

# Fibre Broadband Development Initiative

# Towards a Gigabit Society in South Africa

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## 7. STRATEGY TO ACHIEVE GIGABIT SOCIETY

South Africa has been pursuing the objective of building out ubiquitous broadband infrastructure to support a future digital economy and society for over a decade, albeit with very mixed results. While the government-led initiatives in this regard have seen very limited progress, broadband infrastructure deployment by the private sector has made very significant strides. However, most of this development has been concentrated in the larger urban areas and, in the case of fixed broadband, the main focus has been on more affluent part of the society. Certainly, when considering good quality broadband connectivity at “affordable” prices, there is disparity between the urban (and often more affluent) segment of the country and the peri-urban and rural segments, which are largely reliant on mobile communications.

To achieve a gigabit society, this needs to be corrected. By and large, the legislative framework required to put in place the foundations underpinning a gigabit society already exists. It needs to be updated and expanded, where necessary, and acted on. Furthermore, an overarching national strategy is required to pull together the disparate digital infrastructure development initiatives and programmes to realise effective co-ordination of tasks and streamline the process. The historical targets for connectivity and data consumption need to be updated to recognise the reality which has unfolded over the past ten years and with a much clearer view of the requirements expected within the next ten years.

A gigabit society is a socio-economic ecosystem based on universally available and accessible high-speed, high-quality broadband which enables access to the creation and consumption of a wide range of converged services required for effective economic and social participation.

What is required is a digital masterplan for the deployment of digital infrastructure at national, regional and local area (or district) level. The long-haul backbone, metro backhaul and expanded access broadband infrastructure, along with other digital infrastructure facilities need to be fully integrated.

### 7.1 Strategy Objectives

The proposed objectives of a new strategy for digital infrastructure deployment and creation of a digital society are:

1. Create a ubiquitous and seamless digital infrastructure which will be universally available to consumers and businesses at prices which will allow meaningful and competitive use of that infrastructure.
2. Position optical fibre as the enabler of high-speed broadband connectivity and the gigabit society; the gigabit network connecting all digital infrastructure elements.
3. Stimulate demand for gigabit broadband services across different sectors of the society and various industries, so that it can be leveraged for social and economic development.

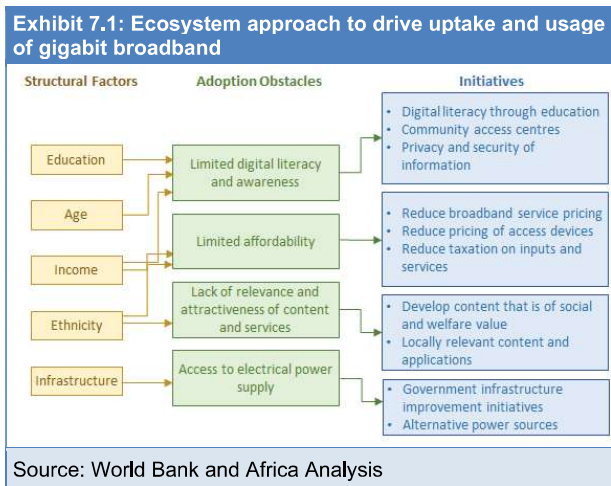
Furthermore, the following challenges need to be addressed in parallel to enable unhindered deployment and operations of the requisite digital infrastructure, and the fulfilment of a gigabit society.

- Resolve the electrical power supply problems. Solutions implemented in this respect need to ensure that there is sufficient electricity generated to: (1) power the digital infrastructure, and (2) for users (consumers, businesses, government agencies and others) to use digital services.
- Enhance demand-side skills. A digitally literate society is required to ensure that digital services are going to be used and will deliver true benefits from a social and an economic perspective. Education and training should focus on the development of the types of skills and knowledge increasingly required by the digital economy, including digital innovation.
- Supply-side skills development. There is a dearth of technical skills available, not only in South Africa, but also globally. It will be important to ensure that there is local availability of adequately skilled human capital in the future in disciplines such as engineering, software developers and programmers. A range

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of technical and creative skills will be required to expand and maintain the digital infrastructure, and to subsequently maintain it, as well as create relevant platforms and digital content (e.g., e-Government services, educational content) which will leverage the digital infrastructure.

- Close co-operation between the relevant government departments to achieve unhindered and optimal deployment and use of digital infrastructure. For instance, co-operation and co-ordination of activities between the Department of Communications and Digital Technologies (DCDT) with the Departments of Basic and Higher Education and Training, Department of Transport and the Department of Public Works and Infrastructure.
- Provide greater security of critical infrastructure – communications and other. The current legislation and initiatives have begun to address the persistent problem of critical infrastructure theft and vandalism but greater measures must be taken to safeguard both public and private sector infrastructure to restore investor confidence and reduce the cost of infrastructure maintenance. This would include prison sentences and high monetary fines for economic sabotage of physical infrastructure.



The exhibit to the left illustrates the comprehensive approach which needs to be taken when creating a gigabit society. The approach must include various facets of the interconnected ecosystem. This paper focuses only on the digital infrastructure element of this ecosystem.

## 7.2 Achieving the Objectives

To achieve the objectives of a strategy aimed at creating a digital society in South Africa, a range of commercial and legislative / regulatory aspects of the ICT industry in South Africa will need to be addressed. Key elements are discussed below.

### Deep Fibre Approach

A deep fibre approach will ensure that the digital infrastructure can be leveraged to its full potential to create a gigabit society. A deep fibre approach is based on the premise of deploying fibre infrastructure as far to the edge of the network as possible from a technical feasibility and commercial viability perspective. Ideally, access to fibre should be available to all households, businesses and institutions. However, if that is not possible, then fibre should at least form the fronthaul and backhaul infrastructure of wireless access technologies, such as 5G.

A large segment of the population is expected to continue to be served by wireless access broadband products, both fixed wireless and mobile. This will be the case in many rural areas but also in some of the semi-rural / peri-urban areas. Although not all rural sites may have a fibre backhaul due to topography and associated costs, as many rural sites as possible should be connected to the national network through fibre infrastructure. Other supportive aggregation and backhaul technologies – microwave and satellite – will be used for backhaul for the remainder of the areas.

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The concept of a deep fibre approach should be supported by the implementation of regulations which make it quicker and less costly to deploy fibre infrastructure, including:

- Pre-deployment of fibre cables and termination mechanisms in greenfield buildings, private and public (fibre-to-the-room / FTTR) and the installation of ducts and pipes when new roads / streets are built, particularly in new residential and business developments.
- Access to existing various passive infrastructure for quicker deployment of fibre cabling, such as roads, railway lines, water pipes and overhead powerline pylons.

## Uniformity of Government Interaction

The processes for the interaction between operators / digital infrastructure providers and government entities at different government levels should be standardised to facilitate more efficient interaction when constructing digital infrastructure. This should include standardisation of rights of way allocation and wayleave tariffs at the municipal, provincial and national levels.

Digitisation of certain municipal services (e.g., water and electricity supply) should be standardised across all municipal areas and districts to: (1) make use of existing infrastructure easier, and (2) expediate the issuing of wayleaves.

Standard guidelines should be set for an approach to progressing the “smartness” of existing cities over time through projects and programmes; for example, addressing security or crime prevention. Smaller towns may be guided by the residents, in partnership with the local government, to determine how these towns should become smarter and set priorities.

## Greater Industry Sustainability

Greater sustainability should be introduced into the telecommunications industry by addressing unnecessary duplication of infrastructure. In some instances, multiple infrastructure is warranted, e.g., for redundancy and competitive purposes. However, in certain instances it amounts to a waste of resources; for example, when deploying infrastructure in low-income areas. A degree of infrastructure sharing already exists in the market, but this should be expanded across infrastructure through appropriate regulation. This would leave more resources available for infrastructure builds in areas lacking sufficient digital infrastructure and/or for the provision of digital services.

## Wholesale Price Regulation

Stronger wholesale price regulation of digital products and services is required to create a more competitive and non-discriminatory environment. This should include network connection fees at “meet me rooms” in public premises such as office parks, residential complexes and shopping centres. High wholesale prices typically translate into high retail prices and lead to lower adoption rates of digital services.

## Innovation Through Regulation

Introduction of proof-of-concept (PoC) pilots to test new fibre (and other) technologies and regulations, addressing specific market areas, problems or challenges, for instance low-income and/or informal communities. Some countries have established such programmes already (e.g., India, Japan and the United Kingdom).

PoCs afford the benefit of being able to test new technologies and business models in a contained environment, without incurring high costs. They are also typically either sponsored or supported by the government to limit exposure to limit the risk. By allowing anyone with a “great idea” to establish a PoC, the door is opened to a far wider pool of talent than only licensed operators or even the incumbent large operators.

A “regulatory sandbox” approach to rights of way would allow the testing of new last mile fixed broadband technologies which could result in quicker identification of specific technologies and solutions suitable for particularly low income users in terms of performance and cost.

### Broadband and Digital Services Affordability

The households’ and businesses’ ability to buy access to the internet and sufficient quantities of data is critical to participation in the digital society.

By addressing aspects of the digital infrastructure environment discussed above, along with other supply-side and demand-side measures, the retail prices of broadband connectivity and digital services should see a decline and become more affordable, particularly for low-income households and micro businesses.

## 7.3 Strategy Targets and Implementation Phases (Roadmap)

The SA Connect Policy established broadband connectivity targets through 2030. However, the programme has fallen behind in its timeline and the initial 2020 connectivity goals were not met. Given the dynamic nature of the ICT industry and the desire to turn South Africa into a digital economy, even the 2030 targets in the SA Connect Policy do not meet the criteria required for a digital society.

The historical connectivity targets need to be revised to consider not only the future connectivity requirements in terms of access and speed but also the quality of broadband connectivity. Their implementation must also be defined in a manner that ensures that they can be used by all stakeholders to meaningfully participate in the digital society.

Countries which are more advanced than South Africa in terms of defining and achieving broadband connectivity targets can provide guidance for a revision of such targets in South Africa.

### Broadband Targets Globally

Countries that are digitally more developed than South Africa have developed national broadband strategies and set ambitious broadband connectivity targets, as have most of the countries which are less digitally developed at present. Examples of such countries and their targets are provided below, including a number of countries in Africa.

Exhibit 7.2: Broadband Connectivity Targets Globally	
Country	Broadband Connectivity Targets
Botswana	<ul style="list-style-type: none"> <li>2023: 100% of households in rural areas connected at 50Mbps and 100% in urban areas at 100Mbps</li> </ul>
China	<ul style="list-style-type: none"> <li>2021: &gt;20 giga cities established, with giga fibre covering 200 million families; &gt;5 million 10G-PON ports; &gt;10 million giga subscribers; 600,000 new 5G sites built</li> <li>2025: &gt;100 giga cities established, with giga fibre covering 400 million families; &gt;10 million 10G-PON ports; &gt;30 million giga subscribers; new 5G sites built in most villages</li> </ul>
France	<ul style="list-style-type: none"> <li>2022: 100% of home access to high-speed broadband at &gt;30Mbps; 80% on fibre</li> <li>2025: 100% of home access to fibre</li> </ul>
Germany	<ul style="list-style-type: none"> <li>2018: 100% of households have access to high-speed broadband at &gt;50Mbps</li> <li>2019: 100% of business parks have fibre connectivity</li> <li>2025: Gigabit-ready infrastructure coverage established</li> </ul>
Hungary	<ul style="list-style-type: none"> <li>2020: 100% broadband coverage with an average speed of 30Mbps</li> <li>2030: 95% of households covered by a gigabit network</li> </ul>
Kenya	<ul style="list-style-type: none"> <li>2022: 90% of households connected at 3Mbps and 50% at 100Mbps; 100% of schools connected at 10Mbps and 80% at 100Mbps</li> </ul>

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	<ul style="list-style-type: none"> <li>2030: 100% of households connected at 10Mbps and 80% at 100Mbps; 100% of schools connected at 1Gbps</li> </ul>
Malaysia	<ul style="list-style-type: none"> <li>2021: 500Mbps network covering specific areas in the capital city and provincial capitals</li> <li>2023: 98% of the population with access to an average speed of 30Mbps; 100% gigabit network coverage of national industrial parks</li> </ul>
Morocco	<ul style="list-style-type: none"> <li>2023: 100% of households with access to a minimum 2Mbps connection</li> <li>2025: 50% of households with access to high-speed broadband at 100Mbps</li> </ul>
Nigeria	<ul style="list-style-type: none"> <li>2022: 70% of households in rural areas connected at 5Mbps and 70% in urban areas at 15Mbps; fibre connectivity to 70% tertiary, 30% secondary and 15% primary institutions of learning</li> <li>2025: 90% of households in rural areas connected at 10Mbps and 90% in urban areas at 25Mbps; fibre connectivity to 100% tertiary, 50% secondary and 25% primary institutions of learning; price of 1GB of data should not exceed 2% of median individual income or 1% of minimum wage</li> </ul>
Sweden	<ul style="list-style-type: none"> <li>2020: 95% of households and companies have access to high-speed broadband at &gt;100Mbps</li> <li>2025: 100% of households and companies have access to high-speed broadband at &gt;1Gbps</li> </ul>
Turkey	<ul style="list-style-type: none"> <li>2023: 100% of households have access to high-speed broadband at &gt;100Mbps and 20% of households have access to high-speed broadband at &gt;1Gbps</li> </ul>
South Africa	<ul style="list-style-type: none"> <li>2016: 50% of population at 5Mbps connectivity; 50% of schools at 10Mbps connectivity; 50% of health facilities at 10Mbps connectivity; 50% of government offices at 5Mbps connectivity</li> <li>2020: 90% of population at 5Mbps connectivity and 50% at 100Mbps; 100% of schools at 10Mbps connectivity and 80% at 100Mbps; 100% of health facilities at 10Mbps connectivity and 80% at 100Mbps; 100% of government offices at 10Mbps connectivity</li> <li>2030: 100% of population at 10Mbps connectivity and 80% at 100Mbps; 100% of schools at 1Gbps connectivity; 100% of health facilities at 1Gbps connectivity; 100% of government offices at 100Mbps connectivity</li> </ul>

Source: European Union website, various government websites, SA Connect

Most of the countries listed in the table above are already well on their way to achieving the set targets. Through its SA Connect (broadband) policy South Africa has also set broadband connectivity targets, although the country has fallen behind in the implementation of these targets.

New (updated) broadband connectivity targets are required to achieve the gigabit society status in the next 10 to 12 years. Proposed new high-level target indicators are provided below as a core element of the strategy to achieve that goal.

Exhibit 7.3: Suggested new broadband connectivity targets for South Africa			
Indicator	By 2026	By 2030	By 2035
Fixed broadband penetration	37%	58%	83%
Gigabit fixed broadband ready	20%	40%	70%
Households fibre ready	55%	65%	75%
Note: Gigabit fixed broadband requires 10G PON or 5G FWA ready infrastructure.			
Source: Africa Analysis			

A detailed roadmap for the implementation of these broadband connectivity targets and how to achieve them follows.

## Target Implementation Roadmap

It is evident that countries more developed than South Africa, and some of its peers, have more ambitious targets and timelines as far as high-speed broadband connectivity and fibre-based gigabit network coverage

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are concerned. These countries can serve as an example to South Africa that it too can make faster and more meaningful progress as far as its broadband connectivity targets are concerned.

The second phase of the SA Connect programme of providing broadband connectivity is being co-ordinated by Broadband Infraco, with the aim of completing this programme by April 2026. The objective is to connect 5.83 million households at a minimum speed of 5Mbps and provide over 33.5 thousand community Wi-Fi 6 hotspots at 100Mbps download speed. Additionally, over 40 thousand government offices will be connected. Most of these connections will be achieved using fibre optic technology.

However, to achieve the gigabit society vision, these targets should be expedited and increased from their historical positions. This will allow South Africa to start realising social and economic benefits sooner, in order not to fall further behind in relation to the more advanced countries and its peers, and improve its competitive position globally.

The proposed updated detailed connectivity targets are presented below. Note that these targets represent access to (availability) of high-speed fixed broadband connectivity. They do not indicate the actual expected uptake levels. The adoption of these fixed broadband products will be up to individual households and business organisations.

Exhibit 7.4: South Africa updated broadband access targets				
Indicator	Baseline (2022)	By 2026	By 2030	By 2035
Infrastructure	<ul style="list-style-type: none"> <li>Households passed with fibre: 27%</li> <li>Fibre to site: 55%</li> </ul>	<ul style="list-style-type: none"> <li>Households passed with fibre: 55%</li> <li>Fibre to site: 70%</li> </ul>	<ul style="list-style-type: none"> <li>Households passed with fibre: 65%</li> <li>Fibre to site: 90%</li> </ul>	<ul style="list-style-type: none"> <li>Households passed with fibre: 75%</li> <li>Fibre to site: 95%</li> </ul>
Households	<ul style="list-style-type: none"> <li>Approx. 24% of all households (mainly urban), using various fixed technologies</li> <li>Households connected on fibre: 10%</li> </ul>	<ul style="list-style-type: none"> <li>Rural: 95% at min. 20Mbps</li> <li>Urban: 95% at min. 100Mbps</li> <li>Households connected on fibre: 17%</li> </ul>	<ul style="list-style-type: none"> <li>Rural: 95% at min. 100Mbps</li> <li>Urban: 95% at min. 200Mbps</li> <li>Households connected on fibre: 28%</li> </ul>	<ul style="list-style-type: none"> <li>Rural: 95% at min. 300Mbps</li> <li>Urban: 95% at min. 500Mbps</li> <li>Households connected on fibre: 45%</li> </ul>
Institutions of learning	Broadband connection: <ul style="list-style-type: none"> <li>Approx. 30% for admin purposes only</li> <li>Approx. 20% for teachers and learners</li> </ul>	Tertiary level institutions: >95% at gigabit connection	Primary and secondary level institutions: >95% at gigabit connection	
Health facilities	Broadband connection: <ul style="list-style-type: none"> <li>Approx. 5% of public facilities</li> <li>Over 90% of private facilities</li> </ul>	In urban areas: >95% at gigabit connection	In rural areas: >95% at gigabit connection	
Public sector facilities (government offices)	<ul style="list-style-type: none"> <li>Approx. 2% of public sector facilities</li> </ul>	In urban areas: >95% at gigabit connection	In rural areas: >95% at gigabit connection	
SMMEs	<ul style="list-style-type: none"> <li>Est. 75% use FBB purchased by the organisation</li> </ul>			<ul style="list-style-type: none"> <li>80% at gigabit connection</li> </ul>
Notes: <ul style="list-style-type: none"> <li>Fixed broadband (FBB) includes xDSL, FWA, FTTH / FTTB, WTTx.</li> <li>SMMEs considered are formal (registered) companies only.</li> <li>Many micro and some small companies use FTTH (rather than proper FTTB) connectivity, especially if they operate out of a home office.</li> </ul>				
Source: Africa Analysis				

Furthermore, the following guidelines should be adhered to:

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- Fibre access to premises should be available to 100% of institutions of learning, healthcare facilities and public sector facilities in the urban areas by 2030, and to such facilities in the rural areas where it is feasible. Fibre access should also be available to at least 70% of the formal commercial businesses in the urban areas by 2030.
- Institutions of learning must have the connectivity reticulated throughout their premises, including learner / student housing, so that high-speed access to the internet is available from multiple locations, rather than a single location at the premises (e.g., the administrative office). This will enable the productive use of broadband connectivity for e-Learning purposes, in school / university laboratories, practical training in a wide range of subjects and for IT development / innovation, among others.
- Health facilities, similar to the institutions of learning, will need to have high-speed broadband connectivity available throughout their facilities for medical treatment, administrative and research purposes, as well as for patients and visitors.
- Public sector facilities should be equipped with public Wi-Fi hotspots, as they are connected to high-speed broadband. The use of these Wi-Fi hotspots should be free of charge to facilitate e-Government services.

The updated connectivity targets, set out above, will need to be monitored on an ongoing basis to warrant that they are sufficient to enable full participation in the digital economy and the digital society at large. It must be borne in mind that going forward, all users will be increasingly using bandwidth-hungry tools and applications based in the cloud, while ultra-high definition video will become the standard.

Apart from the targets focusing on the (1) level of accessibility of broadband services to households, businesses, government offices and other entities, and (2) the speed of the connections, a number of other indicators also need to be considered to ensure that the quality of services provided are adequate for the requirements of a digital society and that the intended positive socio-economic impact is being continuously realised. These indicators are either technical / infrastructural or socio-economic in nature and should have indicative goals set against them and be tracked. They are summarised below.

Exhibit 7.5: Additional gigabit society indicators		
Indicator	Type	Reason
FTTS	Technical	Fibre-to-the-site (FTTS) provides traffic backhaul infrastructure for mobile / wireless sites. Currently, approximately 55% of 4G sites and all 5G sites have FTTS. To provide better quality connectivity and support a digital society, ideally all 4G sites, and certainly all 5G and subsequent generation sites, should have FTTS. Fibre backhaul infrastructure needs to continue expanding.
Latency	Technical	Related to the quality of connectivity, latency is important for certain applications. As applications become more sensitive, low latency will become more important. This can only be supported by good quality gigabit infrastructure.
Data consumption	Technical	Households (and individuals) should be able to consume a certain minimum amount of data daily, weekly or monthly to be able to fully participate in the digital society. The ability to consume certain minimum quantities of data is tied closely to affordability of data products.
FBB prices	Socio-economic	Fixed broadband (and broadband in general) prices should be gauged in terms of household or personal disposable income levels or GDP/capita to ensure that they remain affordable to all segments of the society. Lack of affordability will lead to decreasing data usage which will result in decreasing participation by segments of the population in the digital society. Ultimately, this will widen the digital gap.
GDP contribution	Socio-economic	The contribution of broadband / digital infrastructure to the economy should grow over time, as more economic tasks leverage this infrastructure and the ecosystem that it supports. This can be measured as a percentage of total GDP or value added to the GDP.
Source: Africa Analysis		

## 7.4 Partnerships and Funding Mechanisms

The implementation of this strategy will consume significant financial and other resources. Most of the required funding will be in the build-out of the broadband infrastructure – both fixed and mobile – and is estimated to be in the hundreds of billions of rand. Historically, most of the funding has come from the private sector, with a smaller contribution from the public sector. This is likely to also be the case in the future, given the quantity of funding required and the limited ability of the government to fund extensive digital infrastructure rollout.

For the private sector to extend funding, there must be a tangible benefit to this investment. A portion of the capex spent by the operators may be ascribed to obligations associated with spectrum licences, for example, whereby the operators are obligated to provide broadband connectivity to underserved areas. However, the bulk of the investment is aimed at infrastructure which is expected to provide a financial return on that investment. Even private sector funders with a strong social benefit mandate ultimately require a return on the funding they extend to the operators.

To this extent, attracting funding to the telecommunications sector, as opposed to opportunities in other sectors, must be emphasised. This attractiveness can be created through enabling policy and regulations, including certainty of the road ahead. This is discussed further in the subsequent chapters.

## 7.5 Government Intervention Measures

The government can play a key role in accelerating broadband infrastructure deployment and the adoption of gigabit broadband services through a number of intervention measures targeting both the supply-side and the demand-side.

### Supply-side Intervention Measures

The objective of supply-side intervention measures is to reduce the cost to build digital infrastructure and reduce (or preferably eliminate) any obstacles which introduce delays to those builds. Possible intervention measures include:

- Reduction of input costs for the network operators – This includes reduction or complete removal of import duties and excise taxes on imported network equipment and rebates on diesel used to continue service provision during load-shedding.
- Reduction of the cost to deploy network infrastructure – This can be achieved through regulating the cost of access to government infrastructure suitable for use in fibre deployments and enforcing infrastructure sharing regulations. The deployment of new passive network infrastructure (e.g., power infrastructure, site development, ducts and fibre optic cables) is a key cost driver of retail prices. The introduction of standardised access pricing and infrastructure sharing regulations would alleviate some of the network deployment constraints, expedite network deployment, and speed up the closing of the digital services gap.
- Use of the Universal Service and Access Fund / Digital Development Fund (or another funding mechanism) to cover the cost of fibre backhaul network deployment and/or subsidise backhaul services purchase by ISPs, particularly in more remote, low-income areas. The cost of backhaul can be a deterrent to healthy competition, with lower retail service prices.
- Implementation of measures to de-risk infrastructure deployment in unprofitable areas or areas with a very long return on investment (RoI) for private sector operators, e.g., offering tax breaks or tax reduction for a period of time.
- Radio frequency spectrum assignment and management – More spectrum, relevant to wireless broadband services, should be assigned timeously, in order not to be the cause of infrastructure deployment delays. Spectrum should also be managed in a manner to ensure the optimal use of spectrum resources.
- Prompt type approval of network equipment by the regulatory authority to eliminate any delays resulting from the inability of the network operators to use the necessary network elements. This can also save costs as lower cost equipment becomes available.

### Demand-side Intervention Measures

The objective of demand-side intervention measures is to stimulate the uptake and use of digital services. As users become more experienced in the use of online / digital tools through basic daily activities, their consumption of various digital services and ability to participate in the digital society will grow.

The demand for broadband services can be enhanced through:

- Reduction or elimination of import duties and excise taxes on end-user devices, such as routers and smartphones, to reduce the price of such devices. This could include 0% VAT on broadband services.
- Prompt type approval of end-user devices which can result in greater product competition and lower prices of devices to connect to the internet.
- Introduction of subsidies to make the adoption of broadband services more affordable; for example:
- Subsidies for upfront payments to lower the barrier to entry for households (or micro businesses) wishing to acquire a broadband connection. These subsidies can be directed at:
  - Devices, such as Wi-Fi routers, to connect to the internet, and
  - The initial broadband connection activation costs (where applicable).
- Subsidies for monthly service subscription and/or data consumption. This could be in the form of vouchers.
- Incentivisation of the network operators to offer discounts on services provided to public institutions, such as institutions of learning, or to low-income households (the income level to be defined), or to zero-rate access to certain web sites and use of applications (e.g., eliminate data charges to web sites with educational content and e-Government services). This type of assistance could be considered a form of an obligation placed on the operators in exchange for a reduction in regulatory costs, e.g., lower or waived licence fees or wayleaves, or radio frequency spectrum allocation at a low cost.
  - Banks and telecommunications operators offering financial services could also be incentivised to reduce or eliminate altogether any fees on basic financial transactions conducted digitally, e.g., online, using mobile money or e-Wallet services.

Any subsidies extended by the government would need to be evaluated as to their usefulness and affordability by the government (or the private sector). For example, the merits of once-off vs. recurring subsidies would need to be considered. Moreover, any subsidies would need to be periodically evaluated as to their continued usefulness. A time limit (e.g., ten years) would need to be set on any recurring or long-term subsidies, beyond which the digital infrastructure benefits would be expected to have begun to accrue and no further subsidies would be provided, in order not to distort the market.

A closer look at the recommended steps needed to implement policies and regulations supporting rapid deployment of the digital infrastructure that will underpin the gigabit society is provided in the following chapter – Recommendations and Implementation of the strategy.

## 8. RECOMMENDATIONS AND IMPLEMENTATION

The legal framework which already exists in South Africa makes provision for broadband infrastructure deployment to achieve ubiquitous connectivity by 2030. However, the intended implementation of a deployment programme based on these policies is already behind schedule and insufficient.

Even if the current SA Connect targets are achieved by 2030, the broadband requirement in terms of download and upload speeds then will be much greater than what is now envisaged. This will be driven by the requirements of a gigabit economy and a gigabit society, based on the extensive use of digital services and online applications. Both the population (households and communities), as well as businesses and government organisations will require much faster connectivity than was planned a decade ago.

The suggested steps required to be taken to create a policy and regulatory framework supportive of achieving a gigabit society in South Africa are set out and discussed in this chapter.

### 8.1 Revision of Policy Targets to Encompass Gigabit Economy Milestones

The targets set out in SA Connect and the NIP2050 policies require review and updating to ensure that they will meet connectivity requirements ten years from now and beyond.

The SA Connect Policy explicitly recognises the need for ongoing monitoring and evaluation of its targets to inform possible reviews, and it is clear that this is overdue.

Recommended revised connectivity targets are set out in section 7.3 above. Effective targets should be grounded in the achievable but should also be aspirational and inspirational. Revising the current targets to ones which speak to a gigabit future is a key strategic component in galvanising and inspiring stakeholders.

The NIP2050 notes that fibre infrastructure tends to be located mainly in the larger urban areas and there is a significant degree of network duplication in some localities. A more rational approach to fibre infrastructure build could result in wider availability of fibre connectivity. The NIP2050 should be amended to explicitly refer to fibre-based broadband and the concept of the gigabit economy.

### 8.2 Co-ordination and Co-operation: An All-of-Government Approach

The benefits of gigabit broadband are transversal, impacting on and interacting with all government, business and social activity. A co-ordinated approach involving all of government and the private sector is required to optimise realisation of these benefits.

Currently, there are multiple approaches across government departments and across the public and private sectors when it comes to addressing the development of broadband infrastructure and an ecosystem based on broadband connectivity. These disparate efforts urgently require greater co-ordination and streamlining. Key implementation steps include:

- Formalise the existence of the Rapid Deployment National Co-ordinating Centre (RDNCC) and ensure that it is properly resourced and appropriately constituted. The RDNCC can play a pivotal role in co-ordinating various public and private sector activities to optimise and synergise the effort.
- Finalise the formation of the State Digital Infrastructure Company (SDIC) as a priority. To date, government contribution to the development of digital infrastructure has been small. It is critical that the government plays a greater enabling role in access to broadband infrastructure, e.g., by making high sites available operators.

- Situate rapid deployment of broadband infrastructure within District Development Model initiatives. This will ensure co-ordination of broadband development initiatives between the national, provincial and local governments.
- Ensure that the National Policy on Rapid Deployment is recognised in relevant legislation and that the DCDT interacts with relevant processes across the government. This will facilitate consideration of requirements for communications infrastructure into various development initiatives across all sectors of socio-economic environment.

**Examples:** The South African National Water Resources Infrastructure Agency SOC Ltd Bill was introduced to parliament in August 2023 so as to provide for the establishment of the South African National Water Resources Infrastructure Agency as a state-owned company and major public entity with authority over national water resources infrastructure.

Suggested text for insertion into this bill is:

*“The Agency must, when developing regulations under this Act, take into account the provisions of the National Policy on the Rapid Deployment of Electronic Communications Facilities and Networks and such regulations shall include a standard application process for access to national water resources infrastructure for the purposes of deploying electronic communications facilities as defined in section 1 of the Electronic Communications Act, 2005, as well as the standard terms and conditions, including fees, applicable to such access”.*

A similar approach should be taken to consultations on norms and standards for schools under the South African Schools Act, and norms and standards developed under the Spatial Planning and Land Use Management Act.

### 8.3 Digital Infrastructure One Stop Shop

One of the main reasons for slower than envisaged and more costly digital infrastructure deployment is the burden of having to secure multiple permissions from different authorities to build networks. This is coupled with extreme variation in pricing and processes in applying for such permissions. A single platform for all applications would alleviate much of the delays and resource wastage.

- Implement National Policy on Rapid Deployment and showcase the all-of-government approach by creating a “Digital Infrastructure One Stop Shop” for the processing of applications for rights of ways and other permissions required to deploy digital infrastructure.
- This should be housed in the DCDT, in collaboration with Invest SA under the Department of Trade, Industry and Competition (DTIC), and closely based on the South African Energy One Stop Shop (EOSS) and the phased approach adopted there.

#### **Case study: South Africa Energy One Stop Shop (EOSS)**

In August 2023, the Minister of Trade, Industry and Competition announced<sup>33</sup> the launch of the Energy One Stop Shop, a new facility developed to address red tape for energy developers which is a key constraint slowing down approval of energy supply projects.

The facility is being rolled out in four phases.

- **Phase 1 (completed):** facility with dedicated personnel, a website (<http://energyyoss.gov.za>), a registration portal for energy projects, and a mapped process showing where a project is in the approval processes.

<sup>33</sup> Minister Patel Launches the Energy One Stop Shop and Energy Resilience Fund to Mitigate Impact of the Energy Crisis, <http://www.thedtic.gov.za/minister-patel-launches-the-energy-one-stop-shop-and-energy-resilience-fund-to-mitigate-impact-of-the-energy-crisis-2/>

- **Phase 2:** scoping provincial and municipal processes and building capacity at these two spheres.
- **Phase 3:** single, electronic application process will be put in place, with greater automated feedback.
- **Phase 4:** full implementation covering immediate blockages and a wider reform programme.

Implementation lessons can also be gleaned from other jurisdictions. The GatiShakti Sanchar Portal<sup>34</sup> – launched by the government of India in May 2022 – is a collaborative institutional mechanism between all stakeholders, including different levels of government and service providers, intended to facilitate the right of way application process through a single interface.

- In addition to municipal permissions, the Digital Infrastructure One Stop Shop (DIOSS) should facilitate and co-ordinate applications to state-owned companies (e.g., SANRAL), traditional authorities, water boards, as well as environmental and heritage resource management authorities.
- The one stop shop facility should be linked to the GIS digital infrastructure database held by the RDNCC to facilitate processing and ensure that spatial data is captured. This will greatly enhance enforcement of infrastructure sharing regulatory frameworks.
- The industry identifies challenges in securing energy supply when establishing rural sites as a major cause of delays. Enabling the DIOSS to assist with applications relating to energy supply would alleviate this.
- 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.

### Case study: Before You Dig Australia (BYDA)

BYDA<sup>35</sup> 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.

## 8.4 Fees and Tariffs

The cost of permissions, such as rights-of-way or wayleaves to build communications infrastructure, can constitute a significant input cost into the deployment of broadband networks. This is particularly true for some of the metropolitan areas, with a worrying trend of more urban areas increasing such tariffs. To achieve faster deployment and more affordable broadband services, the cost of digital infrastructure deployment needs to be reduced.

It is recommended that the national government take the lead in implementing the National Policy on Rapid Deployment by reducing and standardising the cost of access to various infrastructure for the purpose of deploying digital infrastructure, while ensuring a transparent and predictable wayleave application process with defined turnaround times. Key elements to address are:

- Reduce SANRAL fees and revenue share for deployment of communications infrastructure on, over or under a national road.
- Standardise appropriate fees for access to servitudes and infrastructure controlled by Eskom, Transnet and other government entities.

<sup>34</sup> <https://gatishaktisanchar.gov.in/>

<sup>35</sup> <https://www.byda.com.au/>

### Case study: Tanzania reduces right of way tariffs

In July 2023, the Tanzanian government reduced by 80% government charges levied on telecommunication companies for utilising road-reserved land under the management of Tanzania Roads Agency (TANROADS) to install fibre optic cables, with the intention of promoting rural coverage.<sup>36</sup>

Nigeria has addressed high and inconsistent state government charges for wayleaves through an agreement reached between the federal government and the 36 state governors to harmonise these charges. In December 2022, the federal government announced a 90% reduction in wayleave charges for a period of two years in places lacking telecommunications infrastructure ("green areas").

Provincial government to standardise and reduce tariffs for deployment on, over or under a provincial road and standardise the approach to and reduce rentals charged for seabed leases for submarine fibre optic cables landing in South Africa by provincial governments.

Support implementation of Operation Vulindlela process to standardise local government right of way and other processes relevant to rapid deployment, including standardisation and reduction of tariffs.

## 8.5 Aerial Fibre

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, unnecessarily increasing the cost of fibre infrastructure deployment.

Through the RDNCC and the South African Local Government Association (SALGA), local government should be educated on the benefits of aerial fibre deployments and the necessity of this mode of deployment in making fibre-based access affordable. Also:

- Adoption by municipalities of Standard By-laws for Deployment of Electronic Communications Facilities which stipulate that wayleaves be granted for aerial deployment and allow access to poles should be supported.
- Applicable standards for aerial fibre deployments should be developed by the SABS, adopted and enforced to mitigate aesthetic concerns.

## 8.6 Infrastructure Sharing

Infrastructure sharing reduces the cost and time required to install and operate an electronic communications network, resulting in the greatest benefit to users in terms of service availability, quality and price. Reforms to the existing electronic communications facilities leasing regulatory framework – including the introduction of wholesale pricing principles – should be pursued through proposed amendments to the ECA. The objective of such reforms will be to ensure that infrastructure sharing is practiced and enforced, wherever possible and desirable, in order to: (1) reduce the cost of digital infrastructure deployment, and (2) expedite such deployment by using infrastructure elements which are readily available.

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<sup>36</sup> Tanzania cuts right-of-way fees in major boost for operators <https://developingtelecoms.com/telecom-business/telecom-regulation/15278-tanzania-cuts-right-of-way-fees-in-major-boost-for-operators.html>

### 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 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 futureproof existing buildings through co-ordination 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.

Nigeria<sup>37</sup> and the United States of America<sup>38</sup> are currently finalising a national Dig Once policy.

## 8.7 National Building Regulations

Amendments to the National Building Regulations (NBRs)<sup>39</sup> should be effected to include a chapter setting out mandatory requirements for in-building reticulation for fibre deployment in new developments and fibre pre-provisioning in new buildings.

Key to implementation of this recommendation is the initiation of a process for the South African Bureau of Standards (SABS) to adopt suitable standards for fibre pre-provisioning. SABS – which falls under the Department of Trade, Industry and Competition (dtic) – is responsible for maintaining the NBRs, which is a set of guidelines and standards that govern the construction of buildings in South Africa.

The framework for the NBRs is contained in South African National Standard (SANS) 10400 and it is a legal requirement that all buildings be constructed, renovated, altered or extended in accordance with the SANS 10400 series.

## 8.8 GIS Database

Having accurate, accessible records on the location and details of broadband infrastructure is critical to enabling and enforcing infrastructure sharing and protecting existing infrastructure. A current GIS database will further allow targeting of underserved areas while reducing planning complexity and facilitating progress reporting and tracking.<sup>40</sup>

This GIS database will also be fundamental to developing digital infrastructure masterplans at local, provincial and national levels.

The National Rapid Deployment Policy requires that licensed operators must submit to ICASA GIS information about the type and location of broadband infrastructure deployed. In turn, ICASA must use this information to update the GIS database maintained by the Rapid Deployment National Coordinating Centre (RDNCC).

<sup>37</sup> <https://leadership.ng/federal-govt-to-unveil-national-dig-once-policy-by-december/>

<sup>38</sup> <https://www.meritalk.com/articles/white-house-dig-once-policy-in-the-works-for-broadband-expansion/>

<sup>39</sup> Published under the National Building Regulations and Building Standards Act 103 of 1977

<sup>40</sup> See National Policy on Rapid Deployment of Electronic Communications Facilities and Networks, para 2(f).

While the above requirement is valid in principle, in practice the GIS database currently does not exist. The rectify this, the following key steps must be taken:

- Implement the National Policy on Rapid Deployment to create and maintain a comprehensive national GIS database of electronic communications infrastructure in the country.
- Create / enforce obligation on the operators to submit infrastructure information to ICASA. This obligation should cover both public and private deployments and specify infrastructure to be reported on (such as fibre optic networks, conduits, ducts, towers, base stations, pylons and poles).
- Ensure collection of information from state-owned (communications) companies.
- Align the GIS database with the provisions of the Spatial Data Infrastructure Act, 2003.

### 8.9 Incentives

Further improvement in the rate and extent of deployment of broadband infrastructure can be achieved by the following:

- Deepen partnerships with the private sector, and transformation initiatives, through an aggressive implementation of SA Connect and Broadband Access Fund initiatives and completion of the transition from the Universal Service and Access Fund (USAF) to the Digital Development Fund (DDF).
- Promote the development of typical gigabit broadband applications in homes and industries through appropriate subsidies or incentives. This could include mobile applications, particularly suitable to the use of 5G technologies which require fibre backhaul.
- A policy direction should be issued to ICASA on infrastructure-based obligations to be imposed through the planned 2024 spectrum auction.
- Support innovation in fibre deployment through a regulatory sandbox approach and subsidising and rewarding successful proof-of-concept implementations.

The objective would be to ensure that promising ideas or proofs-of-concept receive sufficient support to make them viable. This would further strengthen socio-economic development.

### 8.10 Legislative Amendments

Proposed amendments to the Electronic Communications Act, 2005 relating to access to and leasing of electronic communications facilities, as well as the regulation of wholesale pricing for such access, should be pursued and finalised. These amendments – recommended by the Competition Commission in its Final Report on the Data Services Market Inquiry – are embodied in the Electronic Communications Amendment Bill 2022, expected to be introduced into parliament in early 2024.

Further planned amendments to establish a Digital Development Fund (DDF) and reform the financing of universal service and access projects must also be expedited.

### 8.11 Rapid Deployment Regulations

The Rapid Deployment Regulations should be completed by ICASA as required by the National Policy on Rapid Deployment<sup>41</sup>. These regulations will stipulate the framework for calculating compensation to private landowners where they are deprived of use of their property due to digital infrastructure deployment and set out applicable dispute resolution procedures.

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<sup>41</sup> As at October 2023, ICASA had formed a Council Committee to guide the drafting of these regulations.

## **Fibre Broadband Development Initiative**

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Rapid Deployment Regulations must promote the public interest in the rapid rollout of broadband infrastructure and take into consideration national policy. This can be done by including mechanisms that facilitate fibre provisioning, such as:

- Standardising forms to be used to request access.
- Standardising compensation payable to a private landowner for deprivation of use of their property.
- Stipulating reporting requirements to inform the RDNCC GIS Database.

Until such time as these regulations have been completed, the use of private property (land) for digital infrastructure deployment purposes remains problematic and subject to bilateral negotiations between the operators deploying the infrastructure and the landowner. This retards the pace of infrastructure deployment and can make it more expensive than it needs to be.

## **9. CONCLUSIONS**

Despite the progress made in South Africa in the build-out of digital infrastructure, much more development still needs to take place to realise the vision of a gigabit society, where high-speed broadband enables all facets of the society to use digital services to improve their daily lives.

Implementation of the broadband connectivity targets, stipulated in the SA Connect Policy, has fallen behind schedule and by now the targets are outdated. A new set of targets, reflecting the ambition to achieve the gigabit society status, must be adopted and adherence to implementation timelines must be ensured through a focused strategy which involves both the public and the private sector. The targets proposed in this paper consider a timeline until 2035 to reach gigabit broadband availability or at least very high throughput connectivity, sufficient to participate fully in the gigabit society.

To expedite further deployment of a deep fibre fabric required to bring about socio-economic upliftment enabled by broadband, a set of suggested actions was put forward. To a large degree these recommendations build on policies and regulations already in place, with the objective of expanding and enhancing them. A more focused and co-ordinated approach is necessary to drive efficiencies in the deployment of digital infrastructure, from the ability to build networks quicker and at a lower cost to rationalisation of the infrastructure build, e.g., through sharing of public infrastructure already available. Importantly, this includes pre-fiberisation of greenfields developments and buildings to reduce the cost of having to retrofit existing structures with fibre, save time and ensure that good quality internet connectivity is available throughout the premises.

The building blocks to a gigabit society are in place; the vision of where South Africa wants to be in the digital future is clear. It is now time to implement that vision.

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## 11. APPENDIX A

### 11.1 Introduction

We developed a macro-economic model to estimate the impact of increased fixed broadband on the South African economy for the period 2023 to 2032. This model follows the approach developed and utilised by the ITU.

The key determining variables in this model are:

1. Fixed broadband household penetration.
2. The ability for the economy to use fixed broadband to stimulate additional economic growth through the creation of new business models or factor productivity enhancements. This “ability” is an elasticity, or co-efficient, that multiplies the impact of increasing fixed broadband across the economy.

### 11.2 Trends in Fixed Broadband Penetration

The exhibit below shows fixed broadband penetration growth from 2010 to 2022 per ITU world region<sup>42</sup>. The weighted average fixed broadband penetration per 100 people in 2022 ranged from 0.7 lines per 100 people in Africa to 39.8 lines per 100 people in high income Europe, with the majority of ITU world regions reaching around 20 lines per 100 people. The world average for 2022 was 17.9 lines per 100 people.<sup>43</sup>

The ITU (2021) reports that substantial growth in household fixed broadband penetration took place between 2019 and 2020, in response to COVID-19 and a substantial increase in the use of teleworking, distance learning, remote entertainment and telemedicine. Africa experienced the single largest increase during this period, from a low base of 4.3% to 6.0%, or close to a 40% increase in a single year.<sup>44</sup>

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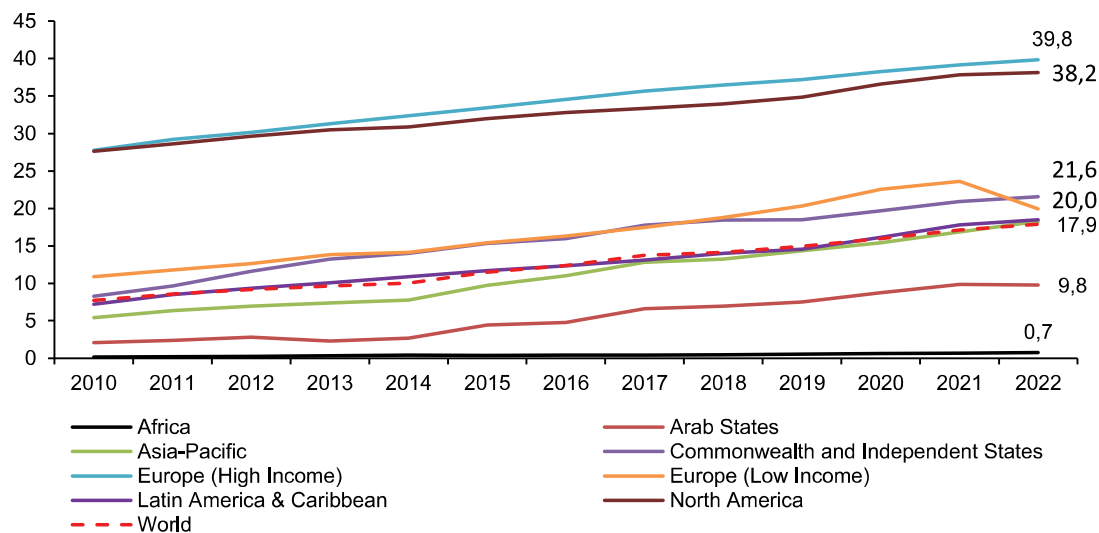
<sup>42</sup> ITU world region as defined by the ITU, (ITU, 2023). The regional averages were calculated by weighting to population.

<sup>43</sup> Based on a weighted average using population as weights and based on ITU data (ITU, 2023).

<sup>44</sup> The ITU does not attribute this growth rate to any particular stakeholder or industry. However, it is unlikely that this rate of growth would have occurred without the need to rapidly connect and/or roll out infrastructure to schools, health clinics and other government facilities. The lessons learnt from COVID-19 include the importance of connectivity and information management to governments, thereby (hopefully) stimulating a second round of rapid connectivity programmes to further connect all government and social infrastructure.

## Fibre Broadband Development Initiative

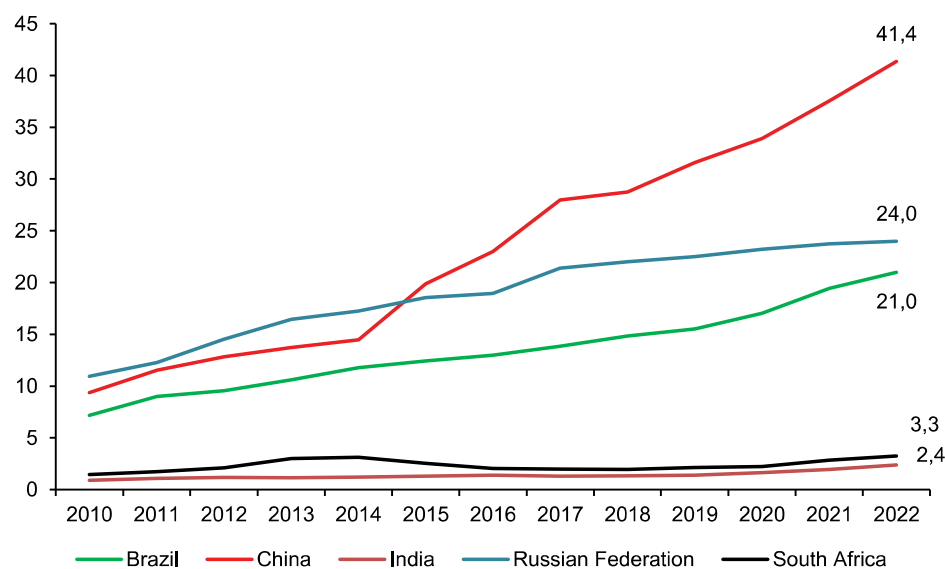
**Exhibit 11.1: Fixed broadband penetration growth (no. of lines per 100 people) by ITU world region, 2010 – 2022**



Source: Based on the latest data from the ITU (2023) and the World Development Indicators (World Bank, 2023)  
 Note: Regional averages were calculated by weighting to population.

A more focussed view of fixed broadband penetration growth per 100 people for Brazil, China, India, the Russian Federation and South Africa (the BRICS countries) is illustrated below.

**Exhibit 11.2: Fixed broadband penetration growth in BRICS countries (no. of lines per 100 people), 2010 – 2022**



Note, the ITU data in this exhibit does not include fixed 4G and fixed 5G connections.

Source: Based on the latest data from the ITU, 2023

## Fibre Broadband Development Initiative

Fixed broadband growth evolved around two distinct growth paths within the BRICS countries:

1. Brazil, China, and the Russian Federation have seen substantial growth in fixed broadband penetration over the period, starting from around 10 lines in 2010 and reaching levels above 20 lines per 100 people. China's fixed broadband penetration growth has been the most rapid, starting from 9.4 lines per 100 people in 2010, and reaching 41.4 lines in 2022; an annualised growth rate of 13.2% over the period.
2. The second group of BRICS countries – South Africa and India – had a much lower base of penetration, of between 0.5 and 1.5 lines per 100 people in 2010, reaching around 1.4 to 3.3 lines per 100 people in 2022.

The trend in growth of fixed broadband penetration across different geographic and economic regions provides a basis for assessing South Africa's potential towards 2032. Weighted average fixed broadband penetration rates per ITU region were calculated using country population numbers as weights within each region. The results are shown below.

Exhibit 11.3: Fixed broadband penetration by ITU region, 2010 – 2022				
ITU Region	Fixed broadband subscriptions per 100 people*			
	2010	2022	Difference	CAGR <sup>45</sup>
Africa	0.2	0.7	0.6	13.0
Arab States	2.1	9.8	7.7	13.7
Asia-Pacific	5.4	18.3	12.9	10.7
Commonwealth and Independent States (CIS)	8.3	21.6	13.3	8.3
Europe (High Income)	27.8	39.8	12.1	3.1
Europe (Low Income)	10.9	20.0	9.1	5.2
Latin America & Caribbean	7.2	18.5	11.3	8.2
North America	27.6	38.2	10.5	2.7
World	7.7	17.8	10.2	7.3
South Africa	1.4	3.3	1.9	7.1
* Weighted averages per region, weighted by country populations within each region. Note, the ITU data in this exhibit does not include fixed 4G and fixed 5G connections.				
Source: Weighted average per region calculated from data from the ITU, 2023				

Africa, the Arab States and Asia Pacific regions were able to achieve compound annual growth rates (CAGR) of more than 10% over the period 2010 to 2022. Latin America and the Caribbean, and the Commonwealth of Independent States (CIS) were able to achieve annualised growth rates of approximately 8%.

South Africa's fixed broadband penetration growth has grown at an annualised rate of 7.1% between 2010 and 2022. It has more than doubled its fixed broadband penetration level from 1.4 lines to 3.3 lines per 100 people in 2022, or a household penetration rate of 10.8%.

<sup>45</sup> The CAGR is the annualised average rate of revenue growth between two given years, assuming growth takes place at an exponentially compounded rate. See: <https://www.gartner.com/en/information-technology/glossary/cagr-compound-annual-growth-rate#:~:text=The%20compound%20annual%20growth%20rate,at%20an%20exponentially%20compounded%20rate.>

## 11.3 Fixed Broadband Penetration Forecast Scenarios

Three scenarios were applied to assess South Africa's future growth potential, with the aim of becoming a gigabit society and a significant collaborative drive to connect homes to fibre infrastructure.

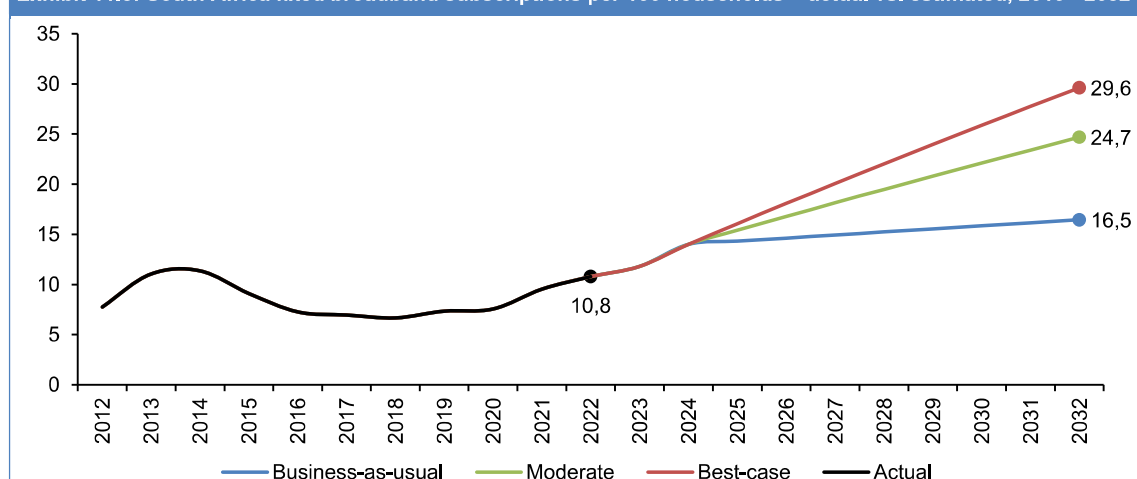
**Exhibit 11.4: Scenarios for growth in fixed broadband penetration**

Scenario	2022	2032			Assumptions (scenarios)
		Business as Usual	Moderate Improvement	Best Case	
Fixed broadband penetration per 100 households	10.8	16.0	25.0	30.0	<ul style="list-style-type: none"> <li>Business as Usual – retain current growth in household penetration</li> <li>Moderate improvement – increase the current fixed broadband penetration rate 2.5x</li> <li>Best Case – increase the current fixed broadband penetration rate 3x</li> </ul>

Source: Africa Analysis calculations

The forecast translates to almost 25% of all households having a fixed fibre connection under the Moderate Improvement scenario and almost 30% for the Best Case scenario, illustrated below.

**Exhibit 11.5: South Africa fixed broadband subscriptions per 100 households – actual vs. estimated, 2010 - 2032**



Source: Africa Analysis calculations

## 11.4 Fixed Broadband Penetration Multiplier Effect

Every economy has a different propensity, or ability, to adopt and leverage broadband connectivity to generate new businesses and services. This elasticity, as shown from various studies, consists of:

1. An economy-wide elasticity.
2. Sector-specific elasticity where certain sectors of the economy are pre-disposed to leveraging the economic potential of increased fixed broadband penetration.
3. A transformational elasticity is introduced, where a substantial increase in speed (e.g., from 10 Mbps to 1 Gbps) stimulates an additional elasticity for specific sectors within the economy.

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The propensity, or elasticity, of the South African economy to benefit from an increase in fixed broadband penetration was estimated for the following scenarios:

Exhibit 11.6: Fixed broadband multiplier scenarios					
Scenario	2022	2032			Assumptions (scenarios)
		Business as Usual	Moderate Improvement	Best Case	
Broadband multiplier for a 10% increase in fixed broadband penetration	0.00	0.00	0.08	1.47	<ul style="list-style-type: none"> <li>Business as Usual – current forecasts already include benefits of broadband</li> <li>Moderate improvement – South Africa reaches the 2021 world average “benefit” of broadband by 2032</li> <li>Best Case – South Africa reaches the 2021 “benefit” of broadband of Latin American countries by 2032</li> </ul>

Each of these scenarios is discussed further below.

### Business as Usual

Under the “Business as Usual” scenario, we assume that the benefits of fixed broadband are already captured in existing economic forecasting models, with no change to be associated with an increase in fixed broadband penetration.

### Moderate Improvement

In this assumption we apply the elasticity estimated by O’Conner et al, 2020, of 0.27% per 10% increase in fixed broadband penetration, at the beginning of the period, ramping up to 0.80% per 10% increase in fixed broadband penetration by 2032 – the world average reported for 2021.

We further apply sector-specific productivity enhancements, based on numerous studies that estimate efficiency enhancements due to broadband connectivity. A study conducted in 2004 (in Australia) found that the impact of broadband on productivity differs per economic sector, as illustrated below.

Exhibit 11.7: Sector-specific productivity effects of broadband penetration	
Industry	Increase in efficiency (%)
Agriculture, forestry and fishing	0.06
Mining and quarrying	0.10
Manufacturing	0.19
Electricity, gas and water	0.12
Construction	0.19
Wholesale and retail trade, catering and accommodation	0.27
Transport, storage and communication	0.33
Finance, insurance, real estate and business services	0.44
General government	0.27
Community, social and personal services	0.26
Source: ACIL Tasman, 2004	

A later study, released in 2013, estimates that increased penetration in industrial sectors could boost annual productivity growth by 1 to 1.5 percentage points.<sup>46</sup> Other studies indicate that the benefit of broadband in the manufacturing and industrial sectors is dependent on co-investment in organisational change, so that firms fully digitally transform.<sup>47,48</sup>

A 2021 study of industries in China identified that increased broadband penetration has a greater impact on operational productivity of low-tech industries.<sup>49</sup> Significantly, this study reports a sustained long-term financial benefit across all types of industries.

Studies in India have reported similar trends, where sector productivity increases as broadband, and particularly digital transformation, increase.<sup>50</sup>

Therefore, the 2004 figures reported by ACIL Tasman represent the minimum positive impact that increased broadband penetration may have on economic sectors. These sector-specific elasticities are applied in a “ramp-up” fashion, whereby no sector experiences a particular increase in productivity within the first two years of the forecast period. The increase in efficiency due to penetration of broadband is to reach its peak by the year 2029, whereafter the sector experiences no further increasing returns to scale to the adoption of broadband.

### Best Case

For our forecast, we apply the O’Conner, et.al., 2020 elasticity at the beginning of the period and reach the elasticity reported for Latin American countries, where a 10% increase in fixed broadband leads to a 1.47% increase in economic growth by 2032.

Further, we recognise the transformative effect that a high-speed broadband connection may have. Some sectors, such as banking and finance, have already adopted broadband and associated technologies as a critical success driver. However, for other sectors, broadband is a general purpose technology where the adoption of its capabilities may not be fully understood or the benefits thereof fully recognised. For these sectors, we are of the view that our proposed rapid increase in high-speed broadband penetration will have a major impact on sector-specific productivity.

Sectors where the benefits of broadband are likely not fully realised are those sectors categorised with a “low” digital intensity, as expressed by the OECD in 2018. The estimated digital intensity of these sectors is likely to have increased dramatically since then, driven in part by the digital transformation that took place as a result of COVID-19. During this episode, firms and households were forced to identify new ways of working, where the introduction of digital methods fully transformed key sectors such as health and education.

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<sup>46</sup> General Electric, 2013: Industrial Internet: A European Perspective. Available at: [https://www.iot-now.com/wp-content/uploads/2013/07/Industrial\\_Internet\\_A\\_European\\_Perspective.pdf](https://www.iot-now.com/wp-content/uploads/2013/07/Industrial_Internet_A_European_Perspective.pdf)

<sup>47</sup> Bertschek, I., Briglauer, W., Hüschelrath, K., Kauf, B. & Niebel, T. 2016: The Economic Impacts of Telecommunications Networks and Broadband Internet: A Survey. Available at: <https://d-nb.info/1193584221/34>

<sup>48</sup> Fabling, R. & Grimes, A. 2021: Picking up speed: Does ultrafast broadband increase firm productivity?, Information Economics and Policy, Volume 57, <https://doi.org/10.1016/j.infoecopol.2021.100937>.

<sup>49</sup> Guo, L.; Xu, L. The Effects of Digital Transformation on Firm Performance: Evidence from China’s Manufacturing Sector. Sustainability 2021, 13, 12844. <https://doi.org/10.3390/su132212844>

<sup>50</sup> Khanna, R. & Sharma, C. 2022: Impact of information technology on firm performance: New evidence from Indian manufacturing, Information Economics and Policy, Volume 60. <https://doi.org/10.1016/j.infoecopol.2022.100986>

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**Exhibit 11.8: Expected impact of Covid-19 on sectors with “low” digital intensity**

Industry	Digital Intensity (2013-2015)	Expected post COVID-19 impact	Direction of Digital Intensity
Agriculture, forestry, fishing	Low	Smart IoT and smart agriculture is increasing exponentially in the agricultural market in South Africa, from emerging farmers installing simple Wi-Fi water use timers to the adoption of smart control systems in feedlots, irrigation, monitoring of tree growth. Smart technologies are also used in the expanding aqua and mariculture operations.	↑
Mining and quarrying	Low	Digital intensity is increasing as mines are investing in robotic mining equipment and 5G systems for improved health and safety	
Food products, beverages and tobacco	Low	Digital intensity is increasing as strict phytosanitary standards require increased automation and digital transformation.	
Electricity, gas, steam and air conditioning	Low	Digital twin systems have become critical tools in the management of old plant and equipment, as well as the management of load during periods of excessively high demand.	
Water supply, sewerage, waste management	Low	Digital twin systems have become critical tools in the management of old plant and equipment, as well as the management of load during periods of excessively high demand.	
Construction	Low	Construction is increasingly using 3D rendition software to monitor and track construction progress, in line with the adoption of digital twin investments for large infrastructure projects. Contractors are using cloud computing software to manage and track site records, quality control and contractual requirements.	
Transportation and storage	Low	GIS live tracking and real-time security footage of both pick-up / drop-off, as well as during transport has significantly increased the ICT requirements of transportation and storage services.	
Real estate	Low	The competitive differentiator of being able to show a 3D video rendition of a real estate is becoming the norm in the post-Covid world, thus increasing the digital intensity of all retail estate transactions.	
Source: Calvino, F., et al. (2018), "A taxonomy of digital intensive sectors", OECD Science, Technology and Industry Working Papers, No. 2018/14, OECD Publishing, Paris, <a href="https://doi.org/10.1787/f404736a-en">https://doi.org/10.1787/f404736a-en</a> .			

We further adapt the sector-specific productivity effects for key sectors of the economy. Adjustments to the sector-specific productivity effects are summarised below.

**Exhibit 11.9: Sector-specific productivity effects of broadband penetration**

Industry	Increase in efficiency (%)	50% additional increase in efficiency
Agriculture, forestry and fishing	0.06	0.09 *
Electricity, gas and water	0.12	0.18 **
General government	0.27	0.405 ***
Community, social and personal services	0.26	0.39 ****
Notes:		
* Big data analytics systems in beef and dairy farming can significantly reduce veterinary bills and increase production yields.		
** 40% of unplanned shutdowns are estimated to be due to operator missteps, which digital twinning technologies could prevent (Engineering News, 2022: The digital twin – your partner in predictive operational efficiency).		
*** The eNatis online vehicle licence disk renewal process is estimated to be 10 times faster than physically visiting a vehicle registration centre (if based in an urban area) and would be immeasurably faster if the end-user is in a rural area.		

## Fibre Broadband Development Initiative

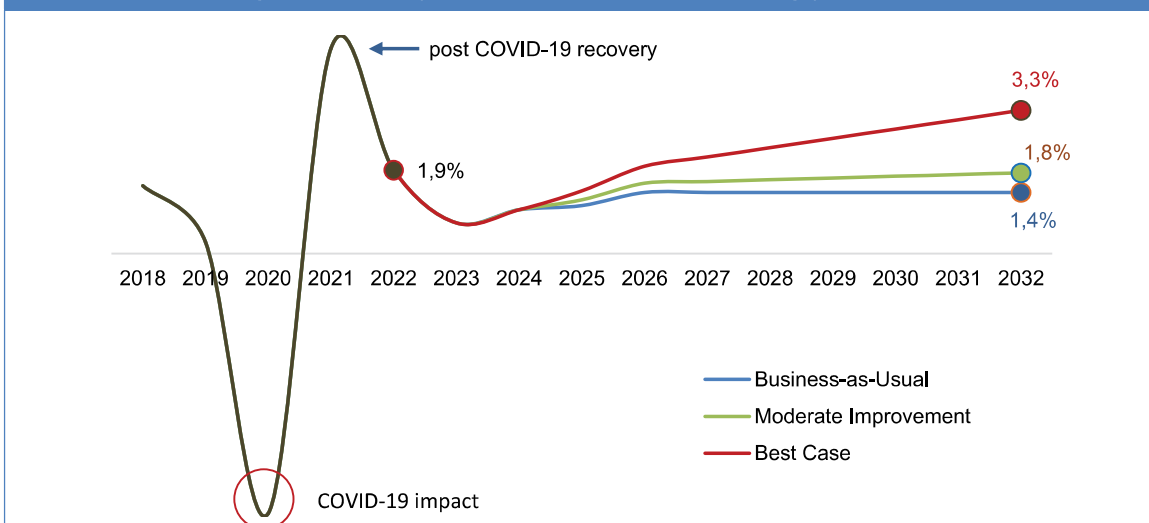
The estimate assumed in this study takes into account the vastness of government processes and procedures that remain in a non-digitised format.

\*\*\*\* The increase in efficiency of healthcare and education systems through implementation of online management tools will reduce costs and improve quality of outcomes.

Source: ACIL Tasman (2004), Africa Analysis calculations

Applying the three scenarios to the ITU econometric model yields the following economic growth trajectory:

**Exhibit 11.10: Real GDP growth forecast (constant 2015 prices, annual % change), 2023 to 2032**



Source: Africa Analysis calculations

The Business-as-Usual scenario indicates that the South African economy will continue along its current limited growth trajectory, and follows the expectations of multilateral institutions. The Moderate Improvement scenario indicates that increased fixed broadband penetration breaks South Africa out of its current low-growth trajectory to be more in line with the historical long-term average growth of the South African economy, as experienced between 1993 and 2022.

The Best Case scenario indicates that increased fixed broadband penetration and the associated efficiency gains reset South Africa's economic growth trajectory towards a 3.3% per year growth rate by 2032.

## 12. GLOSSARY

3D	Three-dimensional	GIS	Geographic Information System
4G/5G	4 <sup>th</sup> / 5 <sup>th</sup> Generation mobile technologies	GVA	Gross Value Added
(A)DSL	(Asymmetric) Digital Subscriber Line	GSMA	Global System for Mobile Communications Association
AI	Artificial Intelligence	HD	High Definition
AOI	Automated Optical Quality Inspection	HH	Household
AR	Augmented Reality	ICASA	Independent Communications Authority of South Africa
BB	Broadband	IMF	International Monetary Fund
BRICS	Brazil, Russia, India, China, South Africa – a co-operation grouping of countries	IoT	Internet of Things
CAGR	Compound Annual Growth Rate	IT	Information Technology
CIS	Commonwealth of Independent States	ITU	International Communications Union
CO <sub>2</sub>	Carbon Dioxide	MB	Megabyte(s)
DCDT	Department of Communications and Digital Technologies	Mbps	Megabit(s) per Second
DDF	Digital Development Fund	mmWave	Milimetre Wave
DIOSS	Digital Infrastructure One Stop Shop	MOOC	Massive Online Open Course
DL	Download	NBR	National Building Regulations
DTIC	Department of Trade, Industry and Competition	NDP	National Development Plan
EC	European Commission	NIP	National Infrastructure Plan
EOSS	Energy One Stop Shop	NRI	Network Readiness Index
FBB	Fixed Broadband	ODN	Optical Distribution Network
FNO	Fibre Network Operator	OTDR	Optical Time-Domain Reflectometer
FTTH/B/S	Fibre-to-the-Home / Business / Site	OTT	Over-the-Top
FTTP	Fibre-to-the-Premises	PHCC	Primary Health Care Corporation
FTTR	Fibre-to-the-Room	PoC	Proof-of-Concept
FWA	Fixed Wireless Access	PPP	Purchasing Power Parity
GB	Gigabyte(s)	Q.nbn	Qatar National Broadband Network
Gbps	Gigabit(s) per Second	RDNCC	Rapid Deployment National Co-ordinating Centre
GCC	Gulf Cooperation Council	SABS	South African Bureau of Standards
GDP	Gross Domestic Product	SALGA	South African Local Government Association

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SANS	South African National Standards	USA	United States of America
SDIC	State Digital Infrastructure Company	USAF	Universal Service Access Fund
SOC	State-Owned Company	USD/US\$	United States Dollar
SME(s)	Small and Medium Size Enterprise(s)	UUCP	Unix-to-Unix Copy
UAE	United Arab Emirates	VDSL	Very-high-bit-rate Digital Subscriber Line
UIF	Unemployment Insurance Fund	VR	Virtual Reality
UK	United Kingdom	WTTx	Wireless to the X (anything)
UL	Upload	ZAR / R	South African Rand

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