireless infrastructure than fixed line, but there is no current data set available that fully breaks down the different input and output categories of ICT investment, inclusive of investments in data centres.

10.4 Lessons learnt from the modelling exercise

The economic growth model results appear similar to other studies conducted in South Africa. The model also shows that effective and timeous policy and ensuing implementation are necessary to capture the results from network investment.[47] The investment impact model results bear two important considerations for future work:

1. The BtG modelling framework assumes a technology choice is made, followed by investment in infrastructure, where this type of infrastructure faces a guaranteed demand (e.g. a water treatment plant).
2. ICT network infrastructure investment, however, does not face a guaranteed demand, and rather, it experiences the risk of over-investment in line with household affordability. Such investment also faces technology substitution as well as competition between service providers. These factors are to be incorporated into future BtG modelling assessment.

The most significant outcome of the modelling results, however, is that the rate of take-up of broadband services has less of an effect on economic growth than expected. Rather, the elasticity value, or the ability for South Africa to productively use Internet connectivity, has a greater effect on model outcomes.

This modelling result aligns with the findings of the Digital Readiness Assessment.

[47] The difference between the Economic Stagnation and Economic Recovery results is driven by the implementation date of policy reform.

11 APPLYING THE UMC PRINCIPLES TO IDENTIFY FUTURE POLICY GOALS

The digital divide is often viewed as an infrastructure access concern. However, the UMC lens shows that the digital divide exists where end users:

- Live in areas where network infrastructure is not sufficient to provide high-speed broadband[48];
- Do not have the devices to connect to the network infrastructure that is already present;
- Cannot afford the cost of services; and
- Are not sufficiently digitally literate to benefit from access to high-speed broadband.

The ensuing section of this report reviews each of these points, with a view to identifying any potential funding mechanisms/programmes that may be necessary.

11.1 Ensuring that last-mile networks can provide high-speed broadband services

11.1.1 The true network access gap is small

The GIS analysis shows that currently there are just under 400 000 homes that do not have access to high-speed broadband, i.e. no access to fixed-line fibre or mobile 4G/5G broadband. This number represents 2.2% of the current number of households in South Africa (although just under 5% in the Eastern Cape).

11.1.2 Investment focus is to increase access network capacity and network resilience/redundancy

Although the true access gap is small, the investment modelling shows that substantial investment is still required to connect all households to 100 Mbps – the target of SA Connect. Therefore, South Africa's forward-looking focus is not one of new geographic network coverage, but rather one of enhancing the current network capacity.

This enhanced network capacity can take multiple forms, including:

- Upgrading of existing networks that are already installed, as is the case for the 4G and 5G networks; and
- Installation of competitor/substitute network technologies.

Scenario 1 (Economic Decline) is an illustration of how South Africa becomes an increasingly reliant and mobile-dependent country. This approach is not unwarranted, given that mobile technologies are the dominant means of broadband connectivity today. The DPI programme of government is indeed structured around this principle.

However, different technology pathways, such as the deployment of fibre and Wi-Fi networks, offer opportunities to increase and enhance the capacity of last-mile networks. The private sector is already leading this charge, rolling out high-capacity mixed fibre/Wi-Fi solutions in low-income areas. These technology investments crowd in additional investment from operators already present in the area (e.g. mobile or FWA) so as to remain relevant.

Enhancing network capacity in South Africa means removing the network deployment constraints that licensees face. This includes both 'red tape' barriers, such as access to wayleaves / rights of way – the municipal permission to deploy a network, through to finding innovative means to reduce the cost of network deployment.

[48] These conditions mean that households either are not covered by a network, or the network that is installed does not offer the expected quality of service.

11.1.3 Connecting government facilities to digital connectivity infrastructure

South Africa's DPI initiatives illustrate how the government is moving towards a digital society in the provision of national government services. Many provinces and municipalities have already adopted digital platforms to improve access to services and to enhance revenue collection.[49]

However, the DPI initiative will not have the impact it desires if government facilities are not connected to suitable high-speed broadband. Section 5.5 provides detailed information on the location of government facilities in relation to fibre networks, as well as points out that there is a perverse incentive for state entities to charge client departments fees that are significantly above current market rates.

Government has significant network capacity in the middle-mile element of the infrastructure stack. This middle-mile infrastructure is situated close to key government endpoints (e.g. railway stations and Eskom network operation centres). Leveraging this capacity is an obvious solution to connect government facilities to high-speed broadband more quickly. Implementing this solution involves significant state coordination and removing the silo-approach of current government decision-making.

Further, as Section 5 shows, government facilities already depend on private sector network infrastructure. Reviewing and developing a clear and coherent cross-government policy framework for connecting facilities to high-speed broadband must recognise this reality and leverage the cost savings this reality provides for. In other words, the cost to connect government facilities (even outside of obligations) may not require further investment by government entities, but rather the leveraging of more effective regulatory tools.

11.2 Device access and affordability

The digital divide will only be closed when all households have the necessary devices to utilise high-speed broadband. The analysis in this report shows that although smartphone penetration is over 70% of all mobile connections, the cost of an average smartphone is still less than 20% of the monthly minimum wage.

However, both the market and government are already addressing this concern. The private sector has introduced innovative financial loan products on digital platforms, while MTN has indicated that it will sell 4G smartphones at R99 (TechCentral, 2025).

National government has a programme in place to reduce the cost of bringing smartphones to market and to explore local production. This is discussed more fully in the Recommendations section.

11.3 Supporting households to afford access to high-speed broadband

The Household Affordability Model illustrates that 10% of households will be able to afford access to broadband services at R90 per month in Scenario 3. However, the R90-per-month products are only available in select geographic areas. Removing network deployment barriers will have a significant impact on supporting operators to reduce their retail product prices.

Should access prices remain in the R300 range, households will have to use the iterative-use consumption model of timing expenditure based on the absolute need for access. In this case, time-of-use pricing models offer far more consumer benefits than the volume-of-use price model.

The affordability assessment illustrates that South Africa needs some form of data affordability social security net to achieve meaningful connectivity for all. Section 13 discusses the potential mechanisms that may be implemented.

[49] The ability for an end user to pay a municipal bill online being marketed as a consumer service is merely a mask for a tool to improve revenue collection.

11.4 Improving digital readiness and digital literacy

Achieving meaningful connectivity means that the country must be ready to adopt the opportunities of the digital society, and the country's citizens must be literate in how to utilise the opportunities that digital connectivity offers. As the international digital competitiveness indices and the Employment Readiness Index illustrate, South Africa is not generating sufficient digital skills in the education system.

While there is not a keen shortage of skills to build network infrastructure, South Africa faces a keen shortage of specialised skills, particularly in areas such as broadband network planning, spectrum engineering, cloud architecture, data centre management and operations, and cybersecurity. Various digital skills programmes exist – led by NEMISA, the Presidential Youth Employment Initiative, and private sector partners such as the Collective X and Naspers Labs – but these efforts are not yet producing the scale or depth of talent needed to support a nationwide digital rollout. Furthermore, institutional skills gaps within government departments and municipalities hinder the effective management of procurement, project oversight, and policy execution. Different government departments at national and provincial levels also all have their own digital skills development initiatives.

However, the availability of suitably skilled educators in the basic education system remains a significant constraint, leading to a rolling back of plans to introduce mandatory coding and robotics training in schools (Pongweni, 2025). In essence, the number of different initiatives in place to respond to the digital skills challenge clearly illustrates the necessary strategic intent of both public and private sectors. What appears to be missing is coordination.

12 FUNDING THE INVESTMENT IN NETWORK CAPACITY

Closing South Africa's digital infrastructure connectivity gap requires a substantial amount of investment across the whole country, if 100 Mbps remains the necessary target. The modelling clearly shows the uneven cost structure across regions, necessitating the adoption of a mix of technologies.

The investment modelling indicates that, under Scenario 1, where the connectivity is mobile-dependent, the level of investment required appears in line with historical trends of mobile network investment and therefore it is not clear that there is a defined need for financial intervention.

In Scenarios 2 and 3, where mobile network infrastructure capacity investment continues to occur, with increasing investment in fixed wireless access and fibre networks, the core cost driver is the availability of metro and national long-distance network infrastructure. [50]

However, before considering specific funding interventions, it is crucial to understand the:

- Cost drivers of network deployment, operations and maintenance; and
- Existing sources of capital.

12.1 Cost drivers of network deployment

The costs of network deployment, when aggregated, consist of the cost of labour, the cost of materials and the cost of capital. Fully grasping the cost drivers provides an understanding as to whether there is a real need for fiscal support or whether there are underlying administrative barriers that artificially raise these cost drivers.

12.1.1 Understanding the cost of capital

Stakeholders across South Africa's digital infrastructure sector have consistently identified the high cost of capital as a key constraint limiting their ability to expand into low-income areas and offer more affordable services. This issue is multi-dimensional and rooted in both macroeconomic and structural sector challenges.

Firstly, the cost of capital is intrinsically linked to South Africa's broader macroeconomic conditions. Lower borrowing costs are achievable during periods of sustained economic growth, and inflation remains under control. Thus, sector-specific investment is indirectly influenced by national fiscal and monetary stability.

Secondly, it is critical to distinguish between the interest rate and the total cost of capital. While interest rates reflect macroeconomic fundamentals, the total capital cost also depends on the size and structure of required financing. Currently, network operators are facing substantial capital outlays due to the need for investments in backup power systems, driven by South Africa's ongoing electricity supply challenges. These added infrastructure requirements increase debt volumes and raise financing costs, inflating the overall cost of network rollout.

Moreover, unstable electricity supply elevates operational expenditure and reduces profitability, making it more difficult for operators to service debt. These conditions have prompted regulators like ICASA to formally request disclosure of backup power investments[51]. Simultaneously, the data centre sector is engaging with Eskom to be recognised as an Energy Intensive User, which would allow access to preferential power tariffs.

In addition to energy-related costs, operational risks further raise the effective cost of capital. Operators report growing challenges from vandalism, infrastructure damage by municipal contractors, and disruptions by organised criminal groups (such as the so-called 'construction mafia'). These risks – often uninsurable – are more prevalent and severe in South Africa than in peer markets, contributing to elevated retail prices. Industry bodies have responded by forming working groups to address these threats, but long-term mitigation remains essential.

[50] Note that Scenario 1 forecasts an ongoing decline in economic growth, which reduces household ability to afford broadband and raises network build costs over time. In other words: Poor macroeconomic performance may weaken the ability of mobile network operators to continue their historic trends.

[51] This is a worthwhile initiative, but municipalities may not support this. Data centres currently fed by municipalities may not receive any bulk volume discounts and therefore face higher cost structures. There are already cases where a data centre on one side of a road is fed by Eskom and receives Tariff A while the data centre on the other side of the road is fed by a municipality and receives Tariff B. Geographic inconsistencies in electricity pricing will shape where investors choose to locate future data centre facilities.

Finally, fiscal and tax policy reform could play a pivotal role. Adopting tax-advantaged structures such as Digital Infrastructure Investment Trusts – similar to real estate investment trusts – can significantly lower the cost of capital by passing income and tax obligations directly to shareholders. These models are already in use in the United States, Europe, Singapore, Japan, Australia and Canada. In South Africa, the Digital Council Africa is in advanced discussions with National Treasury to introduce a similar mechanism, which could help unlock capital for large-scale infrastructure deployment.

12.1.2 Building more versus leasing or sharing backhaul network infrastructure

The investment modelling clearly illustrates that the cost of metro connectivity is a significant cost driver in the expansion of the reach of fibre networks, and will increasingly become a challenge for wireless networks as South Africa continues its migration to 5G.

Operators face a stark choice: build their own backhaul or lease network infrastructure from someone else (the so-called build versus buy decision). In 2018, ICASA prioritised the national long-distance and metro connectivity markets for a procompetitive review, but no action has subsequently been taken. Further, all private sector stakeholders categorically stated their preference not to rely on any service from BBI.

In stakeholders' views, BBI's service quality (particularly BBI's inability to repair network faults within defined time periods) represents a commercial risk. This viewpoint should be viewed as disturbing, given that BBI is a creature of statute with a mandate to support the connecting of South Africans to high-speed Internet. As indicated earlier in Section 5, the state has a strategic strength in the middle-mile, but this strength is not being leveraged fully.

12.2 Where does and will the capital come from for DCI?

The mobile operators in South Africa continue to invest collectively close to R20 billion in fixed capital investment a year, again with a true access gap of just under 400 000 homes in 2024. The fixed network operators are investing in previously unforeseen commercial models to bring low-cost high-speed broadband to low-income areas, while last-mile Wi-Fi and wireless operators continue to expand their networks into new areas. This continued investment means that South Africans are hungry for data, and there is a commercial return to be achieved in providing this access. More importantly, the source of capital for these investments is not only from within South Africa but also from global social infrastructure investment arms such as Meridiam (which invested in the Project Ilitha operations, deploying fibre in the townships in Mdatsane and KwaMashu). Indeed, one key stakeholder commented that capital investment interest in the South African ICT sector was such that no state intervention would be necessary.

A strategically important comment was the following: "Do not look at financial mechanisms like public-private partnerships to resolve access and affordability challenges in South Africa. A PPP-based network is merely a band-aid over an unnecessarily high-cost structure and does not resolve the real inherent constraint to broadband adoption: low incomes and low levels of digital literacy."

In practice, PPP-based networks also incur substantial, unseen monitoring and evaluation costs – a challenge that both BBI and Sentech are currently experiencing. BBI currently does not have any system to track whether its claimed Wi-Fi hotspots are operational at any given stage[52].

Although the private sector dominates overall funding of DCI, provinces have made substantial investments in broadband infrastructure, which has not been recognised in existing government policy documents. For example, no national policy document recognises the existence of the provincial networks in Limpopo, the Eastern Cape, Gauteng and the Western Cape. While certain overlaps are likely to exist, any provincial broadband network that connects a clinic or a school represents a point of leverage to introduce new services.

A better understanding of the existing status of national, provincial and municipal networks is a precondition to assessing the need for future state funding in DCI. Rationalising the SOEs into a structure that can leverage the state' s strengths in the middle mile is also a key consideration in terms of sourcing an alternative source of capital to support ongoing network capacity upgrades. A specific recommendation is crafted on the rationalisation of SOEs under the State Digital Infrastructure Company.

[52] BBI has indicated that it is exploring the implementation of such a system.

12.3 Is there a need for a dedicated fiscal contribution towards network deployment?

Firstly, the true access gap is small and is already being addressed through access obligations. Secondly, although the objectives of the Broadband Access Fund (BAF) are laudable, all private sector stakeholders viewed the fund as of limited value because of how it has been implemented. In fact, certain stakeholders who build networks and provide services in the same target areas have refused to participate in the BAF, specifically because of the implementation mechanism. Limited information being made available to the DCDT prevented DCDT staff from commenting on the efficacy of the BAF. This observation sends a stark message: An operator already builds networks in an area targeted by BBI but refuses to apply for a financial incentive. Other stakeholders who were originally involved in establishing the BAF have distanced themselves completely, given its current manner of implementation.

While disturbing, this observation is not uncommon in industrial policy and incentive design literature, where the principles and objectives often target a key social ill, but the chosen implementation mechanism fails.

12.4 The future role of SA Connect and the Broadband Access Fund

There are two elements to SA Connect: the policy goals and the implementation mechanisms. The policy goals remain laudable and relevant (although requires updating). However, the implementation mechanism, particularly the spending of state funds to deploy networks, requires a fundamental review. The middle-mile infrastructure assessment (Section 5.2) and last-mile GIS assessment (Section 5.4) illustrate that the state has a strong role to play in the metro and national long-distance elements of network infrastructure, while the private sector clearly has a strength in the deployment of last-mile networks.

Crucially, the state has not connected government facilities to high-speed broadband at an affordable level (as reported by the DCDT). Rather, SITA relies on private sector network infrastructure to do so (as illustrated in 6.4), and in doing so, has an opportunity to leverage its position regarding the prices it charges. A specific recommendation on the manner in which SITA levies fees is outlined in the Recommendations section.

Although BBI has built some last-mile network infrastructure, the fees it charges (e.g. to schools) do not serve a developmental purpose, contradicting its mandate. BBI also faces significant competition from other SOEs in the middle-mile market, as outlined in Section 5.

Furthermore, the Wi-Fi hotspot areas supported under the SA Connect programme have been installed in areas where households already have broadband coverage (pricing may have been a bottleneck to up-take). Further, the target number for Wi-Fi hotspots to cover over five million networks is equivalent in coverage to a new mobile challenger network. The following box provides a GIS assessment of BBI-purported achievements regarding household coverage, indicating the importance of having clear benchmark targets and measurement criteria.

Is the BBI public Wi-Fi programme being evaluated effectively?

SA Connect Phase 2 sets a target of deploying "32,055 Wi-Fi hotspots, enabling the connectivity of 5,573,258 households" (DCDT, 2025). This estimate implies that one Wi-Fi hotspot provides access to approximately 174 households.

This measurement approach provides a straightforward way to project coverage, but it is not accompanied by any metrics to estimate the impact of this coverage, i.e. the number of households that utilises the broadband coverage provided. This approach also ignores demographic factors (such as household density in deployment areas) and technical considerations (such as the realistic service range of a Wi-Fi hotspot under acceptable quality of service conditions), which impact the actual number of households covered.

The following figure provides the results of a geo-spatial assessment of household density applied to different hotspot coverage radii, using Wi-Fi hotspot location data from BBI.

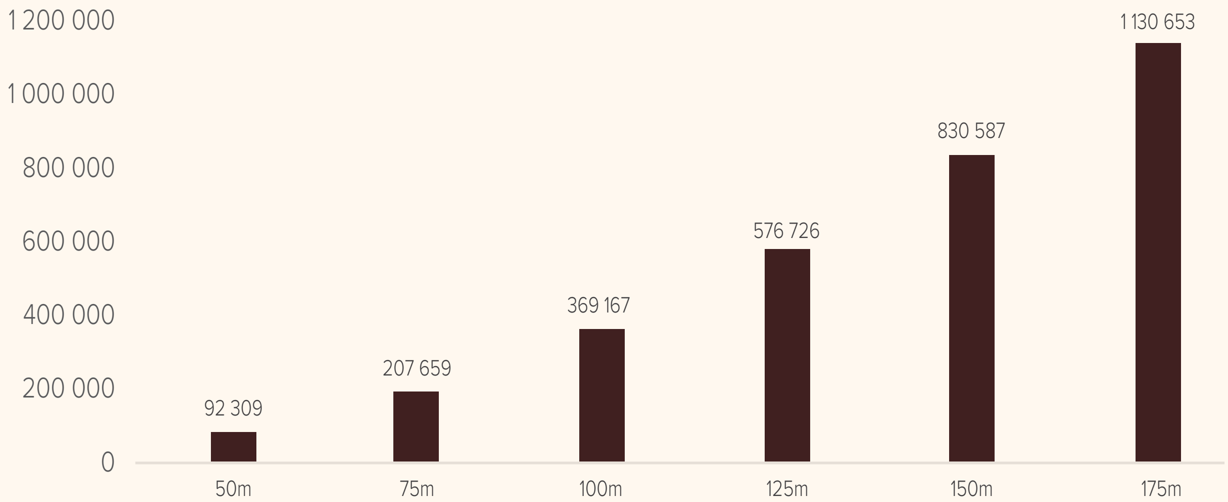


Figure 12-1: How the Wi-Fi hotspot coverage radius influences the number of households covered

Source: Africa Analysis, stakeholder inputs and BBI data.[53]

The implied no. of households per hotspot ratio aligns with technical network modelling characteristics where the average effective coverage radius per hotspot is closer to 50 metres. The formulaic assumption indicates that 1.1 million households have access to broadband, but fewer than 100 000 households when applying a 50-metre service radius. This suggests that reported household connectivity figures may be significantly higher than what is observed in practice.

In addition, current public reporting does not yet capture several important aspects of service delivery and user experience, such as:

- Network uptime and availability;
- Quality of service metrics (download and upload speeds);
- Number of unique users accessing the network; and
- Type of usage (e.g. social media, educational content, e-government services).

Expanding the monitoring framework to include these indicators would strengthen the evidence base for assessing progress under SA Connect and, importantly, provide a clear indication of value for money spent.

[53] The number of households covered in the 175-metre radius band is equivalent to the number of households covered using the BBI reporting formula.

12.5 The role of the Universal Service Fund

A detailed assessment of the Universal Service Fund is provided in the Recommendations. USAASA's performance has been criticised for a lack of credible, evidence-based impact by multiple parties including the Auditor-General and the Parliamentary Portfolio Committee on Communications and Digital Technologies. The 2024/25 USAASA Annual Report states the following:

- As at March 2024, USAASA held a net surplus in total assets of R3.6 billion.
- The Auditor-General has issued a further qualified audit opinion on USAASA's financial records.
- Significant internal control deficiencies exist.[54]

12.6 Concluding remarks on funding the investment in network capacity

Many countries follow a policy process of developing an incentive structure to roll out network infrastructure. However, successful examples of this (e.g. France, Thailand, and Brazil) have all based their assessments on the following:

- A detailed GIS mapping of the location of network infrastructure; and
- A clear definition of government policy goals, which then supports clear definitions of underserved areas.

Furthermore, the World Bank is currently funding numerous studies in Africa (e.g. Zambia) to assist governments to develop a Commercial Transaction Manual for the funding of networks in underserved areas. Such manuals focus on two key items:

- Identifying where investment is needed, and releasing this publicly (hence the need for a GIS map); and
- Rules of engagement for reverse auction allocation of funding to private sector entities to deploy last-mile access networks.

These manuals are then to be implemented by the Regulator or USF. The South African scenario is very different with diverse tools to fund network infrastructure in place that includes a direct budgetary allocations to SA Connect, however, obligations on licensees are onerous as well as a requirement to contribute to the Universal Service and Access Fund.The range of different instruments lends itself to coordination challenges and ultimately delays in achieving targets.

The first step to resolving this coordination challenge is to generate a GIS map of priority areas, which could be completed within six months of focused commitment.

The second step would be to map the different funding mechanisms that already exist, where the reverse auction allocations already exist in the Electronic Communications Act.

The third step would be to craft an implementation plan and system of monitoring. Such a system already exists within licensees' reporting obligations to ICASA.

The Recommendation section goes into some detail on how best to reform the Universal Service Fund.

[54] See page 87 of the USAASA 2024/25 Annual Report.

13 RECOMMENDATIONS

Recommendations in this section relate to the policy, institutional and regulatory (PIR) interventions that act on the enablers of UMC.

The recommendations focus on the PIR environment because South Africa has achieved universal coverage of infrastructure (in general) and now requires targeted coordination mechanisms to close out any infrastructure gaps and to address the real constraint that is hampering South Africa, being digital literacy, digital readiness and general income levels.

The UMC framework is agnostic as to the policy, institutional and regulatory actions any country takes to reach its targets. The following recommendations are formulated within the context of the status quo in South Africa as set out in the Baseline Report and above.

13.1 Adopting the UMC framework and new targets towards 2035

13.1.1 Existing targets require review

Existing targets for connectivity, quality of service, the cost to communicate and a free basic data grant are susceptible to the following criticisms:

- Targets such as those set in SA Connect in 2014 are outdated and the majority of the deadlines have been missed.
- Targets reflect the historically siloed approach to policymaking and are found across different policy documents across different government departments. Further targets are included in licences issued by ICASA, with linkages between regulatory obligations and policy objectives not always established.
- New metrics for measuring meaningful connectivity have emerged internationally.
- The targets in the Medium-Term Development Plan (2024) are not evidence based.

A key recommendation of this report is the need for a consultative process to set new targets towards 2035 using the UMC framework.

These targets must have the buy-in of affected government departments, regulators and agencies, and should act as a unifying context for government and private sector interventions.

Notably, the types of targets included in the MTDP 2024 indicate a movement towards the broader UMC model, introducing a focus on devices and affordability as well as using international indices to benchmark progress.

Finally, we note that adopting a focus on UMC would be timely given South Africa's membership of the G20, which has a specific focus on UMC through its Digital Economy Working Group.

13.1.2 The UMC indicators

The following table lists the indicators for which the ITU has set a target of 2030 under the UMC framework[55].

Table 13-1: Proposed measurement metrics in line with the UMC indicator dashboard

Indicator with units	2030 target	Guiding principle
Universality metrics		
Internet users, % population		
Aged 15 and above	100	Universality
Gender parity score (1 = parity)	1	Parity
Households with Internet access %	100	Universality
Schools connected to the Internet, %	100	Universality
Business using the Internet (0 employees or more), %	100	Universality
> 10 employees	100	Universality
Connectivity enablers		
Mobile network coverage, % population		
3G 4G 5G	100% for the most advanced already present with minimum coverage of 40%	Universality
Fixed broadband speed, % subscriptions		
>10 Mbit/s	100	Universality
School connectivity		
Minimum download speed, Mbit/s per school	20	Technology
Minimum download speed, kbit/s per student	50	Technology
Minimum data allowance, GB	200	Technology
Entry-level broadband subscription price		
% gross national income per capita	2	Affordability
% average income of the bottom 40% of the population	2	Affordability
Individual using a mobile phone		
Gender parity score (1= parity)	1	Parity
Individuals owning a mobile phone, % population		
Aged 15 and above	100	Universality
Gender parity score (1= parity)	1	Parity
Population aged 15+ with basic skills, % population	70	Very high prevalence
Gender parity score (1= parity)	1	Parity
Population aged 15+ with intermediate skills, % population	50	Majority of population
Gender parity score (1= parity)	1	Parity

These indicators align with the seven ICT indicators in the Global SDG Indicator Framework[56] :

[55] Achieving universal and meaningful digital connectivity: Setting a baseline and targets for 2030, available from https://www.itu.int/itu-d/meetings/statistics/wp-content/uploads/sites/8/2022/04/UniversalMeaningfulDigitalConnectivityTargets2030_BackgroundPaper.pdf

[56] https://unstats.un.org/sdgs/indicators/indicators-list/

13.1.3 Developing a South Africa-specific set of metrics and indicators

A review of the metrics and indicators in the previous tables indicates that not all of these are suitable for South Africa's current position in pursuing UMC and its identified priorities. Account must be taken of additional targets which have historically existed in a country, its baseline status and policy focus.

In developing appropriate metrics and indicators, consideration should be given to the following:

- The value of aligning with international metrics and indicators.
- Using 2025 as a new base year, based on, inter alia, maps, recommendations and information produced as part of this report.
- Appropriate quality of service metrics.
- Linking device targets specifically to 4G+ capable handsets.
- Specifically, referencing past targets and linking these to new targets to ensure a continuous narrative and accountability.
- Incorporating evidence-based distinctions between different areas and households. Currently, speed targets apply uniformly, but the definition of UMC should be nuanced to reflect the variety of demand profiles extant in South Africa. Should there be a distinction between metropolitan municipalities and other municipalities? Does a rural school have the same demand profile and affordability characteristics as a city school?

Criticisms about such an approach being discriminatory are acknowledged, but there are material investment and cost implications which could be better managed through an agreed-upon future upgrade path.

- The impact of urbanisation trends.
- While targets should be aspirational, what is realistically achievable in the next 10 years should be assessed based on the outcomes of this report, progress in different interventions and technology developments.
- Whether intermediate targets should be set, for example, for 2030.

A final set of metrics and indicators must be the product of a robust process which aligns the expectations of disparate stakeholders, and the DCDT must play the role of mediating between these expectations and what can realistically be delivered. The importance of this cannot be overemphasised.

This extends to relevant processes that occur within beneficiary departments. For example, the DBE periodically reviews the norms and standards applicable to schools' infrastructure. Any future review should include determining the minimum digital connectivity requirements of schools defined by a needs-based assessment.

A final recommendation is that the DCDT hosts a publicly available dashboard that reflects progress towards attaining agreed-upon targets.

13.1.4 Implementation

Responsible party	This is a policy process driven by the Ministry of Communications and Digital Technologies (MCDT) after consultation with ICASA and USAASA
Other direct government stakeholders	Presidency (Operation Vulindlela, DPME) DPWI DBE DHET COGTA ICASA USAASA DPME
Enabling legislation	Subsection 3(1)(b) of the Electronic Communications Act 2005 *3. Ministerial Policies and Policy directions* *(1) The Minister may make policies on matters of national policy applicable to the ICT sector, consistent with the objects of this Act and of the related legislation in relation to—* .... *(b) universal service and access policy;*
Policy objective	Current targets for universal service and access in South Africa are outdated, fragmented and in urgent need of review. The purpose of this policy is to review and where necessary amend and/or update as well as consolidate targets relating to the attainment of universal service and access in South Africa as set out in the South Africa Connect National Broadband Policy, the National Infrastructure Plan 2050, National Radio Frequency Spectrum Policy 2024 and other relevant policies and government planning documents, having regard to the promotion of the concept of UMC by the ITU.
Process to be followed	Subsequent to the completion of internal government consultations and required steps leading to approval by Cabinet, a draft policy must be published for public comment for a period of not less than 30 working days.
Dependencies	No amendment of legislation or institutional rearrangement required.
Estimated timeline for finalisation	Noting the need for initial research, requirements for consultation with ICASA, USAASA, intergovernmental consultations, engagement with FOSAD, engagement with the SEIAS process, securing Cabinet approval, public participation and finalisation, a period of two to three years is estimated as sufficient to finalise this process.

13.2 Strengthening data collection

Measurement is central to implementing a UMC framework and also a major challenge. This is currently a weakness for South Africa. Brazil – South Africa's predecessor as President of the G20 – partnered with the ITU to produce a report on "Universal and meaningful connectivity (UMC): A framework for indicators and metrics" as an output of the G20 Digital Economy Working Group.

These guidelines propose a statistical framework to monitor the progress towards UMC, assess the challenges of compiling ICT indicators, present innovative statistical methodologies to fill in the gaps, and offer recommendations to increase the statistical capacity of G20 countries in that area.

The indicators proposed are compatible with the list of core ICT indicators adopted by the UN Statistical Commission, as well as with the indicators proposed by the ITU in its manuals.

The ITU suggests exploring innovative strategies to use alternative data sources alongside traditional methods such as household surveys and questionnaires sent to licensees. Examples include the use of:

- Mobile phone data to assess Internet usage patterns and validate the accuracy of mobile network coverage maps. Studies on meaningful connectivity in Brazil and Indonesia, supported by the ITU, demonstrated that estimates of Internet use obtained by processing mobile phone data were comparable to survey data.
- Satellite imagery to identify areas where infrastructure is lacking.
- Social media platforms and digital footprints can provide indirect indicators of digital literacy and Internet adoption.

13.2.1 ICT data collection in South Africa

Benchmarking against international indices requires effective data collection and verification of input data provided by licensees, which South Africa is required to submit to the ITU annually.

Effective data collection is a challenge across industries and government departments, but there are specific short-term measures available to strengthen data collection and analysis. These focus on:

- Data collection from licensees by ICASA, which is aligned with ITU requirements and reporting standards.
- Data collection from and data dissemination to a central point from stakeholder departments and other entities such as regulators.

13.2.2 Improving data collection by ICASA

The following intervention is recommended to strengthen ICT data sector collection relevant to ITU statistics in the short term.

Responsible party	ICASA
Other direct government stakeholders	DCDT, STATSSA
Enabling legislation and regulation	ICASA Act subsection 4(3)(g)
Objective	South Africa needs to strengthen its collection, verification and analysis of ICT sector data.
Process to be followed	ICASA to take steps to enforce the obligation on all Electronic Communications Service (ECS) and Electronic Communications Network Service (ECNS) licensees to submit responses to requests for statistical information. This should include initial measures to: • Create greater awareness of the obligation and the importance of compliance. • Conduct workshops to help SME licensees to understand how to source and provide the requested information. • Enforce the obligation through referrals to the ICASA Complaints and Compliance Committee.
Dependencies	No amendment of legislation or institutional rearrangement required.

13.2.3 Institutional framework for ICT statistics

Challenges experienced by STATSSA as a national statistical office are acknowledged. Remedying this is beyond the scope of this report. However, there remains a need to formalise the distribution of responsibilities in the collection and dissemination of ICT statistics to ensure that local policy and regulation are developed based on the best evidence available, avoid silos and duplication, and facilitate South Africa meeting its reporting obligations to the ITU.

This is a broader intergovernmental cooperation issue, which is being addressed through Phase 2 of Operation Vulindlela.

It is recommended that the DCDT take the lead in developing the required intergovernmental mechanisms and ensuring that all relevant stakeholders are identified. These include:

- ICASA, as the entity which collects ICT statistics from licensees;
- STATSSA, as the key provider of demand-side data;
- DBE, where the absence of data relating to schools' connectivity in the South Africa UMC table earlier is indicative of the need for cooperation between DCDT and DBE;
- COGTA and the South African Local Government Association (SALGA) to provide information on municipalities and municipal networks;
- DHET;
- DTIC; and
- DPME.

Consideration must also be given to:

- Expanding categories of data collected to accommodate new targets and the broader range of the definition of UMC.
- Ensuring that statistical data are publicly available on open data principles.
- Developing competence in the use of big data analytics, machine learning in statistics and emerging AI technologies.
- Greater integration with other geospatial datasets.

13.3 Availability of digital connectivity infrastructure

13.3.1 Introduction

This section focuses on the first element of UMC:

- Availability for use;
- Affordability of services;
- Quality of the connection;
- Affordability of devices;
- Skills; and
- Safety and security.

'Availability for use' incorporates both DCI and the ISP services used by subscribers to get online. The term is used interchangeably with 'connectivity'.

A 10-year time horizon does not leave scope for comprehensive policy or legislative reviews that will have a measurable impact on achieving connectivity targets before 2035. The focus must be on optimal alignment and effective implementation of existing policy, programmes and processes.

Fortunately, key policies relevant to the connectivity component of this study are recent:

- The National Policy on Rapid Deployment of Electronic Communications Networks and Facilities was published on 31 March 2023. The DCDT is monitoring the implementation of the policy while ICASA plans to finalise rapid deployment regulations by the end of March 2026.
- The Next-Generation Radio Frequency Spectrum for Economic Development 2024 was published on 28 May 2024. It is at an early stage of implementation but includes national policy relating to free basic data allowances, universal service and access obligations, and community-centred connectivity initiatives.
- The National Data and Cloud Policy 2024 was published on 31 May 2024. The DCDT has developed an implementation plan, and reforms at SITA are being prioritised.

Established programmes and processes underway include:

- SA Connect Phase 2 – incorporating lessons learnt from Phase 1 – was approved by Cabinet in 2022, while the BAF created through the Presidential Employment Stimulus has been implemented since late 2023.
- Implementation of universal service and access obligations set out in spectrum licences issued in the March 2022 radio frequency spectrum auction and forming part of the broader SA Connect Phase 2.
- ICASA has commenced the process for holding a second radio frequency spectrum auction in 2027/28.
- ICASA is preparing for the renewal of IMT spectrum licences critical to mobile network services in 2028/29 and for the renewal of Individual Electronic Communications Service (IECS) and Individual Electronic Communications Network Service (IECNS) licences during the same period.

If South Africa is to reach its connectivity targets, the focus must be on executing these policies, processes and programmes. Where indicated, policy modifications and implementation optimisation can be undertaken to ensure policy and regulatory coherence.

This section sets out recommendations specific to establishing connectivity through the deployment of DCI. Recommendations are made in respect of:

- Establishing and maintaining a national DCI GIS Database;
- Strengthening local government's capacity to manage and facilitate the deployment of DCI;
- Updating regulations outlining under-serviced areas in South Africa;
- Infrastructure sharing and facilities leasing;
- Satellite services;
- Protection of DCI;
- Universal service and access obligations; and
- Establishing a DIOSS.

13.3.2 Establishing and maintaining a national digital infrastructure GIS database

The National Rapid Deployment Policy 2023 requires the DCDT to establish and maintain a GIS database containing information about the type and location of broadband infrastructure. Identified benefits of the database include:

- Easy identification of the location of existing infrastructure;
- Enabling infrastructure sharing;
- Prevention of damage to infrastructure;
- Reducing planning complexity; and
- Facilitating identification of underserved areas.

The policy sets out the following implementation roles:

Table 13-2: Roles and responsibilities in developing a GIS map of DCI infrastructure

Entity/ies	Role
DCDT	Determine the nature and parameters of information to be provided to the GIS database. Determine standards for the security of the GIS database and criteria governing access to information contained in it.
Rapid Deployment National Coordinating Committee (RDNCC)	Maintain the GIS database.
ICASA	Establish, if required, a regulatory basis for collection of GIS data from licensees as per parameters established by the DCDT. Collect data and provide to the RDNCC.
Licensees	Submit GIS data about the type and location of broadband infrastructure to the DCDT.

To date, limited progress has been made in developing this map. However, there are a significant number of sources from which to obtain the necessary data and develop a GIS map of DCI in South Africa. These include:

- Licensees which have their own coverage and infrastructure data.
- Non-licensees, such as tower companies and licence-exempt private electronic communications networks operated by data centres.
- Private companies which have developed proprietary infrastructure maps.
- ICASA, which requires all ECNS licensees to submit coverage and network deployment information.
- Municipalities and provincial governments routinely require submission of as-built information from holders of wayleaves permitting deployment of broadband infrastructure in the road reserve and will have records of land leased for the siting of masts and other infrastructure. Both will also have records of their own broadband infrastructure.
- SOEs such as BBI, Sentech, SANRAL, Eskom, Transnet, PRASA and SITA have data from the network infrastructure which they own, operate or authorise the construction of.

The following challenges are identified:

- The National Rapid Deployment Policy follows a siloed approach to data collection, restricting population of the database to information collected from licensees by ICASA. This limits the utility of the database and opportunities for cross-verification of data.
- ICASA is not effectively collecting data from licensees and lacks the capacity to properly collate and analyse this data.
- Potential objections relating to the confidential or commercially sensitive nature of information included in the database.
- Data may be captured in different formats.
- The ability of the database to interact with other spatial information and related data sets.

In addition to these challenges, implementation decisions are required to determine how access to the database will be managed and the security standards to be applied.

Broadening data collection

Broadband infrastructure must be situated within broader, standardised spatial data infrastructure frameworks, and steps must be taken to identify different sources of broadband infrastructure data and collect and aggregate this data.

Engagement between the DCDT and COGTA is key to broadening data collection to include broadband infrastructure data held by municipalities and provincial governments. The Portfolio Committee on Communications and Digital Technologies has also taken an active interest in obtaining this information from COGTA.

The Spatial Data Infrastructure Act 2003 is intended to facilitate and coordinate the availability, exchange and sharing of geospatial data and services between various stakeholders, including different levels of government. This Act promotes efficient, cost-effective collection and sharing of spatial data across government while promoting access to information by the public.

Spatial data infrastructure (SDI) consists of policies, institutional arrangements, geographical information systems, databases, networks, web services and portals. It falls within the portfolio of the Department of Agriculture, Land Reform and Rural Development, with the Spatial Data Infrastructure Committee (SDIC) overseeing implementation.

SDI serves to support the spatial and land development planning contemplated by the Spatial Planning and Land Use Management Act 2013, in which the three levels of government must prepare spatial development frameworks and make clear information accessible to the public and private sectors.

The Standard By-laws for the Deployment of Electronic Communications Facilities require the submission of as-built data in GIS format.

Standardising data collection

The Minister of Agriculture, Land Reform and Rural Development has published spatial information standards to be observed under the Spatial Data Infrastructure Act[57].

[57] Copies of all applicable SANS standards can be obtained by emailing nsif@dalrrd.gov.za.

Data collection from licensees

As part of its development of rapid deployment regulations, ICASA is expected to launch a formal inquiry into developing the regulatory framework required to, inter alia, ensure the collection of required information from licensees. This should include:

- A detailed specification on the data to be submitted;
- The required formats;
- An online portal for uploading licensee data;
- Applicable security standards; and
- The mechanism for collating and transmitting this information to the DCDT.

ICASA should also take steps to conduct workshops and otherwise provide guidance to licensees – particularly SMEs – on how to collect and submit network coverage and deployment information in the required format.

Access to the database

The value and utility of the database will be optimised by making it broadly available, subject to any restrictions imposed by competition law and security legislation, such as the Critical Infrastructure Protection Act 2019 or cybersecurity legislation, once finalised. Access should be guided by constitutional rights to access to information and with reference to the Promotion of Access to Information Act 2000 and the work of the Information Regulator.

Different jurisdictions follow different approaches to the availability of broadband infrastructure data. At a national level, regulatory authorities provide a publicly accessible anonymised network infrastructure map to show the availability of different services at a particular location. At a planning authority level, interested parties, who are intent on deploying network infrastructure, may either request access to a detailed database or be obliged to review the database and coordinate any network construction with existing network operators prior to commencing any work.

Competition and confidentiality

The Competition Commission’s ‘Guidelines on the Exchange of Competitively Sensitive Information by Competitors under the Competition Act 1989’ indicate that the use of nationally aggregated, historical data effectively mitigates against competition concerns relating to the sharing of competitively sensitive information through a publicly available database.

Clarity on the provision and sharing of forward-looking data in developing a 'Dig Once' policy will need to be sought from the commission.

Security

Technical specifications and measures for securing the database could be provided by SITA. In future, these will be guided by cybersecurity legislation and regulation currently under development.

13.3.3 Strengthening local government’s capacity to manage and facilitate the deployment of digital infrastructure

While not the only obstacle to rapid deployment of digital infrastructure, the lack of capacity, expertise and financial resources at municipal level has a direct impact on both time to deploy and the cost of deploying and maintaining networks. This is a consistent complaint raised by both private and public sector entities looking to deploy digital infrastructure and requiring wayleaves and other permissions from local government.

Local government’s financial and capacity constraints impact across sectors: This has been recognised by national government, which has included measures to address these constraints under Phase 2 of Operation Vulindlela.

Standard By-laws for the Deployment of Electronic Communications Facilities

The Standard By-Laws for Deployment of Electronic Communications Facilities, drafted under the Operation Vulindlela Phase 1 umbrella and championed by COGTA, are intended to standardise processes by providing local municipalities with the legal framework for accepting, accessing and processing wayleave and other broadband infrastructure-related deployment and maintenance requests. This process also focused on building business processing systems and capacities within municipalities.

A package of supporting documentation, such as template wayleave application forms, municipal land-use agreements and municipal lease agreements, is provided as part of the Standard By-Laws.

There has, however, been limited uptake to date, attributable to:

- Capacity and expertise shortages;
- The lengthy process required to adopt municipal bylaws;
- The fiscal constraints restricting many local municipalities;
- Broadband infrastructure development not being a municipal priority; and
- Stakeholder engagement with COGTA and the DCDT indicates that COGTA has not budgeted for any implementation of the Standard By-Laws or for any support to municipalities.

There is an expectation on the part of COGTA that the DCDT will take the lead in implementation as the Standard By-Laws relate to digital infrastructure. **This is notwithstanding the empowering legislation for the Standard By-Laws, being the Municipal Systems Act.**

It is recommended that a renewed impetus be provided to ensure broader adoption of the Standard By-Laws by local municipalities. This requires coordination between:

- COGTA as the responsible department together with SALGA;
- DCDT with specific reference to the Rapid Deployment Coordination Centre (RDCC) and the Department's Broadband and Digital Skills for Municipalities Programme (provided in partnership with SALGA); and
- The Presidency, given the stated objectives of Operation Vulindlela with regard to local government.

Ultimately, this is an action item for COGTA and not the DCDT, although the latter may play a supporting role. Until COGTA provides budget and resources to promote adoption and implementation of the Standard By-Laws, there will be limited progress towards the goal of speeding up infrastructure deployment by standardising application processes across local municipalities.

As a measure to address capacity and expertise shortages at local government, it is recommended that COGTA and the DCDT establish a Municipal Broadband Support Unit. This could be situated within the RDCC, which already has representation from both departments.

The purpose of the unit would be to provide technical and legal assistance relating to wayleaves and broadband infrastructure deployment to municipalities requiring this. The work of the unit could further be expanded to incorporate the DCDT's Broadband and Digital Skills for Municipalities Programme, launched in September 2024.

Charges and tariffs for government permissions

A major issue for private and public sector players deploying broadband infrastructure is the high fees and tariffs imposed by some municipalities and SOEs for permission to deploy fibre networks, contrary to the requirements of the ICT White Paper which stipulates that fees should recover costs.

The National Rapid Deployment Policy 2023 – which supersedes the provisions of the ICT White Paper as regards rapid deployment – explicitly states that it does not apply to fees charged by local government and other governmental authorities for permits, authorisations or other approvals. The policy, however, references the ICT White Paper provision that wayleave administration fees or tariffs levied by a municipality should not exceed the administrative cost of processing the application.

Municipalities are empowered to determine their own budgets and to set their own tariffs through the finalisation of a medium-term revenue and expenditure framework (MTREF) on an annual basis and with reference to a municipal tariff policy developed under section 74 (read with section 75A of the Municipal Systems Act). The MTREF sets out fees and tariffs applicable to obtaining wayleaves and other permissions, and its finalisation is subject to the conclusion of a public participation process (in which interested parties such as ECNS licensees can take part).

There is no conflict between the National Rapid Deployment Policy 2023 and the legal framework under which municipalities determine tariffs for wayleaves and other permissions. The principles underpinning municipal tariffs set out in section 74 of the Municipal Systems Act include that:

- Tariffs must reflect the costs reasonably associated with rendering the service, including capital, operating, maintenance, administration and replacement costs, and interest charges; and
- Tariffs must be set at levels that facilitate the financial sustainability of the service, considering subsidisation from sources other than the service concerned.

The Constitution requires that the power of a municipality to impose surcharges on fees for services or other taxes, levies or duties be exercised in a way that does not materially and unreasonably prejudice national economic policies.

What is problematic is that local government does not have a standard model for calculating its costs in accordance with these principles when it comes to the deployment of broadband infrastructure. This is reflected in:

- Wayleave application costs ranging from R250 to R250 000; and
- Some municipalities impose additional annual per-kilometre charges based on fibre deployed in the road reserve.

The ICT White Paper requires that SALGA "must endeavour to ensure uniformity in process and process charged by municipalities". It is recommended that SALGA engage with appropriate government entities that can assist in the development of an appropriate costing model and the translation of this into a common model for setting the relevant tariffs (itself translating into greater consistency between municipalities).

There is further a need for provincial governments to standardise and reduce tariffs for deployment on, over or under provincial roads, and standardise the approach to rentals charged for seabed leases for submarine fibre optic cables landing in South Africa.

Charges and tariffs for access to government infrastructure and servitudes

The National Rapid Deployment Policy 2023 places a duty on government entities in all spheres of government that have servitudes for infrastructure such as roads, power lines, water pipelines, sanitation pipelines and railway lines, to permit licensees to use such servitudes to deploy broadband infrastructure. These entities include, without limitation, public utilities such as Eskom, SANRAL, provincial departments responsible for roads, Transnet, and government entities responsible for water infrastructure.

It is recommended that national government, through the DCDT, take the lead in implementing the National Policy on Rapid Deployment by standardising the cost of access to national government infrastructure for the purpose of deploying digital infrastructure. Key to this is the development of:

- A common model for developing charges and tariffs for access to government property and DCI, which can be used for the deployment of electronic communications networks.
- A common set of terms and conditions governing access to property and different categories of DCI.

Standardisation of charges and access terms would also be an expected outcome of the rationalisation of state DCI assets into the SDIC and greater coordination between SOEs in the deployment and use of their DCI.

Tanzania and Nigeria reduce right-of-way tariffs

In July 2023, the Tanzanian government implemented an 80% reduction in government charges levied on telecommunication companies for utilising road-reserved land under the management of Tanzania Roads Agency to install fibre optic cables, with the intention of promoting rural coverage[58].

Nigeria has addressed high and inconsistent state government charges for wayleaves through an agreement reached between the federal government and states to harmonise these charges and reduce them by 90%. After initial enforcement challenges, eleven Nigerian states agreed to waive right-of-way fees completely in February 2025. This is part of a strategy to attract investment in DCI in these states[59].

Aerial fibre deployments

New fibre network deployments targeting lower-income areas rely heavily on aerial fibre – rather than placing fibre cable in trenches and ducts – to reduce the cost of fibre infrastructure build. However, in many areas, aerial fibre is not permitted by the local government due to concerns about aesthetics and the perception that aerial fibre is an inferior solution as opposed to trenched fibre founds in the suburbs.

This leads to areas not receiving fibre coverage, driving away investments to serve lower-income consumers.

In this regard, the following is recommended:

- SALGA should take the lead in educating local government about the benefits of aerial fibre deployments and the necessity of this mode of deployment in making fibre-based access affordable.
- Adoption by municipalities of Standard By-laws for Deployment of Electronic Communications Facilities, which stipulates that wayleaves be granted for aerial deployment and that access to poles and street furniture should be supported.
- Applicable standards for all fibre deployments should be developed by the SABS, adopted and enforced to mitigate aesthetic and safety concerns.

13.3.4 Updating regulations setting out under-serviced areas in South Africa

ICASA is required under the ECA to develop regulations defining under-serviced areas and to review and update the prescribed definition at least every two years. This informs a list of designated under-serviced areas eligible to receive subsidies from the USAF for the construction or extension of electronic communications networks in underserviced areas.

ICASA published the required regulations in 2012, but these have not been reviewed since.

The mapping outcomes of this study afford ICASA a tool to update the 2012 regulations and to regularly review the list of under-serviced areas as required by the ECA.

[58] https://developingtelecoms.com/telecom-business/telecom-regulation/15278-tanzania-cuts-right-of-way-fees-in-major-boost-for-operators.html

[59] https://statehouse.gov.ng/news/president-tinubu-receives-nipss-report-on-digital-economy-reaffirms-committment-to-youth-empowerment-job-creation/

An accurate list of under-serviced areas could be used for:

- Targeted application of funds in a future DDCF;
- Implementation of SA Connect; and
- Design of future universal service and access obligations and refinement of existing obligations.

Responsible parties	ICASA
Other direct government stakeholders	DCDT USAASA COGTA
Enabling legislation	Subsection 88(2) of the Electronic Communications Act 2005 *(2) The Authority must, by regulation, for purposes of subsection (1)(b), define under-serviced areas.*
Objective	To update the Under-Serviced Area Definitions Regulations 2012 so as to better inform targeted subsidisation of digital infrastructure deployment to be deployed in under-serviced areas.
Process to be followed	ICASA regulation-making process.
Dependencies	No amendment of legislation or institutional rearrangement required.
Estimated timeline for finalisation	Noting the need for initial research, public participation and finalisation, a period of 6-12 months is estimated as sufficient to finalise this process.

13.3.5 Infrastructure sharing and facilities leasing

Infrastructure sharing and facilities leasing are established mechanisms for reducing the cost of network infrastructure deployment and maintenance while promoting service-level competition.

Digital communications infrastructure as infrastructure

It is important to recognise that DCI is a subset of physical infrastructure and that there is a broader sense of infrastructure sharing.

DCI is often deployed alongside and co-exists with road, electricity distribution, water distribution and other network infrastructure. The cost of the deployment of DCI can be substantially lowered for greenfield housing and other developments when DCI is deployed at the same time as bulk infrastructure services. A recent housing development in the Moqhaka Local Municipality in the Free State achieved this through an agreement between the Department of Human Settlements and the party appointed by it to complete bulk civil works. This should become standard practice to avoid potentially widening the digital divide.

Further, new homes and redevelopments should provide ducting and other passive facilities for the future deployment of FTTH and fibre to the room.

Case study: Dig Once Policies

Dig Once policies seek to accelerate the roll-out of digital infrastructure through strategic collaboration between the government, FNOs, utility companies and other infrastructure providers.

A Dig Once policy typically:

- Requires government to install a conduit whenever there is construction on public land, including installation of utility infrastructure, road work and maintenance. Conduit and associated infrastructure can then be leased to the FNOs.
- Requires new builds and developments to install conduits, ducts and potentially fibre connectivity during the construction phase.
- Seeks to future-proof existing buildings through coordination of local government, FNOs, utility providers and other stakeholders to reduce excavation and ensure conduits and ducting are installed.
- Once implemented, accelerates fibre deployment, reduces the cost of deployment through infrastructure sharing and promotes new entry and transformation.

The World Economic Forum has developed a model Dig Once policy[60]. Nigeria has adopted a Dig Once policy at federal level, which is being adopted by states[61], and this approach has also been adopted at the local or municipal level across multiple jurisdictions[62].

Several South African municipalities have 'single trenching' requirements as part of their bylaws for work in the road reserve. These are, however, difficult to implement, and DCI providers are often incentivised to have at least an initial period of exclusivity in an area. Such exclusivity stimulates over-building activities and potential inefficient use of financial resources.

This could be addressed through strengthening existing infrastructure-sharing requirements in the Standard By-Laws for Deployment of Electronic Communications Facilities or developing a further set of model by-laws specifically governing the sharing of DCI when deploying within a municipal area.

Infrastructure sharing

There is already significant sharing of passive infrastructure by mobile and fibre network operators in South Africa. This is driven largely by commercial considerations as opposed to legislative or regulatory requirements.

More recently, infrastructure sharing has deepened to include some active infrastructure, such as radios used by MNOs.

Greater infrastructure sharing, particularly in rural areas, should be encouraged and the investment modelling results show the cost saving benefits. There is an existing initiative to establish a rural shared infrastructure network between the MNOs and others, such as tower companies.

This initiative which should be formalised and pursued. While concerns have been raised about the competition law implications of such an arrangement, the Competition Commission expressed an in-principle view that there was no absolute bar to sharing infrastructure in this way. An analogy can be drawn with the co-building of NLD networks by a consortium of local licensees.

Electronic communications facilities leasing

Facilities leasing is a pro-competitive remedy provided for in Chapter 8 of the ECA, read with the Facilities Leasing Regulations 2010, which impose an obligation on licensees to enter into an agreement to lease facilities where a request to do so is technically and economically feasible and the lease would promote the efficient use of electronic communication networks and services.

Historically, this framework has been of limited utility to those seeking access to electronic communications facilities due to the ease with which requests can be delayed and frustrated by an unwilling facilities owner.

[60] https://www3.weforum.org/docs/WEF_Dig_Once_Model_Policy_2023.pdf
[61] https://leadership.ng/federal-govt-to-unveil-national-dig-once-policy-by-december/
[62] See 'Dig Once for Digital Infrastructure BENCHMARK REPORT JULY 2021', World Economic Forum 2021. Available from https://www3.weforum.org/.

There have been a number of High Court judgements in this arena and provide ICASA with the evidence and support to review and strengthen its existing regulatory framework.

13.3.6 Radio frequency spectrum

It is recommended that ICASA give appropriate weight to the importance of Wi-Fi technology for connectivity in South Africa and its use in government connectivity projects when considering South Africa's position on opening up the entire 6 GHz range for licence-exempt use of Wi-Fi, subject to appropriate power restrictions.

It is also recommended that ICASA continue to pursue dynamic spectrum access techniques through trialling in innovation bands. This is an effective technique to enable smaller players' entry into the broader telecommunications markets.

13.3.7 Satellite services

There is little doubt that the rapid growth of low earth orbit (LEO) satellites and very high-throughput satellite services will play a role in closing the digital divide and disaster management while also having the potential to be a new competitor against existing connectivity delivery models.

Current initiatives to attract and facilitate the provision of these services in South Africa include:

- An ICASA inquiry into a proposed new Licensing Framework for Satellite Services. The stated purpose of this inquiry is to simplify licensing for satellite operators, reduce spectrum fees and encourage the deployment of in-country ground infrastructure.
- The issuing by the Minister of Communications and Digital Technologies of a policy directive to ICASA to allow recognition of Equity Equivalent Investment Programme (EIPP) participation in lieu of ownership by historically disadvantaged groups. This is expected to make it easier for satellite providers and other multinationals to enter the South African market.

South Africa is also developing its own satellite capacity to complement terrestrial broadband connectivity. The DCDT, with the Department of Science, Technology and Innovation, Sentech and the South African National Space Agency, has drafted a National Satellite Communication Strategy, which is awaiting Cabinet approval.

13.3.8 Protection of digital connectivity infrastructure

Once deployed, DCI must be protected against:

- Criminal conduct such as theft and vandalism;
- Negligent or accidental conduct, such as third parties, e.g. municipalities, damaging DCI when undertaking their own works; and
- Natural disasters and climate change.

Engagements with local structures such as community policing forums and extending programmes to include alternative energy generation have been successful in various geographic regions and this community-centric approach should become the norm for network deployment.

The criminal courts have, over the past five years, recognised DCI as 'essential infrastructure' for the purposes of determining sentencing. Where there is theft of or damage to DCI, such as Telkom copper cabling and batteries from mobile base stations, this is regarded as an aggravating factor in sentencing. Future implementation of the Critical Infrastructure Protection Act 2019 and the development of cybersecurity legislation will also offer avenues for greater protection of DCI.

The availability of a complete GIS database which incorporates local and provincial government data as a public resource will help to reduce the risk of negligent damage to DCI networks. In future, this database could enable a service allowing a party planning to deploy infrastructure to obtain accurate information about the location of DCI in the affected area.

Before You Dig Australia (BYDA)

BYDA is a national organisation which provides a free-to-use single point of contact to request information and maps relating to any infrastructure networks, such as utilities and telecommunications, that may be affected by planned underground works. Requests can be lodged through a web form or using a dedicated app. This service speeds up deployment on public and private land and reduces damage to existing infrastructure.[63]

Deployment of DCI will increasingly need to factor in resilience and redundancy as natural disasters and extreme weather events grow in frequency. The importance of DCI being available during emergency events cannot be understated. It is anticipated that emerging satellite technologies which operate independently of localised ground infrastructure will be a key component of meeting climate change and disaster relief challenges.

13.3.9 Universal service and access obligations / social obligations

There is a clear and urgent need for a comprehensive review of existing universal service and access obligations (USAOs).

A critical enabling step for improved effectiveness of USAOs is to update the Underserviced Area Definition Regulations, last reviewed by ICASA in 2012. The process will be facilitated by the outputs of this research, supporting the regulator to make evidence-based decisions.

This, in turn, will help inform the establishment of a 2025 baseline for the availability of connectivity and the development of obligations focused on coverage and quality of service.

A 2025 baseline for connectivity to public service institutions (PSIs) must also be established in consultation with beneficiary departments, considering:

- Historical USAOs, their current status and basis for continued service provision.
- The March 2022 spectrum auction social obligations, the current status and the outputs from the Connectivity Obligations Program Management Office (CO-PMO) established to oversee implementation.
- What happens when the term of existing obligations expires.
- PSIs connected by provincial and municipal networks.
- PSIs connected outside of regulatory obligations (for example, school connections sponsored by FNOs and wireless ISPs).
- Connectivity obligations imposed by the Competition Commission when approving mergers and acquisitions falling within its jurisdiction.
- Schools receiving the e-Rate discount.
- The interaction between different USAOs and PSI connectivity initiatives.
- The need for independent verification of data.

The DCI map and PSI connectivity information contained in this report will assist in designing future USAOs to be imposed through spectrum licensing processes, as well as more generally on ECNS and ECS licensees.

Importantly, ICASA should take note of where a PSI is shown to be within a short distance of an existing fibre node and consider imposing a connectivity obligation on FNOs to connect PSIs which are within or adjacent to their existing network footprint.

As set out in the recommendations regarding institutional arrangements, the CO-PMO model could be utilised as an effective mechanism for the implementation of USAOs.

A final recommendation is that ICASA establishes and maintains a 'social obligation dashboard', which makes information about progress in meeting these obligations readily available to the public.

[63] https://www.byda.com.au/

13.3.10 Digital Infrastructure One Stop Shop

From an industry and investment perspective, the availability of a single portal that can be used to lodge a single application for all required permissions to deploy DCI would be ideal.

While this should be viewed as a medium-to long-term project, it is recommended that a DIOSS be created, based on the existing Energy One Stop Shop, situated in the DTIC. This would align with the Digital Transformation Roadmap imperative to remove silos and enable effective sharing of information between government departments and entities.

In addition to municipal permissions, the DIOSS could facilitate and coordinate applications to state-owned companies (e.g. SANRAL), traditional authorities, water boards, as well as environmental and heritage resource management authorities. Challenges in securing energy supply when establishing rural sites are a major cause of deployment delays. Enabling the DIOSS to assist with applications relating to energy supply would alleviate this.

As an initial phase, the DIOSS could provide links to existing and forthcoming government e-services, such as the National Web-Based Environmental Screening Tool, launched by the Department of Forestry, Fisheries and the Environment in early 2025, intended to facilitate faster approvals for new infrastructure and renewable energy projects.

The one-stop-shop facility should be linked to the GIS DCI database held by the RDNCC to facilitate processing and ensure that spatial data are captured. This would greatly facilitate enforcing infrastructure sharing and Dig Once policies.

Once fully actualised, the DIOSS should accommodate a single application form, non-sequential processing of applications to different government entities and a tracker indicating progress to applicants.

Implementation lessons can also be gleaned from other jurisdictions. For example, the GatiShakti Sanchar Portal[64] – launched by the Government of India in May 2022 – is a collaborative institutional mechanism for all stakeholders, including different levels of government and service providers, intending to facilitate the right-of-way application process through a single interface.

13.4 Affordability of services

13.4.1 Introduction

This section focuses on the third element of UMC:

- Availability for use;
- Quality of the connection;
- Affordability of services;
- Affordability of devices;
- Skills; and
- Safety and security.

The ability to afford the costs associated with getting online is one of the main barriers to achieving UMC. The following recommendations relate to the recurring cost of accessing electronic communication services, noting that:

- The cost of devices and upfront connection costs are covered in the next section.
- Affordability is also a supply-side issue in the sense that reductions in the cost of deploying, operating and maintaining digital infrastructure should lead to retail price reductions. This aspect is considered in the section on the availability of digital infrastructure.
- Affordability must be considered not just in terms of cost but also in relation to the quality of service.

[64] https://gatishaktisanchar.gov.in/

Recommendations are made in respect of four complementary service affordability interventions:

- Implementing a free basic data allowance (FBDA);
- Zero-rating of content;
- Reducing the cost to communicate; and
- The e-Rate discount for schools.

13.4.2 Baseline 2025

There are numerous initiatives to reduce the cost to communicate. These include the following:

Free basic data

Provisions of the NIP2050 and the Next Generation Radio Frequency Spectrum Policy for Economic Development 2024 create a policy framework for the implementation of a free basic data allowance and deem access to connectivity as essential for social and economic inclusion. The NIP2050 targets all households that have access to a monthly grant of 10 GB by 2023/24 and 50 GB of data each by the end of March 2026.

No formal implementation has been undertaken.

Electronic Communications Amendment Bill 2023

The Electronic Communications Amendment Bill 2023 (ECAB2023) was developed by the DCDT, ICASA and the Competition Commission as the vehicle for the implementation of recommendations made by the commission in its 2019 Final Report of its Data Services Market Inquiry (DSMI) to promote competition, enablement of MVNOs and reduction of the cost to communicate. A draft version of the ECAB2023 was circulated for public comment in 2023.

In July 2025, the DCDT confirmed in Parliament that the ECAB2023 had been withdrawn in favour of an overall review and alignment of sector legislation, including the ECA. Once finalised, amendments must be operationalised through ICASA regulation-making processes, which also involve public participation and will likely extend the implementation period for a number of years.

Zero-rating of access to content and government services

Vodacom, MTN, Rain, Telkom Mobile and Liquid Intelligent Technologies are obliged to implement zero-rating of public benefit organisation mobile content – including gov.za mobile sites – as part of the conditions of the spectrum licences awarded in March 2022. This must be implemented by 15 January 2027. In many cases, zero-rating of sites is already taking place.

ICASA's e-Rate Regulations

These regulations oblige licensees to offer a 50% discount on Internet services to specified public service institutions, including schools. The regulations are, however, not enforced and observed only on a voluntary basis. ICASA abandoned a review of its e-Rate Regulations a number of years ago, contributing to the uncertainty around the status of this obligation.

ICASA Cost to Communicate Programme

ICASA's programme to reduce the cost to communicate includes:

- Achieving effective reductions in the cost of voice calls through regulation of wholesale call termination rates. A new set of reductions – likely to be the last – came into force on 1 July 2025.
- Intervening to increase transparency and competition in mobile broadband markets through its Mobile Broadband Services Regulations 2021[65]. As of July 2025, these regulations have not been implemented due to a High Court review proceedings initiated by MTN.
- Enforcing changes to the way in which voice and data bundles are consumed, roll-over and expire and reducing out-of-bundle charges through its End-User and Subscriber Service Charter Regulations.

[65] Available from https://www.ellipsis.co.za/wp-content/uploads/2021/07/Mobile-Broadband-Services-Regulations-2021.pdf

Competition Commission Data Services Market Inquiry

The Competition Commission provided an update on the outcome of its DSMI to the Portfolio Committee for Communications and Digital Technologies in February 2025[66].

The commission pointed to the following successes:

- Settlements were negotiated with Vodacom/MTN to reduce monthly prepaid data prices by 50%, provide basic daily free data and zero rate access to all educational and government services.
- This resulted in price reactions from Cell C and Telkom Mobile. The Competition Commission estimates that R4 billion was saved by low-income consumers in the first year after the Final Report, with subsequent savings increasing due to second-year price decreases.
- Over 1 100 sites were zero-rated.
- Openserve restructured and reduced wholesale fibre prices.
- Recommendations regarding MVNO and other obligations were incorporated into ICASA's March 2022 spectrum auction.

As noted earlier, the implementation of recommendations made by the Competition Commission for pro-competitive amendments to the ECA were delayed with the withdrawal of the ECAB2023.

Mobile Virtual Network Operators

As of June 2025, the MVNO market continues to expand, while competition at the wholesale level has also broadened with the entry of Vodacom and Telkom Mobile (alongside Cell C and MTN) as host networks for MVNOs.

Medium-Term Development Plan 2024-2029

The MTDP 2024, adopted in February 2025, includes the following targets through to the end of March 2029:

Intervention indicators	Intervention baseline	Mid-term targets	End-term targets	Lead department
Affordability of devices and data	30% reduction in cost of data	174 216.41	33 453.93	222 985.19
Improve SA ranking in ICT Development Index (IDI), WEF global competitiveness report, UN e-Gov Survey	Current rankings	15% improvement in key rankings	30% improvement in key rankings	DCDT

International affordability metrics

The Broadband Commission for Sustainable Development target for affordability – set in 2018 – states that by 2025, entry-level broadband services should be made affordable in developing countries at less than 2% of monthly GNI per capita.

[66] Highlights of the Competition Commission's work on Communications & Digital Technologies, available from https://www.ellipsis.co.za/wp-content/uploads/2020/12/250211_Final_CC_presentation.pdf

13.4.3 Free basic data allocation

Access to digital infrastructure and the internet by citizens requires access to "data" and therefore the government deems access to "data" as a basic need to access the internet, as an essential means for social and economic inclusion for all citizens.[67]

The affordability analysis undertaken as part of the study shows a significant proportion of South African households will require some form of assistance to afford meaningful connectivity. It has long been recognised by national policy that, irrespective of progress in reducing the cost to communicate, UMC will not be achieved without an effective intervention to assist indigent households to afford both the connectivity and appropriate devices to utilise it.

This intervention complements ongoing efforts to reduce the cost to communicate.

Policy and legislative framework

As summarised in the following table, the relevant policy prescripts are already in place and relatively recent.

Table 13-3: List of in place and recent policy prescripts

ICT White Paper 2016	• People with limited or no income require targeted interventions to make ICTs affordable. • Where regulatory interventions and competition fail to bring prices down sufficiently to meet the needs of those with limited or no income, the government will intervene and provide end-user subsidies through monies collected for the Digital Development Fund.
National Infrastructure Plan 2050	• Consideration of free basic data for low-income users, similar to free access to water and electricity[68]. • Government e-enablement to be leveraged to promote a digital society and universal connectivity, with a target of 10 GB to home by 2023/24 and 50 GB to home by 2025/26[69].
National Radio Frequency Spectrum Policy 2024[70]	• The MCDT must develop a regulatory reform to facilitate receipt of a monthly allocation of free basic data for indigent households and other qualifying beneficiaries. This is to be done within the context of radio frequency spectrum assignment and management. • Determinations about who qualifies are to be set out in regulations to be subsequently developed by ICASA. • The free basic access data to be provisioned and the size of this allowance per household are to be determined by the Minister through a regulatory framework/ policy directive in consultation with ICASA.

There is explicit policy recognition that a measure to support indigent households is necessary to achieve UMC.

The provisions of the ECA relevant to this issue have yet to be implemented. Under the ECA, USAASA is required to make recommendations to the Minister at least every two years, after conducting a public participation process, to allow the Minister to publish determinations on:

- Types of needy persons to whom assistance may be given;
- The persons who must apply for assistance; and
- Persons to whom subsidies may be paid.

No formal determinations have been made.

[67] National Radio Frequency Spectrum Policy 2024, para 22(c)
[68] NIP2050, p.53
[69] NIP2050, p.51
[70] The situation of a policy framework for the development of a free basic data allowance as part of the National Radio Frequency Spectrum Policy is not ideal in that it limits the mechanisms for implementation to radio frequency spectrum licences. As set out later, it may be preferable to use mechanisms applicable to all licensees such as the contribution to the USAF.

Free water and electricity as models

Free basic services (FBSs) to indigent households are not a novel concept. The NIP2050 references models used for delivering a free basic water and free basic electricity grant. South Africa adopted an indigent policy in 2001 intended to provide FBSs to poor households, implemented at municipal level.

Municipalities are required to identify qualifying indigent households according to their own criteria and resources and to vet registration applications received from households. Municipalities can also decide on the extent to which they subsidise an indigent household. A register of indigent households should be created and maintained with a regularly updated version submitted to COGTA.

Provisioning of this FBS has not been without challenges, creating learnings for the roll-out of a free basic data allowance.

However, it should be noted that there are material differences between the FBS and the proposed FBDA intervention:

- While national policy positions access to connectivity as a basic human need and utility-type service, it is one predominantly delivered by the private sector as well as SOEs which have a for-profit mandate. A mechanism is required to place appropriate obligations (and cost recovery where appropriate) on those who deliver data services.
- The FBDA is applied through a national government intervention as opposed to a local government intervention.

Qualification criteria for determining households that qualify for an FBDA

There is an existing body of work undertaken by ICASA and the DCDT during the digital migration process, which could potentially be applied to this determination.

Qualification criteria could be derived from:

- The Municipal Indigent Register hosted by COGTA, noting that not all municipalities have enacted FBS or maintain an updated register.
- StatsSA publications setting out the legal definition of indigent income.
- Data held and lessons learnt in respect of the STB subsidy and other government programmes targeting indigency.
- Qualification criteria for government grants such as the Social Relief of Distress (SRD) Grant.
- Data made available through this study and the overlay of digital infrastructure availability maps with affordability.

As noted, the ECA currently provides for USAASA to make recommendations to the Minister, allowing him or her to determine who would qualify for support as a needy person.

Neither ICASA nor USAASA should be responsible for determining the criteria to qualify for the FBDA. This is a silo approach which fails to leverage the existing body of work and practice by other government departments and agencies to make this determination and deliver basic services.

Further, while ICASA and USAASA should arguably play a role in determining under-serviced areas in respect of electronic communications infrastructure and services, they are not well-placed or appropriately resourced to make determinations relating to indigency.

Distribution of the FBDA

A possible mechanism would be to link the FDA to an existing national government grant, such as the SRD Grant. Persons who qualify for the SRD Grant could be deemed to qualify for the FBDA.

The SRD Grant would be supplemented with a voucher for a determined amount of data that can be redeemed with any service provider, which the grant recipient has access to. This could be a mobile network operator, low-cost fibre network, wireless Internet service provider or reseller of these services within local communities.

Digital delivery of the voucher would enable efficient distribution and tracking of voucher redemption. Mobile network operators and low-cost fibre providers already utilise voucher and token systems for purchasing prepaid access on their networks.

Importantly, the Digital Transformation Roadmap, forming part of Phase 2 of Operation Vulindlela, includes an intention to use technology to address issues such as fraud and exclusion in the SRD grants. This may represent an opportunity to integrate the FBDA as a digital voucher.

Government roles and responsibilities

Under the National Radio Frequency Spectrum Policy 2025:

- The MCDT must develop a regulatory reform to facilitate indigent households and other qualifying beneficiaries, which are to be determined through regulations, to receive a monthly allocation of free basic data.
- The free basic access data to be provisioned through the users of the spectrum for community use and the size of the free basic access data per household are to be determined by the Minister through a regulatory framework/policy directive in consultation with the authority.

Determining the size of the free basic data allowance

Under the National Radio Frequency Policy 2024, the MCDT is responsible for determining the free basic access data to be provisioned to users of the spectrum for community use and the size of the free basic access data per household through a regulatory framework/policy directive in consultation with the authority.

This determination of the size of the FBDA should be based on an existing international instrument, such as the publications of the ITU Expert Groups on Telecommunication/ICT Indicators[71]. The Expert Group on Telecommunications/ICT Indicators plays a critical role in ensuring that the measurement framework remains relevant and updated, accounting for shifting usage patterns, technological advancements and user expectations.

Funding the free basic data allowance

Three options are presented for funding the free basic data allowance.

Universal Service and Access Fund

The USAF was always conceived as the manner to fund support to needy persons / indigent households. The ECA explicitly authorises USAASA to apply money in the USAF for the payment of subsidies for the assistance of needy persons towards the cost of the provision to, or the use by, them of broadcasting, electronic communications network services and electronic communications services[72].

Over the past decade, this has found expression in the subsidisation of set-top boxes for indigent households during the broadcast digital migration process.

All ECNS and ECS licensees currently pay an annual prescribed contribution based on revenue from licensed activity to the USAF. ICASA is required to prescribe, through regulation, the basis and manner of determination of this contribution, which “must not exceed 1% of the licensee’s annual turnover or such other percentage of the licensee’s annual turnover as may be determined by the Minister after consultation with the affected parties”[73].

The current contribution level of 0.2% of annual turnover derived from the licensee’s licensed activity, less service provider discounts, agency fees, interconnection and facilities leasing charges and government grants and subsidies, was set by ICASA in 2011 and has not been reviewed since.

Once ICASA has received payment of licensee contributions, USAASA – as required by subsection 89(4) of the ECA – must collect all money that is due and payable to the USAF from the authority.

Currently, however, the practice is for ICASA to pay licensee contributions received to National Treasury. The latter then makes an allocation to USAASA and the USAF based, among others, on the budgetary requirements provided.

[71] https://www.itu.int/en/ITU-D/Statistics/Pages/expertgroups.aspx
[72] ECA ss88(4)
[73] ECA ss89(2)(a)

Notwithstanding the characterisation of the USAF contribution as being for the specific purpose of funding universal service and access objectives, and the clear wording of section 89(4) of the ECA, it is treated as a general tax[74]. Importantly, this breaks the link between the level of the contribution and the funding of the USAF.

The USAF contribution is paid by all ECS and ECNS licensees rather than only the MNOs. This is equitable where the FBDA is available on fixed and mobile networks.

Discussion: Should the USAF contribution level be increased?

A Global System for Mobile Communications Association (GSMA) review of universal service funds (USF) in Africa, published in October 2023[75], shows South Africa as having the lowest contribution rate (0.2%) among African countries which impose this levy, with Chad the highest at 3.5%. The GSMA notes that there is no one-size-fits-all approach to determining an appropriate contribution rate, with consideration given to:

- The access gap that the fund seeks to address;
- The investment required to close this gap over a period;
- The capacity of the USF authority to implement various aspects of USF projects (such as project design and performance monitoring) over the same period; and
- The capability of service providers to sustain a given level of contribution in view of other capex and opex requirements.

In South Africa, as discussed earlier, there is no direct relationship between the total quantum of the USAF contribution and the amount that is disbursed to the USAF by National Treasury. It follows that increases in the contribution rate constitute an additional general tax payable by licensees which is not directly applied to meeting UMC policy objectives or funding the FBDA.

In this context, it is difficult to have a conversation about increasing the contribution level and any increase is likely to be passed on directly to subscribers by licensees. The benefit of any increase in the contribution rate must, at the very least, outweigh the impact on the cost to communicate.

While it remains feasible to fund the FBDA and other universal service projects through allocations by National Treasury, it will be difficult to consider an increase in the USAF contribution as a specific FBDA funding mechanism without:

- Finalising the disestablishment of USAASA and associated reforms to create the DDCF; and
- Creating or restoring the direct link between USAF contributions and funding available for universal service interventions through the fund.

The inability of USAASA to deliver on its mandate is discussed in the section on Institutional Arrangements, as is the plan to disestablish it and refresh the mandate of the fund as provided for in Chapter 5 of the ICT White Paper 2016. This process must be accelerated as a new approach and new institutional structure performing the functions currently assigned to USAASA are critical to any process to vary the contribution rate.

Obligations on IMT spectrum licences

[74] According to the DCDT, the funds allocated to the USAF by National Treasury since its establishment slightly exceed the total USAF contributions made by licensees through ICASA. This is mainly attributable to allocations made for the broadcasting digital migration process made since 2016.

[75] Universal service funds in Africa Policy reforms to enhance effectiveness, available from https://www.gsma.com/about-us/regions/sub-saharan-africa/wp-content/uploads/2023/10/USF-Africa.pdf

As noted earlier, the National Radio Frequency Spectrum Policy sets out a framework for an FBDA to be implemented within the context of the use, management and licensing of the radio frequency spectrum. While this approach is identified as self-limiting, the relevant implementation mechanisms would be:

- Imposing this obligation during the process to renew IMT900, IMT1800 and IMT2100 radio frequency spectrum licences issued to Vodacom, MTN, Cell C, Telkom, Liquid and rain. This must occur in 2028/29.
- Conducting a second high-demand spectrum auction during the 2027/28 financial year. Assuming the necessary groundwork has been done, provision can be made for the FBDA to be implemented through an obligation on successful licensees.

In our view, these **are not suitable levers for implementing the FBDA**. Firstly, this approach limits participation as service providers in the FBDA to a very small sub-set of spectrum licensees. Secondly, the FBDA should be redeemable on any chosen network, limiting it to the FBDA limits consumer choice. Thirdly, the FBDA is a demand-side vehicle. Such a mechanism implemented via the FBDA risks baking in existing market shares as individuals may feel they may not churn between networks.

Implementation

Responsible parties	MCDT in consultation with USAASA and ICASA
Other direct government stakeholders	Presidency (Operation Vulindlela, DPME) Department of Social Development (DSD) SASSA
Enabling legislation	Subsection 3(1)(b) of the Electronic Communications Act 2005 *3. Ministerial Policies and Policy directions* *(1) The Minister may make policies on matters of national policy applicable to the ICT sector, consistent with the objects of this Act and of the related legislation in relation to—* …. *(b) universal service and access policy;*
Policy objective	To address the affordability gap in South Africa by ensuring implementation of a suite of affordability interventions so that all South Africans are able to afford meaningful connectivity.
Process to be followed	USAASA to develop a business case for the FBDA and its funding requirements for submission to National Treasury.
Dependencies	No amendment of legislation or institutional rearrangement required.

13.4.4 Zero-rating

Effective zero rating of specified content and services also contributes to affordability.

Zero-rating is:

- A broad intervention applicable to all – it does not specifically target indigent households or needy persons (although that is where its value may be highest).
- A narrow intervention in that it targets access to specific content.

In South Africa, a zero-rating regime is scheduled to come into effect in January 2027, allowing free access to content approved for this purpose by ICASA. This will be available to subscribers of MNOs awarded spectrum in March 2022. ICASA has begun accepting applications from sites for their content to be included in a database of sites to which the MNOs are required to zero rate access.

Some MNOs that provided zero-rated access during the COVID national disaster have voluntarily continued this practice despite being under no obligation to do so.

ICASA published a notice outlining the process for submitting applications for mobile content to be zero rated in May 2024, including measures to mitigate against abuse, where an industry association has provided a system of managing applications to limit and avoid abuse.

Zero-rating appears to be working, and the ICASA framework will assist in formalising current zero-rating activities. It is recommended that:

- ICASA, as soon as possible, publish and maintain an authoritative list of sites with zero-rated access and take active steps to draw the attention of potential beneficiaries to the existence of this resource.
- Consideration be given to extending zero-rating obligations to all ECS licensees as part of the licence renewal process that will take place between 2027 and 2029. Note that zero-rating has no impact on uncapped services which are predominantly fibre-based.
- Consideration be given to whether the current deadline can be moved forward.
- Alignment with the Digital Transformation Roadmap to ensure that gov.za and government e-services portals are zero-rated.

13.4.5 Mobile Virtual Network Operators

The market for MVNOs has grown substantially over the past three years, resulting in a reduction in the cost to communicate with specific reference to voice and data services. Users of these services have unprecedented choice, and while it is notable that many MVNOs are not traditional ICT companies, they are strong local financial services or retail brands with excellent distribution networks.

This growth has happened in the absence of any legislative or regulatory framework intended to enable this market and the competition which results. The draft Electronic Communications Amendment Bill 2023 included a chapter intended to provide this framework but as noted above, this bill is being reconsidered, and there is no clarity on when any future provisions intended to facilitate MVNO competition will come into effect.

ICASA's approach to MVNOs is restricting rather than promoting this competition. The regulator has adopted a position that it does not regulate MVNOs as they are licence-exempt resellers. Further, ICASA's regulations governing access to numbering resources were amended in 2023 to prevent MVNOs from applying for and receiving mobile numbers. As a result, MVNOs in South Africa can only operate as 'branded resellers' and not as 'full MVNOs', i.e. they are artificially restricted to the lowest rung of the value chain as a branded reseller due to ICASA regulation.

Table 13-4: Differences between a branded reseller and a full MVNO

	Branded reseller	Full MVNO
Focus	Marketing and selling mobile services under its own brand (or co-branded with the MNO)	Operates its own core network and manages its own SIM cards, numbering and routing
Control	Relies entirely on the MNO for network services and infrastructure	Has significant control over core network operations and service delivery
Responsibilities	Sales, customer care, and potentially some billing	Manages its own core network, SIM management, and potentially some aspects of radio access network
Pros	Quick market entry, minimal technical overhead, and lower upfront costs	Greater control over service customisation, potential for unique service offerings, and higher revenue potential
Cons	Limited control over network performance and service customisation	Higher upfront costs, greater technical complexity, and more significant operational challenges

Full MVNOs – while still reliant on infrastructure provided and spectrum allocated to host MNOs – compete directly with MNOs and have greater scope for innovation and price reductions as they are not merely reselling voice minutes and data packages from the host MNO.

It is recommended that ICASA take steps to amend its Numbering Plan Regulations 2016 to align them with the applicable ITU Recommendation and ensure that the full benefits of MVNO competition can be realised in South Africa.

Responsible party	ICASA
Other direct government stakeholders	DCDT
Enabling legislation	Section 4 read with Chapters 3 and 11 of the Electronic Communications Act 2005.
Policy objective	To amend the Numbering Plan Regulations 2016 to allow licensees or licence-exempt persons to apply for and be allocated mobile numbers where they have an appropriate agreement with the holder of a local IMT spectrum licence that allows such licensee or licence-exempt person to lawfully offer a mobile service, so as to be aligned with ITU Recommendation E.212.
Process to be followed	ICASA to develop draft amendments to the Numbering Plan Regulations 2014 and to finalise these, subject to the required public participation process.
Dependencies	None
Estimated timeline for finalisation	6-12 months from date of initiation.

13.4.6 Public Free Wi-Fi

Another intervention directly relevant to the affordability element of UMC is the provision of public, free Wi-Fi services. While several government and private sector free or subsidised Wi-Fi initiatives have come and gone, the Western Cape Government has implemented a sustainable model. The service is accessed by nearly half a million devices daily, each receiving up to 6 GB of free Internet data per month, and is available at 1 600 sites, including public schools, clinics and libraries. Each site typically runs on a 10 Mbps line, but this can be increased in increments of 10 Mbps up to 100 Mbps, based on usage patterns, the number of access points (APs), and the end user's quality of experience.

The Competition Commission made firm recommendations regarding public free Wi-Fi in its Data Services Market Inquiry Final Report, noting that community gathering points such as transport centres should be targeted.

However, technologically, although public Wi-Fi services represent a suitable tool to connect individuals to the Internet, such hot spots cannot (yet) provide households with an always-on 100 Mbps service.

13.4.7 The e-Rate

The requirement for licensees to provide Internet services at a discounted rate of 50% to public health institutions, schools, colleges, and further education and training institutions can play an important role in ensuring the affordability of these services for PSIs on a sustainable basis. This obligation applies to all ECNS and ECS licensees and is complementary to obligations to connect PSIs specified in licences issued pursuant to the March 2022 spectrum auction.

It is recommended that ICASA re-establish the process of drafting the e-Rate regulations. It should also be noted that USAASA is also empowered under the ECA to pay for Internet services on behalf of PSIs and to claim the e-rate discount from the service-providing licensee or licensees.

Responsible party	ICASA
Other direct government stakeholders	DCDT DBE
Enabling legislation	Section 4 read with section 73 of the Electronic Communications Act 2005.
Policy objective	To amend the e-Rate Regulations.
Process to be followed	ICASA to develop draft amendments to the Numbering Plan Regulations 2014 and to finalise these, subject to the required public participation process.
Dependencies	None
Estimated timeline for finalisation	6-12 months from date of initiation.

13.4.8 Government to government connectivity fees

Any fee one arm of government levies to another for services should typically be cost-recovery to ensure value for money. This section outlines why the fees currently levied between government entities warrant further exploration.

13.4.8.1 SITA

The State Information Technology Agency (SITA) operates primarily as a Layer 3 service provider within the Open Systems Interconnection Model. This functionally positions it as a provider of routing, IP-based connectivity and value-added network services – essentially, acting as an ISP to government departments. It is not directly responsible for physical transmission (Layer 1) or data-link services (Layer 2), and it does not own or operate the last mile infrastructure.

Further, each government department is responsible for the software systems, data governance, and application-layer services that are executed over SITA-provided network links. While SITA may provide hosting, cloud, or support services under separate contracts, data management and system integrity remain the domain-specific responsibility of the departments themselves.

Pricing benchmark and infrastructure ownership

Market pricing considerations

Given that SITA does not own the last-mile infrastructure and primarily resells or integrates connectivity through upstream Layer 2 and Layer 1 service providers, its Layer 3 offering should be cost-benchmarked against equivalent market services from private ISPs providing enterprise IP-VPN, MPLS, or DIA services. There is no structural justification for premium pricing beyond the cost recovery and service integration markup, unless value-added services (e.g. cybersecurity, cloud access, SLAs) are bundled.

Value proposition assessment

Where SITA's cost exceeds comparable market offerings, the burden of justification must fall on:

- Specific government-mandated security compliance requirements;
- Economies of scale or centralised procurement advantages; and
- Cross-subsidisation to support universal access or rural delivery mandates.

Absent these, cost parity with private sector equivalents should be the baseline expectation under National Treasury norms for cost-efficiency and value for money.

Contractual and operational implications

As noted, network Layer 3 service charges and fees are often captured under separate line items or contractual arrangements distinct from application level or systems integration services. This segmentation is vital for:

- Transparent cost accounting;
- Avoidance of double-billing; and
- Proper allocation of opex vs. capex across IT budgets.

Vendor-neutral access

Given that SITA does not control the physical infrastructure, departments should not face barriers to accessing equivalent Layer 3 services from competitive providers, subject to compliance with security, integration and procurement regulations.

Implementation

Responsible party	DCDT, SITA, ICASA
Other direct government stakeholders	SITA client departments (e.g. Home Affairs) National Treasury
Enabling legislation	*SITA Act, as amended* *Public Finance Management Act, as amended* *Electronic Communications Act, 2005 as amended* *Competition Act, 1998 as amended*
Policy objective	To ensure that government departments pay cost-reflective prices for broadband connectivity services.
Process to be followed	SITA to provide the fee charged per Layer 3 service to ICASA (SITA holds an Individual Electronic Communications Services licence and is therefore obliged to lodge its tariffs with ICASA). ICASA to compare the tariff list to comparable connectivity service offerings, including those offered by SITA's connectivity services providers. ICASA to conduct a value-for-money assessment received by government client departments (including a review of Service Level standards).
Dependencies	None

13.4.8.2 BBI

The fees levied by BBI for school connectivity must be reviewed and amended urgently. The current fee level reported by the DBE represents a significant constraint to the introduction of digital technologies in the schooling system.

Furthermore, it is unknown whether BBI is the only network that could provide services to any particular school where such levies are currently being charged.

Responsible parties	DCDT, ICASA, BBI
Other direct government stakeholders	DBE
Enabling legislation	*Public Finance Management Act, as amended* *Electronic Communications Act, 2005, as amended*
Policy objective	To ensure that all schools connected under the SA Connect programme pay affordable and market-comparable fees for broadband connectivity services.
Process to be followed	ICASA to map the location of schools served by BBI to the existing private sector network infrastructure to determine whether BBI is the only potential service provider (all technology service providers). Where a private sector service provider could connect a school, BBI's retail price should be restricted to the maximum retail price that the alternative supplier would charge for the same level of connectivity. Where BBI is the only possible service provider for the defined required service, BBI may not charge more than the national average of a similar connectivity service.
Dependencies	Note that BBI is effectively providing an Electronic Communications Service, a licence which BBI does not hold. Further, BBI is obliged to comply with the e-Rate legislative provisions, discussed earlier.

13.5 Devices

This section focuses on the fourth element of UMC:

- Availability for use;
- Quality of the connection;
- Affordability of services;
- Affordability of devices;
- Skills; and
- Safety and security.

The Minister of Communication and Digital Technologies has made device affordability a core priority of his tenure. An initial success is the removal of the ad valorem excise duty on lower value smartphones (<R2 500) effected through the 2025 National Budget. Although this amounts to a small reduction in the cost of these devices, it is an important statement of intent by government.

Industry has also recognised that device affordability is key to uptake and optimal usage of its current and future services. MNOs have always adopted innovative financing mechanisms to allow consumers to purchase handsets and MTN's initiative to make heavily discounted 4G capable handsets available at a R99 pricing point is a recent example of this focus shifting to the bottom end of the market.

Other initiatives to address access to devices include:

- A feasibility study on device affordability being undertaken by the World Bank and the GSMA subsequent to an engagement with the MCDT in February 2025.
- Efforts to establish local industries for the design and assembly of devices as articulated in the Digital Economy Masterplan.
- Digital skills development programmes helps to build consumer confidence in owning and using smartphones.
- Smartphone adoption is also an area of renewed focus internationally, with the GSMA, World Bank, and other global institutions announcing a new coalition to improve handset affordability for lower-income populations in July 2024.

- The Broadband Commission's Working Group Report on Smartphone Access Strategies towards Universal Smartphone Access outlines interventions to be considered.

Table 13-5: Recommendations from the Broadband Commission on smartphone access strategies

Financing	• Allow customers to choose the frequency of their instalments to enable them to control their finances and increase confidence in loan repayments. • Design targeted financing for marginalised communities, such as women, people from remote locations, and low-income individuals. • Integrate device financing initiatives with mobile money to support customer repayment practices and provide potential financiers with creditworthiness data. • Use device lock technologies to reduce the cost of device financing. • Increase customer engagement with the financing service and guiding them through the whole process of acquiring and using a smartphone.
Taxes and import duties	• Design tax reforms to consider the benefits of mobile broadband penetration. • Set a long-term, balanced approach to taxation to meet domestic revenue collection objectives and provide a conducive environment for digital inclusion and economic development. • Examine the total cost and net impact of mobile ownership when designing tax reforms. • Reduce taxes for devices below certain thresholds to incentivise smartphone manufacturers to cut prices to make their smartphones eligible for tax reduction/ exemption.
Distribution channels	• Partner with local retail chains and community organisations with whom local customers already have high levels of trust. • Invest in training sales agents so they can effectively assist customers through the process of smartphone purchase and acquisition. • Provide agents with sample handsets to help first-time and price-sensitive customers decide on smartphone purchases.

Source: Broadband Commission (2022)

In addition, the Broadband Commission is developing new strategies to:

- Create partnerships across the digital value chain;
- Improve regulation and quality standards for pre-owned smartphones;
- Develop strategies to recycle mid- and low-tier price band devices;
- Explore the use of universal service funds and government subsidies; and
- Model the benefits of reducing tax and import duties.

In our view, interventions to improve access to smartphones will be largely driven by industry, which is motivated to grow its current and future market, particularly as MNOs locally and internationally migrate away from 2G and 3G services. The majority of the proposed interventions outlined by the Broadband Commission and others are aimed at industry.

Further, convergence between the telecoms and financial services industries is making innovative funding for handsets easier to realise. In South Africa, the mobile networks are embracing mobile money and other financial services, while the entry of most of the major banks into the MVNO market allows for heavily discounted handsets.

In this context, the current focus of government on reducing taxes on low-end smartphones and developing local production capacity under the Digital Economy Masterplan framework is appropriate. Additional demand-side measures could include:

- A public drive to promote the donation and recycling of used smartphones no longer required by their owner due to contract upgrades or other reasons.
- Implementing effective strategies to tackle handset theft and the trading of counterfeit devices[76] .

Strategies also need to be developed with regard to devices other than handsets, particularly:

- Tablets and computers required for education and learning; and
- Customer premises equipment for the receipt of fixed broadband services.

[76] Improving handset affordability in low- and middle-income countries, GSMA 2024. https://www.gsma.com/solutions-and-impact/connectivity-for-good/mobile-for-development/wp-content/uploads/2024/10/Policy-Brief-Improving-handset-affordability-in-LMICs.pdf. See also Affordable Devices for All: Innovative Financing Solutions and Policy Options to Bridge Global Digital Divides, Rami Amin and Doyle Gallegos 2023. https://documents1.worldbank.org/curated/en/099080723143031193/pdf/P1737510ac79240b90aaa10618d282c1780.pdf

Interventions for the provision of devices or access to devices for needy persons / indigent households can also be funded from the USAF.

13.6 Skills

This section focuses on the fifth element of UMC – skills, particularly, those related to digital literacy and skills development.

- Availability for use;
- Quality of the connection;
- Affordability of services;
- Affordability of devices;
- Skills; and
- Safety and security.

The research shows that South Africa is lagging behind in digital competitiveness, largely because of a poor digital skills development pipeline. The Employment Readiness Index confirms this finding. The significant volume of skills development initiatives across government and the private sector illustrates a significant level of momentum to resolve this challenge.

However, NEMISA reports that although its projects and programmes do have a significant impact on the future employment levels of students, the scale of the current programmes is too small to make a discernible impact, and current SETA accreditation processes are a bottleneck, particularly for not recognising the micro-skills certification and development trends within the ICT sector.

The scale of resolving the skills development debate is substantial and requires a coordinated government approach. A skills development pipeline is exactly that, a pipeline. Such development occurs over years and even decades (e.g. the Indian Government's 1970s strategy to develop STEM and IT skills is bearing fruit now as India has become an outsourcing powerhouse).

Developing a long-term Digital Skills Strategy needs to begin with the basics. The DBE has started with the Professional Development Framework for Digital Learning, but what is missing in this back-to-basics approach is proper data on the level of ICT proficiency of teachers in the education system. Many stakeholders intimated their willingness to assist in training initiatives (if well structured), and EIPP agreements have played a significant role in sourcing the funding required.

The first step towards developing and implementing a revised digital skills development pipeline is to establish the baseline – how many teachers are suitably trained to teach ICT and digital skills?

The minimum recommendation is that the DBE supports the DCDT and ICASA in compiling the requisite core ICT indicators that refer to education.

More importantly, however, would be to review the roles and responsibilities for digital skills development of government departments related to the resources and impact each department may have. Leveraging budgets and facilities is crucial in this environment, where the relevant departments responsible for teaching and learning are major role-players. The DBE is responsible for Early Child Development through to the completion of secondary schooling. This responsibility includes having access to training and education facilities country-wide, as well as access to a body of educators to equip young South Africans to enter the digital world. The DHET is equipped with resources, facilities and institutions to expand digital education and training at post-secondary schooling levels. This not only includes public universities but all the TVET colleges and sector education and training authorities.

Implementation

Responsible party	The Presidency
Other direct government stakeholders	• DBE • DHET • Department of Employment and Labour • DCDT • SALGA
Enabling legislation	*N/A*
Policy objective	• To define the departmental roles and roles and responsibilities at each stage of the digital skills development pipeline for South Africa from early childhood development to life-long learning. • To consolidate the total government budget allocation to digital training and learning initiatives. • To develop a performance monitoring system that tracks the progress of individuals from the moment of labour market entry to obtaining secure income opportunities (particularly relevant for post-secondary schooling interventions).
Process to be followed	This process of review should consist of assessing the current state of progress/implementation of all digital skills development initiatives underway by government, followed by a review of institutional capacity for future implementation.
Dependencies	Nil
Estimated timeline for finalisation	This process will likely require intergovernmental consultations, engagement with FOSAD and engagement with civil society structures. This initiative may lead to the movement of entities or teams of staff from one department to another. Therefore, while the initial review and decision on roles and responsibilities may require a six-month period, actual implementation of such a change may take between two and three years.

13.7 Safety and security

This section relates to ensuring that South Africans can use connectivity and access services and applications in a safe and secure manner. It does not form part of DCI but is an important aspect of encouraging uptake of services, i.e. an unsafe and unsecured environment disincentivises use of online services and applications.

Achieving UMC will result in a substantial number of new users of online services. Ensuring they can use online services without being the victim of fraud, disinformation, or other criminal or harmful conduct requires a multi-layered approach involving government, service providers, civil society, business, schools and users.

The following initiatives are noted:

- Cybersecurity legislation is under development, with a draft bill circulated for limited comment in 2024. No clear timelines are available for the introduction of this legislation to Parliament. There are industry computer security incident response teams (CSIRT) active in the banking, mobile network operator, ISP, educational, state security and other sectors. The Cybersecurity Hub acts as the national CSIRT and is housed within the DCDT.
- The Regulation of Interception of Communications and Provision of Communication-related Information Act 2002 (RICA) – which governs SIM card and user registration as well as lawful intercept in South Africa – is currently being comprehensively reviewed by the Department of Justice and Constitutional Development. No clear timelines are available for the introduction of amending legislation to Parliament.
- The Cybercrimes Act 2020 provides for the investigation and prosecution of defined cybercrimes, including criminalising certain malicious communications and non-consensual sharing of intimate images. This Act also governs requests for information from law enforcement agencies to service providers such as mobile network operators and ISPs.
- The Protection of Personal Information Act 2013 creates a comprehensive framework for the protection of personal information of data subjects, overseen by an independent Information Regulator. This legislation is aligned with the EU General Data Protection Directive and includes a compulsory requirement to notify affected parties of security compromises involving personal information.

- The DCDT has developed national policy on audio and audio-visual content services, which includes specific provisions relating to online safety.
- The Films and Publications Act 1996 provides the Film and Publication Board (FPB) with powers to combat the manufacture and distribution of child sexual abuse material and creates offences in respect of cyberbullying and other online harms. The FPB plays an active role in creating awareness around online safety issues in schools and communities.
- The Domestic Violence Act 1998 allows a judicial officer to order the take-down of content found to constitute or be evidence of domestic violence.
- The Electronic Communications and Transactions Act 2022 creates a take-down notice mechanism, which is used to remove three to four locally hosted harmful sites every week. This Act and the Consumer Protection Act also contain protection for e-commerce consumers and rules about direct marketing using electronic communications.
- Skills development and digital literacy training programmes are important in creating user awareness of being safe and secure online.
- The South African Law Reform Commission has made comprehensive recommendations on steps to be taken to provide greater protection to children from adult experiences when online.

Comprehensive recommendations on the safety and security element of UMC are beyond the scope of this report. Nevertheless, the following interventions are raised for consideration:

- There is a policy gap regarding cybersecurity which requires addressing. Cybersecurity legislation must be finalised as quickly as possible.
- The law relating to cybercrimes and online harms (e.g. cyberbullying, non-consensual sharing of intimate images, disinformation, deepfakes) is fragmented between the Cybercrimes Act, the Films and Publications Act and the Criminal Law (Sexual Offences and Related Matters) Amendment Act 2007.
- There is a need for comprehensive online harms legislation and regulation to ensure that vulnerable groups are afforded clear protection as well as affordable and accessible remedies.
- A clear approach and implementation plan must be developed targeting training and awareness at schools.
- The need to include concerns regarding safety and security in all legislative reviews and assessments of institutional capacity.

13.8 Institutional framework

The recommendations in this section relate to the institutional framework relevant to moving South Africa towards UMC.

13.8.1 Intergovernmental cooperation

The South African Government is aware of and taking steps to address intergovernmental cooperation challenges impeding infrastructure development, including the deployment and maintenance of digital infrastructure.

Note is taken of the focus of Phase 2 of Operation Vulindlela and the introduction into Parliament of the Intergovernmental Monitoring, Support and Interventions Bill 2025. This Bill provides for:

- Targeted support to provinces and municipalities in need of assistance;
- Monitoring of provinces and municipalities as to the fulfilment of their executive obligations in terms of the Constitution or legislation;
- Alternative steps to interventions to induce compliance by provinces or municipalities in undertaking their executive obligations; and
- The deployment of administrators by the intervening national executive or provincial executive.

13.8.2 Transversal benefits require transversal relationships and obligations

The transversal benefits of deploying digital infrastructure and digital transformation are well-established, and the DCDT leads these processes. More attention, however, needs to be paid to the transversal relationships which enable these benefits and the role of beneficiary government departments in articulating the benefits they wish to realise.

Challenges with the design and implementation of social obligations imposed on licensees awarded spectrum licences during the March 2022 spectrum auction illustrate the problems caused by ineffective intergovernmental cooperation and coordination.

Misalignment between DBE and DCDT/ICASA on connection speeds for schools resulted in the social obligation to connect 16 132 schools being downgraded from providing connectivity for teaching and learning to providing connectivity for administrative purposes only.

Licensees have also been provided with incomplete and/or incorrect information and reported difficulties arising from schools not being aware of the obligation to connect them or not wanting the solution.

This includes duplications, including schools already connected through an existing social obligation. Steps taken by the DCDT and the Association of Communication Technologies (ACT) – an industry body which represents affected licensees – to address implementation challenges through the formation of a dedicated project management office (PMO) have been successful and provide a model for future collaboration.

The PMO was established within the DCDT under a memorandum of understanding (MOU) signed between the DCDT and ACT in November 2024. It includes representatives from the DCDT, ACT, affected licensees, SITA, COGTA, as well as the government departments which would benefit from the social obligations (DBE, DSAC and DOH)[77].

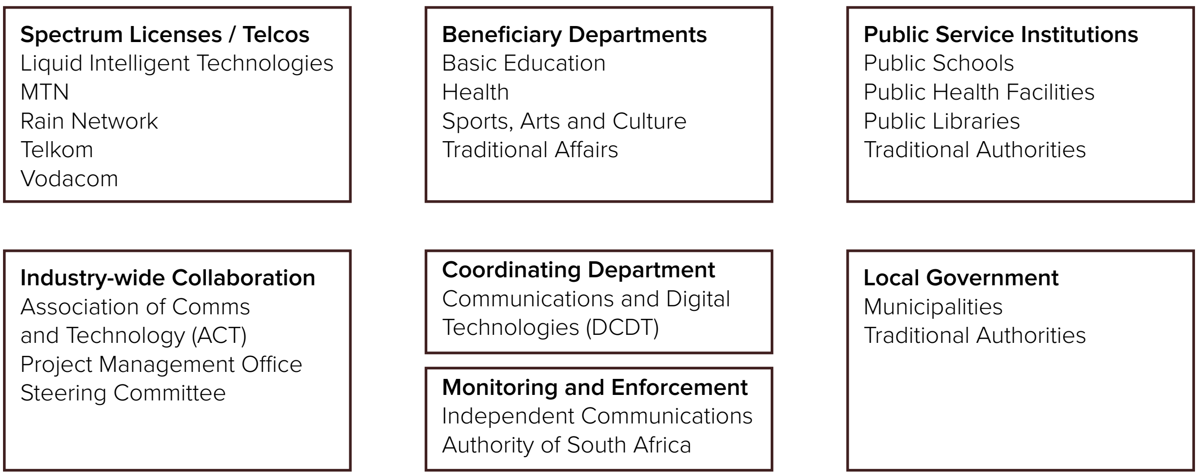


Figure 13-1: Participants in the USO Project Management Office

Source: Association of Communications Technologies

[77] ICASA is not represented due to concerns that it cannot effectively play a role as an independent regulator in enforcing the social obligations if it is involved in the PMO.

The DCDT is responsible for facilitating alignment between various government departments that affect or are affected by the implementation of social obligations. ACT serves as the primary liaison between licensees and the PMO and as a channel for escalating implementation challenges.

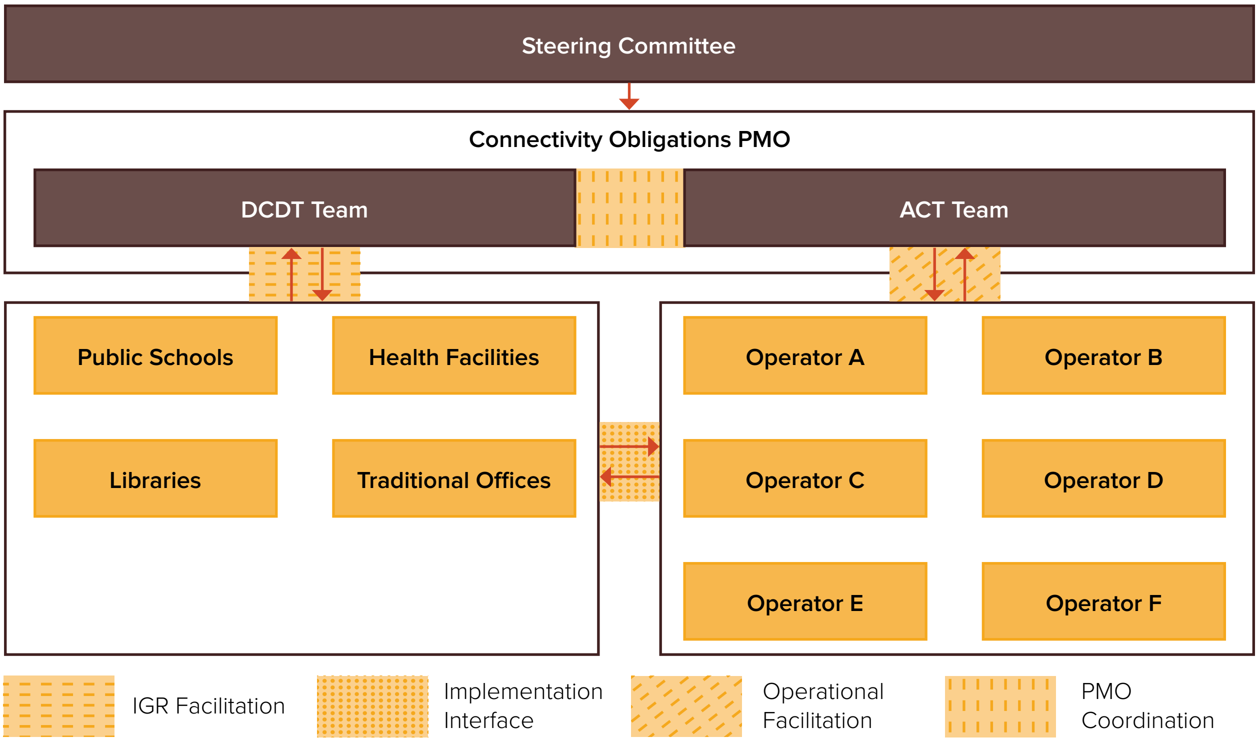


Figure 13-2: Structure of Connectivity Obligations PMO

Source: Association of Communications Technologies

The MOU includes a detailed installation guide and is intended to standardise installations and installation procedures while providing a framework for accountability, tracking and performance assessment through a database of completed installations. The guide assigns responsibilities to beneficiary departments and licensees and sets out clear roles to be completed by the beneficiary department, the PMO and licensees.

The actions of the PMO directly increase the value of the social obligations: This is a model which should be replicated.

Future social obligations should be situated within the UMC measurement approach to address misalignment between obligations and targets. They should also be informed by updated universal service areas regulations and documented learnings from the implementation of the March 2022 spectrum auction social obligations.

13.8.3 ICASA

The effective functioning of ICASA is critical to achieving UMC targets. The next five years already feature several processes important to meeting connectivity and affordability targets. These include:

- A planned spectrum auction in 2028. Before the auction process can commence, ICASA must negotiate an inquiry into the competitive outcomes of the March 2022 spectrum auction, which will focus on spectrum sharing practices that are already the subject of litigation. The findings of this inquiry will inform the structure of the invitation to apply to be issued to ECNS licensees and will have important implications for competition in providing mobile services.
- Renewal of service licences: More than 500 pairs of IECNS and IECS licences will need to be renewed between 2028 and 2030. ICASA will need to guide this process, determine whether to amend any of the applicable terms and conditions and decide on the extent to which it will enforce compliance with existing obligations as a requirement for renewal.
- Renewal of IMT spectrum licences: ICASA will also need to attend to the renewal of critical spectrum assignments in the IMT900, IMT1800 and IMT2100 bands in line with the requirements of the National Radio Frequency Spectrum Policy 2024.
- Implementation and enforcement of the social and other obligations set out in the spectrum licences issued by ICASA pursuant to the March 2022 spectrum auction.
- Consideration of policy directions on equity equivalent investment programme agreements as an alternative to ownership by historically disadvantaged groups and the availability of individual licences. ICASA will come under particular scrutiny where it seeks to amend its regulatory framework on transformation by licensees to comply with a finalised EIPP policy direction.
- Finalisation of a new satellite licensing framework: South Africa needs to respond to the emergence of Low Earth Orbit (LEO) satellite operators in the connectivity delivery chain and the role they can play in meeting UMC targets in hard-to-serve areas. ICASA is undertaking an inquiry into facilitating the entry of LEO operators and encouraging investment in satellite gateway earth stations and other ground infrastructure in South Africa.

There remain significant reservations about ICASA's ability to complete these processes timeously, noting that the above is far from an exhaustive list of processes and deadlines faced by ICASA.

The following practical recommendations are suggested to assist ICASA in discharging its functions:

- Accountability: The performance assessment framework for ICASA needs to be finalised and enforced as contemplated in the ICASA Act.
- Structure: The current structure in terms of which ICASA's Council holds executive powers should be reviewed and consideration given to situating these powers with the CEO and senior management. This will remove bottlenecks and ensure continuity of processes where the terms of councillors heading council committees expire.
- Funding: The manner in which ICASA is funded has been debated since the establishment of the regulator in 2000. More recently, the success of the March 2022 spectrum auction in raising revenue paid into the National Revenue Fund – made possible by a ring-fenced grant from Treasury – has reignited focus on whether ICASA should be self-funded, and the regulator is actively lobbying for change. Several comparative studies have been completed on funding models, but there is no serious consideration of undertaking a process to effect the required amendments to the ICASA Act.
- Instead of the manner of funding, the focus must be on ensuring that ICASA is adequately resourced to complete the tasks before it in a manner which furthers UMC objectives. National Treasury has successfully allocated ring-fenced funding to ICASA for specific processes, such as spectrum auctions. Current fiscal constraints mean this approach is likely to continue, with no substantial increase to the general budget allocated to ICASA by the DCDT.
- Appointment of councillors: ICASA councillors are appointed for a four-year period (five years for the chairperson), and they may serve a maximum of two consecutive terms. ICASA's Council is routinely left short of a full complement for more than six months due to a failure to commence the process for the timely appointment of new councillors. This can easily be remedied as the dates for expiry of councillors' terms are known well in advance.

13.8.4 Consolidation of regulators

The ICT White Paper suggested the consolidation of existing regulators into one single entity. Such an initiative involves significant complexities and prioritising this process in the short-to-medium-term is not recommended for the following reasons:

- Any consolidation will be disruptive to the effective functioning of each of the affected regulators. The impact on ICASA, in particular, may actively hamper reaching connectivity objectives.
- A consolidation process will drain resources from more important processes, including an institutional review of ICASA designed to enhance its effectiveness and optimal funding levels.
- The FPB has a role to play in the safety and security element of UMC, with a role in regulating online content and online harms. This can be executed independently of any consolidation.
- ZADNA oversees the .za namespace and is the custodian of Internet governance matters in South Africa. It has a relatively peripheral role in the safety and security element.

Enhanced communication and cooperation between regulators with overlapping jurisdiction and areas of interest remains an important objective. The process to deepen cooperation between ICASA, ZADNA, the FPB, the Information Regulator, Competition Commission and Financial Sector Conduct Authority, through the formation of a Digital Regulators Forum, should be pursued.

13.8.5 Universal Service and Access Agency of South Africa

USAASA is recognised as an underperforming entity, and the DCDT is following a process contemplated in Chapter 5 of the ICT Policy White Paper 2016 to:

- Disestablish USAASA and subsume its functions within the DCDT and ICASA, and
- Repurpose the USAF into a DDCF.

Implementing this change will require amendment of the ECA, and the DCDT is developing the required amendment bill, although this has been delayed.

Delays in implementing this policy are not facilitating effective targeting of under-serviced areas and the provision of assistance to needy persons. The ineffectiveness of the agency mandated to pursue universal service and access is an obstacle to achieving UMC. It is recommended that the process to finalise the required legislative amendment be reinvigorated and prioritised to a conclusion.

13.8.6 Rationalisation of SOEs

There is a longstanding national policy to rationalise and consolidate state digital infrastructure assets under an SDIC. This vision is anchored in the 2017 SOC Rationalisation Framework approved by Cabinet. It aims to leverage underutilised digital infrastructure assets across the public sector to deliver connectivity for government services and households in under-serviced areas.

The National Radio Frequency Spectrum Policy 2024 requires ICASA to set aside spectrum for the SDIC, enabling it to play the role identified for it by government, which includes:

- Provide backhaul for state connectivity and then expand its network to rural, under-serviced, and remote areas as part of ensuring universal connectivity.
- Utilise its digital infrastructure to support transformation objectives, enable participation of SMMEs in the industry on transparent, reasonable and favourable commercial terms as part of reducing barriers to entry to the industry.
- Be the lead implementation agent for SA Connect.

Over the past eight years, little progress has been made:

- A decision was made to prioritise an initial 'narrow' conception of the SDIC through the consolidation of the complementary BBI fibre and Sentech fixed wireless networks.
- A second broader phase would target inclusion of digital infrastructure assets held by non-ICT SOEs, such as Eskom, SANRAL, Transnet, PRASA and SANREN.
- Phase Two was divided into two sub-phases: Phase 2A entailed entering into access agreements with non-ICT SOCs, while Phase 2B related to accessing broadband infrastructure at the provincial and local government levels under COGTA. The final phase concerned establishing access agreements with private sector stakeholders.
- Notwithstanding that both BBI and Sentech fall within the DCDT portfolio, a variety of plans to merge the two, or for Sentech to acquire BBI, have fallen through, mainly due to BBI's technical insolvency. National Treasury has declined requests to assist BBI, and the DCDT is assisting BBI to explore market-based funding solutions.

Parliamentary hearings held in October 2024 and June 2025 reflect a renewed interest in the SDIC by the Portfolio Committee for Communications and Digital Technologies, which supported the revival of a task team responsible for implementation and called for further bi-annual updates.

In the interim, non-ICT SOEs have taken steps to develop and commercialise digital infrastructure while also reporting that portions of this infrastructure are underutilised and/or undermaintained. All of these SOEs have developed plans to partner with the private sector to ensure appropriate investment in the infrastructure and to offer dark fibre or electronic communications network services.

Implementing the SDIC policy

The SDIC represents a critical opportunity to ensure that the state is positioned to play a constructive role in addressing structural barriers to digital transformation and enabling access across marginalised communities.

State-owned digital infrastructure is being utilised in a fragmented and uncoordinated manner, and the existing dispute between Eskom and BBI shows that this is actively frustrating current government connectivity initiatives. Digital infrastructure assets are underutilised, representing a wasted opportunity, and without further investment, a portion of these assets will need to be written off. This lends a degree of urgency to implementation.

The following recommendations are made:

Intergovernmental cooperation

Converging the digital infrastructure of multiple entities under a single governance model presents significant coordination and governance challenges. A large number of government departments and SOEs will need to be coordinated, requiring significant political authority.

While technically feasible, vested interests and decentralised governance structures will hinder progress. Full realisation of the SDIC as a functional, unified and financially independent entity will not happen without structural reforms and high-level political intervention.

Given the complexity of the rationalisation process and the involvement of multiple line departments, this is a project which should ideally be situated in the Presidency and not led by the DCDT. The existing process, considering the rationalisation of SOEs, may be an appropriate vehicle.

Broaden the scope of the SDIC policy

The vision of the SDIC should include managing all available state digital infrastructure as a coherent set of electronic communications facilities and networks to enhance the state's ability to contribute to UMC objectives.

It is recommended that the scope of the intervention be broadened to include other government digital infrastructure and infrastructure that can be used for the deployment of digital infrastructure, and which would usefully form part of the SDIC. An example would be the extensive tower and high-site assets held by the DPWI.

A process to identify and develop an asset register of state digital infrastructure – including provincial and municipal networks, infrastructure and land – is a critical enabling step.

Delink implementation from BBI's financial constraints

For the last eight years, BBI's insolvency has been the sticking point for advancing the SDIC policy. Turnaround plans to remedy financial constraints are unlikely to succeed:

- BBI has not been able to effectively operationalise legislative rights to fibre infrastructure and servitudes due to commercial disputes with non-ICT SOEs, particularly Eskom. These SOEs are all pursuing their own commercialisation strategies, resulting in direct competition with BBI. BBI is unable to resolve these issues.
- Private sector entities are highly critical of the quality of BBI's infrastructure and services, preferring to avoid using it if other options are available.
- Past performance and persistent undercapitalisation do not provide a basis for optimism, and a constrained fiscal environment limits BBI's ability to attract sufficient market-based financing in the short term.

Even if solvency is achieved, the time taken is inconsistent with the urgency of implementing the SDIC policy. Implementation of the SDIC must be delinked from the financial position of BBI.

Reconsider implementation through legislation

Given the delays already experienced, it is recommended that government attend to drafting legislation to establish the SDIC and the framework for its operation and acquisition of state digital infrastructure assets over time.

At the same time, BBI and Sentech should be disestablished, with the strategic function, assets and skills base of each being transferred to the SDIC.

Refining the phased approach

A phased approach towards a fully integrated SDIC is correctly proposed by the DCDT. There are several interim measures – some of which can be done in parallel – which can realise short-term wins. These could include:

- Cooperation in the provision of remote support and maintenance services;
- Interlinking of network operation centres;
- Fibre swaps;
- Identification by participating entities and departments of infrastructure which needs to be ring-fenced for internal operations;
- Identify spare capacity and co-location spaces;
- Joint planning of network extensions and upgrades; and
- Use of intergovernmental processes, including dispute resolution processes, to ensure that BBI is able to discharge its mandate pending disestablishment/incorporation into the SDIC.

Strength in the middle-mile

Government fibre infrastructure is concentrated in the middle mile, which is where the largest DCI challenge is over the next 10 years, as backhaul networks are deepened and upgraded. There is therefore a significant opportunity for state DCI to play a constructive role in providing backhaul services which support the higher capacity requirements of the future.

At the same time, these networks will compete directly with private sector national long-distance routes from incumbents, as well as new routes being constructed to distribute traffic from new undersea and earth stations.

APPENDICES

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B. FTTH NETWORK MODELLING METHODOLOGY

B.1 Introduction

This section outlines the modelling approach used to estimate the capital and operational expenditure required for deploying FTTH infrastructure in South Africa as part of the broader digital infrastructure investment strategy. The methodology aligns with the BtG framework, focusing on infrastructure layers most directly linked to last-mile connectivity and access.

The FTTH modelling is grounded in a Gigabit Passive Optical Network (GPON) architecture selected for its suitability in delivering cost-efficient high-speed broadband in both high-density urban and lower-density peri-urban areas. GPON enables shared access through passive splitters, reducing the need for active equipment in the field and is thus particularly advantageous for developing markets with constrained fiscal and technical resources.

The modelling framework disaggregates the FTTH network into four main cost layers – Metro Network Access Network Home Connection and (excluded from BtG) NLD. Each layer has distinct infrastructure components and cost drivers informed by stakeholder inputs, real-world operator practices, and geographic variability in fibre deployment. The GPON-based design supports a phased and scalable investment approach with cost parameters adjusted for housing density deployment method (aerial vs. trenched) and service-level assumptions.

Critically, the BtG-aligned methodology omits NLD costs under the assumption that backbone infrastructure either exists or is under shared-sector development. This allows for targeted investment planning that prioritises affordability service coverage and fiscal efficiency in the access and distribution segments where the digital divide is most acute.

This Appendix provides a detailed breakdown of the design parameters, capital expenditure elements, operating expenditure drivers and associated unit costs used in the FTTH modelling. It is intended to guide both policymakers and technical stakeholders in understanding the underlying assumptions and investment implications of the proposed FTTH expansion strategies.

B.2 FTTH network design: GPON architecture

The FTTH network in this model is based on a GPON design, a widely adopted standard for cost-effective, scalable and high-performance broadband delivery to residential and small business users.

B.2.1 Advantages of GPON for developing countries

Cost-efficiency (capex and opex)

- Shared infrastructure: One fibre optic line from the central office serves up to 64 users via passive splitters, reducing fibre and trenching costs.
- No active field equipment: Lower power requirements and fewer active components in the field translate into reduced operational complexity, lower maintenance costs and lower carbon footprint.
- Phased deployment: Supports incremental roll-out by activating more splitters and optical line terminal (OLT) ports as demand grows.

Simplicity and scalability

- GPON networks are relatively easy to plan, deploy and manage – making them suitable for operators with limited technical capacity.
- Allows for quick scalability in high-growth areas such as peri-urban zones or economic corridors.

Mature ecosystem and vendor support

- GPON is a well-established global standard with strong vendor competition resulting in lower equipment costs and widespread technical know-how.
- Good performance for residential users.
- Provides up to 2.5 Gbps downstream and 1.25 Gbps upstream shared bandwidth, which is generally sufficient for households and small businesses in early-stage broadband markets.

B.2.2 GPON architecture overview

GPON is a point-to-multipoint passive optical network that uses optical splitters to enable a single optical fibre to serve multiple premises. It operates on a shared downstream bandwidth model with traffic managed by time-division multiplexing and dynamic bandwidth allocation.

- Central office equipment: OLTs are installed in the Fibre Central Office and serve as the interface between the metro/core network and the access layer.
- Passive optical splitters: These are deployed in field enclosures or cabinets and divide the signal from each OLT port into 1:16, 1:32 or 1:64 splits depending on design assumptions and service-level targets.
- CPE: Each home or premise is connected via drop fibre to an optical network terminal (ONT), which converts the optical signal into Ethernet for end-user access.

B.2.3 Key design characteristics

- Passive distribution: No active equipment is required between the OLT and ONT, reducing power and maintenance requirements in the field.
- Split ratio optimisation: The split ratio is selected based on balancing cost-efficiency with bandwidth per user. A 1:32 ratio is common in urban areas, while lower ratios (e.g. 1:16) may be used in rural or high-demand areas.
- Reach and coverage: GPON typically supports up to 20 km between the OLT and the farthest ONT, allowing flexible deployment across urban and peri-urban geographies.
- Scalability: The architecture allows incremental deployment by activating additional OLT ports and splitters as demand grows, facilitating phased investment planning.

B.2.4 Design implications for cost modelling

- Metro layer: Includes the OLT infrastructure at the central office and the upstream metro fibre connection to the core network.
- Access layer: Includes feeder fibre, passive splitters, distribution fibre and drop cables forming the physical Layer 1 network.
- Premises layer: Includes ONTs and routers, which are typically bundled as part of the service provisioning cost or CPE capital.
- O&M considerations: Passive field components minimise operational complexity, while active equipment at the Fibre Central Office and CPE levels requires routine maintenance, software updates and replacements.

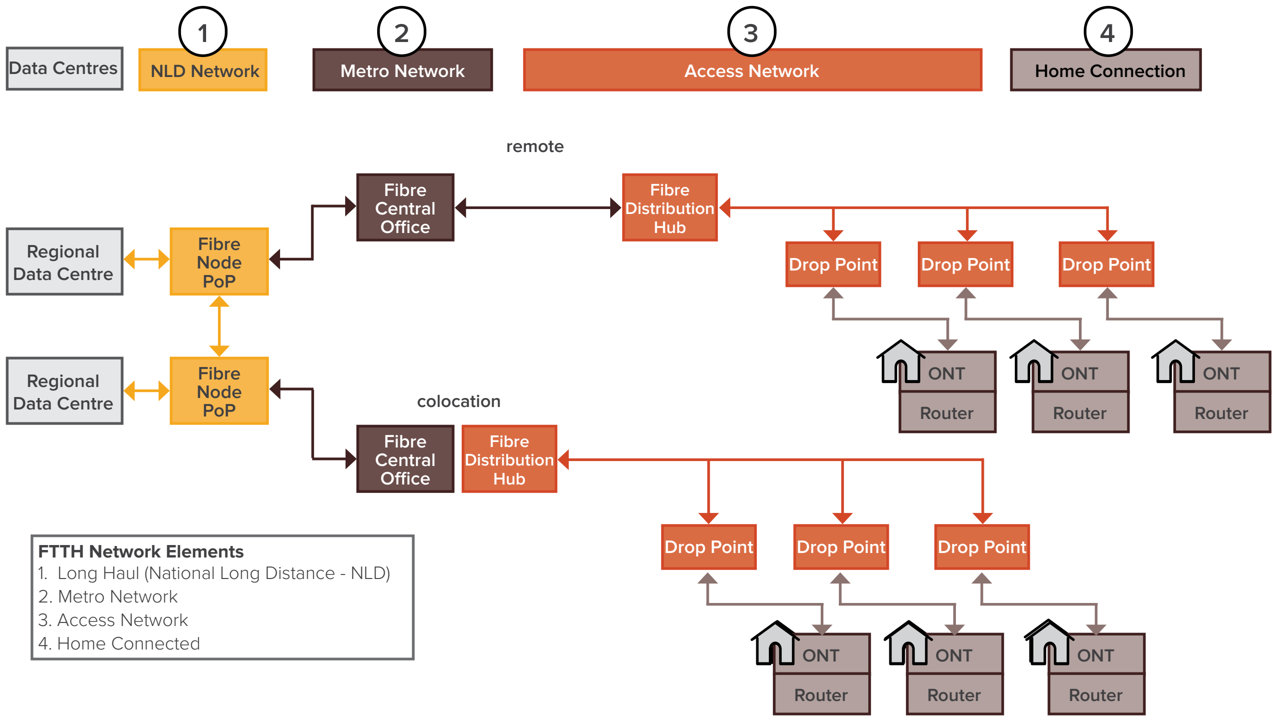
This GPON-based design is especially suitable for universal service goals due to its low operating cost profile, shared infrastructure model and ability to deliver high-speed broadband to multiple users with minimal environmental and energy impact.

B.3 FTTH network cost elements

An FTTH network is typically segmented into four major layers each associated with specific infrastructure components and cost drivers:

1. Long-haul costs (NLD);
2. Metro network costs;
3. Access network costs; and
4. Home connected costs.

Appendix B-1: FTTH Network Design



Source: Africa Analysis with Stakeholder Input 2025

B.4 Beyond the Gap methodology application

The FTTH network design adopted in the BtG methodology explicitly excluded the NLD component.

This design choice reflects the focus of the BtG methodology on infrastructure layers that are most directly associated with last-mile connectivity and access to service delivery. The NLD segment – typically involving high-capacity intercity or backbone fibre routes – was excluded for the following reasons:

- Scope alignment: BtG aims to estimate the investment needs to close the digital access gap, particularly in terms of achieving universal and affordable broadband at the local level. National backbone infrastructure, while foundational, is usually a one-time or sunk cost not directly tied to per-user access expansion.
- Assumption of existing backbone infrastructure: The methodology assumes that national fibre backbone networks are either already in place, under development, or shared across multiple sectors (e.g. electricity transport), and hence do not represent a marginal cost specific to expanding last-mile FTTH networks.
- Avoiding double counting: Including NLD could risk duplication of investment estimates already captured under national digital infrastructure plans or could obscure the true cost of connecting unserved households.
- Policy and investment prioritisation: By excluding NLD, the BtG methodology concentrates policy attention and fiscal planning on metro distribution and access segments – where the cost per connected user is more variable and context-dependent.
- Stakeholders maintained that there was substantial NLD infrastructure in place, with sufficient headroom.

As a result, the BtG cost model begins from the metro aggregation layer (i.e. metro fibre and central office nodes) and traces investment needs downward through the access and customer premises layers, which are the most relevant for service affordability quality and universal access objectives.

B.5 Exclusion of power back-up from FTTH capex

No provision of backup or redundant power supply has been made in the FTTH cost modelling. The capital expenditure estimates presented in this study exclude the costs associated with power back-up systems such as batteries, inverters, or standby generators at network sites (e.g. aggregation nodes, distribution points and customer premises equipment). These components, while important for ensuring service continuity in areas with unstable electricity supply, are treated as separate operational or resilience-related investments. Their exclusion aligns with the BtG methodology's focus on core network deployment costs and avoids inflating baseline capex requirements.

B.6 FTTH build capital expenditure phasing

The network rollout has been structured around a linear investment profile with capex evenly distributed across the 10-year planning horizon. This approach assumes a consistent annual investment allocation, thereby facilitating streamlined budgeting implementation, scheduling and alignment with typical medium-term infrastructure financing frameworks.

The annual capex figures are derived from a forecast of current-priced (2025 R) infrastructure costs. These forecasts reflect expected costs at current price levels without inflationary adjustment to enable comparability across years and maintain consistency with baseline investment modelling assumptions.

The underlying assumption of a flat capex profile ensures that network deployment is evenly paced, allowing for steady progress toward universal access targets and enabling staged policy, regulatory and institutional interventions over the implementation period.

B.7 FTTH capex elements

Appendix B-2: Capex drivers for FTTH networks				
	Long haul costs (NLD)	Metro network	Access network	Home connected
Infrastructure	• High-capacity fibre routes interconnecting major cities or regions.	• Urban or regional fibre networks aggregating traffic from multiple neighbourhoods or localities.	• Last-mile fibre deployment from the central office to the user's vicinity.	• Final segment connecting the premises and enabling service delivery.
Capex components	• **NLD fibre backbone:** Long-distance optical fibre laid along highways or railways. • **Fibre-node breakout:** Infrastructure for offloading national traffic into local or regional networks (e.g. fibre splice points or optical transport switches).	• **Metro fibre:** High-capacity fibre rings or mesh networks connecting districts business parks and neighbourhoods. • **Fibre Central Office:** Facilities housing OLTs network control systems and aggregation switches.	• **Fibre distribution:** Feeder fibre from the central office to distribution points (e.g. cabinets or splitters). • **Access fibre:** Local loops delivering fibre from distribution points to the customer's premises boundary.	• **Drop fibre:** Fibre from the property boundary to inside the home. • **ONT:** Converts optical signals to Ethernet inside the premises. • **Home router:** Provides LAN and Wi-Fi connectivity.
Capex cost drivers	• Trenching ducting and fibre cable deployment over long distances. • Optical amplifiers regeneration equipment and access rights of way.	• Civil works in urban areas (higher per km costs). • Equipment and space for power cooling and security at the Fibre Central Office.	• Fibre splitters enclosures and ducts. • Right-of-way and pole access (especially in aerial deployments). • Labour-intensive deployment in suburban or dense urban areas.	• Home installation labour. • CPE costs.

Source: Africa Analysis with Stakeholder Input 2025

The following provides the capex values used in the network design.

Appendix B-3: Capex values used for network costing			
	Metro network	Access network	Home connected
Infrastructure	• Urban or regional fibre networks aggregating traffic from multiple neighbourhoods or localities.	• Last-mile fibre deployment from the central office to the user's vicinity.	• Final segment connecting the premises and enabling service delivery.
Fibre costs (2025 values)	**Metro fibre:** • Aerial: R87 pm (range R74 - R99 pm) • Buried: Not considered • Trenched: R400 pm (range R350 pm - R400 pm)	**Access fibre:** • The deployment is aerial fibre in a midblock deployment configuration with a drop to four homes per pole. • The average drop per home is R544. This is calculated from R2 350 per four homes.	**Drop fibre:** • Range used in the model varies from R200 - R1 400 per home. • The value used in the model is a function of the density of the homes per squared kilometre. The higher the density, the shorter the drop. • The weighted average value is R1 386 per home vs. the homes with access to fibre at R1 154 per home.
Components	**Fibre Central Office:** • Range used in the model varies from R100 - R2 500 per home. • The actual value used is a function of the density of the homes per squared kilometre. The higher the density, the shorter the drop.	**Fibre distribution:** • This capex cost is included in the access fibre cost per drop per home.	**ONT + router:** • The cost of an ONT + router is R800 per home connected.
Total costs per home	**Total cost per home for metro network:** • The weighted cost per home to be passed is R544 per home.	**Total cost per home for access network:** • The weighted cost per home to be passed is R544 per home.	**Total cost per home connected:** • The weighted cost is R2 186 per home to be connected.
Notes	• All the FNO stakeholders indicated that they would trench metro fibre. In some cases, metro fibre is buried, but this is the exception.	• Some municipalities do not allow aerial fibre to be deployed and only authorise trenched deployment. • There is no industry standard regarding the choice of aerial vs. trenched. The choice where allowed is made by the fibre network operator.	• The cost per drop is a function of the distance from the house to the street. Higher density areas have shorter lengths of drop.

Source: Africa Analysis with Stakeholder Input 2025

B.8 FTTH opex elements

Appendix B-4: Opex (operations and maintenance) drivers for FTTH networks				
	Long haul costs (NLD)	Metro network	Access network	Home connected
Infrastructure	• High-capacity fibre routes interconnecting major cities or regions.	• Urban or regional fibre networks aggregating traffic from multiple neighbourhoods or localities.	• Last-mile fibre deployment from the central office to the user's vicinity.	• Final segment connecting the premises and enabling service delivery.
Optical fibre cable maintenance	• Fibre integrity monitoring (OTDR testing). • Route inspections and patrols (especially in rural/remote areas). • Repairs due to cable cuts (road works, theft, natural events). • Lease payments for shared infrastructure (ducts, poles, rights-of-way).	• Preventive inspections and route maintenance. • Cable joint inspections and cleaning. • Coordination with municipal works (avoid accidental cuts). • Licensing and permits for urban infrastructure sharing.	• Splitter cabinet maintenance and audits. • Periodic OTDR testing for degradation. • Troubleshooting fibre faults (especially for FTTH with passive splitters). • Splice point inspections and restoration supplies.	• High callout rate due to customer environment (gardening pets home renovations). • Frequent drop replacements or re-splicing. • Service reactivation or relocation requests.
Optical component maintenance	• Power backup systems maintenance (e.g. battery/inverter replacement). • Environmental controls (cooling dust/humidity protection). • Preventive maintenance of patch panels and splice enclosures. • Security and access control systems upkeep.	• Energy consumption (24/7 operation). • HVAC system operation and servicing. • Equipment monitoring firmware upgrades troubleshooting. • Staffing (technical support monitoring personnel). • Security fire protection and facility insurance.	• Labour-intensive fault isolation and repairs. • Coordination with local utilities and property owners. • Upkeep of poles/ducts for aerial or underground fibre. • High variability in terrain or housing density affects cost-to-serve.	• Firmware and software updates. • Remote monitoring and customer troubleshooting (help desk). • Replacement under warranty or service contracts. • Power consumption at premises (small but cumulative).

Source: Africa Analysis with Stakeholder Input 2025

B.9 Households by distance bands

In FTTH network design, grouping households by their distance from existing or planned fibre infrastructure – commonly segmented into bands such as 0 - 5 km, 5 - 10 km, 10 - 20 km and beyond – serves as a crucial geospatial classification. This approach enables more accurate infrastructure planning, cost modelling and rollout prioritisation.

Within the South African digital infrastructure investment context, this method has been implemented using GIS analysis to assess household proximity to fibre nodes. These nodes represent key points of aggregation or signal termination in the fibre network architecture, and their spatial relationship to residential clusters directly influences the feasibility and cost-effectiveness of last-mile connectivity strategies.

B.9.1 Understanding the provincial distributions

The following table shows the distribution of households by distance band and by province:

Appendix B-5: Distribution of households by distance band per province

Distance bands	WC	GT	FS	NC	KZN	EC	MP	NW	LIM
Within 5 km	**78.2%**	**76.4%**	64.9%	50.6%	44.4%	40.9%	38.3%	31.7%	19.5%
Between 5 and 10 km	14.3%	20.8%	22.6%	16.7%	23.2%	15.2%	18.8%	19.9%	13.6%
Between 10 and 20 km	4.8%	2.7%	4.8%	12.4%	20.2%	25.1%	21.3%	25.2%	26.7%
Greater than 20 km	2.7%	0.2%	7.7%	20.3%	12.1%	18.9%	**21.6%**	**23.2%**	**40.3%**

Source: Africa Analysis GIS Analysis 2025

High proximity to fibre nodes in Gauteng and Western Cape

- Gauteng (GT): 76.4% of households are within 5 km of a fibre node.
- Western Cape (WC): 78.2% are similarly well positioned.

These provinces are prime candidates for FTTH expansion with relatively low incremental cost. The existing fibre backhaul infrastructure reduces the capital expenditure needed to reach homes. Urban density also supports quicker return on investment for operators.

Moderate access provinces – Free State, Northern Cape and KwaZulu-Natal

- Free State (FS) and Northern Cape (NC) have 64.9% and 50.6% of households within 5 km, respectively.
- KwaZulu-Natal (KZN) sits at 44.4%.

FTTH rollout in these provinces can proceed selectively, especially in denser towns and cities. However, hybrid models using a mix of FTTH and FWA might be more cost-effective in peri-urban and less dense areas.

Low proximity provinces – Limpopo, Mpumalanga, North West

- Limpopo (LIM): Only 19.5% within 5 km; 40.3% are over 20 km away.
- Mpumalanga (MP): 38.3% within 5 km; 21.6% over 20 km.
- North West (NW): 31.7% within 5 km; 23.2% over 20 km.

These provinces are poorly positioned for immediate FTTH rollout. The high percentage of households over 20 km from a fibre node implies significant capex requirements for middle- and last-mile infrastructure. FWA, satellite, or subsidised public-private models may be more appropriate here.

The stark variance across provinces (e.g. 78.2% within 5 km in WC vs. 19.5% in LIM) underscores spatial inequality.

Implication: Without targeted interventions, FTTH expansion could worsen the digital divide, favouring already-connected regions and leaving rural/low-income areas behind. This necessitates:

- Clear policy and regulatory mechanisms to support network operators to deploy fit-for-purpose high-speed broadband technologies (e.g. fixed or wireless) in all geographic areas (including potential blended finance models (e.g. via the Broadband Access Fund).
- Emphasis on shared infrastructure and open access networks.
- Increased deployment of low-cost FWA as a stopgap in less dense areas.

B.9.2 Access to fibre nodes

The distribution of households by distance from a fibre node strongly signals unequal availability of fibre nodes across provinces and highlights where additional NLD fibre infrastructure is most needed to close access gaps and enable last-mile solutions such as FTTH or FWA.

B.9.2.1 Fibre node availability is highly concentrated in urbanised provinces

- Gauteng (76.4%) and Western Cape (78.2%) have the highest share of households within 5 km of a fibre node.
- Free State (64.9%) and Northern Cape (50.6%) also perform relatively well, mostly in urban centres.

These provinces have dense fibre node coverage and relatively mature NLD and metro fibre infrastructure. There is less immediate need to expand NLD networks, and investment should focus on:

- Last-mile access;
- Upgrades to metro rings; and
- Increasing service uptake.

B.9.2.2 Severe fibre node gaps in rural or less developed provinces

- Limpopo (LIM): Only 19.5% of households are within 5 km; 40.3% are over 20 km.
- North West (NW): 31.7% within 5 km; 23.2% over 20 km.
- Mpumalanga (MP): 38.3% within 5 km; 21.6% over 20 km.

These areas suffer from a sparse NLD and metro backhaul network, reflected in limited fibre-node presence. It implies:

- Underinvestment in NLD fibre over the past decade; and
- Insufficient reach to secondary towns and rural areas.

Implication: There is a clear need to extend NLD routes into these provinces to:

- Create new aggregation points for fibre nodes;
- Enable backhaul connectivity to smaller municipalities and rural towns; and
- Support cost-effective rollout of fixed and wireless access.

This aligns with findings in the GIS note, which point out that municipalities with high shares of households beyond 20 km from a fibre node likely require intra-municipal middle-mile backhaul and NLD extension.

B.9.2.3 Strategic role of NLD in closing the coverage gap

Availability of fibre nodes is a function of:

- Proximity to existing NLD routes;
- Presence of aggregation equipment and power; and
- Metro fibre extensions from NLD trunks.

Where households are beyond 10 - 20 km from a fibre node, this often indicates that:

- No fibre backbone reaches the area, or
- Fibre passes through but is not terminated or aggregated for local distribution.

Thus, provinces like Limpopo, North West, and parts of Mpumalanga will require:

- New NLD build-outs to bring high-capacity routes within the feasible range of underserved towns; and
- Strategic placement of aggregation nodes to serve surrounding rural communities.

The household proximity data point to a spatial mismatch in fibre-node availability and underscore a critical infrastructure gap in several provinces. The key implications are:

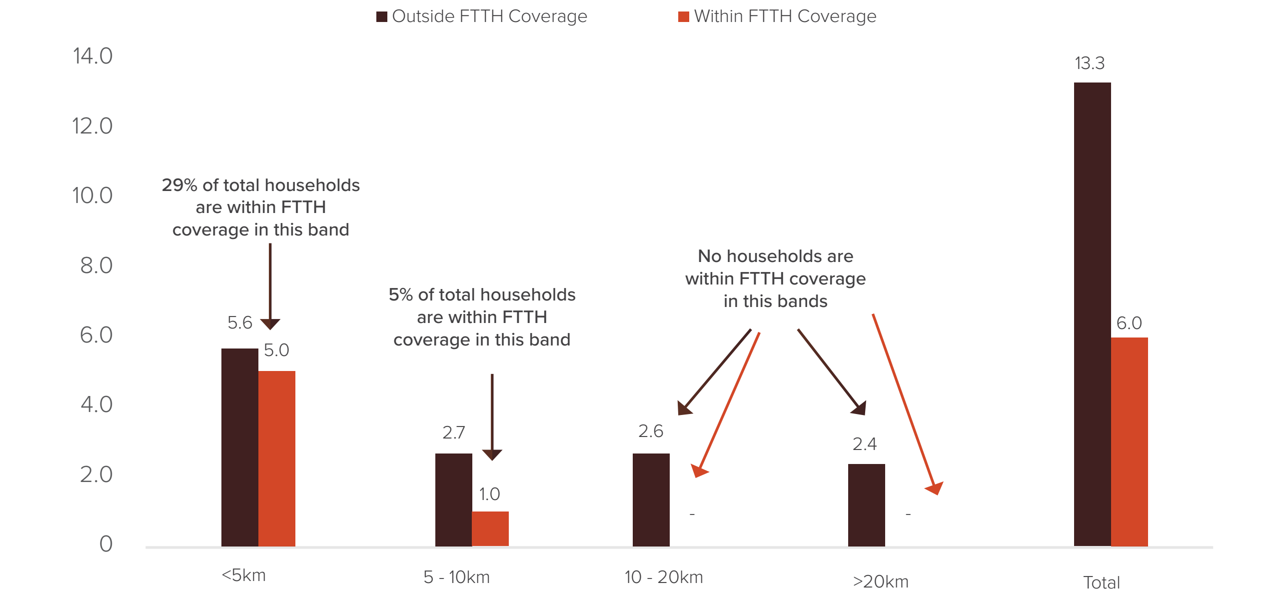
- NLD investment is urgently needed in Limpopo, North West, Mpumalanga, and deep rural parts of the Eastern Cape and KwaZulu-Natal (the cost of this expansion is captured under the metro network build in the modelling methodology).
- This should be paired with middle-mile aggregation and metro fibre extensions to seed future last-mile FTTH or FWA investments.
- Without such backbone expansion, universal broadband goals for 2030 - 2035 will not be met in these regions.

This calls for public-private investment incentives (e.g. the Broadband Access Fund) and policy coordination under SA Connect and SIP 35 to mobilise infrastructure deployment in unserved geographies.

B.9.3 Households inside/outside exiting FTTH coverage

Within the South African digital infrastructure investment context, this method has been implemented using GIS analysis to assess household proximity to fibre nodes. These nodes represent key points of aggregation or signal termination in the fibre network architecture, and their spatial relationship to residential clusters directly influences the feasibility and cost-effectiveness of last-mile connectivity strategies.

Appendix B-6: Households by distance bands for 2025



Source: Africa Analysis 2025

The 2025 fibre reality shows a total of 13.3 million households outside FTTH coverage and 6 million within coverage.

B.9.4 Key Observations

Within FTTH Coverage (6.0 million households total):

- The majority (5.5 million) of households already within FTTH-covered areas are located less than 5 km from a fibre node.
- A small proportion (0.5 million) fall within the 5 - 10 km range reflecting the limited reach of existing fibre networks into peri-urban or fringe areas.
- No FTTH-covered households are recorded beyond 10 km highlighting the current boundary of economic viability for fibre rollout under existing conditions.

Outside FTTH Coverage (13.3 million households total):

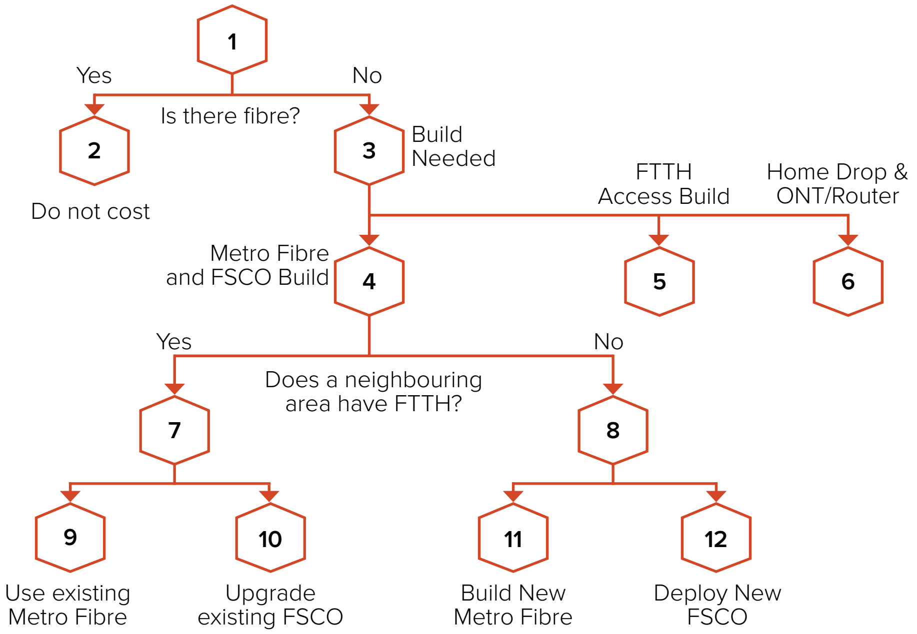
- 7.0 million households fall within 5 km of a fibre node yet remain unserved. This indicates a substantial opportunity for infill deployment within already feasible zones.
- An additional 2.3 million households lie within 5 - 10 km a range that becomes increasingly costly to serve and may require targeted policy or subsidy interventions.
- 2.9 million households are located 10 - 20 km from a node and 1.0 million are beyond 20 km areas that are most likely to depend on alternative broadband solutions such as fixed wireless access or satellite due to prohibitive fibre deployment costs.

B.9.5 Impact of existing FTTH network deployment

The methodology also implicitly considers the contiguity of fibre coverage – if adjacent areas already have FTTH deployments, the neighbouring area is more likely to be prioritised for rollout due to potential cost-efficiencies and network continuity benefits. In such cases, the existing metro fibre infrastructure does not require expansion, and the focus shifts to upgrading the Fibre Switching and Control Office to accommodate service delivery to additional households. Note that the FTTH access and the home drop and router would still need to be deployed.

This approach is captured in the GIS-based FTTH deployment decision tree as illustrated in the following figure.

Appendix B-7: FTTH build decision tree

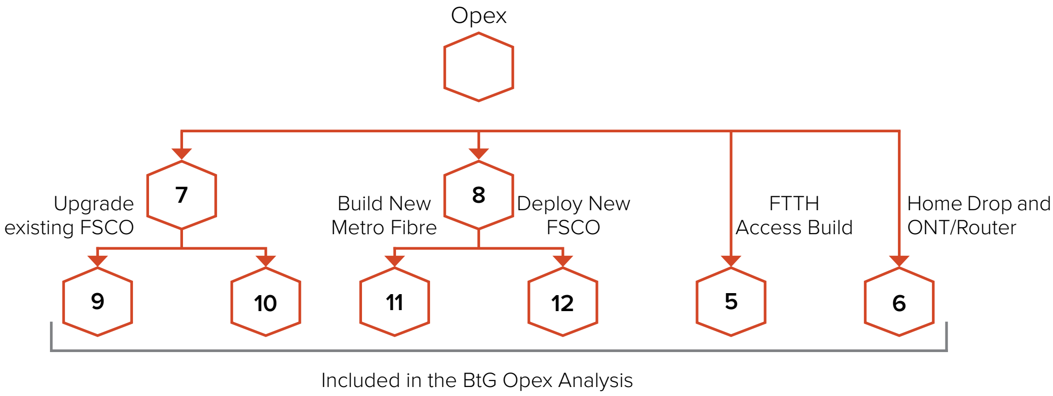


Source: Africa Analysis with Stakeholder Input 2025

Similarly, a corresponding decision tree was developed to guide the inclusion of network opex components in the BtG analysis. This decision logic ensured that only relevant and scalable opex elements were considered, and aligned with projected infrastructure rollout and service coverage assumptions.

This is shown in the following figure:

Appendix B-8: FTTH opex decision tree



Source: Africa Analysis with Stakeholder Input 2025

B.9.6 FTTH network capex

B.9.6.1 Ten-year investment horizon

Over the 10-year investment horizon, both initial and replacement capital expenditure will be influenced by four key pricing dynamics:

- Exchange rate volatility: Fluctuations in the South African rand affect the cost of imported equipment.
- Labour cost inflation: Particularly relevant given the labour-intensive nature of fibre deployment, which constitutes a significant portion of total capex.
- Local equipment inflation: Rising prices for domestically sourced materials and components.
- Technological performance improvements: Declining unit costs as enhanced capabilities become available at lower prices.

These same pricing pressures will apply not only to the rollout of new infrastructure but also to the replacement and upgrade cycles required over the investment period.

B.9.6.2 Ten-year opex horizon

Ongoing operational expenditure will be primarily influenced by two key cost drivers:

- Local equipment inflation: Escalating costs for maintaining and replacing domestically sourced network components, including power systems, enclosures and customer premises equipment.
- Labour cost inflation: Rising wages in the local labour market, especially significant for network maintenance and support services which remain labour-intensive over the long term.

These factors will exert upward pressure on recurring costs throughout the network's operational lifecycle, particularly for infrastructure deployed in high-maintenance or remote areas.

B.9.7 FTTH Network Capex

B.9.7.1 Distance – FTTH capex cost driver

This capex breakdown illustrates the new build FTTH investment requirements under the BtG methodology using constant 2025 pricing. The BtG framework emphasises disaggregated costing, service-level targeting and cost-effectiveness. Each line item in the table reveals important insights about the cost structure of universal FTTH rollout, which informs prioritisation, technology mix and fiscal planning.

Appendix B-9: FTTH capex for full build in 2025

Capex element		<5 km	5 - 10 km	10 - 20 km	>20 km	Total
Local access	R billion	4.9	2.3	2.3	2.0	11.6
Drop + Router + ONT	R billion	10.0	5.1	5.4	4.9	25.4
Metro + NLD	R billion	0	1.7	3.8	6.5	12.0
Fibre SCO	R billion	0.3	0.2	0.2	0.2	0.9
Total capex	**R billion**	**24.6**	**13.7**	**26.1**	**12.3**	**76.7**

Source: Africa Analysis with Stakeholder Input 2025

B.9.7.2 Cost drivers by distance band

<5 km zone (R24.6 billion)

- Dominated by Drop + Router + ONT (R10.0 billion), indicating proximity to existing infrastructure reduces the need for expensive metro or middle-mile build.
- Local access capex (R4.9 billion) is also high due to density – more households per km^2 translate into greater immediate demand.

BtG implication

This zone offers the best returns per rand invested and should be prioritised for early deployment under SA Connect Phase 2 and subsidy pilots.

5 - 10 km zone (R13.7 billion)

- Drop + Router + ONT (R5.1 billion) remains a key driver, but metro costs (R1.7 billion) start to appear.
- Local access capex declines due to fewer homes/km^2, increasing unit costs.

BtG implication:

Moderate-cost areas where blended finance is still viable. Additional support may be required in lower-income zones.

10 - 20 km zone (R26.1 billion)

- Metro capex surges to R3.8 billion, reflecting extensive backbone and aggregation fibre requirements.
- Capex total is highest here despite fewer households than in the <5 km zone – this is a turning point in the cost curve.

BtG implication:

These zones require targeted investment and technology-neutral deployment – FTTH should be limited to key institutions or areas with sufficient density. For others, FWA or satellite is more appropriate.

>20 km zone (R12.3 billion)

- Metro capex peaks (R6.5 billion), but household counts drop, reducing total costs.
- The per-household cost is highest here.

BtG implication:

These are non-commercial viability zones for FTTH. Investment here should focus on service-level substitution via alternative technologies. FTTH only makes sense in high-priority public service locations.

B.9.8 Key BtG methodological takeaways

Cost disaggregation enables strategic targeting. The breakdown allows policymakers to segment interventions spatially, fiscally and technologically.

- Drop + Router + ONT is the largest cost component (R25.4 billion): This includes splicing trenching and optic cabling – highlighting that civil works and passive infrastructure dominate capex.
- Metro costs rise sharply with distance: Underscores the importance of the need to build metro and NLD.

B.9.8.1 Policy implications

- Urban-first FTTH rollout strategy maximises efficiency: Cover <5 km and 5 - 10 km zones first for 50 - 60% of total coverage at ~50% of the cost.
- Beyond 10 km, leverage technology substitution (FWA, LEO, satellite, etc.).
- Maintain fiscal flexibility: The cumulative cost for FTTH in all zones (R76.7 billion) excludes opex and replacement costs, which could add another 30 - 50% over 10 years.
- Build around institutional demand aggregation (schools, clinics, police stations) to anchor rural rollout.
- This capex profile aligns with the BtG principle of 'cost-effective equitable service delivery'. FTTH is optimal where demand and density support it, but where this is not the case, policy must adapt with a tiered technology and investment strategy. The disaggregated cost modelling enables data-driven decisions on when, where and how to connect the unconnected – without overshooting fiscal limits.

C. MOBILE BB AND BB FWA NETWORK MODELLING METHODOLOGY

C.1 Introduction

This section outlines the modelling approach used to estimate the capital and operational expenditure required for deploying additional mobile BB (4G I LTE and 5G) infrastructure in those areas currently not covered, as well as the improvement in the current service to meet the expectations through capacity upgrades as part of the broader digital infrastructure investment strategy for South Africa. The methodology aligns with the BtG framework, focusing on infrastructure layers most directly linked to last-mile connectivity and access. As there are several existing players in the industry, it is a necessary assumption that these players will share active equipment to keep the required expenditure as efficient as possible, and hence, to keep costs at a reasonable level.

To do so requires a MOCN or at least MORAN shared infrastructure network where, as far as possible, existing sites, towers and masts are used or reused. It is important to note that the 2G and 3G networks have been assumed to be decommissioned during the period of this study, and hence, it is these existing sites which have been repurposed for the broadband rollout using sub 1 GHz spectrum, which needs to be re-farmed for 4G and 5G use.

The resulting architecture selected will deliver cost-efficient high-speed mobile and FWA broadband to cover both high-density urban and lower-density peri-urban areas for a range of applications, including mobile broadband apps, IoT, as well as traditional fixed applications.

The modelling framework disaggregates this network into two main cost layers – RAN and the core network, which includes the backhaul transmission from mobile RAN sites to fibre nodes, and (excluded from BtG) NLD and interconnectivity with the first mile, other mobile core infrastructure, as well as other ICT operators and networks. Each layer has distinct infrastructure components and cost drivers informed by stakeholder inputs, real-world operator practices and geographic variability in mobile network deployment.

Critically, the BtG-aligned methodology omits NLD costs under the assumption that backbone infrastructure either exists or is under shared-sector development. This allows for targeted investment planning that prioritises affordability, service coverage and fiscal efficiency in the access and distribution segments where the digital divide is most acute.

This Appendix provides a detailed breakdown of the design parameters, capital expenditure elements, operating expenditure drivers, and associated costs used in the mobile network modelling. It is intended to guide both policymakers and technical stakeholders in understanding the underlying assumptions and investment implications of the proposed shared mobile network expansion strategies.

C.2 Mobile BB and BB FWA network design: Shared RAN architecture

The mobile BB and BB FWA network in this model is based on a shared 4G I LTE and 5G RAN design, the only mobile BB, as well as a highly efficient BB FWA high-performance broadband delivery to individual mobile users, as well as nomadic or fixed residential, IoT devices, government facilities and small business users.

C.2.1 Advantages of mobile BB and BB FWA for developing countries

Cost-efficiency (capex and opex)

- **Shared infrastructure:** A single site can serve a large number of mobile BB or FWA customers through the same 4G and 5G RAN infrastructure.
- **Phased deployment:** Supports incremental roll-out by deploying RAN capacity upgrades as and where needed.

Coverage and understanding

- Mobile networks have been around in South Africa for the past three decades, are well understood, and are extensive in terms of their existing coverage and reach, especially for the sub-1 GHz spectrum range, where many sites have been where they are located now, since the outset of mobile in the country.
- Allows for the quickest scalability in high-growth areas such as peri-urban zones or economic corridors through site up- or downgrades as traffic expectations fluctuate.

Mature Ecosystem and Vendor Support

- 4G | LTE and 5G are well-established global standards with strong vendor competition resulting in lower equipment costs and widespread technical know-how.
- Reasonably good Performance for all Users, especially with the newer generation technologies.
- Based on current tests across the country, Mobile BB currently provides between 30 and 82 Mbps down-, and between 10 and 24 Mbps upload speeds (depending on the operator) for shared bandwidth, which is generally sufficient for mobile users, while for FWA users (households, IoT devices, government facilities and small businesses) the performance can be up to an order of magnitude higher, which is generally sufficient as well.

C.2.2 4G | LTE and 5G architecture overview

Mobile BB uses a point-to-multipoint mobile wireless network with active cell handovers to ensure mobility when users are on the move. For fixed wireless users, the technology offers improved throughput rates over mobile BB.

- Site RAN equipment: Transceivers and antennas make up the bulk of the equipment; however, this RAN equipment interfaces with the backhaul via a radio resource unit (into which the transceivers are connected, and this backhaul can be either via a fibre transmission link, or a microwave link/hop to another site or to a fibre node. As the current capacity of these site backhaul links is unknown, it has been assumed that they will not be large enough to carry the capacity of the current site as it would be upgraded by 2035 (which, for a fibre backhaul, will be almost certainly the case), but for microwave backhaul hops, this is unknown. As a result of this, it has been assumed that these links will be insufficient to carry the capacity required from multiple 'daisy-chained' sites, so all new sites are assumed to need to be connected to either another 'new site', or to the nearest fibre node.
- CPE and end-user devices: Each user is assumed to have their own smartphone or tablet-type device for mobile BB connectivity. However, each BB FWA-connected home, premise or facility is connected via an FWA device, which would be available from any of the existing operator outlets or stores, and as such will not need to be provided specifically by the network due to the variety of such devices in the marketplace. As long as the SIM card is active on the network and inserted/attributed to the device (especially for virtual SIMs), and the device is registered on the network, it should function correctly.

C.2.3 Key design characteristics

- Reach and coverage: Mobile BB coverage range is determined by the associated spectrum band, and for sub-1 GHz spectrum, this can range up to 30 km. For higher-order spectrum, this range reduces significantly, and so it is important to use as much of this low spectrum as possible (the 700 MHz, 800 MHz and 900 MHz ICASA licensed bands being of particular importance here), allowing flexible deployment across urban, peri-urban and rural geographies. What is important to note is that where higher capacities are required (especially in urban and peri-urban areas where densities of users are much higher), it is often necessary to move to a higher-order spectrum, and in places build new 'fill-in' sites to guarantee the required coverage. This is especially the case in areas with a higher density of users, and/or where the required throughput rates are higher.
- Scalability: The architecture allows incremental deployment by upgrading sites with additional transceiver cards, as well as the addition of MIMO antennas as and where necessary, as demand grows, facilitating phased investment planning.

C.2.4 Design implications for cost modelling

- RAN or site: Includes the RAN infrastructure at the site and the upstream metro fibre or microwave link connection to the core network (either via a fibre node or via another site, where they can be daisy chained).
- Premises costs: Includes smartphone or tablet-type devices and routers, which are typically bundled as part of a package contract, or purchased separately by a user, so not network owned, and hence not part of the required capital.
- O&M considerations: Preventative and corrective maintenance required at each site, and the ongoing radio planning and reconfiguration costs, are included as part of the O&M considerations for a mobile operator.

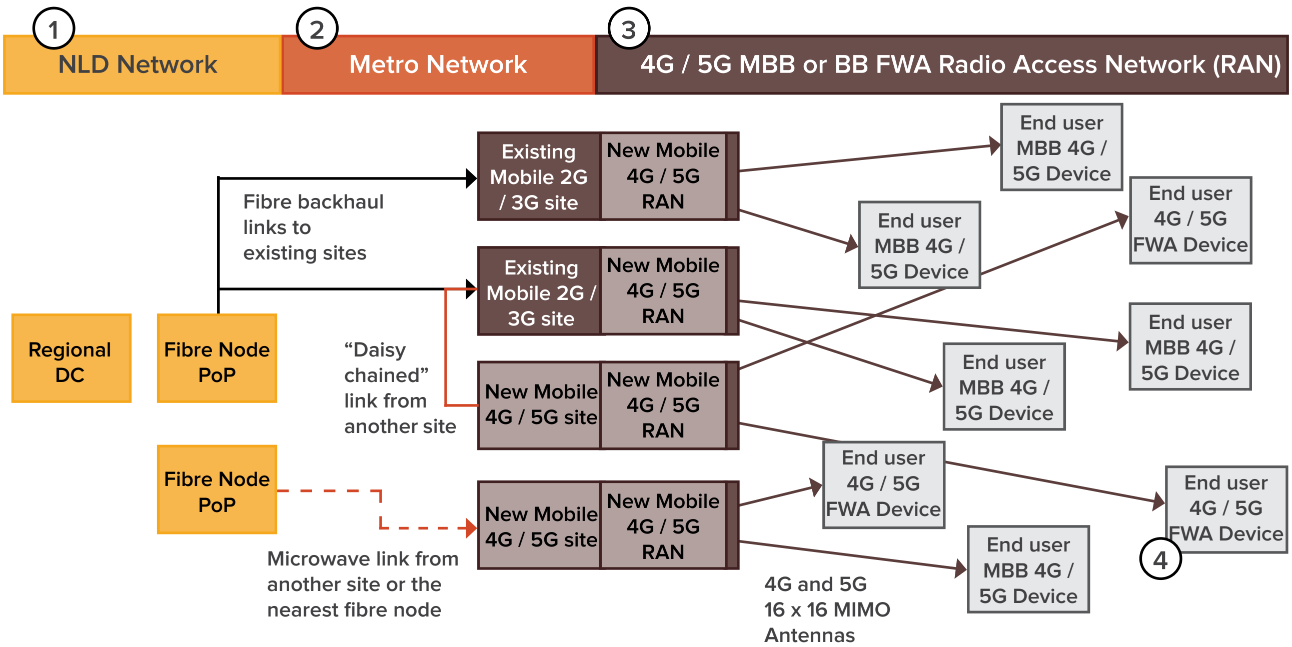
This mobile BB-based design is especially suitable for universal service goals due to its moderate operating cost profile, shared infrastructure model, and the ability to deliver high-speed broadband to multiple users with minimal environmental and energy impact.

C.2.5 Mobile BB and BB FWA network design

A mobile BB and BB FWA network is typically segmented into three major parts, each associated with specific infrastructure components and cost drivers:

1. Long haul costs (NLD);
2. Metro fibre or microwave network costs;
3. RAN costs; and
4. Mobile device / BB FWA device (premise, facility or home connection costs not borne by the operator, so discounted here, and not included).

Appendix C-1: Mobile BB & BB FWA network design



Source: Africa Analysis with Stakeholder Input 2025

C.3 Mobile BB and BB FWA network modelling

As described earlier, for a mobile BB and BB FWA network to function most efficiently, it will be necessary for all operators to share this capacity on an Open Axis basis, and hence, the previous model assumes the active RAN sharing which comes with a MOCN or MORAN setup. Duplication of this infrastructure will not be cost-effective and will result in shortfalls due to the inherent costs involved. Due to the scarcity of spectrum, the MOCN model is preferred, but the MORAN model can be made to work if necessary.

A broadband model needs to analyse the current and projected future South African broadband market within the 213 local municipalities and metropolitan municipalities over a period of 11 years (2025 to 2035). The original intention of modelling the country at the local & metropolitan municipal level was found to generate unrealistically high capex requirements due to the inherent averaging that this level of modelling necessitates. As a result, a lower level of granularity modelling was necessary, and this was done at the H3 hex level, where the country was broken down into 333 459 hexagons.

At this level, sufficient resolution was available to more accurately define the network, and hence, capex requirements for the two major component broadband models, namely the FTTH fibre network model and the mobile BB and mobile BB FWA network model. To achieve the objectives of providing the requisite access technology by the end of the modelled period (i.e. by 2035), it has been necessary to take stock of the current position and the projected market by 2035, and see what expansions per technology are required by that end date.

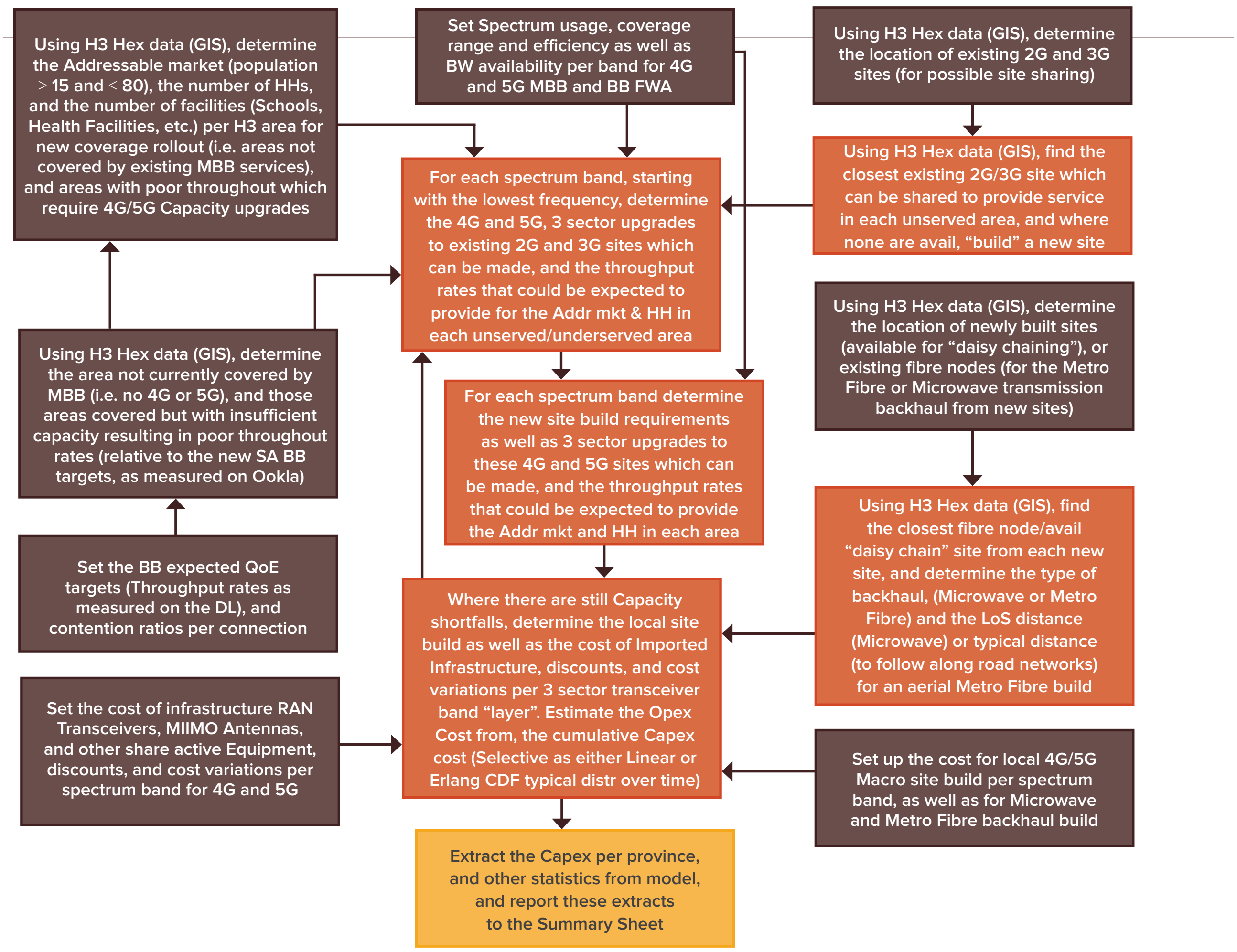
C.4 Defining broadband technology: Why 2G and 3G are insufficient

- 2G is not a broadband technology, as it is primarily designed for voice and low-speed data services (e.g. SMS, USSD, and basic mobile Internet at kilobits per second). Its existence or phase-out does not impact broadband availability and can largely be ignored.
- 3G, while offering improved data capabilities, does not meet modern broadband speed benchmarks. Most 3G networks deliver download speeds ranging from 2 Mbps to 10 Mbps, which is far below the 100 Mbps threshold often considered the minimum for next-generation broadband services. Even with enhanced 3G technologies like HSPA+ (42 Mbps peak speeds), real-world performance remains inconsistent and cannot effectively support high-bandwidth applications such as 4K streaming, cloud computing, and emerging digital services.

4G and upwards (LTE, LTE-A, and 5G) are the only technologies that should be classified as broadband-capable. LTE-Advanced, for instance, can exceed 100 Mbps in real-world conditions, while 5G significantly enhances capacity, reduces latency, and improves spectral efficiency. Newer technologies such as 6G are not considered relevant to this study due to the impact that they will have only really affecting the end few years of this study (2030 to 2035), where this technology is expected still to be in its infancy. In other words, as a technology, it will be barely out of the development/startup phase and only at the start of its commercial rollout and uptake by 2035.

The approach that was followed to model the mobile BB and BB FWA network was as follows:

Appendix C-2: Mobile BB and BB FWA network modelling approach



Source: Africa Analysis with Stakeholder Input 2025

C.4.1 Beyond the Gap methodology application

The mobile BB and BB FWA network design adopted in the BtG methodology explicitly excluded the NLD, existing metro fibre or microwave backhaul and existing site components.

This design choice reflects the focus of the BtG methodology on infrastructure layers that are most directly associated with last-mile connectivity and access service delivery.

The NLD segment – typically involving high-capacity intercity or backbone fibre routes – was excluded for the following reasons:

- Scope alignment: BtG aims to estimate the investment needs to close the digital access gap, particularly in terms of achieving universal and affordable broadband at the local level. National backbone infrastructure, while foundational, is usually a one-time or sunk cost not directly tied to per-user access expansion.
- Assumption of existing backbone infrastructure: The methodology assumes that national fibre backbone networks are either already in place, under development, or shared across multiple sectors (e.g. electricity transport) and hence do not represent a marginal cost specific to expanding last-mile mobile BB and BB FWA networks.
- Avoiding double counting: Including NLD and any existing mobile BB infrastructure could risk duplication of investment estimates already captured under national digital infrastructure plans or could obscure the true cost of connecting unserved households.
- Policy and investment prioritisation: By excluding NLD and any existing mobile BB infrastructure, the BtG methodology concentrates policy attention and fiscal planning on metro distribution and access segments, where the cost per connected user is more variable and context-dependent.

As a result, the BtG cost model begins from the metro aggregation layer (i.e. metro fibre and existing 2G and 3G sites) and traces investment needs from existing 4G and 5G site upgrades and new 4G and 5G sites downward through the RAN access to the customer premises or user device, which is the most relevant for service affordability quality and universal access objectives.

C.4.2 Exclusion of power back-up from mobile BB and BB FWA capex

No provision of backup or redundant power supply has been made in the Mobile BB and BB FWA cost modelling. The capital expenditure estimates presented in this study exclude the costs associated with power back-up systems such as batteries, inverters, or standby generators at network sites (e.g. aggregation nodes, distribution points, and customer premises equipment). These components, while important for ensuring service continuity in areas with unstable electricity supply, are treated as separate operational or resilience-related investments. Their exclusion aligns with the BtG methodology's focus on core network deployment costs and avoids inflating baseline capex requirements.

C.4.3 Mobile BB and BB FWA build capital expenditure phasing

The network rollout has been structured around a linear investment profile with capex evenly distributed across the 10-year planning horizon. This approach assumes a consistent annual investment allocation, thereby facilitating streamlined budgeting implementation, scheduling and alignment with typical medium-term infrastructure financing frameworks.

The annual capex figures are derived from a forecast of current-priced (2025 R) infrastructure costs. These forecasts reflect expected costs at current price levels without inflationary adjustment to enable comparability across years and to maintain consistency with baseline investment modelling assumptions.

The underlying assumption of a flat capex profile ensures that network deployment is evenly paced, allowing for steady progress toward universal access targets and enabling staged policy, regulatory and institutional interventions over the implementation period.

Appendix C-3: Mobile BB and BB FWA capex overview			
	Long haul costs (NLD)	Metro backhaul network	Radio access network
Infrastructure	High-capacity fibre routes interconnecting major cities or regions.	Urban or regional fibre or microwave networks aggregating traffic from multiple RAN sites.	Last-mile RAN wireless access from a mobile site to the user's vicinity.
Capex components	• **NLD fibre backbone:** Long-distance optical fibre laid along highways or railways. • **Fibre node breakout:** Infrastructure for offloading national traffic into local or regional networks (e.g. fibre splice points, Reconfigurable Optical Add Drop Multiplexers, or optical transport switches.	• **Metro fibre backhaul**: High-capacity fibre spur networks connecting new sites to existing fibre nodes, or to other new sites where 'daisy chaining' has been enabled and the total metro fibre distance is <= 13 km (the break even point between fibre and microwave). • **Microwave backhaul:** High-capacity microwave links connecting new sites to existing fibre nodes, or to other new sites where 'daisy chaining' has been enabled and the total metro fibre distance is > 13 km (the break even point between fibre and microwave).	• **4G and 5G RAN coverage:** First three sectors coverage at a frequency of 700 MHz to cover the H3 Hex where there is a new (previously unserved with mobile broadband) customer. • **4G and 5G RAN capacity upgrades:** Additional capacity transceiver/ antenna upgrades in incrementally increasing spectrum bands for all three sector layers covering the H3 hex area. • **4G and 5G RAN capacity fill-in site:** The cost of establishing a new site where a capacity fill-in is required (i.e. where existing site capacity has been exhausted plus the first three sectors' capacity at the new higher order required frequency).
Capex cost drivers	• Trenching ducting and fibre cable deployment over long distances. • Optical amplifiers regeneration equipment and access rights-of-way.	• Civil works in all areas where fibre rollout has taken place, and site installation of microwave infrastructure and dish antennas on masts/ towers etc. on either end of the links in all areas where microwave links are required. • Equipment and space for power cooling and security at the sites.	• Number of 16x16 MIMO antennas required for site capacity upgrades. • Number of transceivers required per frequency band for site capacity upgrades. • Site builds for fill-in capacity sites at higher frequency than the coverage sites.

Source: Africa Analysis 2025

The following provides the capex driver costs used in the network design.

Appendix C-4: Mobile BB and BB FWA capex driver costs		
	Metro backhaul network	Radio access network
Infrastructure	• Urban or regional fibre or microwave networks aggregating traffic from multiple RAN sites.	• Last-mile RAN wireless access from a mobile site to the user's vicinity.
Infrastructure and site costs (2025 values)	**Metro backhaul fibre where the distance following along typical roads is <=13 km (= LoS distance X the transmission link routing factor of 1.3):** • Aerial R120 pm, including the capitalised cost of poles and the erection thereof. • Imported equipment cost USD5 000 with a decease at a rate of 3% per annum. **Microwave backhaul where the fibre distance along typical roads >13 km:** • Installation and configuration costs per microwave link of R360 000, including the cost for a pair of dish antennas, and tower upgrades to handle the additional wind loading. • Imported equipment cost USD65 000, with a decrease at a rate of 3% per annum	**Transceiver costs and a portion of the 16x16 MIMO antenna to connect to the transceiver:** • The following 2025 costs per transceiver per frequency band: (Costs in USD are expected to decrease at a rate of 3% per annum, and are offered with the following multi-frequency band imported equipment discounts). » 700 MHz: USD15.312 with 50% (disc) » 800 MHz: USD15.312 with 40% (disc) » 900 MHz: USD15.312 with 30% (disc) » 1.8 GHz: USD18.312 with 30% (disc) » 2.1 GHz: USD20.312 with 30% (disc) » 2.3 GHz: USD20.312 with 30% (disc) » 2.6 GHz: USD40.312 with 30% (disc) » 3.5 GHz: USD40.312 with 12.5% (disc) » 3.6 GHz: USD50.312 with 20% (disc) » 4.9 GHz: USD40.312 with 10% (disc) » 26 GHz: USD40.312 with 25% (disc) **New capacity fill-in site build costs:** • The following 2025 costs in (nominal) R per site type per frequency band: » 700 MHz: R2.5 million » 800 MHz: R2.2 million » 900 MHz: R2.0 million » 1.8 GHz: R2.0 million » 2.1 GHz: R2.0 million » 2.3 GHz: R1.75 million » 2.6 GHz: R1.5 million » 3.5 GHz: R1.0 million » 3.6 GHz: R0.9 million » 4.9 GHz: R0.8 million » 26 GHz: R0.7 million
Notes	• All the FNO stakeholders indicated that they would trench metro fibre. In some cases metro fibre is buried, but this is the exception. • Some municipalities do not allow aerial fibre to be deployed and only authorise trenched deployment. • There is no industry standard for the choice of aerial vs. trenched. The choice, where allowed, is made by the fibre network operator. • Where the cost of trenched fibre is higher than the microwave alternative, the latter should be deployed.	• A selection of spectrum frequencies and allocation to 4G and 5G has been made such that the lowest is allocated to 4G first. This needs to be further evaluated and a decision made based on the actual availability at the time of rollout. ICASA has provided the spectrum band data, but some of the bands are still being used by other services (e.g. analogue TV in the 800 MHz bands in some regions).

Source: Africa Analysis 2025

C.4.4 Mobile BB and BB FWA opex elements

Appendix C-5: Opex (operations and maintenance) drivers for mobile BB and BB FWA networks				
	Long haul costs (NLD)	Metro network	Radio access network sites infrastructure	Home, facility or business connected
Infrastructure	• High-capacity fibre routes interconnecting major cities or regions.	• Urban or regional fibre networks aggregating traffic from multiple neighbourhoods or localities.	• Last-mile site build and RAN deployment for 4G and 5G BB coverage from the site to the user's vicinity.	• Final segment connecting the premises, facility or business and enabling service delivery.
Preventative and corrective maintenance	• Fibre integrity monitoring (OTDR testing). • Route inspections and patrols (especially in rural/ remote areas). • Repairs due to cable cuts (road works, theft, or natural events). • Lease payments for shared infrastructure (ducts, poles, rights-of-way). • NLD site infrastructure, patch panel, splicing enclosure, power and HVAC inspections and maintenance.	• Preventative inspections at sites (for microwave backhaul), along routes (for fibre backhaul) and route maintenance. • Microwave dish and waveguide inspections and cleaning as well as cable joint inspections and cleaning. • Coordination with municipal works (avoid accidental cuts). • Licensing and permits for urban infrastructure sharing.	• Regular mast and tower inspections and maintenance. • Antenna and feeder cable (and microwave dish and waveguide, if relevant) inspections cleaning and replacement where necessary. • Site infrastructure, power and HVAC inspections and maintenance.	• Service billing, activation or other requests/ complaints handled through a call centre agent / self-service site.

Source: Africa Analysis 2025

C.5 Households and facilities by distance bands

C.5.1 Overview of distance band grouping and its effect on a mobile-based service

In FTTH network design, grouping households and facilities (schools, health facilities and other government facilities) by their distance from existing or planned fibre infrastructure – commonly segmented into bands such as 0 - 5 km, 5 - 10 km, 10 - 20 km and beyond – serves as a crucial geospatial classification. This approach enables more accurate infrastructure planning, cost modelling and rollout prioritisation. This impacts the target market for BB FWA users as most potential users would rather take up a fibre service in preference to a BB FWA service (price dependent, of course, but assuming similar pricing), due to the effective limitless bandwidth that the former offers, making it more future proof. As such, this has been used as a limitation to the rollout of BB FWA services (where there is an FTTH service, the usage of BB FWA has been restricted in the modelling). However, this has no impact on the target market for mobile BB services due to the requirement for mobility, as offered by a mobile BB service, which must still be ubiquitous in nature. It just means that specific capacity upgrades have not been planned for sites serving those areas where FTTH is being rolled out. As there is still mobile BB coverage, a household or facility can still connect with a BB FWA device in the same way as in targeted areas.

Within the South African digital infrastructure investment context, this method has been implemented using GIS analysis to assess the location of fibre nodes. These nodes represent key points of aggregation or signal termination in the fibre NLD and metro connectivity backhaul network architecture and their spatial relationship with existing sites (2G, and 3G for areas with no current mobile BB services, as well as existing 4G and 5G sites in areas where mobile BB is currently available, and where capacity upgrades to these may be required) has a direct influence on the cost of these services. In turn, the location of the addressable market (those >=15 years and <80 years of age), their residential clusters and facilities, relative to their closest serving sites, directly influence the capacity requirements of these serving sites, and hence the feasibility and cost-effectiveness of last-mile connectivity strategies using mobile BB and mobile BB FWA type services.

C.5.2 Application to South Africa

Within the South African digital infrastructure investment context, this method has been implemented using GIS analysis to assess household and facility proximity to fibre nodes. These nodes represent key points of aggregation or signal termination in the fibre network architecture, and their spatial relationship to residential clusters directly influences the feasibility and cost-effectiveness of last-mile connectivity strategies. Where they are seen to lie within the 'distance band', this area is earmarked for FTTH rollout, and where it is further, the area is earmarked for additional capacity through a BB FWA rollout strategy. Similar to the distance bands, where the densities of households are extremely high (e.g. >6 000 HH / km^2), the area is in all likelihood a low-income area, and for the purposes of this modelling, has been considered a low-cost public Wi-Fi target area. Therefore, despite the ubiquitous mobile BB service, which should intentionally cover all these areas, the capacity of serving mobile BB sites will not be expanded to cover the capacity requirements for households or facilities, as these areas have been excluded from the list of mobile BB FWA target areas.

This same distance band split, with a household density caveat, has been applied to households and facilities for very deep rural areas, where even the provision of mobile BB as a service will be marginal. In these areas, the distance band limit is > 100 km from a fibre node, and where the density applied is < 5 HH / km^2. This is considered the domain of the satellite operators. With the distance bands mapped to the three economic scenarios as detailed earlier, this results in the following figure which shows the forecast to 2035. (Important to note in the following table that the "only" does not preclude the breaching of these boundaries, which have been purely set for the purposes of modelling to determine an investment quantum required).

Appendix C-6: Households restriction distance bands for 2035 as have been mapped to economic scenarios

	No. HHs to be covered 'only'' by BB (mobile 4G / LTE & 5G) FWA	No. HHs to be covered 'only' by public WiFi type FWA	No. HH to be passed 'only' by fibre	No. HH to be covered "only" by satellite	Total No. HHs in South Africa
Mobile BB coverage in all areas and with all three alternative technologies activated as described above ***(Growing Economy Scenario, where HH < 20 km of a FN are served by fibre)***	1 761 325	-	22 758 299	719	24 520 343
Mobile BB coverage in all areas and with all three alternative technologies activated as described above ***(Stagnating Economy Scenario, where HH < 10 km of a FN are served by fibre)***	6 064 906	48 046	18 406 672	719	24 520 343
Mobile BB coverage in all areas, and with all three alternative technologies activated as described above in the ***(Declining Economy Scenario, (where HH < 5 km of a FN are served by fibre)***	10 152 462	644 598	13 722 563	719	24 520 342

Source: Africa Analysis 2025

This same distance band split has been applied to the facilities within South Africa and mapped to the three economic scenarios as detailed above, and results in the following:

Appendix C-7: Facilities restrictions by distance bands for 2025						
Schools: Uncontended Health facilities: Uncontended Other govt facilities: 1:20 contention ratio		No. Facilities to be covered 'only' by BB (mobile 4G / LTE and 5G) FWA	No. Facilities to be covered by public Wi-Fi type FWA	No. Facilities to be passed by fibre	No. Facilities to be covered by satellite	Total No. Facilities in South Africa
Mobile BB coverage in all areas, and with all three alternative technologies activated as described above **(Growing Economy Scenario, where facilities <20 km of a FN are passed by fibre**)	Schools	5 350	-	10 722	-	16 072
	Health facilities	978	-	3 043	-	4 021
	Other facilities	590	-	2 144	-	2 734
Mobile BB coverage in all areas, and with all three alternative technologies activated as described above ***(Stagnating Economy Scenario, where facilities < 10 km of a FN are passed by fibre)***	Schools	10 332	-	5 740	-	16 072
	Health facilities	1 759	-	2 262	-	4 021
	Other facilities	1 226	-	1 508	-	2 734
Mobile BB coverage in all areas, and with all three alternative technologies activated as described above in the ***(Declining Economy Scenario, where facilities < 5 km of a FN are passed by fibre)***	Schools	13 023	-	3 049	-	16 072
	Health facilities	2 278	-	1 743	-	4 021
	Other facilities	1 613	-	1 121	-	2 734

Source: Africa Analysis 2025

On the BB FWA side, it is proposed that use be made of existing 2G and 3G sites in areas where there is no current mobile broadband coverage. This is due to the current plans to phase out 2G and 3G over the next decade. Due to the unavailability of existing site backhaul capacity data, it has been assumed that existing 2G and 3G sites do not have sufficient spare backhaul capacity to enable these existing sites to be used for 'daisy chaining' new site build backhaul capacity to the core of the mobile network. However, for all new fill-in 4G and 5G BB sites, this restriction is not there, and so 'daisy chaining' off other 'new' sites is facilitated in the model where it makes sense (i.e. where another 'new' site is closer than a fibre node, then the data traffic is backhauled via that site as opposed to directly to a fibre node). Doing this can save a significant amount of capex costs on the backhaul.

Key observations

The uptake of mobile BB FWA coverage is expected to be within a range of between 1.7 million and 10.2 million households and totally depends on the number that take up an alternative technology service.

- Almost all households will lie within an area covered by mobile BB by 2035. This means that they will be covered by a mobile BB or BB FWA service, which some will adopt even if they are in an FTTH-serviced area, and are passed by fibre.
- A small proportion (0.6 million) of low-income households have been excluded from the target lists of the BB FWA service, as they are assumed to be covered by the cheaper public Wi-Fi-type FWA-based service. As the mobile BB service will cover these areas due to the mobility requirement of the addressable market, as well as the requirement for mobile BB to be ubiquitous in nature, it is fully expected that a portion of these households might well take up a BB FWA service, which is expected to be better than a public Wi-Fi-type FWA service in terms of its performance and throughput rate.
- Conversely, the public Wi-Fi-type FWA-based service operators are expected to try to capture as many of the BB FWA 'only' areas as they can, with their cheaper service offerings.
- A very small number of households (about 700) are in such remote and deep rural areas (>100 km from a fibre node and where the density of households is <5HH/km^2), that it is likely that they will be served by a satellite service. Again, it is fully expected that a number of households and/or facilities that are in areas served 'only' by FTTH or BB FWA will also be interested in a satellite service and may well adopt it.

C.6 Impact of existing mobile BB and BB FWA network deployment

The methodology also implicitly considers the proximity of ubiquitous mobile BB coverage – if adjacent areas already have mobile BB deployments, the neighbouring area is more likely to be prioritised for rollout due to potential cost-efficiencies and network continuity benefits through the sharing of sites (where they are closer than existing fibre nodes) for backhaul through 'daisy chaining', as described earlier. In such cases, the existing metro fibre infrastructure does not require extensive expansion, and the focus shifts to upgrading the capacity of the relevant sites and backhaul links to accommodate service delivery to additional addressable market people (for the mobile BB service), as well as households and facilities (for the BB FWA service).

C.7 Mobile BB and BB FWA network capex

C.7.1 Ten-year investment horizon

Over the 10-year investment horizon, the capital expenditure will be influenced by four key pricing dynamics:

- Exchange rate volatility: Fluctuations in the South African rand, affecting the cost of imported equipment. As imported equipment is the largest component of the capex build, due to the requirement for capacity upgrades over time, the mobile BB and BB FWA service is particularly susceptible to this dynamic element.
- Labour cost inflation: Particularly relevant given the R component dominance of site build in South Africa, which constitutes a notable portion of total capex in the higher order speeds (>100 Mbps) for some scenarios. For speeds of 100 Mbps and below, there are almost no site build requirements due to the reuse of existing 2G and 3G sites, the refarming of sub-1 GHz spectrum after the 2G and 3G shutdown, and the active deployment of 4G and 5G infrastructure at these sites. In areas with mobile BB, the only cost is the upgrading of current capacities.
- Local equipment inflation: Rising prices for domestically sourced materials and components (e.g. towers and other passive site infrastructure).
- Technological performance improvements: Declining unit costs as enhanced capabilities become available at lower prices. This works to make imported equipment cheaper to the tune of about a 3% discount per annum, but it still falls short of increases in nominal R terms due to the exchange rate forecast, as mentioned earlier.

These same pricing pressures will apply not only to the rollout of new infrastructure but also to the replacement and upgrade cycles required after this initial investment period is over. The useful lifespan of this mobile RAN infrastructure is between 10 and 15 years, so no replacement capex costs have been included in these forecasts.

C.7.2 Ten-year opex horizon

Ongoing operational expenditure will be primarily influenced by one major cost driver:

- **Total network size:** The size of the mobile network, as measured by its cumulative capex, is the key indicator of annual opex expenditure requirements in an efficient mobile operator. It is anticipated that the operators will be efficient in their utilisation of manpower and resources through the intelligent use of outsourcing, etc. This means that once the active build phase is over, any contracted resources that were heavily involved initially are released, and the longer-term operations and maintenance crews are what remain at the network. In other words, the size of the opex budget per annum, at an efficient mobile network operation, is directly proportional to the cumulative capex network build that was required to establish it. As the network grows in size, so will the opex expenditure.

C.8 Mobile BB and BB FWA network capex

C.8.1 Provincial breakdown – mobile BB and BB FWA capex breakdown

The following capex breakdown illustrates the new build and upgrade mobile BB and BB FWA investment requirements under the BtG methodology, using nominal USD and R pricing projected to 2035, but expressed in real 2025 R terms (i.e. this includes exchange rate fluctuations and forecasts up to 2035).

The BtG framework emphasises disaggregated costing, service-level targeting and cost-effectiveness. Also in this table is the effective cost per added user. The reason why the R-based capex is so low is due to the reuse of 2G and 3G sites across the country. In this base case (Declining Economy Scenario with a download access speed of 100 Mbps and a contention ratio of 1:20), only one new fill-in site is required in KwaZulu-Natal. The rest of the capex is required for upgrades to 4G and 5G RAN infrastructure, and is therefore USD based.

Appendix C-8: Mobile BB and BB FWA capex breakdown by province

	USD capex active RAN equipment and upgrades (Rm 2025 real terms)	R capex passive site build costs (Rm 2025 real terms)	Total cumulative mobile BB FWA capex costs (Rm 2025 real terms)	Total additional users catered for by 2035 (MBB + BB FWA)	Approx. capex / additional user in USD for the base case by 2035
Eastern Cape	3 959.67	-	3 959.67	1 846 223	107.24
Free State	2 116.93	-	2 116.93	850 670	124.43
Gauteng	13 911.58	-	13 911.58	5 319 673	130.76
KwaZulu-Natal	10 714.70	1.68	10 716.38	2 885 882	185.67
Limpopo	5 033.80	-	5 033.80	1 838 894	136.87
Mpumalanga	4 762.63	-	4 762.63	1 432 987	166.18
North West	4 134.12	-	4 134.12	1 150 422	179.68
Northern Cape	1 219.96	-	1 219.96	335 379	181.88
Western Cape	5 812.36	-	5 812.36	2 271 599	127.94
	51 665.76	**1.68**	**51 667.43**	**17 931 729**	**144.07**

Source: Africa Analysis 2025

C.8.2 BtG implication

The previous table illustrates the importance of making sub-1 GHz spectrum available for mobile broadband use, as this facilitates the use of existing 2G and 3G sites for mobile BB and BB FWA use. By eliminating such a large cost base, the capex per added subscriber can be kept below USD150 per user, a remarkable feat if this can be achieved in practice.

C.8.3 Key BtG methodological takeaways

Freeing up the sub-1 GHz bands has become urgent to achieve, and requires strategic targeting. This refers to the 700 MHz and the components of the 800 MHz bands that are waiting to be freed up, as the 900 MHz bands have already been licensed to, and are used by existing operators for 2G access. These 900 MHz spectrum bands can be re-farmed for 4G as soon as 2G is retired.

C.8.4 Universal access speed and contention ratio acceptability for rural areas

With a download speed of approximately 100 Mbps (contended at a ratio of 1:20, with the exception of both school and health facilities, which have been left uncontended), we are looking at a worst case (Economic Decline Scenario where the FTTH cutoff was set at < 5 km) total capex investment quantum of around R51.7 billion (in 2025 real R). Rerunning this case again at 100 Mbps (with the same contention ratio settings) but now with a midway economic scenario (Economic Stagnation where the FTTH cutoff was set at < 10 km), this only requires a total capex investment quantum of about half of that amount (a total 10-year capex quantum estimated at R25.7 billion). With a best-case economic scenario (the Economic Growth Scenario, where the FTTH cutoff was set to < 20 km), it will require a capex investment quantum of only approximately R18.6 billion (in 2025 real R) due to the bulk of households being served by FTTH.

Reducing the 'acceptable' download speed to 50 Mbps (with the same contention settings) causes a large reduction in capex requirements. In the worst case (Economic Decline Scenario where the FTTH cutoff was set at < 5 km), the total capex investment quantum sits at around R22.4 billion (in 2025 real R). Rerunning this case again at 50 Mbps (with the same contention ratio settings) but now with a midway economic scenario (Economic Stagnation where the FTTH cutoff was set at < 10 km), this only requires a total capex investment quantum of 0.68 times that amount (a total 10-year capex quantum estimated at R15.2 billion). With a best-case economic scenario (the Economic Growth Scenario, where the FTTH cutoff was set to < 20 km), it will require a capex investment quantum of about R13.3 billion (in 2025 real R) due to the bulk of households again being served by FTTH.

Taking this to the next logical step resulted in a set of speed variation tests for each scenario (where the fibre cutoff limit was set in accordance with the earlier definitions).

C.9 Mobile BB and BB FWA analysis by access speed per scenario

C.9.1 Economic Decline Scenario speed analysis (< 5 km band)

In this scenario, all H3 hex areas which are less than 5 km from a fibre node have been specifically excluded from the mobile BB FWA HH and facility targets (but are still included in the mobile BB targets). Similarly, the households within areas otherwise considered the domain of mobile BB FWA have been excluded where the household density is > 6 000 HH / km^2. This is considered to be a lower-income area and is therefore considered to be the domain of the lower-cost public Wi-Fi type FWA networks. Again, this restriction on households has no effect on the mobile BB targets. In the same way, where an H3 hex area falls greater than 100 km from a fibre node, and where HH density is <5 HH / km^2, this has been considered the domain of the satellite service operators, so mobile BB FWA as a service has been excluded, while mobile BB as a service to the addressable population is still included.

Appendix C-9: Mobile BB and BB FWA capex cost drivers by access speed – Declining Scenario

Economic Decline Scenario

Capex Costs per selected download speed with a contention ratio of 1 : 20 (with capacity upgrades applied to all areas)	*20 Mbps*	*50 Mbps*	*100 Mbps*	*200 Mbps*	*500 Mbps*	*1 Gbps*
ZAR related costs (Site build etc.) : (ZAR m)	-	-	1.68	95.50	553.81	1 625.53
USD related costs (active equipment) : (ZAR m)	11 885.41	22 389.60	51 665.76	104 584.81	142 409.13	158 316.51
Total Capex costs : (ZAR m)	**11 885.41**	**22 389.60**	**51 667.43**	**104 680.31**	**142 962.94**	**159 942.04**
Market average annual Investment : (ZAR m)	25 000.00	25 000.00	25 000.00	25 000.00	25 000.00	25 000.00
Share replacement capex:	40%	40%	40%	40%	40%	40%
Share new capex :	60%	60%	60%	60%	60%	60%
Market average annual new capex : (ZAR m)	15 000.00	15 000.00	15 000.00	15 000.00	15 000.00	15 000.00
No. of years of new capex:	0.79	1.49	3.44	6.98	9.53	10.66
Fibre HH Restriction : distance from FN <	5	5	5	5	5	5
Low cost FWA HH Restriction : HH density >	6 000	6 000	6 000	6 000	6 000	6 000
Sat HH Restriction : distance > & HH density <:	100km & < 5	100km & < 5	100km & < 5	100km & < 5	100km & < 5	100km & < 5
Total no. of new sites to be built:	-	-	1	49	288	898
Total no. of 3 sector (1.1.1) upgrades reqd.	39 447	74 310	171 476	347 014	471 383	513 818
Additional MBB (Addressable Mkt) customers:	***942 005***	***942 005***	***942 005***	***942 005***	***942 005***	***942 005***
Additional HHS covered by Mobile BB FWA:	***490 997***	***490 997***	***490 997***	***490 997***	***490 997***	***490 997***
Tot covered MBB (Addressable Mkt) customers:	*49 184 679*	*49 184 679*	*49 184 679*	*49 184 679*	*49 184 679*	*49 184 679*
Tot covered HHS only covered by Mobile BB FWA	*10 152 462*	*10 152 462*	*10 152 462*	*10 152 462*	*10 152 462*	*10 152 462*
# School facilities only covered by Mob BB FWA:	***13 023***	***13 023***	***13 023***	***13 023***	***13 023***	***13 023***
# Health facilities only covered by Mob BB FWA:	***2 278***	***2 278***	***2 278***	***2 278***	***2 278***	***2 278***
# "Other" facilities only covered by Mob BB FWA:	***1 613***	***1 613***	***1 613***	***1 613***	***1 613***	***1 613***
Associated Opex estimate : (ZAR m)	**11 122.73**	**20 952.86**	**48 351.64**	**97 946.17**	**133 691.56**	**149 392.54**
Total Opex + Capex : (ZAR m)	***23 008.14***	***43 342.46***	***100 019.07***	***202 626.48***	***276 654.50***	***309 334.58***

Source: Africa Analysis 2025

As can be seen from the previous data table (where all capex and opex cost components are quoted in R millions), there is a large increase in the cost-of-service curve at around the 200 Mbps DL access speed point due to the requirement to start building sites to get the required throughput capacity to deliver on expectations. In fact, above this inflexion point, there is a decrease in the cost per Mbps due to the efficiency of more advanced technologies, but at the high investment level required to realise these efficiencies offered through the more advanced technologies, the total investment cost is prohibitively high, so it is unlikely that any investment will be made and can thus be ignored.

Below this inflexion point, the major cost driver is the imported equipment required to upgrade the capacity of each of the existing 2G and 3G sites with 4G RAN infrastructure. Only when the capacity of 4G is exhausted in each spectrum band is the next highest band deployed, and hence, as it stands, very little 5G infrastructure is required (until the target throughput rate increases to the 500 Mbps DL speed and above ranges) because of the approach followed.

As can be seen in the previous table, the total capex + Opex for the 100 Mbps case is around R100 billion (in 2025 real terms).

C.9.2 Economic Stagnation Scenario speed analysis (< 10 km band)

Again, in this scenario, the limits have been defined to restrict the households and facilities served through mobile BB FWA (but where the mobile BB service offered to the addressable population still remains, due to their mobility requirements). For this scenario, the lower FTTH limit has been increased to less than 10 km from a fibre node. Again, the households within areas otherwise considered the domain of mobile BB FWA have been excluded, where the household density is >6 000 HH / km^2. As this is considered to be a lower-income area, it is seen as the domain of the lower-cost public Wi-Fi type FWA networks. In the same way, where an H3 hex area falls greater than 100 km from a fibre node, and where HH density is <5 HH / km^2, this has been considered the domain of the satellite service operators, so mobile BB FWA as a service has been excluded. As was the case for the Economic Decline Scenario, these limitations are only applied to the BB FWA service and is such that the mobile BB service is expanded for all users requiring 'mobility' to cover all areas currently with no mobile BB (4G I LTE and / or 5G) services, as well as to increase the capacity in areas where the Ookla test data shows the service to be less than the minimum expectations.

Appendix C-10: Mobile BB and BB FWA capex cost drivers by access speed – Stagnating Scenario

Economic Stagnation Scenario

Capex Costs per selected download speed with a contention ratio of 1 : 20 (with capacity upgrades applied to all areas)						
	20 Mbps	*50 Mbps*	*100 Mbps*	*200 Mbps*	*500 Mbps*	*1 Gbps*
ZAR related costs (Site build etc.) : (ZAR m)	-	-	-	50.00	410.40	1 595.96
USD related costs (active equipment) : (ZAR m)	11 284.24	15 248.87	25 674.45	47 189.88	85 199.27	111 885.03
Total Capex costs : (ZAR m)	**11 284.24**	**15 248.87**	**25 674.45**	**47 239.88**	**85 609.67**	**113 480.99**
Market average annual Investment : (ZAR m)	25 000.00	25 000.00	25 000.00	25 000.00	25 000.00	25 000.00
Share replacement capex :	40%	40%	40%	40%	40%	40%
Share new capex :	60%	60%	60%	60%	60%	60%
Market average annual new capex : (ZAR m)	15 000.00	15 000.00	15 000.00	15 000.00	15 000.00	15 000.00
No. of years of new capex :	0.75	1.02	1.71	3.15	5.71	7.57
Fibre HH Restriction : distance from FN < :	10	10	10	10	10	10
Low cost FWA HH Restriction : HH density > :	6 000	6 000	6 000	6 000	6 000	6 000
Sat HH Restriction : distance > & HH density < :	100km & < 5	100km & < 5	100km & < 5	100km & < 5	100km & < 5	100km & < 5
Total no. of new sites to be built :	-	-	-	28	210	835
Total no. of 3 sector (1.1.1) upgrades reqd. :	37 496	50 670	85 313	156 794	282 034	360 636
Additional MBB (Addressable Mkt) customers :	***942 005***	***942 005***	***942 005***	***942 005***	***942 005***	***942 005***
Additional HHS covered by Mobile BB FWA :	***455 094***	***455 094***	***455 094***	***455 094***	***455 094***	***455 094***
Tot covered MBB (Addressable Mkt) customers :	*49 184 679*	*49 184 679*	*49 184 679*	*49 184 679*	*49 184 679*	*49 184 679*
Tot covered HHS only covered by Mobile BB FWA :	*6 064 906*	*6 064 906*	*6 064 906*	*6 064 906*	*6 064 906*	*6 064 906*
# School facilities only covered by Mob BB FWA :	***10 332***	***10 332***	***10 332***	***10 332***	***10 332***	***10 332***
# Health facilities only covered by Mob BB FWA :	***1 759***	***1 759***	***1 759***	***1 759***	***1 759***	***1 759***
# "Other" facilities only covered by Mob BB FWA :	***1 226***	***1 226***	***1 226***	***1 226***	***1 226***	***1 226***
Associated Opex estimate : (ZAR m)	**10 661.11**	**14 406.80**	**24 256.66**	**44 622.63**	**80 811.74**	**106 940.57**
Total Opex + Capex : (ZAR m)	***21 945.35***	***29 655.67***	***49 931.12***	***91 862.52***	***166 421.42***	***220 421.56***

Source: Africa Analysis 2025

As can be seen in the previous table, the total capex + opex for the 100 Mbps case is about R50 billion (in 2025 real terms), which, like the Economic Decline Scenario case above, sits below the inflexion point, which is due to the need to deploy higher-order spectrum equipment, requiring a degree of site build.

C.9.3 Economic Growth Scenario speed analysis (< 20 km band)

In this third scenario, all H3 hex areas less than 20 km from a fibre node have been specifically excluded from the mobile BB FWA households and facility targets (but are still included in the mobile BB targets). Similarly, the households within areas otherwise considered the domain of mobile BB FWA have been excluded, where the household density is >6 000 HH / km^2. As this is considered to be a lower-income area, it is considered to be the domain of the lower-cost public Wi-Fi type FWA networks. Again, this restriction on households has no effect on the mobile BB targets. In the same way, where an H3 hex area falls greater than 100 km from a fibre node, and where household density is <5 HH / km^2, this has been considered the domain of the satellite service operators, so mobile BB FWA as a service has been excluded, while mobile BB as a service to the addressable population is still included.

Appendix C-11: Mobile BB and BB FWA capex cost drivers by access speed – Recovery Scenario

Economic Growth Scenario

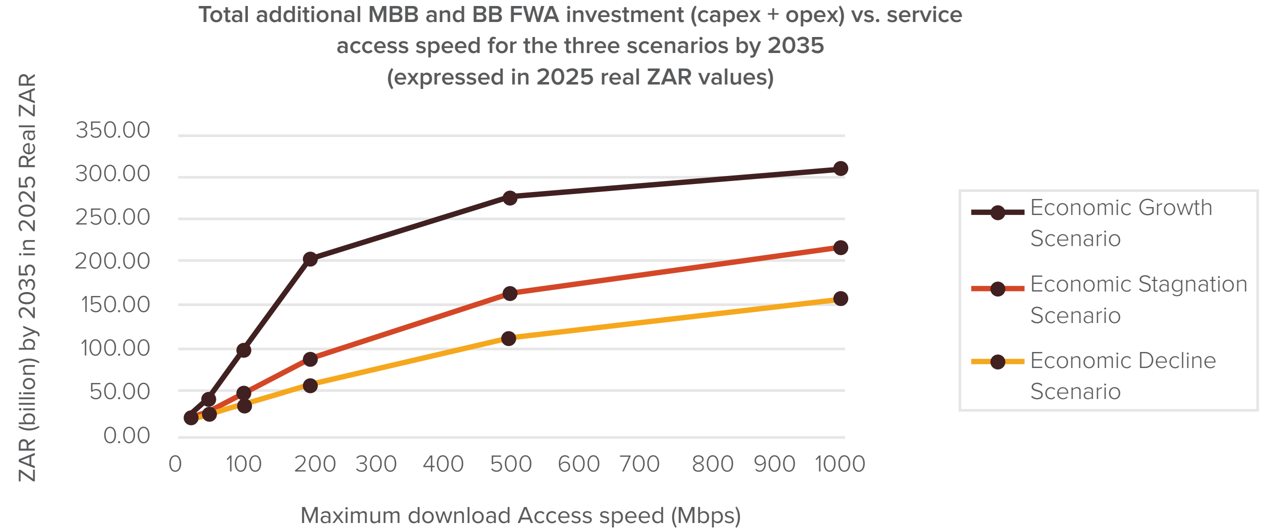
Capex Costs per selected download speed with a contention ratio of 1 : 20 (with capacity upgrades applied to all areas)	20 Mbps	50 Mbps	100 Mbps	200 Mbps	500 Mbps	1 Gbps
ZAR related costs (Site build etc.) : (ZAR m)	-	-	-	6.11	259.54	1 095.95
USD related costs (active equipment) : (ZAR m)	10 735.60	13 313.63	18 595.72	31 355.96	58 610.83	81 343.79
Total Capex costs : (ZAR m)	**10 735.60**	**13 313.63**	**18 595.72**	**31 362.07**	**58 870.37**	**82 439.74**
Market average annual Investment : (ZAR m)	25 000.00	25 000.00	25 000.00	25 000.00	25 000.00	25 000.00
Share replacement capex	40%	40%	40%	40%	40%	40%
Share new capex:	60%	60%	60%	60%	60%	60%
Market average annual new capex : (ZAR m)	15 000.00	15 000.00	15 000.00	15 000.00	15 000.00	15 000.00
No. of years of new capex:	0.72	0.89	1.24	2.09	3.92	5.50
Fibre HH Restriction : distance from FN <	20	20	20	20	20	20
Low cost FWA HH Restriction : HH density >:	6 000	6 000	6 000	6 000	6 000	6 000
Sat HH Restriction : distance > & HH density < :	100km & < 5	100km & < 5	100km & < 5	100km & < 5	100km & < 5	100km & < 5
Total no. of new sites to be built:	-	-	-	3	126	579
Total no. of 3 sector (1.1.1) upgrades reqd.	36 029	44 681	62 408	105 225	196 128	265 626
Additional MBB (Addressable Mkt) customers:	***942 005***	***942 005***	***942 005***	***942 005***	***942 005***	***942 005***
Additional HHS covered by Mobile BB FWA :	***277 065***	***277 065***	***277 065***	***277 065***	***277 065***	***277 065***
Tot covered MBB (Addressable Mkt) customers:	*49 184 679*	*49 184 679*	*49 184 679*	*49 184 679*	*49 184 679*	*49 184 679*
Tot covered HHS only covered by Mobile BB FWA:	*2 857 035*	*2 857 035*	*2 857 035*	*2 857 035*	*2 857 035*	*2 857 035*
# School facilities only covered by Mob BB FWA:	***5 350***	***5 350***	***5 350***	***5 350***	***5 350***	***5 350***
# Health facilities only covered by Mob BB FWA:	***978***	***978***	***978***	***978***	***978***	***978***
# "Other" facilities only covered by Mob BB FWA:	***590***	***590***	***590***	***590***	***590***	***590***
Associated Opex estimate : (ZAR m)	**10 063.72**	**12 480.40**	**17 431.92**	**29 398.34**	**55 145.51**	**77 109.34**
Total Opex + Capex : (ZAR m)	***20 799.31***	***25 794.03***	***36 027.64***	***60 760.41***	***114 015.88***	***159 549.09***

Source: Africa Analysis 2025

As can be seen in the previous table, the total capex + opex for the 100 Mbps case is about R36 billion (in 2025 real terms), which, like the Economic Stagnation Scenario, sits below the inflexion point. This is due to the need to deploy higher-order spectrum equipment, requiring a degree of site build. In this scenario, the inflexion point is just below 200 Mbps access speed.

C.9.4 Final speed analysis

Appendix C-12: Mobile BB and BB FWA capex cost access speed driver by scenario



Source: Africa Analysis 2025

In graph C-12, the inflexion point at around the 200 Mbps mark for the Economic Decline Scenario (as was described earlier) can be clearly seen, but not really for the other two scenarios. This results in a flattening of the curve (i.e. it becomes cheaper, in terms of added cost per added Mbps, to add capacity as we get higher in the curve). This is understandable, as the higher-order newer technologies are more efficient and effective when compared to earlier technologies.

However, the key component to look at is the affordability of the overall solution within the country. In the worst-case scenario (the Declining Economy Scenario), at the 100 Mbps level, given a current investment level in the South African mobile industry of around R15 billion per year, it would take approximately 3.5 years to pay off the capex spend of R51.7 billion. This is arguably doable in South Africa, but expenditure more than this is unlikely to attract investors due to the resultant returns on investment, and as a result, this was set as the benchmark level for this study. Important to note is that this is the worst-case scenario, and hence, should the evolving reality be better than this, the investment required would be less, the payoff period would be quicker, and hence the returns much greater.

C.10 BtG implications

The analysis illustrates the importance of calculating the correct access speeds and contention ratios which would be deemed acceptable in South Africa. It is not known how the current SA Connect access speeds were determined, but they possibly need to be revisited and redetermined based on affordability and a satisfaction index (value for money) for end users being able to access the Internet at appropriate access speeds and with the appropriate contention ratios.

In effect, these are merely there to reduce the cost to invest in a network, as most users do not need their nominal throughput rate at all times, and so it is there to enable a number of users to contend for or share each unit of capacity between them, thereby reducing the cost of the network, and ultimately the end user access fees payable to the mobile network operator. Taking this to its logical conclusion, this requires a careful look at all the quality-of-service parameters, including acceptable limits for network latency, jitter and packet loss.

C.10.1 Key BtG methodological takeaways

Freeing up the sub-1 GHz bands (specifically, the 700 MHz and the components of the 800 MHz bands that are waiting to be freed up, as the 900 MHz band has already been licensed to operators) has become urgent to achieve and requires strategic targeting.

A set of calculated acceptable access speeds, contention ratios and other critical network quality-of-service parameters (including latency, jitter, and packet loss) must be determined for each market segment and paired with the appropriate and corresponding technology as available in South Africa. This includes that available for mobile broadband, as well as that available for fixed access technologies (FTTH, mobile BB network-based FWA, public Wi-Fi-based FWA, and satellite services). This would then be a guide for ICASA to issue future licence agreements with prospective operators and would replace the current SA Connect targets.

C.10.2 Scenario sensitivity: Cost impact of socio-economic trajectories

The Economic Decline Scenario consistently incurs the highest costs. This is due to:

- Higher per-unit costs in low-density rural or economically distressed areas; and
- Greater capacity requirement to be delivered via mobile BB FWA due to a largely shrunk FTTH offering.

Implication

If the economy falters or demand remains low (i.e. the Economic Decline Scenario), the state must absorb more infrastructure costs with less private sector participation, worsening fiscal pressure. Conversely, under the Economic Growth Scenario, higher uptake and co-investment could lead to cost-efficiencies and shared capex.

C.10.3 Policy Timing and Prioritisation

The rollout and capacity upgrades can be evenly spread across the time period. Where site build has been identified, it makes sense to start these early on in the process to factor in any potential delays which could otherwise disrupt the project.

Implication

Policy focus should:

- Prioritise urban and peri-urban deployment where site build might be required early (high return on investment zones might exist as well as to reduce the impact of any site build delays on the project).

C.10.4 Investment strategy and blended finance potential

Higher costs under the Decline and Stagnate Scenarios imply greater reliance on public investment and subsidy instruments (e.g. Broadband Access Fund). The Economic Growth Scenario suggests a more viable environment for private capital especially in open-access models.

Implication

- Blended finance structures will be essential to mitigate risk and attract private sector capital under higher-cost scenarios.
- Multilateral DFIs and concessional lending could fill gaps in late-stage deployments in the Economic Decline Scenario, particularly in rural or informal settlements.

C.10.5 Risk of delayed implementation

If implementation lags until later years (e.g., major investments deferred beyond 2028) the model illustrates rapidly escalating costs due to the volume of imported infrastructure and exposure to exchange rate degradation. This reinforces:

- The cost of inaction, especially in the face of inflation, exchange rate volatility and increased labour or material costs; and
- The risk of not meeting 2030 - 2035 digital inclusion targets as outlined in SA Connect and the NDP.

The BtG Mobile BB and BB FWA cost model shows how socio-economic trends, policy implementation pace and geographic deployment strategy profoundly impact investment needs. Early proactive infrastructure rollout in the Economic Growth Scenario minimises long-term public cost exposure and maximises socio-economic returns. Conversely, the Economic Decline scenario poses a fiscal and operational risk that necessitates strong public planning subsidy support and institutional coordination.

D. HOUSEHOLD AFFORDABILITY MODELLING METHODOLOGY

D.1 Objective of the Household Affordability Model

The Household Affordability Model aims to estimate the ability of households to afford ICT devices and broadband services. The model is to provide a breakdown of the number of households that can/cannot afford broadband per municipality.

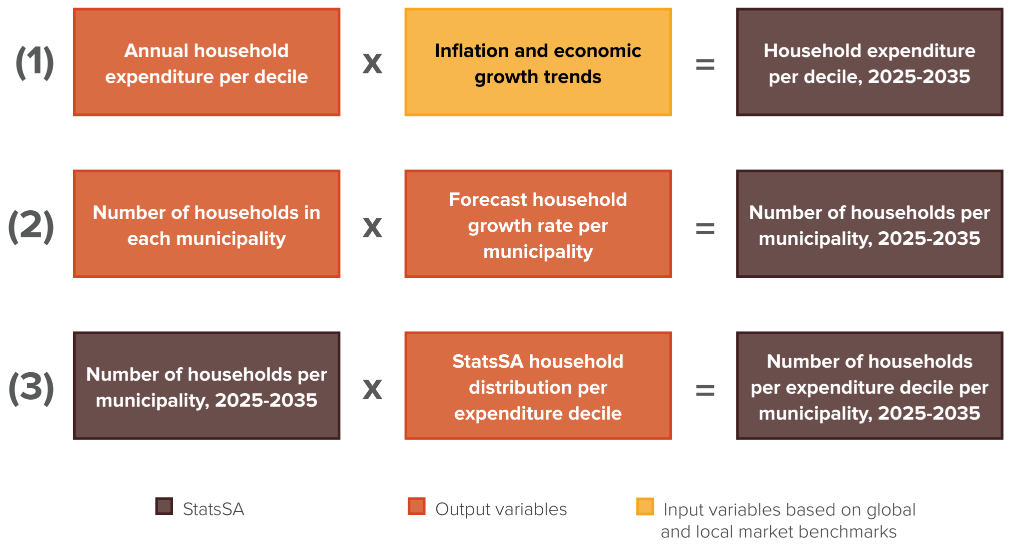
D.2 Model methodology

The key unit in this model is the household as the primary location where:

- Multiple devices may connect to the Internet, where each device does not require network authentication or payment for use.
- Minimum expected quality of service is suitable to provide high-speed broadband connectivity to support multiple different consumption cases, including consumption by individuals without any disposable income (e.g. children).

The following figure describes Stage 1 of the model: determining the number of households per expenditure decile per municipality for the forecast period of 2025 - 2035.

Appendix D-1: Household Affordability Model – Stage 1

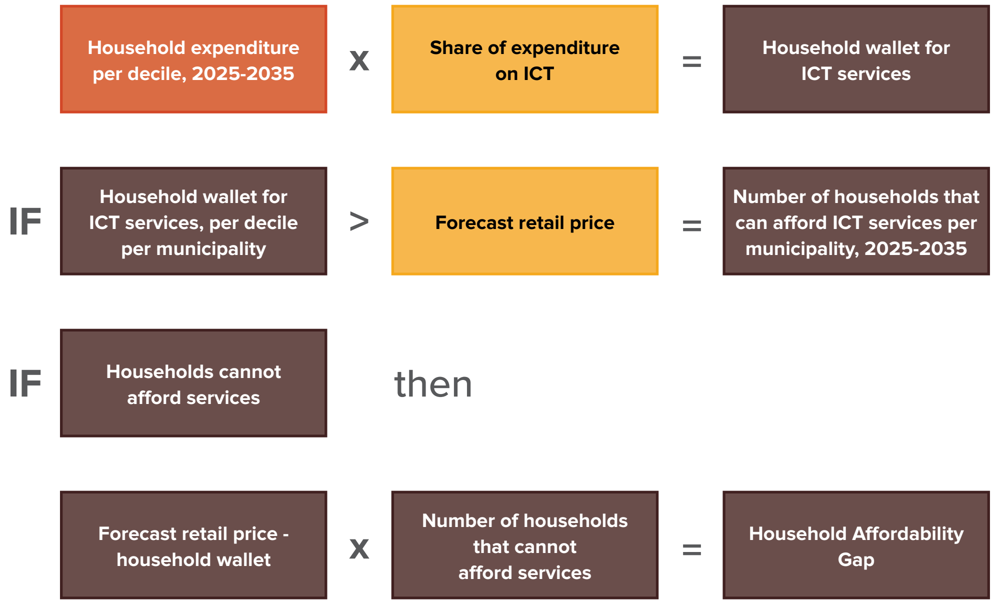


Source: Africa Analysis 2025

The following figure explains Stage 2 of the model, which has two objectives:

- To identify the number of households that can afford broadband services at specific expenditure shares and price points; and
- To estimate the household affordability gap.

Appendix D-2: Household Affordability Model - Stage 2: Scenario planning



Source: Africa Analysis 2025

D.2.1 Input variables

There are three distinct categories of input variables:

- Scenario planning variables;
- Historical data on household expenditure (e.g. StatsSA 2023 Income and Expenditure Survey); and
- Sector-specific variables in terms of household expenditure and retail prices.

D.2.2 Scenario planning variables

Household expenditure over time may increase or decrease, dependent on real household income growth (driven by economic growth) and the impact of inflation. Annual household expenditure is forecast for each of the three scenarios.

D.2.2.1 Historical data on household expenditure

Household expenditure data has been extracted from the following StatsSA series:

- Income and expenditure of households (P0100); and
- Living conditions of households in South Africa (P0310).

D.2.2.2 Sector-specific variables for household expenditure and retail prices

The two scenario-dependent variables in the model are:

- The retail price of a service; and
- The share of household expenditure that is spent on ICT services.

The following table outlines the assumptions made for each of these variables.

Appendix D-3: Project scenarios for the year 2035			
	Economic Decline	Economic Stagnation	Economic Recovery
	Technology-neutral price per month for an uncapped low-contention high-speed broadband product to the home		
Model assumption			
2025	R299 per month & R90 per month		
2035[78]	R380	R360	R330
Rate of pass-through of inflation rate per year	50%	50%	30%
Justification (price)	• The retail price of high-speed broadband for the period 2025 - 2035 is calculated using a base price in 2025, extrapolated outwards based on inflationary price increases under each scenario. • Feedback from industry consultation is that while, historically, there have been price declines over the period 2020 - 2025, operators have experienced cost increases over the same period. To balance return on investment and cost pressures, operators are likely to follow a cost+ price annual price increase linked to the overall inflation rate. • The household data consumption profile consists of at least three devices accessing the Internet with a minimum of two unique users concurrently consuming data. The consumption profile consists of streaming both entertainment and education content, social media, and Internet access for employment/work purposes. The data consumption profile of this household will increase as digital literacy and participation in the digital economy increases (e.g. through platform-based work, work-from-home call centres, etc.). • The technology-neutral base price per month for an uncapped, low-contention high-speed broadband product in 2025 is assumed to be R299. • This base price assumes a low cost of capital and a take-up rate of over 50% per network location. • This assumption is high with many FNOs targeting take-up rates of between 35% - 45%. • If take-up rates of broadband services are low, then operators will be forced to increase retail prices at rates greater than inflation.		
Justification (rate of pass-through of inflation)	• Operators will attempt to not pass through inflation costs to avoid losing existing customers. • Over time, the take-up of broadband services is expected to increase, leading to an increase in operator revenues. • The increase in revenues allows operators to reduce the cost of capital and have more flexibility to determine price levels to sustain and increase take-up levels. • In both Scenarios 1 and 2, the inflation pass-through rate is assumed to be the same. In Scenario 1, operators may wish to increase prices at a higher rate but cannot do so without facing the risk of losing end users due to general affordability constraints.		
	Share of household expenditure allocated to ICT services		
Model assumption	4.1% of household expenditure is spent on ICT services	4.1% of household expenditure by 2035	4.1% of household expenditure by 2035
Justification	It is a global trend that households are spending more on ICT services, especially as social media and gaming products become more mainstream. For this reason, the Household Affordability Model holds the share of household expenditure constant through the forecast period, at the national average of 4.1% (expenditure by the lowest decile).		

[78] Rounded to the nearest ten Rand.

D.3 Model results

D.3.1 Household affordability according to household expenditure deciles

Appendix D-4: Retail prices at different shares of household expenditure (2024 South African rand)					
Decile	Monthly total household expenditure (IES 2023 data in constant 2024 values)	Share of household expenditure			
		2%* @ R300.00	4.50%** @ R300.00	2%* @ R90.00	4.50%** @ R90.00
Lower	2 151.00	43.03	96.81	43.03	96.81
2	3 481.00	69.63	156.66	69.63	156.66
3	4 544.00	90.88	204.48	90.88	204.48
4	5 653.00	113.07	254.40	113.07	254.40
5	6 943.00	138.86	312.44	138.86	312.44
6	8 615.00	172.29	387.65	172.29	387.65
7	10 983.00	219.67	494.25	219.67	494.25
8	15 002.00	300.04	675.09	300.04	675.09
9	22 900.00	458.00	1 030.50	458.00	1 030.50
Upper	53 056.00	1 061.12	2 387.51	1 061.12	2 387.51
Average	2 151.00	266.69	600.05	266.69	600.05

Source: Africa Analysis 2025 calculations. World Development Indicators

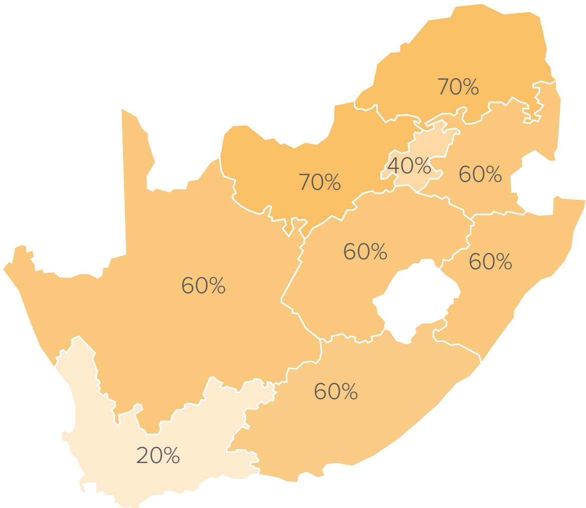
*UMC indicator ** Aggregate StatsSA household expenditure on ICT services

D.3.2 The share of households that cannot afford a household broadband connection in 2035

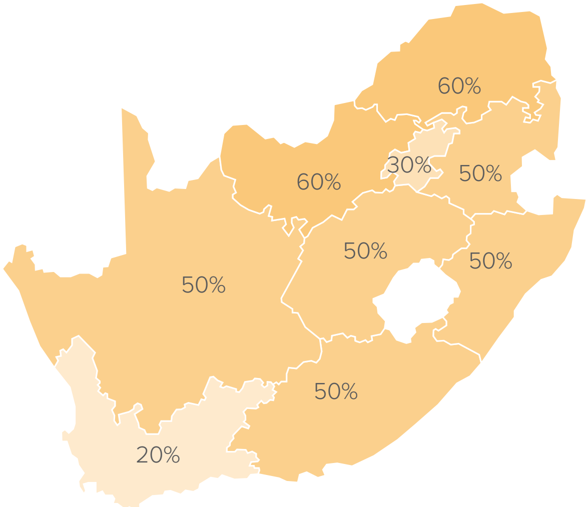
D.3.2.1 Retail price of R300

Appendix D-5: Share of households that cannot afford a broadband connection at R300, indexed to 2035

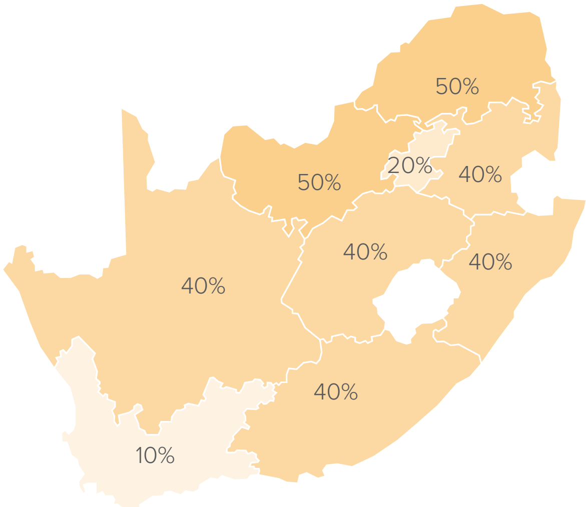
Scenario 1: Decline



Scenario 2: Stagnation



Scenario 3: Economic Recovery

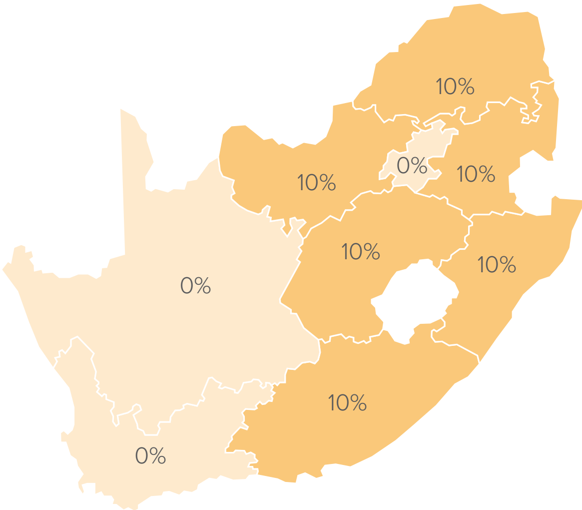


Source: Africa Analysis Household Affordability Model 2025

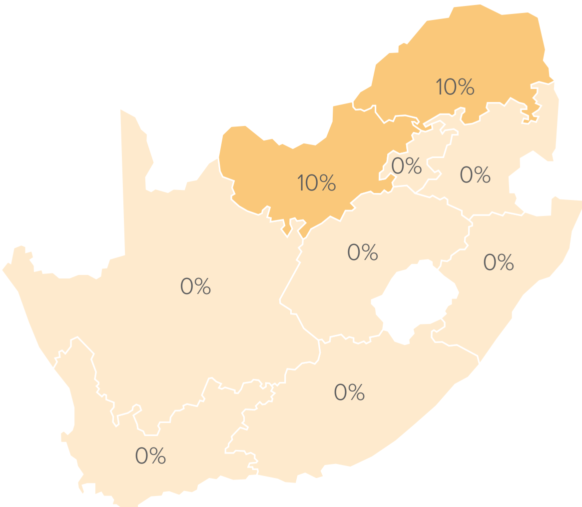
D.3.2.2 Retail price of R90

Appendix D-6: Share of households that cannot afford a broadband connection at R90, indexed to 2035

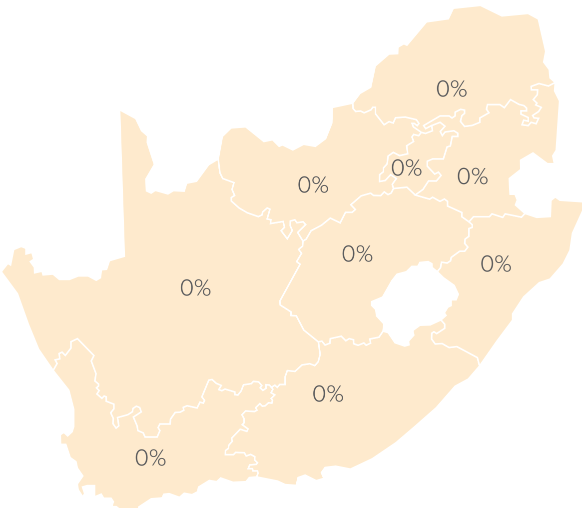
Scenario 1: Decline



Scenario 2: Stagnation



Scenario 3: Economic Recovery



Source: Africa Analysis Household Affordability model

D.4 The importance of an uncapped connection that is shared between multiple devices

The following table illustrates the number of households that can afford access to broadband under three time-constraint use cases:

1. An always-on connection;
2. Available for 10 hours a day (intermittent use case 1); and
3. Available for five hours a day (intermittent use case 2).

The following table illustrates that an always-on connection is beyond the reach of 50% of South African households in 2025. However, over 65% of South African households will be able to afford an always-on connection by 2035 in Scenario 3, where economic growth recovers substantially over the next 10 years.

Only 16% of households in 2025 cannot afford access to the Internet for 10 hours per day (where the time of use is measured across all devices connected to the router in the home). By 2035, only 9% of households will be unable to purchase this form of Internet access, in a situation of economic decline for 2025 - 2035.

Only 2% of households cannot afford access to the Internet for five hours a day in 2025, with all households expected to be able to afford this form of intermittent access to the Internet by 2024, despite the economic trajectory.

Key considerations in this analysis are the following:

1. Households are paying for a period of time for access to the Internet, i.e. there are no volume caps.
2. These connections are open to all devices that are normally present within the household.
3. Routers for the distribution of connectivity to multiple end-user devices are installed and available in every household.

Appendix D-7: How many households can afford time-of-use-based iterative consumption patterns

		Scenario 1		Scenario 2		Scenario 3	
	Total number of households	Monthly retail price	% of households that cannot afford a service	Monthly retail price	% of households that cannot afford a service	Monthly retail price	% of households that cannot afford a service
	Always-on connection						
2025	19,327,573	325	51%	325	51%	325	51%
2030	21,809,672	363	47%	362	46%	345	42%
2035	24,520,343	411	50%	397	41%	364	31%
	10 hours per day						
2025	19,327,573	136	16%	136	16%	136	16%
2030	21,809,672	151	13%	151	9%	144	7%
2035	24,520,343	172	9%	165	7%	152	4%
	5 hours a day per house						
2025	19,327,573	68	2%	68	2%	68	2%
2030	21,809,672	76	0%	75	0%	72	0%
2035	24,520,343	86	0%	83	0%	76	0%

Source: Africa Analysis Household Affordability Model 2025

Contrary to the per device mobile data charging model, household-based access to the Internet, where traffic from all end-user devices is aggregated at the router inside the household, generates larger volumes of data traffic, and therefore lower per GB access and usage fees.

D.5 Conclusions

South Africa has achieved the UMC pricing target of 2% of monthly GNI. South Africa looks 'good' on an international basis. However, this masks significant affordability constraints. South Africa's household income levels, particularly in the lower four deciles, are too low to afford high-speed broadband at R300 per month. Retail prices of broadband packages have declined over the last few years, and the introduction of fixed fibre to Wi-Fi hotspot services is driving more affordable high-speed broadband services into lower-income geographic areas.

Despite this, the ability for households to afford an always-on high-speed broadband connection is not dependent on sectoral pricing (alone). The real constraint is the low absolute level of monthly household income. This is a function of the performance of the South African economy, and more particularly, the job market (where unemployment is at over 33.2% of the labour force in Quarter 2, 2025).

E. INFORMATION SOURCES AVAILABLE AND USED IN THIS PROJECT

Appendix E-1: Infrastructure-focused digital readiness indicators and their availability		
Value chain element	**Metric**	**Are data points publicly available in South Africa?**
Supporting infrastructure	• Availability of secure supply of electricity • Infrastructure map of provision of electricity supply to end users	• Data on use and availability do not capture granular levels of detail for electricity
First mile	• Number of international undersea cables	• Public sources
	• Total capacity of international undersea cables	• Public sources
	• Average usage of international	• ICASA and ITU
Middle mile	• Availability of fixed backhaul links between all urban and secondary towns (transmission)	• Available from some operator websites
	• Number and volume of traffic carried by internet exchange points	• Public sources
	• Number and capacity of data centres	• Public sources
	• Middle-mile infrastructure access gap	• Available from ITU, but data are compiled from public research • Data are not available/compiled for policy development, monitoring and evaluation
Last mile	• Population coverage by mobile operators (by technology)	• Mobile operators, ICASA, ITU
	• Number of homes/businesses passed (fibre and FWA services)	• None
	• Number of homes/businesses connected (fibre and FWA services)	• ICASA and ITU
	• Government facility connectivity	• No date captured/made available in a centralised form
	• Last-mile infrastructure access gap	• Individual network operator websites • Data are not available for policy development, monitoring and evaluation
	• Affordability indices	• Public sources • ICASA, StatsSA and ITU

Source: Africa Analysis Household Affordability Model 2025

Appendix E-2: Metrics for the measurement of e-government readiness		
	Metric	**Data available**
Interfaces with government and end users	List of priority services that government requires all entities to provide online.	No
	Quarterly reporting [79] on provision of online services, covering a minimum of: • Uptime; • Number of unique users per day; • Cause of network/service downtime; and • Number and type of cyber attacks.	No
	Existence of a project management office/support team that all government agencies may approach for assistance[80].	No
Data management and data exchange	Compliance with information security control standards.	Yes
	Specification of common standard for data exchange between entities.	No
	Specification of entities that hold data of national significance that may benefit all departments (or a cluster).	No
	Specified standards for the use of private hosting facilities, including data backup, cybersecurity, etc.	Yes
	Specification that all government departments must digitise records by a specific deadline.	No
	Obligation on all government entities to digitise government records prior to any office relocation.	

Source: Africa Analysis 2025

[79] Such reporting already occurs anecdotally via the Government Information Technology Officers Council.
[80] This vehicle could follow the same principles as the Government Technical Advisory Centre.

Appendix E-3: Infrastructure-focused digital readiness indicators and their availability		
Value chain element	Metric	Are data points publicly available in South Africa?
Supporting infrastructure	• Availability of secure supply of electricity • Infrastructure map of provision of electricity supply to end users	Data on use and availability do not capture granular levels of detail
The first mile	Number of international undersea cables	Public sources
	Total capacity of international undersea cables	Public sources
	Average usage of international capacity	ICASA, ITU
Middle mile	Availability of fixed backhaul links between all urban and secondary towns (transmission)	Available from some operator websites
	Number and volume of traffic carried by Internet Exchange Points	Public sources
	Number and capacity of data centres	Public sources
	Middle-mile infrastructure access gap	• Available from ITU, but data are compiled from public research • Data are not available for policy development, monitoring and evaluation
Last mile	Population coverage by mobile operators (by technology)	Mobile operators, ICASA, ITU
	Number of homes/businesses passed (fibre and FWA services)	None
	Number of homes/businesses connected (fibre and FWA services)	ICASA, ITU
	Last-mile infrastructure access gap	• Individual network operator websites • Data are not available for policy development, monitoring and evaluation
Demand-side aspects of digital readiness		
System capability	Number and proportion of schools connected to the Internet for teaching and learning (at a defined quality of service)	No
	Number and proportion of teachers trained to utilise digital technologies to deliver lessons	No
	Proportion of ICT-qualified teachers in schools	No
	Proportion of learners who have access to the Internet at school	No
	Does the school curriculum include a specific subject related to 4IR?	Yes (as of 2024)
	Does the school curriculum include digital-use life lessons in the curriculum?	No
	Availability of free online courses on 4IR topics	Yes
	Ranking of availability of free online courses	Not available
	Take-up/completion rate of free online courses	Not available
	Ability to track location of demand for online courses	Unknown
	Existence of a digital strategy for teaching and learning	No
Content		
Teaching material	Is all school teaching material available online?	Unknown
	Are reporting systems utilising an online system?	Unknown
Lesson material	Are all textbooks and lesson content available online for access by learners?	Yes
	Is access to this content zero-rated?	Yes

Appendix E-4: Metrics for the measurement of e-government readiness		
	Metric	**Data available**
Interfaces with government and end users	List of priority services that government requires all entities to provide online.	No
	Quarterly reporting [81] on provision of online services, covering a minimum of: • Uptime; • Number of unique users per day; • Cause of network/service downtime; and • Number and type of cyber attacks.	No
	Existence of a Project Management Office/support team that all government agencies may approach for assistance[82].	No
Data management and data exchange	Compliance with information security control standards.	Yes
	Specification of common standard for data exchange between entities.	No
	Specification of entities that hold data of national significance that may benefit all departments (or a cluster).	No
	Specified standards for the use of private hosting facilities, including data backup, cybersecurity, etc.	Yes
	Specification that all government departments must digitise records by a specific deadline.	No
	Obligation on all government entities to digitise government records prior to any office relocation.	

Source: Africa Analysis 2025

[81] Such reporting already occurs anecdotally via the Government Information Technology Officers Council.
[82] This vehicle could follow the same principles as the Government Technical Advisory Centre.

F. METHODOLOGY TO CHOOSE TARGET BENCHMARKING COUNTRIES

The following table outlines the core indicators utilised to identify comparator countries in this project:

Appendix F-1: Outcome-indicators identified to choose countries for direct comparison	
ICT-specific metrics Rationale for use of this metric to determine country benchmarks	
Fixed broadband penetration	The NIP2050 and the SDG targets all envisage high-speed use cases for Internet connectivity in the home and at the office, covering use cases such as virtual reality, e-health and e-medicine services, all of which rely on very high-speed and very low-latency services. While 5G technology is technically capable of providing such connections, the technical standard to ensure high-speed broadband services is through fixed-line fibre technologies.
Average mobile download speed	The average mobile download speed provides a useful metric to compare the overall quality of broadband network availability in a country.
Population coverage by 4G technologies	Mobile broadband is the primary mode of Internet access for end users. The level of population coverage of 4G technologies provides an indication of the level of technological development within the mobile broadband sector, as well as a measure of the quality of access to mobile broadband.
Price of mobile broadband	Mobile broadband is the primary mode of access for South Africans and the vast majority of broadband users globally. This metric allows us to determine whether (considering infrastructure scale and cost aspects) South Africa's prices of mobile broadband (data) are globally comparable.
Socio-economic factors	
Population size	A country's population size indicates the potential economies of scale related to the installation and operation of an end-user-focused network industry (such as communications or electricity).
Level of urbanisation	A country's urbanisation rate indicates the potential for a rural-urban divide in access to ICT infrastructure. Further comparison of South Africa with countries of similar urbanisation levels allows for strict assessments on the density of mobile tower infrastructure and other network assets.
Population living in slums	The share of the urban population living in slums is a measure that indicates the share of the urban population that is most likely to be served by mobile broadband technologies only, or through a combination of mobile and fixed wireless technologies.
Distribution of income (Gini coefficient)	The inclusion of the GINI coefficient as a socio-economic factor allows a comparison between South Africa and other countries and examines how the distribution of income impacts the universal service demand gap (the gap between what individuals are able to pay for broadband services and the current price of broadband services).
GDP per capita	Increased access and adoption of broadband services are expected to drive an increase in a country's GDP per capita, as broadband effectively increases total factor productivity in macroeconomic models.

Source: Africa Analysis 2025

G. NIP2050 STRATEGIC ELEMENTS AND ACTION ITEMS

Appendix G-1: Metrics included in the ITU core list of indicators	
ICT-specific metrics	**2050 Vision – How it will be done**
High-speed broadband is universally accessible	• High-speed broadband will be available in underserved areas and will be affordable and accessible to low-income communities. • Investment in last-mile connectivity will occur mainly through a complementary mix of wireless broadband technologies targeting rural and underserved populations. • Lessons from SA Connect and universal-access initiatives will be reviewed to improve delivery and impact in the future. • There will be better coordination of infrastructure projects to leverage complementary resources (such as roads or electricity).
Government services and buildings are digitally enabled	• All government buildings will be connected with high-speed broadband and have sufficient services to make the broadband usable (LAN, WAN equipment). • All government buildings will offer low-income users free Wi-Fi. • Government will implement the National e-Strategy and e-Government Strategy and Roadmap (2017). There will be clear role identification and approaches to ensure interoperability and data sharing. • Government e-enablement will be leveraged to promote a digital society and universal connectivity. There will be a target of 10 GB to the home by 2023/24 and 50 GB to the home by 2025/6. There will be an accelerated focus on enhancing service delivery with e-health and e-education. • Universal access and public sector connectivity will primarily rely on government as procurer and regulator, with SOEs and the private sector implementing. The Western Cape and Tshwane offer two different examples. • Digitisation in transport energy and water infrastructure will be prioritised as a way of modernising and strengthening efficiencies in maintenance and operations. • There will be transparent monitoring and evaluation of digital services in the public sector.
Regulation enables competitive and universally accessible broadband	• ICASA's regulatory capability will be benchmarked as the best globally. • The appointment of ICASA regulators will be transparent with clear criteria. • ICASA will be held accountable for the quality of regulation with respect to spectrum pricing, infrastructure sharing and similar. • There will be a robust model for wholesale data services that is effectively regulated.
Public sector capacity is strong and can drive the required policy agenda	• Government capacity to design and procure digital infrastructure and services projects will be technically sound. • There will be commitment to institutional stability, good governance and appropriate capacitation through senior appointments. • There will be attention to leveraging state infrastructure.
Private sector participation in achieving universal broadband access is prevalent	• The model of delivery will increasingly leverage vibrant private sector participation and blended financing. It is envisaged that R30 billion to R80 billion will be raised to finance the rollout of government broadband and services in the medium term. • There will be special vehicles promoting blended finance in public broadband infrastructure. Among other things, these provide incentives for de-risking private sector investments in rural areas and accelerating broadband delivery in peri-urban areas.

Source: Africa Analysis 2025

H. SOUTH AFRICAN DATA CENTRE MARKET DYNAMICS

This Appendix provides:

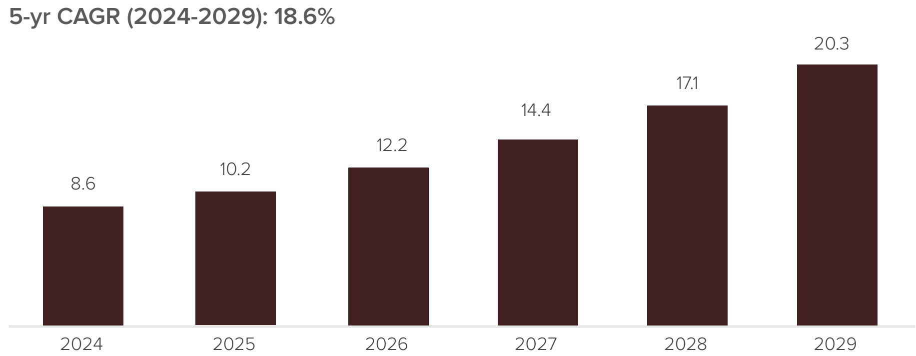
- A forecast on South African data centre revenue growth to 2029;
- Estimated IT load expansion to 2029;
- Impact of the adoption of AI on data centre design requirements;
- Summary of the SA cloud market;
- An outline of how AI adoption drives power demands for data centres; and
- A discussion on the supply of green energy to data centres in South Africa.

H.1 Data centre revenue growth

The South African data centre market is expected to generate USD471 million (R8.6 billion) in revenue in 2024, and it is forecast to reach a market value of USD1.1 billion (R20.2 billion) by 2029, growing at a CAGR of 18.6% (Mordor Intelligence, 2023). This growth is driven by various factors: an increase in digital transformation initiatives, a high level of cloud services adoption and a growing demand for colocation services. The National Data and Cloud Policy and other related legislation have also contributed to the expansion of data centre facilities as they require organisations to meet data sovereignty and regulatory compliance of storing some of the data within the country.

Appendix H-1 presents the expected data centre market revenue growth from 2024 to 2029.

Appendix H-1: Data centre revenue growth, 2024 - 2029 (R billion)



Note: The SA rand values are based on a constant exchange rate of USD1:R18.36 as at mid-2024.
Source: Africa Data Centres Association, CBRE, Mordor Intelligence, Africa Analysis

Despite this growth, the South African data centre market continues to trail the demand for data centre services. As AI adoption gains momentum in the coming years, the need to process and store AI workloads in data centres will drive the demand for more facilities. AI workloads consume more power than other IT workloads and require higher rack densities. It will be necessary for the local data centres to evolve by upgrading their existing infrastructure and expanding to accommodate the AI workload requirements.

Another factor exacerbating the shortage of data centre space is the growing demand for digital services. South Africa is experiencing strong growth in Internet usage and cloud service, outpacing the development of data centre infrastructure. This is recognised by both the government and the private sector, with new investment being committed to the expansion and upgrading of the existing facilities, and development of new data centres. However, investors are calling for a conducive investment environment through favourable regulations that are aimed at fostering the growth of the industry.

H.2 IT load growth

The IT load capacity of data centres in South Africa is experiencing steady growth and is expected to reach 435 MW in 2024 and 829 MW in 2029, growing at a CAGR of 17.5% (Mordor Intelligence, 2023). The increase in power consumption will be driven by an increasing number of organisations migrating their IT workloads to the public cloud, a growing adoption of digital services, an increase in the use of AI technology, and the rising demand for data storage and processing capabilities.

The estimated demand per data centre in South Africa has grown to between 80 MW and 160 MW. In response, data centre operators are upgrading and/or building additional data centres to accommodate upwards of 200 MW to cater for more customers and IT workloads. Some 300 MW in data centre infrastructure is currently being built in anticipation of future demand.

The increasing power consumption has also steered the data centre operators towards green energy projects, such as solar power farms, as alternative energy sources. These initiatives are supported by Eskom's (the national electricity utility) power wheeling agreements signed with the data centre operators, enabling them to use Eskom's national grid to transmit their green or renewable energy to their various data centre facilities.

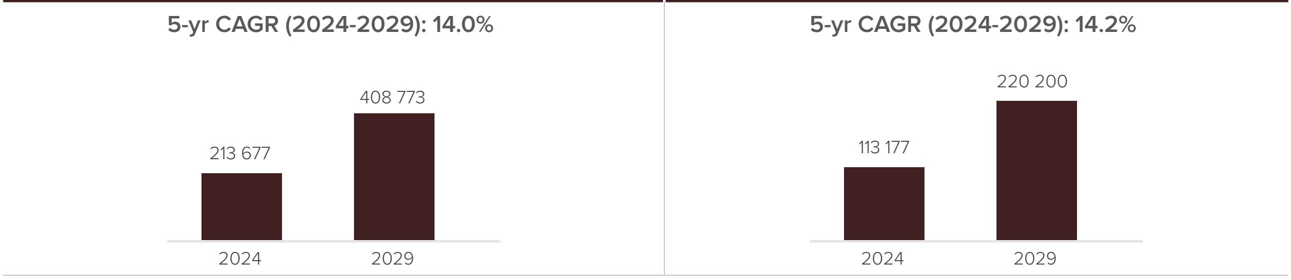
H.2.1 Raised floor and installed racks

The expansion of data centre facilities is leading to the growth in raised floor space, expected to reach 213 677 m^2 and projected to grow by a CAGR of 14.0% to 408 773 m^2 in 2029. The number of installed racks is projected to grow at a CAGR of 14.2% between 2024 and 2029, from 113 177 to 220 200 racks. Johannesburg is expected to house the most racks by 2029.

The following figures present the growth of total raised floor and installed racks in data centres between 2024 and 2029.

Appendix H-2: Total raised floor and installed racks in South African data centres

Total raised floor, 2024 - 2029 (m^2) | Number of installed racks, 2024 - 2029



Source: Mordor Intelligence, Africa Analysis 2025

H.3 Data centre site selection criteria

Decisions made by data centre operators, including the hyperscalers, regarding the location of their data centres are impacted by several considerations, apart from the expected level of demand for their services. The three key considerations are discussed below. To attract investment into the data centre industry and realise the expected growth, South Africa needs to ensure that these criteria do not present risks to the potential investors.

1. **Location selection:** A stable political environment, a reliable electricity power grid and a favourable regulatory landscape are critical considerations when selecting a data centre location. South Africa should ensure that the country's political environment is stable to mitigate economic, internal political and geopolitical risks.
2. **Diversification strategy:** Data centre operators with multiple facilities prefer to distribute their facilities across different geographic regions to mitigate the risk associated with a single political hotspot. In the case of South Africa, facilities are typically built in Gauteng province, Cape Town and Durban. South Africa needs to ensure that adequate infrastructure is available for data centres to continue to be built in these areas and perhaps develop further areas which would appeal to data centre operators.

3. **Sustainability initiatives:** Alternative/renewable energy sources are critical to data centre operators to help them address concerns around energy costs, energy scarcity and the reduction of environmental impact. In South Africa, regulations enabling the entrance of independent power producers into the market are a step towards alleviation of these concerns.

Appendix H-3: Data centre market growth drivers and constraints	
Growth drivers	Constraints
Adoption of cloud services: Driven by startups, local businesses pursuing digital transformation, and multinationals wanting to replicate what they have in other countries where they operate.	**Costs:** Data centres require substantial upfront investment and ongoing operational expenses. These include construction, equipment, cooling systems and maintenance.
Increasing population and urbanisation: This, coupled with growing Internet penetration, are significantly contributing to the rapid growth of data centres to meet the escalating demand.	**Power grid unreliability:** Unreliable power supply from the state-owned power company, Eskom, poses a serious operational challenge to the data centre operators. Despite this, data centre investments continue to be committed.
Emerging technologies: Emerging technologies, including big data analytics, IoT, AI and many cloud solutions are fuelling demand for data centres.	**Water scarcity:** Data centres consume large volumes of water for electricity generation if sites are independently powered, as well as for cooling servers. Water scarcity potentially threatens the continued expansion of data centres.
Data sovereignty: POPIA has contributed to the expansion of data centre facilities to help businesses comply with data sovereignty regulations.	**Access to land:** Data centres are difficult to construct as they require a combination of hard-to-obtain inputs such as several thousand square metres of land located close to business districts. Such land can be expensive to acquire, especially when there is no support from the government.
Digital skills training: The South African Government's initiative for digital skills training at institutions of learning is helping to enable advancement towards a digital economy which requires an expanded data centre environment.	**Lack of digital skills:** A lack of sufficient ICT skills in the country is an impediment to the wider uptake of Internet services, which ultimately translates into lower demand for data centre capacity. A dearth of digital skills also restrains the growth of the digital economy.

Source: Africa Analysis 2025

H.4 Risk factors potentially impacting the growth forecast

Various economic and geopolitical risks can negatively impact the expected data centre growth trajectory. In the case of South Africa, domestic (rather than international) factors present far greater potential risk. These risks are summarised in the following table.

Appendix H-4: Risk factors potentially impacting the growth forecast

Economic risks	Geopolitical risks
Electricity power grid constraint: A major concern is potentially insufficient power infrastructure to support rapidly growing demand for data centre services. This would lead to higher construction costs and delays due to the need for grid upgrades and securing alternative sources of energy to meet the growing power demand.	**Political instability:** Unstable political environments in certain parts of the country can create challenges in obtaining permits, navigating regulatory hurdles, and securing the necessary infrastructure for data centre development.
Energy price increases: Above-inflationary energy price increases can significantly impact data centre opex and profitability. Over the past years, South Africa has experienced significant increases in electricity and fuel (diesel). This has the potential to slow down the growth of the market as operators struggle to balance opex and construction investments (capex). This also results in higher data centre service prices, which may dampen the demand.	**International conflicts:** Geopolitical tensions and conflicts can disrupt data centre operations, particularly in border regions, impacting connectivity, data flow, and disrupting the supply chain. In the case of South Africa, such a risk is minimal.
Capex burden: Building large data centres requires significant upfront investment, which can be a barrier for smaller companies, especially during economic downturns. South African GDP growth has been very low for the past 15 years, and the future growth forecast is timid.	**Data sovereignty concerns:** Strict data privacy laws can limit the ability of global data centre operators to store and process data, impacting market access.
Demand fluctuations: Economic recessions can lead to decreased data usage and cloud services adoption, negatively impacting data centre utilisation rates.	**Regulatory changes:** Shifting regulatory landscapes regarding data privacy, cybersecurity and environmental impact can create uncertainty for data centre operators.

Source: Africa Analysis 2025

H.5 Impact of AI adoption on latency, security and bandwidth requirements

The increased use of AI by various user groups is already having a significant impact on the data centre environment (both positive and negative), leading to the redesign of data centre builds and equipping, increasing opex, but also more effective security and data protection measures. Some of the key impacts are discussed next.

H.5.1 Impact on latency

AI applications often require real-time processing of large volumes of data and quick turnaround of the processed data. This drives the demand for low-latency connectivity. Data centre operators have begun to prioritise infrastructure upgrades aimed at minimising latency, particularly through technologies such as edge computing and high-speed fibre optic networks to facilitate fast data transfer and quick response times. To meet AI demands, data centre operators are designing facilities with optimised network topology, high-performance computing clusters and specialised hardware, such as graphic processing units (GPUs), to efficiently process large datasets.

Edge computing brings data processing closer to the sources of data generation, e.g. in small edge data centres or even user devices. This significantly minimises the distance that data must travel to be processed. In South Africa, edge data centres are already being deployed by some operators, in particular, open-access data centres.

H.5.2 Impact on security

AI can be used to improve data centre security through more effective detection and defence against cybersecurity threats, for instance. Specifically, AI can improve security in data centres in the following ways:

- Anomaly detection: By monitoring network traffic, access logs and system behaviour, AI can identify unusual patterns and detect potential problems before they develop into actual problems. This real-time detection helps security teams mitigate potential risks before damage occurs.
- More proactive security measures: Traditional security measures are reactive rather than proactive. AI analysis enables data centres to predict potential threats and vulnerabilities, closing gaps in defences before they are breached.
- Protecting data: By leveraging AI algorithms and techniques, data centres can improve data processing, storage and security. This helps protect the business-critical uptime, reliability and integrity of data in transit and storage.

H.5.3 Impact on bandwidth

Growth in the use of AI is significantly increasing the demand for bandwidth in data centres and, in particular, in hyperscale data centres, which support large-scale AI workloads. AI applications generate massive amounts of data that require fast transfer speeds, leading to a need for higher-capacity network infrastructure and upgrades to accommodate the increased data traffic. This has the following impact on the data centre environment:

- Data centre design: The design of new data centres is being optimised to support the unique bandwidth requirements of AI workloads, including optimised network topology and high-performance interconnects.
- Network upgrades: To accommodate the increased bandwidth demands, data centres are transitioning to higher-speed (fibre optic) network technologies, such as 800 G and 1.6 T Ethernet, for high-capacity data transmission.
- High-performance computing requirements: AI often utilises specialised hardware, such as GPUs, which demands high-bandwidth connections to efficiently transfer large data volumes between processing units.

H.6 South African cloud market

The South African cloud market has experienced strong growth over the years, with many businesses and government institutions implementing digital transformation strategies to become cloud-first organisations. Supporting this growth are the significant investments made by the hyperscalers (large global cloud providers) in the establishment of cloud regions in South Africa. Alibaba Cloud, AWS, Google Cloud, Huawei, Microsoft Azure and Oracle have established their presence in South Africa, spurring the growth of data centres in the cloud resellers ecosystem.

In 2020, AWS launched a cloud region in South Africa, positioning itself for expansion, particularly in the infrastructure-as-a-service and platform-as-a-service segments, aiming to close the gap between itself and Microsoft, the largest cloud services provider in the country. Google Cloud also launched a cloud region in Johannesburg in 2024, following the launch of cloud regions by Huawei, Microsoft, AWS, Oracle and Alibaba.

H.6.1 AI driving power demands of data centres

At the core of the AI revolution is the rapid advancement in semi-conductor technology. A computation task that used to take 32 hours to perform can now be accomplished in just one second with the latest GPU[83] technology. The ability to train, iterate and improve AI models at faster and faster speeds is making the entire AI ecosystem more valuable. The pace of AI innovation will continue to accelerate with each new generation of GPUs.

To accommodate the increasing power requirements resulting from the progressing adoption of AI, data centre operators have to upgrade the architecture of their facilities. This is not unique to South Africa. Data centres are being upgraded across the globe, implementing alternative energy sources and strategies to reduce carbon emissions.

New energy and cooling solutions being implemented by data centres due to growing AI adoption are discussed next.

[83] A GPU is a specialised electronic circuit able to perform vast numbers of calculations rapidly. It has been adopted in diverse fields, including AI, where it excels at handling data-intensive and computationally demanding tasks. (Wikipedia)

H.6.2 Small modular reactors

As traditional power grids struggle to satisfy the demand for electricity, nuclear power is being adopted as a preferred solution, particularly in developed markets. The sector is exploring both traditional large-scale nuclear power and small modular reactors (SMRs), which can be built in factories, reducing construction costs and timelines. They are small enough to be deployed on or next to a data centre site, making it less vulnerable to grid failure and cyberattacks, thus improving data security and operational resilience. These reactors produce more zero-carbon electricity than renewable energy sources within the same land area, and they require a substantially smaller footprint than either wind or solar solutions, while their output is not dependent on the weather.

In South Africa, AWS announced that it will build SMRs in the country to power its data centres. It has invested in X-energy (a US company) to develop these advanced nuclear reactors. This investment is driven primarily by the need for clean energy to support its growing AI operations across its data centre facilities. Google also announced that it will be building SMRs in the USA, something that it will most likely replicate in other countries.

H.6.3 Liquid cooling

A shift to liquid cooling will be essential to accommodate GPU advancements, which require more energy to function optimally. For instance, NVIDIA's latest AI chips consume up to 300% more power than earlier models. This will double the industry's energy demand in the next five years.[84] In new data centre builds, liquid cooling infrastructure has become the default installation. For existing facilities transitioning to higher-density workloads, including AI technologies, liquid cooling will be a viable solution and an opportunity for owners and investors to upgrade their assets.

Liquid cooling is becoming essential for high-density racks, with a hybrid approach emerging, where data centres now rely on liquid cooling for 70% of their cooling requirements and air cooling for 30%. Liquid cooling installations are currently taking the form of rear-door heat exchangers and direct-to-chip technologies. These technologies can also be retrofitted into existing facilities, transitioning to higher-density workloads.

H.6.4 Immersion cooling

Immersion cooling will likely become a common thermal management strategy as GPUs move above 150 kW per rack, but broad implementation of the technology is still a few years away. The global average rack density is currently only 12 kW, and immersion cooling has been implemented in less than 10% of data centres. Deployments of immersion cooling over the next few years will be concentrated in AI facilities and in sections of traditional data centres running AI workloads. While the technology promises many benefits, including highly efficient cooling, it also faces challenges related to liquid quality, reliability and maintenance.

Additionally, immersion cooling introduces new challenges in structural design due to weight considerations. The weight of the largest cooling baths can reach up to four metric tons when filled with equipment and cooling fluid, which requires significantly more reinforced flooring. This will need to be addressed in data centres implementing immersion cooling on a large scale.

H.6.5 Green energy power supply solutions in place in South Africa

Data centre operators in South Africa are supplementing their energy needs with renewable energy due to the unreliable supply by Eskom (the national power utility) and to assist in fulfilling their sustainability goals. Several examples of such undertakings are provided next, although further data centres have begun to implement green energy measures.

Apart from green energy, collected grey water is also used by various data centres to assist in cooling the data centre facilities.

[84] 2025 Global Data Center Outlook, accessible here: https://www.us.jll.com/en/trends-and-insights/research/data-center-outlook, Jones Lang LaSalle (JLL)

Africa Data Centres

ADC has a 20-year power purchase agreement with Distributed Power Africa (DPA), a subsidiary of Cassava Technologies, which also owns ADC. DPA will supply ADC with 12 MW of renewable solar energy to its data centres. The contribution of renewables to the energy mix for ADC's South African operations will increase to more than 33%. In 2024, ADC began building a 12 MW solar plant in the Free State province to supply energy to its JHB1, JHB2 and CPT1 facilities.

Amazon Web Services

AWS's solar plant in the Northern Cape province supplies the AWS data centre in Cape Town with up to 10 MW of capacity. The plant can produce up to 28 MW of renewable energy annually. AWS plans to build a second 18 MW solar farm in the Free State province. Both plants will provide power for AWS's data centres, logistics facilities, physical stores, corporate offices and on-site electric vehicle charging points.

Teraco (Digital Realty)

At a cost of approximately R2 billion, Teraco is building a 120 MW solar plant in the Free State province to power its data centres through a wheeling agreement with Eskom. The project is to be completed in 18 months. Teraco has also installed approximately 6 MW of rooftop solar panels, integrated into its building facilities, and plans to increase this capacity to 10 MW as new facilities become operational.

Vantage data centres

Vantage has a 20-year power purchase agreement with SolarAfrica for 87 MW of solar power, which will be wheeled over Eskom's national grid from a solar site in the Northern Cape province. The solar farm can produce 87 MW of energy in ideal conditions, which means that in one year, it will produce about a third of the energy needed by the Vantage data centre campus.

I. AUTONOMOUS VEHICLES

Technology developments have led to the development of high-speed, high-capacity sensors and systems that can take over the role of managing transport systems (e.g. SMART cities) through to complete control of driving a vehicle itself. Technologies to achieve fully autonomous vehicles (AVs) have been developed in laboratory and real-world use settings, where traditional automotive manufacturers, original equipment manufacturers (OEMs) and technology companies have either self-developed their vehicles or formed collaborative partnerships based on technology strengths.[85] The following table outlines the rationale and use case for autonomous use cases across different environments.

Appendix I-1: Overview of the four main vehicle autonomy segments

	Personal vehicles	Robotaxis and robo-shuttles	Autonomous trucks	Special purpose autonomous vehicles
Expected benefits	• Increased road safety by reducing human error • Enhance convenience during travel	• Enhance flexibility of public transport • Reduce operational costs and improve accessibility	• Address critical driver shortages • Increase efficiency and flexibility with 24/7 uptime	• Improve safety in hazardous environments • Enhance efficiency for specialised tasks
Ownership	Privately owned or leased	Municipal/fleet providers own and operate	Fleet providers own and operate	Specialist firms own and operate
Domain	Highway suburban and urban	Suburban and urban	Highway and suburban	Special environments

Source: (WEF, 2025)

Several robotaxis are in operation in different parts of the world, including:

- Phoenix San Francisco and Austin in the United States; and
- Beijing Wuhan and another ten cities in China (The Economist, 2024, and Marketplace, 2024).

Fully self-driving personal vehicles have not yet been authorised for ownership and use in any country to date, while autonomous special-purpose vehicles have been in operation in specific environments for more than a decade (especially in the mining sector).

The ecosystem to introduce AVs includes the availability of vehicles with suitable technologies, a clear regulatory framework to set standards, as well as roles and responsibilities between infrastructure owners and AV operators, the digital platforms to monitor the performance of AVs, and a host of other issues (WEF, 2025, and Hesavar Manivasakan, 2021). One key issue that is not often discussed is the potential labour-displacing impact of the introduction of AVs.

The South African National Land Transport Strategic Framework (NLTSF) (2023 - 2028) (RSA, 2023) refers to AVs but does not make any reference to the introduction of AVs themselves and rather focuses on the introduction of autonomous transport management systems (e.g. digital transport management systems, digital ticketing and e-hailing frameworks). The precursor to the NLTSF), the National Transport Master Plan (2050), commissioned in 2005 and completed in 2010/11, did not make any reference to AVs. However, both documents outline the importance of coordination across national, provincial and municipal departments, and entities in the “coordination of budgets, policies, activities, information sharing, and granting approvals, authorisation, exemption, licence or permission for the implementation of projects” (RSA, 2023). This coordination is a significant challenge. As an example, every layer of government is responsible for the development of their land-use strategies, transport plans, road management plans, maintenance and upgrading activities.

[85] Traditional OEMs include BMW, Toyota and Volkswagen, while technology-based companies include Nvidia, Amazon (Zoox), Alphabet (Waymo), WeRide and Baidu (source: various websites).

Numerous authors, e.g. Hesavar Manivasakan (2021), have outlined the importance of understanding the infrastructure requirements for the introduction of AVs. The Department of Transport Strategic Plan for 2021 - 2025 indicated that regulations for the implementation of AV technologies would be introduced by 2025. However, the strategic plan and all ensuing annual performance plans indicate that a prerequisite to the introduction of AVs is the quality of road infrastructure – a constant issue raised by users, municipalities, provinces and national authorities.

Between 2025 and 2035, South Africa may see further introduction of AVs in specialised environments, but the introduction of personal, public or freight-related AVs will only commence when the quality of road infrastructure has improved, including both expected road quality [86] and the necessary connectivity infrastructure.

Opportunities to explore include the introduction of public-transport AVs and/or the introduction of AV freight corridors (such as between Gauteng and Durban / Richards Bay). However, such plans should consider the technological and infrastructure requirements and the socio-economic impact on existing users and service providers.

[86] The South African Department of Transport publishes road infrastructure standards. See Roads – The Department of Transport

J. THE IT STRATEGY OF INDIA

India's strategic investment in education during the 1970s laid the groundwork for the global dominance of its outsourcing industry from the 1990s onward. Next is a structured analysis of this transformative period, dissecting the key policy choices and their long-term economic implications.

J.1 Strategic vision and policy orientation

During the 1970s, India, under a semi-socialist economic framework, recognised the critical role of human capital in national development. While the country faced infrastructural and financial constraints, policymakers prioritised self-reliance in science, technology, and education.

Key actions included:

- Central planning with a focus on human development, despite a relatively closed economy, including significant investments in STEM-based education;
- Acknowledgement that science and engineering were national strategic assets; and
- Emphasis on institutional capacity building, notably in higher education.

J.2 Investments in STEM education

India significantly expanded its focus on mathematics, science and technical education. The following initiatives were pivotal:

J.2.1 Expansion of IITs and NITs

- The Indian Institutes of Technology (IITs) and National Institutes of Technology were strengthened and expanded.
- These institutes followed rigorous curricula in engineering and mathematics, modelled after Western institutions.
- IITs gained a global reputation, producing graduates competitive in international markets.

J.2.2 Emphasis on mathematics and English in schools

- The Central Board of Secondary Education curriculum embedded high standards in mathematics and science subjects.
- English, while not the mother tongue, was retained as a medium of instruction for higher education and STEM, enabling global mobility and integration.

J.2.3 Public sector research and technical institutions

- Institutions such as the Indian Statistical Institute, Indian Institute of Science, and Indian Institutes of Management were nurtured to produce world-class talent.

J.3 Policy continuity and capacity pipeline

India's technocratic elite and policy planners ensured continuity in educational planning through the:

- Five-year plans (particularly the fourth and fifth plans), which emphasised science and technology education.
- Establishment of vocational training centres to supply mid-level technical skills.
- Support for computer science education by the late 1970s and early 1980s, anticipating the rise of the digital economy.

J.4 Catalytic role of the Indian diaspora and return migration

- Indian professionals who migrated abroad (particularly to the US) during the 1970s and 1980s contributed to reverse brain drain in the 1990s.
- Many returnees brought technical expertise and global networks, which enabled the formation of early IT services firms.

J.5 Positioning for the outsourcing boom

By the early 1990s, India was uniquely positioned to capitalise on the IT outsourcing wave due to:

- A deep bench of technically trained English-speaking professionals;
- High numeracy skills derived from a strong mathematics education tradition; and
- Institutional strengths in engineering and computing education.

J.6 Outcomes: Export-led IT services growth

- Companies like Infosys, TCS and Wipro leveraged this talent pool to deliver offshore services to Western clients.
- India emerged as the 'back office of the world' offering services in software, business process outsourcing, and later knowledge process outsourcing and research and development outsourcing.
- By the 2000s, the outsourcing sector became a major GDP and employment driver.

J.7 Conclusion: A long-term, skills-centric triumph

India's 1970s strategy to invest in technical education was not explicitly aimed at building an outsourcing industry, since the concept barely existed. However, by emphasising mathematics, science and English, and by fostering elite institutions and STEM education at scale, India inadvertently built a human capital architecture that became the foundation for its emergence as a global outsourcing powerhouse two decades later.

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