

SADC RURAL BROADBAND GUIDELINES AND RECOMMENDATIONS

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ACRYNOMS

ADSL	Asymmetrical Digital Subscriber Line
BTS	Base Transceiver Stations
Capex	Capital Expenditure
CRASA	Communications Regulators' Authority of Southern Africa
DTT	Digital Terrestrial Television
GNI	Gross National Income
ICT	Information and Communications Technologies
ISP	Internet Service Provider
Opex	Operating Expenditure
PPP	Private Public Partnership
RoI	Return on Investment
SADC	Southern African Development Community
STEM	Science, Technology, Engineering And Mathematics
SWN	Single Wholesale Network
TRxs	Intelligent Transceivers
UA	Universal Access
USF	Universal Service Fund
WDR	World Development Report

SECTION 1

1. OVERVIEW

The Southern African Development Community (SADC) Ministers took a deliberate stance to agree to the following targets in regards to broadband deployment in the SADC region:

a) 80% of the population of each SADC Member State to be covered by broadband services by 2020;

b) Broadband connections to all primary and secondary schools to allow e-education by 2020;

c) Broadband connections to 70% of the health facilities to allow e-health by 2020;

d) Broadband connections to all public-sector agencies to allow for e-government by 2020;

e) Broadband connections to 50% of the SADC Member State Households by 2020; and

f) Broadband services per month should not cost more than 5% of Gross National Income (GNI) per Capita by 2020.

In addition, the SADC Ministers issued a directive that strives to set a minimum download speed of 1Mbps as a broadband entry level, which shall be reviewed with the aim to increase the download speeds on a per country basis in line with targets contained in the broadband plan of each country. The definition of broadband coverage includes geographical and population coverage. For the purpose of this Guidelines broadband is defined to mean internet access that is always on, with a minimum of 1 Mbps download speed available to the population residing in the rural regions. This speed should evolve as SADC Ministers revise the definition for the region.

Digital technologies have shown to have potential gains on economic and social development, including the three (3) digital dividends, namely: growth through reduction of cost of acquiring information, increased job opportunities through expanded trade and delivery of better public services. Despite the fact that 8 out of 10 individuals have access to mobile phones, still there is a digital divide whereby out of 7.4 billion people, 6 billion are without broadband, 4 billion are without internet, 2 billion without mobile phone and almost 400 million people still outside any digital signal (World Development Report (WDR) 2016) [1].

Internet, especially high-speed internet (broadband), has a positive impact on development and its greatest impact is three-fold;

a) Social and economic inclusion of citizens as it allows for reduction in the cost of acquiring information and making more information available leading to expansion of trade, creating jobs and increased access to public services. Internet has been acknowledged as a driver for more trade, better capital use and increases market competition.

[1] World Development Report, 2016

b) Allow for efficiency as most organisations and governments have been able to automate their operations.
c) Internet has also promoted innovation through decrease in the transactions costs thereby increasing the returns to scale bringing in new business models. Similar to energy and transport, the internet has become a critical infrastructure for development.

In 2017, the SADC had an average internet user penetration of 16.03%. It was noted, however, that most of users of the internet were accessing the service over the mobile networks. The average mobile penetration in the SADC region is 80.84%, with five (5) Member States with over 100% in terms of subscriptions. Pricing of internet services varies hugely within the Region. For instance, the cost for 1 GB data on mobile prepaid ranges from 1.12% to 45.53% of average monthly income[2]. The current benchmark for affordability, set by the United Nations Broadband Commission, is 1 GB for 2%, of monthly income.

The rural populations is characterised as those areas that have low levels of literacy, low population density and low per capita income. The Rural Broadband Guidelines, in Section 5, is proposed for use as a guide by members. The Guidelines aims to ensure that all citizens in the rural areas do affordably access and benefit from broadband services irrespective of religion, race or ethnicity, location, language, political persuasion, gender, economic status, etc.

[2] Alliance for Affordable Internet (A4Ai) 2017 Affordability Report

SECTION 2

2. IMPACT OF BROADBAND ON SOCIAL AND ECONOMIC DEVELOPMENT OF RURAL AREAS

Broadband adoption can accelerate the socio-economic development in remote and rural areas. It has positive impact in the way public services are delivered as well as increases productivity of the businesses.

2.1 Public Service Productivity

The delivery of public services becomes efficient through broadband enabled applications. Most governments have automated their back-office operations as well as the services being delivered to the citizens. In regard to service delivery to citizens, broadband enables automation of services, such as, travel document and VISA applications and processing, income tax filing, business registration, birth and death certificate registration and national identity services, amongst others. It has been noted that governments which are enabling their service delivery to be automated and accessed on high speed internet allow for inclusion and increased participation of the citizens.

2.1.1 e-Health

Most of the rural areas do not have specialized facilities or infrastructure in regards to health services. Most of the rural health centres lack specialized medical workers and infrastructure. Broadband services allow the remote access to the specialized medical attention and infrastructure. Broadband services will remove the geographical barriers to medical care by enabling, among other things, video consultations and efficient exchange of patient and/or treatment information.

2.1.2 e-Education

The demands for a new information-based economy requires substantial changes to the existing education system. The high failure rate and minimal academic progression by students in the remote and rural areas can be alleviated by broadband services by assisting them to achieve similar success rate as students studying in urban areas. Some of causes of minimal academic progression are the scarcity of well trained teachers in key areas such as Science, Technology, Engineering and Mathematics (STEM), inequitable distribution of highly qualified teachers and a deficit of well-trained principals and administrators.

Further, there is a widespread inability to engage students in learning and a lack of standards and assessments to measure learning effectively. In addition there is insufficient access to timely, individualized content for students. Exacerbating these challenges are limited organizational transparency and accountability as well as the inability of teachers and principals to share best practices, content and strategies to improve achievement.

With broadband, students and teachers can expand instruction beyond the confines of the physical classroom and traditional school day and can also provide more customized learning opportunities for students to access high-quality, low-cost and personally relevant educational material. Broadband can also improve the flow of educational information, allowing teachers, parents and organizations to make better decisions tied to each student's needs and abilities. Improved information flow can also make educational product and service markets more competitive by allowing schools to develop or purchase higher-quality educational products and services.

2.1.3 e-Commerce

The availability of broadband will promote electronic commerce in turn creating new jobs and attracting new industries and facilitating market access.

2.1.4 e-Government

Broadband connectivity will make easier for the public to access the government services at their convenience. Services such as Visa applications, ID, passport, tax submissions, registration of businesses, utilities bill payments etc.

2.1.5 e-Tourism

The rural and remote areas are host to significant tourist operators in the region. The availability of high speed and reliable broadband would boost the tourism and hospitality sectors by providing global advertising channels to business in the tourism sector, thus attracting more visitors into the country hence increasing foreign exchange in thus way boosting the economy.

2.1.6 e-Agriculture

Broadband access will facilitate the agricultural activities enabling market access for the farmers and to check market prices. Farmers will also get access to information that might otherwise not reach them. Farmers are now able to access video content and written content that rich in imagery for demonstrating techniques. Without broadband, the freely available, rich content is not accessible to the rural farmers.

2.2 Public Protection And Disaster Preparedness Management

Broadband services can assist public safety personnel to react to disasters or emergencies and respond swiftly when they occur. Broadband services provide the public new ways of calling for help and receiving emergency information in multiple formats and languages. Broadband services could also create cutting-edge public protection systems that allow first responders to communicate to each other, sending and receiving critical information through voice, pictures, video or text to save lives, reduce injuries and fatalities.

2.3 Entrepreneurial Productivity

Adoption of broadband internet has increased efficiency and effectiveness for most businesses globally. It is also noted that entities using broadband services for selling and purchasing of services and products, the managing of inventory and banking transactions are more productive than those who are yet to adopt the use of broadband in their operations. It is further noted that African firms using the internet have, on average, 3.7 times higher labour productivity than those not using internet.

Broadband has proven to have impacted and fostered international trade by facilitating sharing of information available to all players in the global market. Broadband provides online marketplaces, providing for organised marketplace for firms to advertise their services and products as well as get buyers from across the borders or overseas. This has allowed for cost reduction in doing business as it eliminates the need for intermediaries and therefore traders are able to form direct connections to each other.

2.4 Job Creation

In the broadband era, there is little need for companies and businesses to employ workers who have to work in one premise. Broadband has rapidly changed the nature of work whereby workers can work remotely or at home. It has allowed businesses also to outsource jobs, thereby, provide job opportunities to those living in the remote and rural areas as long as there is access to broadband. Access to broadband in the rural areas would enable rural people to be able to work from their places of residence, and thus have jobs they might not have otherwise.

2.5 Innovation

Broadband has enabled applications delivery of certain public services such as health and education, which in turn has facilitated and promoted innovation and research as well as discovering new business model that increase productivity levels and create new economic opportunities for users, service providers, application developers, and network operators.

2.6 Culture & Entertainment

Consumer benefits include better social relations between people regardless of distance, e.g. through social media and sharing of online video and audio material.

2.7 Digital Literacy

Digital literacy can be defined as the knowledge to handle digital devices like computers, tablet PCs and smartphones, and Internet usage. Digitally literate persons would be able to access and operate digital devices such as computers, tablets and smart phones for the purpose of sending and receiving emails, browse internet, access government services, search for information, undertake cashless transactions, among other things.

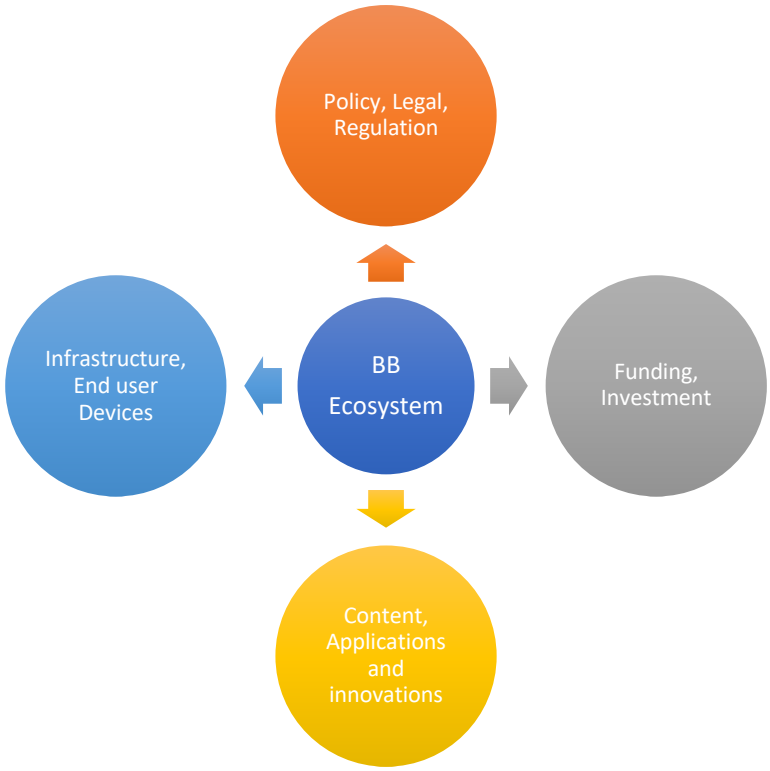
Digital literacy is one of the key activities needed for the rural population to effectively use a state of the art broadband infrastructure. If the majority of the people in the country lack the basic skills to access broadband services then the deployment of broadband infrastructure will be of no benefit to the country. Countries that were successful in transforming their economies from resource to service based economies through increased adoption of broadband services invested heavily not just in the deployment of broadband infrastructure but also in building capacity of the citizenry to spur demand.

SECTION 3

3. RURAL BROADBAND ECOSYSTEM

In the past, universal service and access programmes were focused on increasing telephony access and not to the effects of broadband use on the economy and quality of life. As shown in the below Figure 1 a qualitative change in approach is proposed: the broadband ecosystem regime driven by regulation and policy, access, applications, service, and innovation with special attention to contents and training of population on broadband use.

Figure 1: Broadband Ecosystem



3.1 Policy, Legal And Regulation

Investment friendly Government policies and sound legal and regulatory frameworks go a long way in fostering innovation and investment across the ecosystem. These could be in the form of policies targeted at lowering infrastructure costs, encouragement and fostering of competition, provision of low-frequency spectrum, regulatory permission and frameworks for infrastructure sharing, amongst other interventions.

3.2 Infrastructure And End User Devices

Numerous challenges exist which hinder the deployment of infrastructure necessary for providing access to broadband services in rural areas. Rural unserved and underserved areas are usually lacking of basic infrastructure such as roads. This worsens the logistics difficulties in delivering,

building and deploying infrastructure. The lack of public power grids means that operating network infrastructure incurs significant costs in supplying and running diesel generators and alternative power sources. Sparsely populated rural areas pose a technical challenge for the siting of infrastructure to ensure universal coverage. Backhaul Capital Expenditure (Capex) and Operating Expenditure (Opex) are substantially higher when using satellite backhaul.

Concerning end-user devices, the cost of access to devices is a significant factor impeding on the achievement of Universal Access (UA) objectives. The cost of access to end-user devices is a combination of the cost of manufacture and the components of the inbound supply chain (import duties and taxes imposed on smartphones, etc.). In addition, Inefficiencies exist in the distribution channels available to rural consumers, as access to smartphone retailers is usually difficult due to location. Rural consumers end up bearing the high transport and inventory cost incurred by a local retailer.

3.3 Content, Applications And Innovations

The content and applications currently offered on the internet do not meet the needs of rural consumers in the SADC region and do not help to solve the problems of the communities, taking into account and considering the high level of illiteracy and also the high prices. This is an impediment to consumer access to telecommunications services.

3.4 Funding And Investment

It is recognized that service providers are encouraged to fund and invest in the deployment of infrastructure in and commercially attractive areas that offer Return on Investment (RoI). Whilst measures can be put in place to impact on the commercial viability of these areas, it is necessary for multiple funding solutions to be considered in tandem with the investments of service providers.

SECTION 4

4. CHALLENGES TO RURAL BROADBAND CONNECTIVITY AND ADOPTION

4.1 SUPPLY SIDE FACTORS

4.1.1 Geographical Terrain

Some of the terrain in unserved and underserved areas is usually mountainous, uninhabited thick forest or of a vast dry desert environment. The terrain in these areas does pose technical difficulties in the laying of fibre for wireline backbone connectivity and access network infrastructure build. The said terrain results in cost prohibitions as mountainous terrain prevents wider line of sight, thus requiring large sums of financial investment for Base Transceiver Stations (BTS) sites.

4.1.2 Cost of Infrastructure Deployment

The demographics of most SADC rural areas typically dictate that these areas are sparsely populated with scattered pockets of small populations spread across vast land areas with rough terrains that are not easily accessible due to lack of basic infrastructure such as roads. These areas are also usually not connected to the public power grid. These populations are also typically constituted of very low-income earners.

In terms of deploying network infrastructure, the characteristics of these areas translate to high logistics costs of transporting the equipment required to put up the network infrastructure and the development of special equipment to counter challenges of terrain. Because of the lack of access to public power grids, network infrastructure needs to be powered by expensive alternatives such as diesel generators (which have to be refuelled frequently).

The low demand, contributed to by the lack of digital literacy and low-income-earning powers of rural residents, means that the profitability of the deployed infrastructure does not suffice to justify the significant financial investment.

4.1.3 Lack of Infrastructure

The infrastructure leasing market is generally uncompetitive due to the lack of or limited broadband infrastructure. This problem is more acute in landlocked countries which do not have access to infrastructure such as submarine cables. This scarcity fosters dependence on connectivity with coastal countries with cable landing stations. Landlocked countries become chronically dependent on neighbours' landing stations, therefore, they cannot compete and negotiate lower rates.

Providing fast broadband services requires substantial investments to deploy modern network infrastructure. However, low expected revenues in rural areas result in negative return on investments for broadband service providers, discouraging sustainable investment in these areas.

As a result, any broadband that is available in rural areas may be impacted by technological limitations. Asymmetrical Digital Subscriber Line (ADSL) connection speeds, in particular, slow down the further one is from the exchange , which is a problem even in busy environments let alone in low density areas.

4.1.4 Lack of Access to Low Frequency Spectrum

Because of its excellent propagation characteristics, spectrum below sub-1GHz is crucial to providing access to broadband in rural areas. The digital dividend spectrum – the 700 MHz and 800 MHz bands – still remain largely unavailable for mobile broadband services in the region as the Digital Switchover from analogue to Digital Terrestrial Television (DTT) broadcast is happening at a very slow pace. Networks built on the 700MHz and 800MHz bands cover wider areas with multiple-times fewer base stations than networks build on 900MHz, 1800MHz and 2100MHz frequency bands.

4.1.5 Lack of Competition

The bottlenecks in broadband connectivity in rural communities in the SADC Region, can be attributed to the fact that the entire infrastructure used in providing internet connection is in many cases owned by the incumbent operators. In the value chain, the structure is such that these companies are vertically integrated, thus affording them total control of the process. In many instances, there is no effective competition and incumbents tend to use a number of ploys to retain their monopoly statuses.

4.1.6 Access to Backbone/Backhaul Infrastructure

Some key factors make the broadband network backbone/backhaul ecosystem a challenge to Universal Access. Firstly, the lack of infrastructure results in poor interconnection between networks in rural areas (which are usually small) and the larger segment of the network. The interconnectivity of these networks is necessary to make communication possible for residents of rural areas. Because of the characteristics of underserved areas (terrain, lack of infrastructure, lack of power supply, cost of Rights of Way, etc.), backhaul networks are usually built on microwave links which require the building of ‘hop’ sites in remote locations and powered by generators with manned security, as well as access to costly microwave spectrum.

Secondly, in some instances, the ownership of some backhaul infrastructure by former incumbent operators who engage in monopolistic practices with regards to infrastructure access and sharing hinders the rapid extension of networks and the provision of competitive services and pricing in unserved and underserved areas.

4.1.7 Internet Service Provision Market

In some instances, the dependence of Internet Service Providers (ISPs) on internet access providers makes them vulnerable. The reasons are as follows:

a) anti-competitive practices;

b) denial of access to the wired local loop;

c) incumbent operators competing with service providers;

d) refusal to lease international bandwidth.

Such practices are also perpetrated by technicians employed by incumbent operators, evidenced when failures occur on customers' lines and repair times are abnormally long.

Some incumbent operators have established a national number with uniform pricing to encourage internet connection from analogue telephone lines. Unfortunately, this wholesale advantageous pricing is not passed on to the customers of internet service providers. As a result, customers of ISPs are financially penalized for internet connection and are obliged to subscribe to incumbent operator. This discriminatory practice distorts competition and perpetuates the vicious cycle the introduction of competitors for incumbent operators sought to eliminate.

It would be a good practice if ISPs were charged wholesale rates and would undertake to sell their services to their customers at retail prices based on the actual costs incurred to provide a service/ access to the internet. However, this is not the practice and many ISPs have suffered from this situation and been forced out of the market.

4.1.8 Access to International Bandwidth

Anti-competitive tactics from incumbents with international bandwidth capacity has restrained competition in the internet access market. In some countries, the tariffs are set prohibitively high for small service providers. Collaborations among smaller service providers as ISP associations have been effective in offering relief to the high cost of services; as collectives with significant market power can negotiate for lower prices.

In some SADC regions regulatory frameworks do not allow for competition in the International Gateway ecosystem, where restrictions on such service providers are designed to allow only monopolies operate in that space. This creates a lack of options, lack of competition, predatory pricing and a hurdle to access to international bandwidth.

4.2 Demand Side Factors

There are several reasons for lower broadband penetration rate in remote and rural areas. Some of these are highlighted as follows:

4.2.1 Affordability

According to GSMA Intelligence statistics of 2016, the unserved and underserved rural areas are typically inhabited by very low and middle income earners for whom access to mobile broadband devices and services is financially difficult. Amongst low and middle income earning communities, 62% of basic feature phone owners said the cost of smartphone devices posed a barrier to mobile phone usage for them[3]. In this segment of society, the cost of acquiring a phone and 500Mb of data per month represented, on average, more than 10% of their monthly income.

4.2.2 Lack of relevant Local Content

According to estimates by the World Bank, a minimum of 80% of content on the internet is in one of the following 10 languages – English, Chinese, Spanish, Japanese, Portuguese, German, Arabic, French, Korean and Russian[4]. More than 50% of online content is in English but only 21% of the world's population understands English. A large part of the relevance, usefulness, accessibility and reliability of internet content to people depends on the content and services being provided in a language they understand.

4.2.3 Digital Literacy Skills

Whilst language is a key factor affecting access to internet, some digital/technical skill is necessary to navigate broadband devices and find and interact with internet content. Even though digital literacy skills are not a prerequisite to using broadband technology, a substantial segment of the population in unserved and underserved areas lack the digitals skills required to ensure that they take advantage of the opportunities in the digital economy.

4.2.4 General Perception of the Value of Access Broadband

The factors above combine to adversely affect the perception of the value of broadband access to rural dwellers. Individuals in these areas will usually struggle to see the value that access to smart devices and broadband can have on their personal and professional lives.

[3] *GSMA Intelligence*

[4] "Internet Access, Yes, But in my Mother Tongue Language!" World Bank, 2014.

SECTION 5

5. STRATEGIC RECOMMENDATIONS

Closing the broadband coverage gap is not a technical but is primarily an economic challenge. As previously stated, the uncovered populations typically live in rural locations with low population densities, low per capita income levels and weak or non-existent enabling infrastructure such as electricity and high capacity broadband networks. These obstacles have a profoundly adverse impact on all aspects of the business case for broadband expansion.

The aim of this document is to serve as a guide or template that members can base their respective national universal access and strategies on. With. The aid of this document, members should be in a position to enable broadband connections to all unconnected schools, healthcare institutions, homes and other government institutions. All this could be achieved while ensuring that there is technological neutrality (depending on network topology), installation of appropriate terminal equipment, and installation of information infrastructure in regional centres. The Guidelines is meant to also enable the development and provision of intelligible e-learning software about Internet use, and ensuring access to informative and educational applications and contents for all schools.

Further we ought to ensure access to informative, advisory and healthcare applications and contents, install software for exchange offer, demand and distribution of agricultural products, install software for exchange offer and demand of tourist services and install software that will permit access to contents from mobile network operators

Decisions about each of the following identified policy areas can have a significant positive or negative impact on the business case for broadband expansion. By adopting these recommendations into the CRASA Rural Broadband Guidelines, governments can create an enabling environment that leads to more proactive and commercially sustainable investments in rural network and service extensions.

In order to achieve universal broadband in rural areas, the following strategic pillars have been identified:

Pillar 1:	Policy and Regulatory Frameworks
Pillar 2:	Infrastructure
Pillar 3:	Funding and Investment
Pillar 4:	Access
Pillar 5:	Cross-Sector Collaboration

5.1 PILLAR 1: ENABLING POLICY AND REGULATORY ENVIRONMENT

5.1.1 Public Policy Intervention to Achieve Universal Rural Broadband Connectivity

SADC member states need to develop investment-friendly policies to incentivize the deployment and achieve universal access to broadband services for people living in the underserved or unserved rural areas. This Guidelines recommends the following policies:

a) Taxation Policy, Tax Incentives, Waivers, Customs Rebates

Member States should to consider establishing tax policies that targets the use, such as, taxes and surtaxes imposed on Information and Communications Technologies (ICT) subscriber services and products for ICT infrastructure development in the rural areas.

b) Access to information / Data Protection Bill

Member States to consider passing the Access To Information/Data Protection Bill. With the passing of such a bill in the respective country, it gives the users in the rural areas legal rights to the information stored about them while using e-services. It also makes the operators and services providers of such services accountable to the manner in which this information is handled by law.

c) Cyber Crime Bill

Member States to develop or review of cybercrime laws. Where there is no existence of such Law, Member States to establish such and whereas for those with existing cybercrime laws, ensure that they are aligned to new and specific issues that have arisen due to new and advanced technologies. The absence of cybercrime laws undermines the realization of the full potential of ICT adoption.

d) Review and Implement ICT For Education Policies

Member States to encourage to maximise use, make more accessible and affordable of telecommunications and information services that are available to educational institutions such as schools and libraries.

e) Framework for Administering Rights Of Way

Member States to encourage investment in ICT networks through issuing licences and assisting operators to obtain rights of way. This can achieve much better results as opposed to placing restrictions on deployments of infrastructure such as fibre networks.

f) Provide Non-Discriminatory Access to Public Infrastructure

Member States to provide guidelines that are effective, transparent and non-discriminatory wholesale access to the subsidized networks. Many national governments have deployed extensive public infrastructure to deliver education, transport, postal and other vital services to their populations. School buildings, hospitals and post offices are often the key reminder of the

State existence in the remotest areas. However, broadband as described above can have a major impact on the enhancement of these State resources to provide better and more efficient services to communities. In as much as these services have been provided the same ought to be applied to broadband and ensure access to the entire population of a country.

Operators as far as possible should be granted access to publicly-owned facilities to set up broadband infrastructure. Such a policy can save on the up-front and operating costs of setting up a tower. Policy makers can support efforts to expand broadband network coverage by offering open and non- discriminatory access to State-owned public infrastructures such as buildings, roads, railways and ducts for utility services. Such access can be easily implemented and significantly accelerate the network roll out process.

5.1.2 Regulatory Intervention to Achieve Universal Rural Broadband Connectivity

National Regulators to enable uptake of ICT services by coming up with regulations to enhance demand for broadband access. This includes ensuring that services are available, accessible and affordable. Deliberate regulations to ensure that people living in rural areas get affordable digital literacy skills and access to local content.

Enable provision of ICT services through the following investment-friendly initiatives –

a) Technology-neutral regulatory framework

b) infrastructure sharing regulation and guidelines (Regulators to ensure that all types of infrastructure sharing is permitted)

c) spectrum policy

d) competition policy

e) interconnection policy

f) Quality of Service regulation

g) Consumer protection Policy

5.1.3 Allocation of Broadband Spectrum for Rural Connectivity

Spectrum is the lifeblood to a successful operation of broadband networks. Regulators have to ensure that:

a) spectrum is fairly priced

b) it has a clear spectrum release roadmap

c) spectrum assignment is not rigidly tied to specific technologies

d) sufficient spectrum below 1GHz is available for rural area coverage

e) they harmonise with the SADC spectrum plans and guidelines related to broadband

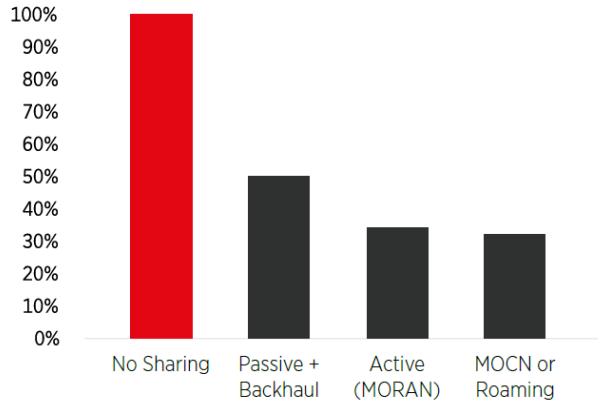
5.1.4 Content, Applications and Innovations

Mobile internet adoption rates are often higher in markets, which have vibrant digital ecosystems offering end users online content, and services that are localized and relevant to their needs[5].

Making access to the internet relevant to the targets of Rural Broadband strategies by translating the language of online content and services into the local languages, making available online content and services to meet specific demands (health, agriculture, lifestyle, etc.), deliberate policies to enable hosting of internet servers and internet exchange points locally, development of effective e-Government services, etc.

5.2 PILLAR 2: INFRASTRUCTURE

Investment cost in infrastructure is greatly reduced if operators share active and passive infrastructure. The investment is further reduced where operators share all the infrastructure (multi-operators radio access network). It is one of the most important ways in which national governments can support commercially sustainable investments by broadband service providers. Figure 2 sets out the impact of different infrastructure sharing models on operating and capital costs over five years for rural/remote network expansion.



Source: Coleago

The benefits of infrastructure sharing are:

a) Lower costs due to more efficient use of infrastructure;

b) Lower risk due to co-investment; and

c) Growth opportunities from expanding coverage to new areas.

[5] GSMA

From the perspective of the regulators, the potential positive outcomes of infrastructure sharing, particularly for rural connectivity, include:

d) Optimising scarce resources and positive environmental impacts;

e) Less duplication of investment and lower capital and operational expenditure;

f) Product and technological innovation as operators compete on service differentiation;

g) Greater consumer choice as entry and expansion become easier;

h) Reductions in wholesale and retail prices for broadband services; and

i) Overall Positive incentives to expand coverage into underserved areas.

Even though passive sharing provides the greatest savings, operators may need to maximize their savings through active infrastructure sharing or national roaming in order to cover the remote and rural areas. The SADC Member States should have regulatory interventions that foster for voluntary sharing of both passive and active infrastructure. The need for infrastructure sharing to be encouraged as a voluntary initiative is emphasised as the alternative (i.e. obligating infrastructure sharing) will discourage investment in infrastructure deployment be second-movers.

5.3 PILLAR 3: FUNDING AND INVESTMENT

Alternatives to private-sector investment in funding rural broadband infrastructure include the effective use of Universal Service Funds (in countries where they are available), Grants from governments and multilateral development finance institution such as the World Bank, African Development Bank, International Finance Corporation, etc. Below are other initiatives that are considered for funding and investment in rural broadband deployment.

5.3.1 Single Wholesale Networks (Backbone Providers)

Policymakers in a few countries are evaluating the creation of a single sharednetwork know as a Single Wholesale Network (SWN), to extend access to underserved areas. In this model, a single government initiated network monopoly is created to deliver wholesale services to operators. Objective of the SWN is to deliver affordable, national broadband coverage.

In considering SWNs as a part of a solution to address UA, it is important to be cognizant that, from a theoretical perspective, SWNs hold the potential to create infrastructure monopolies that may result in sub-optimal investment in coverage and quality in the medium and long terms. From a practical perspective, the complexity of implementing a SWN has resulted in various failed attempts to deploy commercial SWNs, thus failing to achieve the intended connectivity objectives.

Whilst SWNs can be carefully considered for unserved and underserved areas, the focus should remain on encouraging infrastructure sharing through Network sharing guidelines and regulations

as this is can achieve the same benefits of scale while reducing the implementation and competition risks.

5.3.2 Universal Services Funds (USFs)

Universal Service Funds (USF) have become an increasingly common Guidelines used by governments to try to extend coverage. USFs are designed to offer financial incentives to operators to provide universal service. Typically they are financed by contributions from operators (e.g., fixed fee or percentage of gross revenues). In some countries, the USF fee is a portion of overall regulatory or licensing fee. Fee may go directly to the USF or be collected by the regulatory authority and then transferred to fund manager or administrator. Extra financing possible from spectrum auctions, license fees, direct contribution from governments or private industry may also be allocated to the fund.

Where USFs are to be considered, it is important that the fund should be:

a) An Autonomous/independent fund structure with a fund administrator who is accountable to an impartial party/authority, not subject to political interference and with a clearly-defined governance structure.

b) Based on a legal and regulatory framework that is flexible, technology and service neutral, highly flexible with respect to effecting policy, allows use of funds for ancillary/complementary purposes (but still ICT related) and has the ability to easily adjust levies (in consultation with stakeholders).

c) One with clearly specified and measurable objectives prepared in consultation with stakeholders, including coverage and service delivery targets.

d) Highly transparent from a financial reporting perspective, along with fair allocation of funds through competitive bidding processes.

e) One that has guidelines and procedures for working with other funding sources (e.g. Development Banks).

f) One that considers providing incentives for efficient deployment and innovations for cost minimisation, with a focus on the ongoing sustainability of the solutions proposed.

g) One that adopts a 'pay or play' approach where operators can choose if they want to pay a contribution to the fund or use those funds to directly invest in areas aligned with the fund's objectives.

5.3.3 Coverage Obligations (Licence Obligations)

Coverage obligations can be an effective mechanism to ensure coverage. However, the main challenge resides in setting the adequate level of coverage. Coverage obligations that are too ambitious and disregard the realities of the market will be impossible to attain. Covering commercially unviable areas imposes a financial burden on operators. Increasing the margins and

the reach of the sustainable coverage helps operators comply with coverage obligations. It is important to balance the coverage obligation with the market value of broadband spectrum.

When setting coverage obligations, the following should be considered:

a) Coverage obligations in rural areas should only be considered for low frequency spectrum (below 1 GHz) - the frequency bands that have the propagations characteristics suitable to providing wide coverage. Covering rural areas with high frequency spectrum (above 1 GHz) results in expensive and commercially unsustainable networks;

b) Including coverage obligations in the initial licence conditions, along with the enforcing mechanisms and sanctions, allowing Broadband Service Providers to integrate these obligations in their business plan when bidding for newly released spectrum;

c) Setting realistic coverage obligations in terms of targets and timelines, giving Broadband Service Providers a real opportunity to comply;

d) If spectrum is released through an auction, the reserve price of licences that include coverage obligations must take compliance costs into account; and

e) Avoiding duplication of infrastructure in areas with low economic potential by limiting the number of frequency blocks that include coverage obligations and allowing infrastructure sharing to facilitate compliance.

5.3.4 Subsidies/Grants

Subsidies can be direct (e.g., monetary grants) or indirect (e.g., tax rebates). For subsidies to work, they must align the economic incentives of broadband service providers and the regulator. This requires a scheme that is:

a) Targeted

b) Transparent

c) Efficient

5.3.5 Public Private Partnerships (PPP)

Operators contribute to the fund through a levy as well as Government contribute as a grant, operators are then requested to bid for the fund to deploy the networks in the identified areas. The operator which requires less subsidy is awarded the fund to provide the service in remote areas.

The following are the funding models for universal rural broadband connectivity:

a) local community model – community residents or local businesses, form a jointly owned organizational group, which oversees the network building contract.

b) private-sector company receives public funding (often a grant) to assist it in deploying a network that offers open wholesale access. Again, the public sector has no role in owning or running the network. Where sufficient funding is available to attract interest from operators to work in rural areas, and where the operations of the network can be effectively transferred to an operator with little ongoing control from the managing authority, this model is more appropriate for larger-scale investments than the bottom-up model (ITU, 2013).

c) public outsourcing model, a single contract is awarded to a private-sector organization covering all aspects of the design or construction of the network. The infrastructure is built and operated by the private sector, but the public sector retains ownership and some control.

d) joint venture (partnering) model, a private-sector organization builds and operates the network, while the public sector manages all aspects of deployment and operation.

e) public design, build and operate model is appropriate when a managing authority needs to have absolute control over the operations of the network, or when it is confident that a targeted investment will inspire investment from other sources.

It is recommended that the best funding models be chosen based on the following -

a) type of project (backhaul, passive, demand side projects)

b) the size of the project

c) the stakeholders involved in the projects.

d) Type or source of funds that will be used for the deployment

5.4 PILLAR 4: ACCESS

5.4.1 Digital Literacy

ICT capacity building among the population is a key requirement for a wider penetration of broadband usage. Broadband Internet access is essential, but access alone is not enough. Basic digital skills and high-level cognitive skills for finding, evaluating, ethically using, creating, and sharing information are also required for digitally inclusive communities. Therefore, the seven elements of digital literacies, as highlighted under Figure 3 below, should form an integral part of the ICT Policy directives.



Source: Jisc (2014)

Members States are encourage to take into consideration that a Digital Literacy development Guidelines should be launched as an integral part of the roll out of broadband. The delivery of the programme should be through a public private partnership model to be spearheaded by the relevant custodian such as the Ministry of Education, relevant ICT ministries and Research institutions.

5.4.2 ICT Infrastructure Sharing and Access

ICT Infrastructure Access is one of the tools that the rural broadband Guidelines sees to have an impact on the rollout of broadband services. This is through means of increase utilization of their spectrum assets, provide better coverage and throughput to broadband service consumers, and to reduce Capex and Opex.

5.4.2.1 Supply management (increasing efficiency of the power source)

Technologies like 'Integrated Hybrid Power Management Systems', is one solution that can be implemented to increase power source efficiency.

5.4.2.2 Renewable Energy Adoption

Technologies like solar photovoltaic, wind power and other renewable energy sources can be deployed to power telecom base stations sites. Whilst the initial capital outlay is higher than the cost of traditional power sources, the OPEX is very minimal which makes this option ideal for rural areas, which are far from the service centres.

The lack of adequate electric grid infrastructure in rural areas is restricting infrastructural developments in telecommunications. Vast quantities of diesel fuel are consumed by diesel generators at telecom towers annually to meet the energy demand-supply gap. Telecom infrastructure companies are turning to 'green' power management solutions.

Activities like passive infrastructure sharing, replacement of old Base Transceiver Stations (BTS) with new generation BTS, usage of outdoor BTS, optimized cooling at shelter, usage of intelligent transceivers (TRXs), reduction of air conditioner load by using cold ambient air for shelter cooling and operating air conditioners using stored energy in the batteries to reduce diesel consumption and carbon emission are some of the initiatives that can been implemented.

5.4.3 Reducing Red Tape on the Part of Local Authorities (Rights of Way)

Local authorities play an important role in facilitating the deployment of broadband infrastructure. Governments or Ministries of ICTs should play an active role in harmonizing approval processes across municipalities for applications for deployment of such infrastructure including applicable charges. Appropriate law must be enacted that oblige local government authorities to facilitate deployment of broadband infrastructure in a reasonable space of time if the applying service provider meets all requirements.

5.5 PILLAR 5: FOSTER CROSS-SECTOR COLLABORATION

The collaboration of regulatory authorities from different infrastructure sectors has the potential to reduce the costs and delays in the deployment of broadband infrastructure, especially in rural, unserved and underserved areas. Broadband infrastructure projects cut across sectors, including utilities (e.g. broadcasting, water, energy, and rail), real estate, public/municipalities, environment, and roads. Capitalising on the synergies between these sectors is particularly important for infrastructure projects to deploy new infrastructure that is required for rural connectivity.

SADC Member States to consider the following to foster cross-sector collaboration:

a) Creating a single information point for permit granting, transparency, rights of way, and dispute resolution for infrastructure deployment;

b) Pursuing mapping initiatives of relevant infrastructure and make this data available through a single information point; and

c) General obligations to make advance notifications of planned civil works across all sectors.

d) Establish a broadband expansion coordinating committee through regulations composed of representatives from all sectors involved in the rural broadband deployment ecosystem.

5.5.1 Capacity Building To Develop Digital Skills And Content

Teachers in the local communities are the key to whether technology is used appropriately and effectively. Appropriate use of ICT's can catalyse paradigm shift from teacher-centred teaching to

a more effective leaner centred teaching. Capacity building of teachers as well as administrator and play a major role in enabling this shift.

It is recommended that Member States train teachers on how to use ICT and provide them with the skills and expertise required to use ICT's to teach a curriculum, which is better suited to prepare leaners for the 21st Century.

5.5.2 Application And Content Development

The development of relevant and localized applications and content that meet the needs of the consumers and society. The most important content to people is typically that which is in their own language and is relevant to the communities in which they live and work. The communities may be defined by their location, culture, language, religion, ethnicity or area of interest and individuals may belong to many communities at the same time. Further, communities evolve so what is relevant will change over time. This relevant content is what is referred to as "local content".

Technology can help support the recognition, creation, preservation, dissemination and utilisation of local content and there have been several important technological advancements in recent history most importantly ICTs among others, that have greatly increased ability to create and disseminate content.

The following are the recommendations in regards to the harnessing content development in the region:

a) Foster an environment for crowd-sourced content creation and community-developed and peer-reviewed knowledge bases in Educational Institutions.

b) Support local content hosting platforms and development of content in local languages.

c) Foster progressive policy environment that supports digital entrepreneurs and innovation.

d) Ensure that government services are accessible online or via mobile.

5.5.3 Exchange Of Technology Transfer

The phenomenon of knowledge transfers from vendors/consultants to the users during implementation of new technologies should be carefully planned and carried out. Enterprises have to make a choice between the following options.

5.5.3.1 Exploration Oriented

Requiring users' active participation in all phases of the project implementation and gradual knowledge transfer from vendors/consultants to the users during day-to-day project work.

5.5.3.2 Instruction Oriented

Depending on the formal trainings sessions provided by the vendor/consultants not requiring users' active participation in the project implementation activities.

The choice of the knowledge transfer approach has an influence on the project external workload and thus, costs. Generally, in order to transfer the same quantity of knowledge for projects with similar scope, the enterprise which choses the instruction oriented approach has to engage more consultancy services compared to the exploration oriented approach.

SECTION 6

6. MONITORING AND EVALUATION

Crucial to the implementation of this Guidelines is establishing whether the SADC member States are implementing the activities as planned and whether each project under each pillar is on track and determining the challenges experienced during the implementation phase and establishing the remedial actions. A robust monitoring, measurement and evaluation framework with clear timelines for deliverables should be prepared and publicized to all implementing agencies to ensure proper tracking of progress. Further, responsibility for this function should be clearly defined and assigned to avoid ambiguity on who is responsible for results and outcomes in this area of the Guidelines.

6.1 RURAL BROADBAND GUIDELINES TARGETS

CRASA will endeavour to develop its broadband ecosystem according to its sector members' unique requirements but also taking into account all other regional broadband initiatives that have been approved at SADC level.

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