

ICT Opportunities in SADC for DBSA Funding



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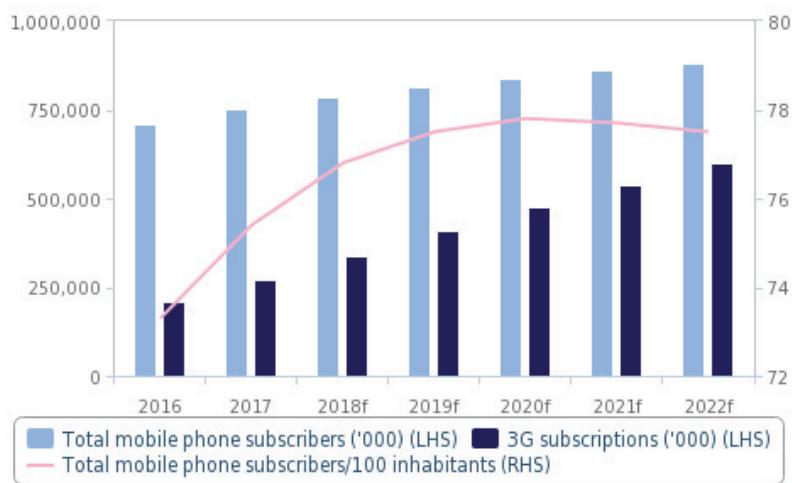
Introduction

Status of Telecoms Market in Sub-Saharan Africa

The take-up of mobile communications services in sub-Saharan Africa (SSA) continues to grow with usage of 3G/4G services and mobile broadband driving this expansion over the next five years. This growth, however, will be uneven. It will be in urban and coastal areas where the infrastructure for such services is available, and where the demand for premium services is at its strongest. For those living in rural areas, access to the internet and even to mobile services will continue to be at best patchy. And even where there is access, service quality will often be poor and costs will be high. A lack of digital awareness in these underserved areas means that even where there is access, usage will be limited to the most basic services.

The partial access, poor service quality, high costs and digital illiteracy present in many parts of SSA has caused a digital divide between those that are connected to the internet and are benefitting from such a connection and those that remain unconnected to the internet and are unable to benefit from digital services. This divide is important. Those that are not connected are missing out on the power of technology to improve lifestyles, drive economic growth and enable social development. Bridging the digital divide can deliver many things to different people in SSA – some will benefit from access to healthcare, others will profit from creating a local business, and others still will experience an improved education. One only has to look at the power of mobile financial services in East Africa to see the transformation that transferring money using a mobile phone has had on a country such as Kenya. It is incumbent on governments, regulators, the private sector and Development Finance Institutions (DFIs) such as DBSA to break this digital divide. Greater investment in infrastructure – especially in rural areas – will start to bridge the gap and enable access to services and empower local innovation.

Fig 1: Mobile subscription growth, SSA - 2016-2022

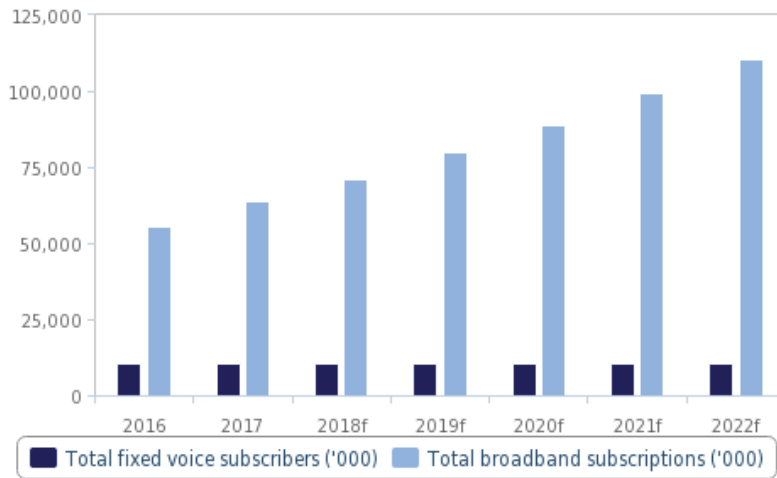


f = BMI forecast. Source: BMI, Regulators, Operators

At the end of 2017, the mobile penetration rate across SSA was just over 75% and BMI Research projects this will reach 77.5% in 2022. Limited access to rural areas and high costs are largely responsible for this slowing growth expected over the next five years. The proliferation of the tower sharing model in SSA could yet accelerate this growth but only if Africa’s mobile operators are serious about extending their services to rural areas. Over the last five years many mobile operators have sold their tower assets to dedicated infrastructure companies, many of whom dominate markets such as Nigeria, Ghana, Cote d’Ivoire, Cameroon, Uganda, Tanzania, Zambia and the DRC. This more cost-effective operating model could enable mobile operators to extend basic 2G networks and introduce more advanced 3G and 4G networks into underserved areas more quickly.

Broadband growth – which we define as total market for fixed broadband and dedicated mobile broadband subscriptions – will be strong over the next five years. Governments are more and more focused on developing ICT strategies to support economic growth and empower SMEs. Wireline operators are gaining some traction with fibre services in urban areas and key business districts but it is the introduction of 4G networks that will be crucial in making high-capacity broadband services accessible and affordable to the wider consumer market.

Fig 2: Fixed voice vs Broadband subscription growth, SSA - 2016-2022



f = BMI forecast. Source: BMI, Regulators, Operators

Our forecasts for broadband growth remain conservative with the majority of consumers unlikely to afford a broadband connection over the next five years. There is some potential for stronger growth given the rise of a provider such as Liquid Telecom (as it supplies fibre optic, satellite and international carrier services to Africa’s largest mobile network operators, ISPs and businesses) and the potential rollout of wholesale, satellite or drone-powered networks by Google and Facebook.

Ideas as to how to reach the unconnected are plentiful, and there is a general movement in the right direction. Progress is slow, however. Governments need to play their role in encouraging an acceleration in the bridging of a digital divide. But governments can only do so much – they can lay the groundwork for action, but they too need support from the private sector and from financial institutions to fund and project manage activities that will improve access to the internet to people in all areas of SSA. Furthermore, the usage of digital services in rural areas must not be limited to the most basic and these services must be affordable to all.

DFI Telecoms Projects in Sub-Saharan Africa

It is the role of DFIs to provide loans, guarantees and technical support for development projects and policy reforms. In general, their work should have a public interest, such as economic empowerment or sustainable development. The telecoms market fits well with this public interest purpose. As can be seen through the selection of projects listed below (some have been completed, others are underway and some are currently being appraised), all of these projects will result in economic empowerment and development that can be sustained and grown. And many of these projects can be replicated and scaled to other countries or regions.

Infrastructure lies at the heart of all these projects. And so it should. Providing access is the cornerstone to digital enablement. There is an increasing divide within access between those with a slow 2G connection and those with a fast 4G or fixed broadband connection. It is this divide that many of the below projects are aimed at bridging (eg Regional Communications Infrastructure Program – World Bank, Central Africa Fibre-Optic Backbone Project – African Development Bank, Broadband Satellite Services – European Investment Bank).

But supporting digital enablement for all communities goes far beyond access. Ensuring affordability, encouraging an appetite for using digital services (by making them relevant) and teaching digital literacy are as important as creating access through large infrastructure projects. It is therefore pleasing to see several DFI projects that tackle some of these issues.

- Lower prices for international connectivity is at the centre of the World Bank's Regional Communications Infrastructure Program.
- The creation of an IT foundation in Senegal – through a Digital Technology Park – will allow the country to modernise its economy and act as an engine for growth for SMEs.
- Greater access to tertiary education – encouraged by the African Virtual University – will empower people that previously would have had no access to this level of education.
- A networking platform allowing 50 million women across Africa to have access to business networks and mentors as they seek to become entrepreneurs themselves will help to strengthen the economies of several countries in SSA.
- Local investment in an online payment system in Ethiopia will give greater financial support and freedom to millions that, in turn, will empower them to transfer money or pay for goods more easily.

Many of these projects point to an exciting future. Empowered by digital technology, many communities can radically improve their lives and contribute to a better society. But the reverse is also true with those unable to benefit from technology becoming more economically and socially disadvantaged.

It is time for a shift from the focus being on ideation to being on scaling-up. Digital enablement solutions and projects need to work on market principles, being built for scale and industrialisation.

Project	Project Type	Lead DFI Funding	Project Value (US\$m)	Project Notes
Regional Communications Infrastructure Program	Infrastructure	World Bank	483.9	A 5-phase project impacting Madagascar (complete), Rwanda (complete), Malawi (complete), Comoros (ongoing) and Uganda (ongoing). Aims: <ul style="list-style-type: none"> lower prices for international connectivity extend geographic reach for broadband networks improve government efficiency through e-government applications overcome bottleneck for networks by providing access to coastal landing stations of submarine cables
Digital Malawi Project	Innovation & Economy	World Bank	72.4	Increase access to affordable, high quality internet services for government, businesses and citizens (ongoing) Aim: to make Malawi a more attractive and competitive place for digital investment and innovation, ensuring the benefits of digital technology are reaching all citizens and laying the groundwork for the growth of digital economy.
Central Africa Fibre-Optic Backbone Project	Infrastructure	African Development Bank	21	Laying of 1,050 km of fibre-optic cable in Central African Republic on the interconnection roads with Cameroon and Congo and the establishment of a local urban loop comprising a national data centre (Datacentre) and a Digital Training Centre in Bangui. The project also provides for the establishment of an e-government platform. Ongoing project Executing agency is the Ministry of Post & Telecommunications. Project to be co-financed by European Union (EU).
Lesotho E-Government Infrastructure Program	Government	African Development Bank	12.8	Deployment of a modern and secure e-government broadband infrastructure. Specifically, the project will enhance coordination of public service delivery across ministries, key agencies and local governments. The Project will also strengthen existing Government data centres and portals; and improve access to e-services for state buildings such as automated administrative services including e-payroll; civil registration; e-health, e-procurement, e-customs; and revenue management.
Senegal Digital Technology Park	Innovation & Economy	African Development Bank	84.5	Creation of a solid IT foundation that will allow it to leverage past investments in networks and to modernise and diversify its economy. The project will establish a Digital Technology Park, which will include a data centre, BPO facilities, ICT incubator and AV & content production centres.
African Virtual University	Innovation & Economy	African Development Bank	15.6	Increase higher education access through ICT assisted education and training in 22 African countries, especially in science and technology programs. The funding will result in the establishment of new Open Distance and eLearning (ODeL) centres at 27 institutions. Also included in the funding is the training of staff in such centres and the scaling up of capacity within the 27 institutions.
Africa Women Networking Platform	Services & Economy	African Development Bank	12.4	Development of an innovative networking platform "50 Million Women Speak", which forms part of the Affirmative Finance Action for Women in Africa program. The platform targets women entrepreneurs who need access to information on financial and non-financial services, and provides business networks and mentors that can support them in their efforts to grow their businesses. Implemented by regional economic communities, COMESA (East & Southern Africa), EAC (East Africa) and ECOWAS (West Africa).
Broadband Satellite Services	Infrastructure	European Investment Bank	108 (approximate)	Launch and deployment of two satellites for the provision of broadband services in remote and dispersed communities across Pacific islands and selected African Least Developed Countries (LDCs) and island nations. Satellites to be launched in 2021 for Africa. Under appraisal.
Kenya Telecom Expansion	Infrastructure	European Investment Bank	92 (approximate)	Expansion of coverage and capacity of Telkom Kenya's mobile (3G & 4G) network to improve coverage and quality of mobile services and an FTTB network to ensure enhanced fixed broadband coverage to small businesses and corporate customers. TK wants to strengthen its position against market leading Safaricom by offering alternative network and its own mobile money service. Under appraisal.
Mobile Banking - Ethiopia	Services	European Investment Bank	3.6	Investment in M-Birr, an Ethiopian IT company offering an online payment system. The financial support will help to expand the service which is limited to 5 microfinance institutions. EIB is in partnership with KfW (German DFI) for this active investment.

Source: BMI

Below is an illustration of the value chain by which we are assessing where there are gaps in which a DFI such as DBSA may be able to play a development role.

Submarine pipes	International Connectivity	Connections to the rest of the World provided by satellite or fiber-optic cable (usually submarine).
Backbone	Domestic backbone	Traffic carried between fixed points within a network. Provided by satellite, microwave, or fiber-optic cable.
Rural mobile (broadband) & Fixed line	Switching/Routing	"Intelligence" in the network that ensures that communications traffic is routed correctly.
	Access	Link between the customer and the network - usually xDSL or cable networks. In developing countries, wireless is often used.
Community literacy & Digital Technology park	Retail services	The "soft" inputs required, such as sales, customer care, and billing.
	Applications	The applications, projects and initiatives that employ communications capabilities to enhance the economy.

Source: BMI

Everything starts with international connectivity. Without it, the country will be home to voice and SMS services and there will be no internet connectivity. Weak international connectivity creates inertia from consumers as there is little content to attract them, or access to this content is slow and patchy.

Once enough international bandwidth is made available to a country, the task becomes to distribute this bandwidth fairly among the citizens and to cover all communities and population centres. This is where the backbone comes into play. The distribution of bandwidth is best done via fibre rings. Many countries attempt to meet the connection needs of its citizens through elaborate and lengthy national backbone plans that generally only end up covering urban populations. Rural populations hardly get enough coverage from the national backbone.

Last mile connectivity delivers to the end consumers. The effectiveness of this connectivity is represented by a combination of the quality of the physical last mile connectivity (access) and the price of the provided service (retail services) and the relevance of services on offer applications). Internet usage levels will depend on quality of access, cost of services and their relevance to local needs.

SSA Index: Development Project Scorecard

Acting as a framework to assess where development funding in SSA is most required, and which markets are most relevant for the replication or scaling of successful projects, BMI has designed an Index to show the relative maturity of 20 telecoms markets in SSA, as agreed with DBSA. These include the SADC countries and a number of other strategically important countries, such as Ghana, Nigeria, Kenya and Rwanda. The purpose of the Index is to identify where there are technology gaps (either from an Infrastructure perspective or where there has been less investment over a period of time) and from this to suggest the most pressing funding opportunities available to DBSA. The focus on these opportunities is where there is the most need.

The Index is designed in such a way that it evaluates the following indicators.

Current Technology

- Data Centre Opportunity
- Access Networks
- Submarine Access Networks
- Rural Access
- Backbone Infrastructure

Future Technology Outlook

- Investment
- Public Sector (government)
- Public Sector (regulatory)
- Rural/Innovation
- Connections (fixed)
- Connections (mobile)
- Connections (3G)
- Connections (broadband)

Indicator	Measurement
Data Centre Opportunity	No of co-location data centres per country
Access Networks	International Internet bandwidth (bit/s) per Internet user
Submarine Access Networks	Access to submarine by capacity Tbps/country. Note: not all this capacity is for the country, it is only part of submarine cables whose total capacity add up to this figure.
Rural Access	Internet penetration in comparison with urbanisation rate
Backbone Infrastructure	Backbone network – by transmission type – VSAT, Point to Point links, Fibre
Investment	CAPEX/country – total telecom investment between 2000-2014
Public Sector (government)	Subjective analysis of government appetite for investment in ICT initiatives
Public Sector (regulatory)	Subjective analysis of ease of investment in ICT initiatives (as led by regulator)
Rural / Innovation	Subjective analysis of the importance of initiatives that will ease rural access or improve innovation in that market. The more initiatives that focus on rural access and innovation, the higher the score.
Connections (fixed)	Fixed-Line penetration by inhabitant (CAGR 2018-22)
Connections (mobile)	Mobile subscription penetration by inhabitant (CAGR 2018-22)
Connections (3G)	3G+ subscription penetration by inhabitant (CAGR 2018-22)
Connections (broadband)	Fixed broadband connections forecasts (CAGR 2018-22)

Source: BMI

The Index is best viewed as a dashboard showing where countries perform strongly and where there are clear gaps that need to be filled. The order of the countries in itself is less revealing. Looking at the order, the most relevant markets for DBSA funding emerge as Democratic Republic of Congo (DRC), Zimbabwe, Ghana, Botswana and Angola. There are clear infrastructure gaps across all these countries, as highlighted below.

- **DRC**

- » Access Network
- » Rural Access
- » Backbone Infrastructure

- **Zimbabwe**

- » Data Centre
- » Submarine Network Access
- » Backbone Infrastructure

- **Ghana**

- » Access Network
- » Rural Access

- **Botswana**

- » Data Centre
- » Rural Access

- **Angola**

- » Rural Access
- » Backbone Infrastructure

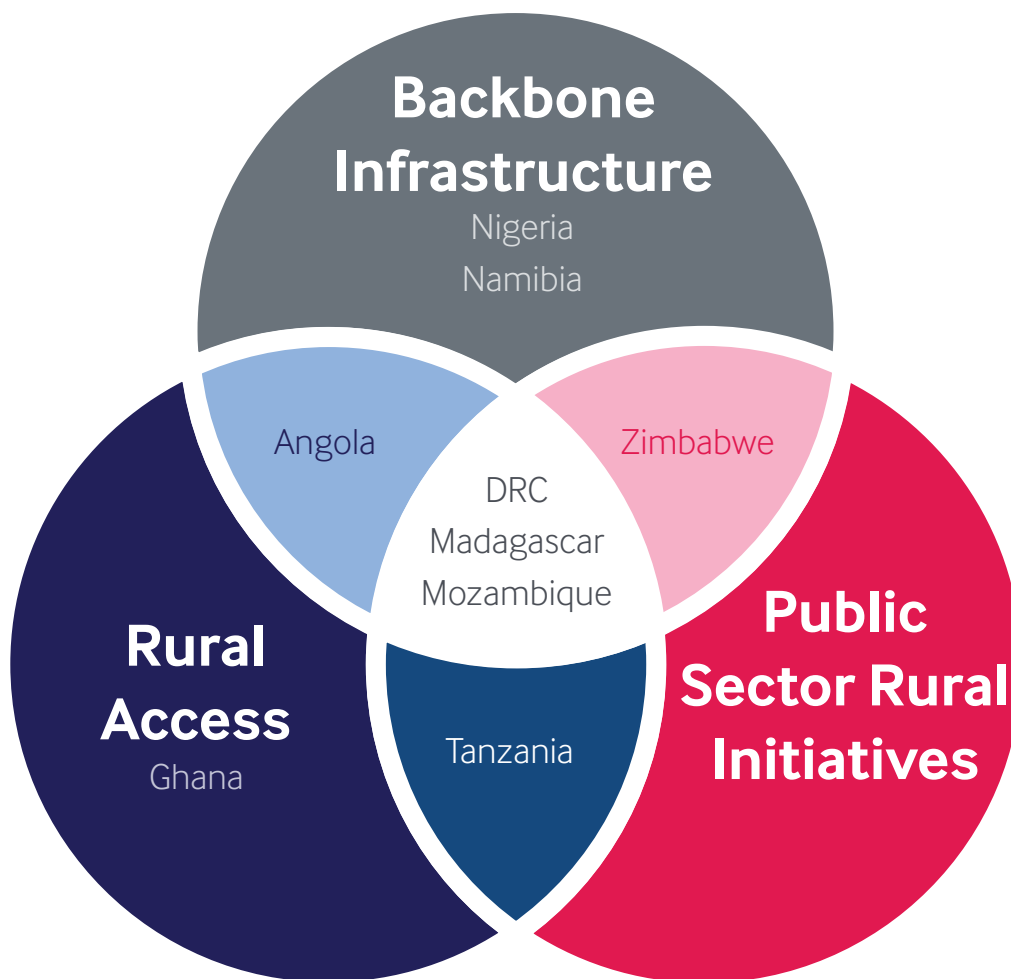
All these countries score well (Botswana and Angola less so) in terms of public sector appetite for ICT initiatives, which suggests there is a greater potential for government interest in DFI project funding.

	Current Technology					Future ICT Outlook								
	By the most relevant to DBSA	Data Centre Opportunity	Access Networks	Access Networks (submarine)	Rural access	Backbone Infrastructure	Investment	Public Sector (government)	Public Sector (regulatory)	Rural/ Innovation	Connections (fixed)	Connections (mobile)	Connections (broadband)	Technology (3G subs)
1	DRC	1	220	10	20	19%	2,310	1	1	4	-100.00%	-0.32%	49%	12.03%
2	Zimbabwe	0	10,129	6	11	35%	15,745	4	5	1	-2.90%	-0.03%	32%	0.46%
3	Ghana	2	1,550	15	15	53%	3,365	5	9	9	-2.90%	0.86%	3%	8.50%
4	Botswana	0	5,454	11	13	46%	795	2	7	16	-4.13%	-1.25%	18%	5.09%
5	Angola	3	5,871	91	17	39%	2,971	7	14	7	-4.89%	-1.86%	63%	7.81%
6	Zambia	0	2,429	5	12	52%	106	9	6	11	-4.46%	0.79%	15%	0.58%
7	Nigeria	7	2,589	55	6	38%	13,141	6	11	15	0.00%	-2.03%	0%	12.64%
8	Madagascar	0	8,085	6	19	28%	440	16	17	5	-2.60%	0.19%	-20%	7.17%
9	Tanzania	1	3,655	6	18	41%	31	12	13	3	0.00%	-2.64%	37%	7.06%
10	Malawi	0	1,950	5	10	50%	0	3	10	13	-15.91%	4.11%	-23%	15.37%
11	South Africa	21	146,731	110	7	52%	18,777	8	4	14	-1.27%	-0.03%	36%	9.92%
12	Mozambique	0	9,512	6	16	34%	638	17	16	2	0.00%	0.99%	0%	13.45%
13	Rwanda	0	2,267	46	8	52%	838	11	3	12	0.00%	1.13%	57%	11.67%
14	Namibia	0	34,498	50	14	34%	572	13	15	17	-3.28%	-0.85%	20%	0.71%
15	Lesotho	0	3,085	0	9	95%	115	12	18	6	-2.90%	-0.58%	11%	11.79%
16	Kenya	6	42,582	47	1	56%	8,675	14	8	8	0.00%	0.89%	34%	4.23%
17	Uganda	0	4,609	46	4	53%	1,308	10	12	10	-2.90%	1.99%	50%	12.51%
18	Mauritius	7	41,829	15	3	92%	2,194	19	2	19	-0.08%	0.09%	12%	6.72%
19	Swaziland	0	1,928	0	2	44%	136	18	19	18	-1.11%	-1.29%	21%	10.91%
20	Seychelles	0	62,120	0	5	50%	43	20	20	20	-0.59%	-0.26%	8%	3.84%

Source: BMI

However, the Index should be studied in a more three-dimensional way than merely looking at the ranking of countries.

As highlighted above, ensuring greater coverage of rural areas at affordable prices is pivotal to working towards a better connected SSA. Rural penetration is lowest in markets such as DRC, Madagascar, Tanzania, Angola and Mozambique. The government and regulator have focused on rural initiatives especially closely in Zimbabwe, Mozambique, Tanzania, DRC and Madagascar. There is a good overlap in the identity of those markets where rural access is limited and where the appetite for ICT initiatives aimed at improving rural access is strongest. Add in the state of the backbone infrastructure, and this is an overlap which DBSA should assess. In those countries where infrastructure is at its most basic and where the government's appetite for improving access to rural areas is at its strongest, is where DBSA should prioritise its funding.



There are different ways in which governments can sponsor improved rural connectivity, as shown by the activity of governments in DRC, Malawi and Ghana. These are all important signs of governments investing in an improved future outlook for ICT. Evidence of this kind of activity from a government is important in appraising the appropriateness of project funding.

DRC

Fiscal Measures

Ministry of Telecommunications & Digital Economy will launch a fund for access and universal service to improve connectivity in rural and landlocked areas of the country. Operators will need to contribute 2% of their turnover to the fund.

Malawi

Infrastructure Measures

Government is investing in National Fibre Backbone Project, which will lay fibre from the northern border to the south of the country. This investment in infrastructure will lead to improvement in access, but will need to be followed up by greater digital literacy.

Ghana

Policy Measures

Ministry of Communications is encouraging collaboration between private and public sector on the development of the country's technology ecosystem with the aim of technology usage promoting economic growth.

The Index has been designed in such a way so that it identifies the most important infrastructure needs from across the 20 countries. These needs will not be unique and through other completed or ongoing projects funded and managed by DFIs or by the private sector, investors and project managers should look to replicate, scale up or industrialise those projects that have been most successful in supporting economic empowerment and sustainable development.

Using the Index as a framework for assessing market gaps, below is an illustration of opportunities for DBSA that are highlighted in the course of this report. There are two such tables – one for South Africa and the other for SADC – with more detail on these opportunities analysed in Chapters 2 and 3 of the report.

South Africa Opportunities		
Identify the gap	Why is it important to fill this gap?	How can DBSA help to fill this gap?
Rural Mobile	Mobile is by and large the only means of connectivity to data and internet services in rural Africa. Access to these services makes or breaks ICT equality and empowers local communities to make a greater economic impact.	DBSA should assess, evaluate and look to invest in successful solutions for accessing rural areas of South Africa, eg Zenzeleni in South Africa and Rhizomatica in Mexico. Solutions such as these can be replicated across rural areas in South Africa and elsewhere in the continent.
Backbone Infrastructure	A strong backbone infrastructure provides faster and more reliable data and internet services for business in cities and greater coverage to ensure better connectivity for rural areas.	DBSA should look to invest in one of the smaller ISPs that can offer competition to Telkom, Liquid and Broadband Infracore (BBI) in terms of building a fibre-optic network. DBSA can also play an advocacy role in encouraging the regulator to play a more supportive role in offering incentives for providing a backbone infrastructure that will better serve rural areas.
Fixed line / Fixed broadband	To build an economy comparable to OECD countries, South Africa needs to enhance its fixed penetration, which currently sits at 6%, and bring it more in line with the OECD's 33%. This is vital if businesses are to compete on the global stage.	DBSA should look to work with local municipalities in South Africa to tackle the issue of last mile access. Many need support in laying fibre that can address their connectivity needs and offer any excess fibre capacity on a wholesale basis to enable more widespread fixed line access.

SADC Opportunities		
Identify the gap	Why is it important to fill this gap?	How can DBSA help to fill this gap?
Rural Mobile Broadband	Mobile is by and large the only means of connectivity to data and internet services in rural Africa. Access to these services makes or breaks ICT equality and empowers local communities to make a greater economic impact.	There are several countries which need support in bringing mobile broadband solutions to rural areas, especially Zambia, Zimbabwe and Botswana. DBSA could look to work with Huawei, who are already deploying a phase 2 rural connectivity project to build over 800 communications towers in Zambia. It is possible that such a project could be replicated in other SADC markets. DBSA should also consider other innovative solutions in providing connectivity to rural areas, such as Google's Project Loon.
Backbone Infrastructure	A strong backbone infrastructure provides faster and more reliable data and internet services for business in cities and greater coverage to ensure better connectivity for rural areas.	There are specific investment opportunities in a number of SADC member states, namely DRC, Tanzania and Zimbabwe. In DRC, the regulator needs support in its efforts to build the country's backbone. In Zimbabwe, there may be opportunities to invest in state-owned operators to guide them on how to expand and enhance the backbone national network. In Tanzania, there are potential investment opportunities around phase 3 and 4 of the National ICT Broadband Infrastructure.
Connectivity to submarine pipes	Submarine access (ie the International Gateway) sits at the top of the access value chain for the Internet. Without enough connectivity to submarine pipes, a strong national backbone and rural connectivity can do nothing.	Lack of enough access to a submarine cable is causing a bandwidth issue in Tanzania. DBSA should work with the incumbent operator TTCL to connect Tanzania to the TEAMS cable – if possible – or if not to build submarine cabling with Tanzania as a landing point.
Community	Even optimal ICT connectivity status (supply side) needs to be accompanied by a group of initiatives that are relevant and work towards the enhancement of the community (demand side). Education, healthcare, agriculture and entrepreneurship, to name a few, are some of the verticals where ICT connectivity can have a major and effective impact.	There are several community-led projects that DBSA should look to support which will feed into some of the SADC's aims as set out in its Regional Infrastructure Development Plan (capacity building & content; e-applications & services). These may include establishing a modern e-government infrastructure (as done in Lesotho), developing a mobile platform to improve the ability of women entrepreneurs or establishing a digital program around increasing usage of internet services in local communities (by connecting more local schools, for example).
Technology parks	ICT connectivity should be employed to boost economic development. Technology parks can create the ideal ecosystem to catalyse ICT-based economic development through creating solutions that encourage collaboration and innovation and mitigate bottlenecks.	In Kenya, Konza City will be a sustainable technology hub driving local innovation. In Rwanda, a Centre of Excellence for ICT will promote entrepreneurship and Senegal's Digital Technology Park will provide a base from which ICT can play an important part in the country's economic growth. DBSA should work with member state governments to fund and manage the establishment of similar technology parks that can spur local innovation, entrepreneurship and economic growth.

Chapter 1: South Africa Opportunities

South Africa ranks halfway down our Index, suggesting there are many other markets that are more appropriate for DBSA to look to manage and help fund development projects. However, as DBSA's home market, it is important that South Africa is considered, and there are some very clear investment needs. South Africa scores poorly for its backbone infrastructure and is behind countries such as Kenya, Nigeria and Uganda in terms of rural access. Despite high levels of investment (relative to other markets in SSA), there is slowing growth in the number of mobile connections and fixed-line penetration remains low (fixed-voice subscriptions are just 6%, as of 2017).

The table below shows how South Africa compares across all indicators with the countries appearing at the top of the scorecard (DRC, Zimbabwe and Ghana) as well as Nigeria (included for its size) and Kenya (included as a progressive, vibrant ICT market).

	By the most relevant to DBSA	Current Technology				Future ICT Outlook								
		Data Centre Opportunity	Access Networks	Access Networks (submarine)	Rural access	Backbone Infrastructure	Investment	Public Sector (government)	Public Sector (regulatory)	Rural/ Innovation	Connections (fixed)	Connections (mobile)	Connections (broadband)	Technology (3G subs)
1	DRC	1	220	10	20	19%	2,310	1	1	4	-100.00%	-0.32%	49%	12.03%
2	Zimbabwe	0	10,129	6	11	35%	15,745	4	5	1	-2.90%	-0.03%	32%	0.46%
3	Ghana	2	1,550	15	15	53%	3,365	5	9	9	-2.90%	0.86%	3%	8.50%
7	Nigeria	7	2,589	55	6	38%	13,141	6	11	15	0.00%	-2.03%	0%	12.64%
11	South Africa	21	146,731	110	7	52%	18,777	8	4	14	-1.27%	-0.03%	36%	9.92%
16	Kenya	6	42,582	47	1	56%	8,675	14	8	8	0.00%	0.89%	34%	4.23%

Source: BMI

The South African government has identified the need for greater investment towards a “digital society.” It also realises that it needs to reverse the recent trend of ICT spending which actually decreased from 13% GERD (Gross Expenditure on Research and Development) in 2009 to 10% in 2015.

Investment towards the “digital society” will be underpinned by creating greater availability of infrastructure across the country and introducing interventions to promote competition and Small, Medium and Micro-sized Enterprise (SMME) development across the ICT sector.

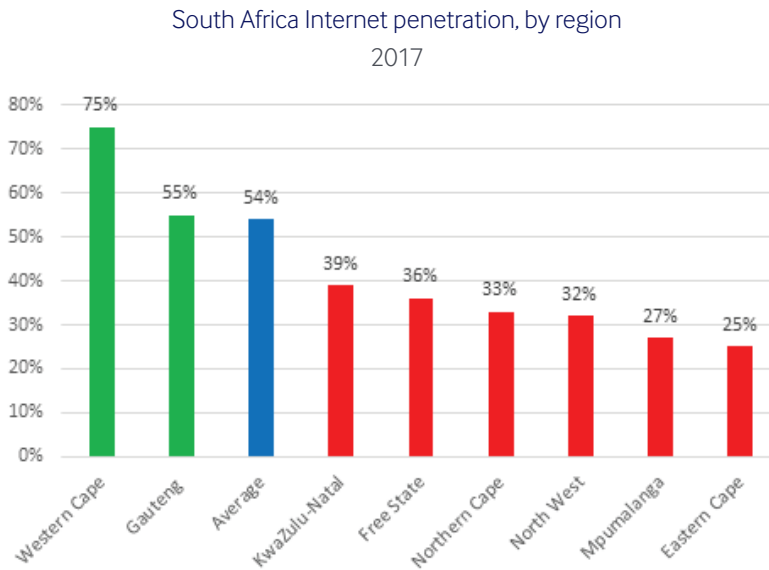
Despite this plan for a “digital society”, the government has been thus far slow in announcing specific strategic plans to encourage innovation in the ICT sector or solutions that will directly impact rural areas.

Growth in South Africa’s telecoms market is being driven by 4G network expansion – funded by the private sector - and by the greater availability of advanced data and value-added services, especially to more urban parts of the country. However, without access to additional spectrum resources, operators will suffer from heavily congested data networks, which will weigh on their return on investment and the quality of service experienced by their customers. Increased competition in the fixed-line sector, which is driving the roll-out of convergence services and next-generation network infrastructure, has the potential to stimulate demand for fixed-line services over the long term. This does suggest there are opportunities for project funding, and would help fill an important gap in allowing businesses to use ICT services more effectively – and especially small businesses – to compete both domestically and internationally.

Rural Mobile Opportunity

By the end of 2017, there were over 30 million internet users in South Africa representing a penetration rate of 54% (according to figures released by *Hootsuite*). With Internet access becoming synonymous with economic empowerment, this is an important statistic. But it is becoming ever more important to ensure this access is available to those in underserved areas, and especially beyond major metropolitan areas.

Internet penetration at a province level varies markedly from the national penetration rate as shown by data published by *World Wide Worx* in 2017.



Source: World Wide Worx – Internet Access in South Africa, 2017

Access to the Internet does not just vary by geography, but also by income. For adults earning more than ZAR30,000 per month, the adult Internet penetration is over 80%, a figure that declines by 20 percentage points for those earning ZAR14-18,000 per month. This is still above the average penetration rate, but for those earning ZAR3-6,000 per month, the adult Internet penetration is 40% and dips below 30% for those earning ZAR2,500 per month.

A lack of market competition means higher prices for those that can least afford it. MTN and Vodacom command 77% of the market share in South Africa. Moreover, in many remote areas, only one of the two provides coverage on a town-by-town basis with the other preferring not to compete where coverage is more expensive and the addressable market is relatively small. Universal service and access obligations have been inadequate to meet the substantial scale of the access problem. Even where access has been created, voice and data services still remain unaffordable to many rural dwellers.

With average incomes significantly lower in rural areas, there is a real need to focus efforts on funding solutions that will work to help connect rural communities to the Internet. The gap is there for DFIs such as DBSA, and there are successful solutions that DBSA could look to replicate and scale.

The Mankosi Rural Community

Rural communities can set up their own mobile services to reduce service costs. This is what was done in Mankosi in the Eastern Cape, where the local community created and now owns its own telephone and internet company. The results are transformative: local calls are free, calls to other networks cost half what they would on other networks and data costs are one tenth of the market price. The project is known as *Zenzeleni* (or Do-it-Yourself in isiXhosa).

Zenzeneni Networks Mankosi Ltd. is a fully licensed (PECN-Private Electronic Communication Network) telecommunications co-operative, owned and operated by local people. It provides free internal calls, and discounted rates to call mobile phones and landlines from a set of public phones spread in the community connected via a network of WiFi access points.

The starting point for this initiative was the high cost of communications services for a community that spent about 20% of their income on telecommunications. In 2012 when a research team from the University of Western Cape proposed introducing mesh networking to Mankosi, a remote rural community home to 6,000 people. This is a cheap, low-energy system using scattered node devices rather than central masts or beacons. Each node communicates with the nearest nodes. Data is forwarded through the network by passing through as many nodes as necessary. In the absence of an electric grid, the Mankosi network is solar-powered with the power systems allowing Zenzeleni users to charge phones at the houses which host the nodes, as well as providing lighting to those homes.

Zenzeleni Networks is just like any other service provider in that it installs and maintains a telecommunications infrastructure and sells voice and data services. It is equipped with an Internet and VoIP gateway and a billing system, all run by the Mankosi community co-operative, built on a mesh network and WiFi stations.

Although recognised by ICASA, the network has been granted a licence exemption so it costs nothing in fees to operate the infrastructure. It only has to pay for the backhaul Internet connectivity, which it gets at wholesale prices.

Pivotal to the initiative is the community itself: all revenues stay in the community with residents deciding what to do with the money paid for Zenzeleni's services. This means the project is self-sustainable and actually fosters economic growth, both in terms of providing valuable services and in using the proceeds to fund local ventures (eg sending young community members to attend tertiary education institutions).

Whilst GSM is the most effective way to connect rural communities in South Africa, operators with access to that spectrum are either not providing affordable services or are choosing not to make use of it in certain areas for the modest return on investment expected. A small portion of that spectrum could be designated for Social Purpose GSM operators reusing the PECN/ECSLE scheme granted to Zenzeleni Networks. Such a scheme would work well within the government's "digital inclusion" initiative.

Mexico: Supporting local communities with GSM licensing

In Mexico, the national telecommunications regulator, CoFeTel has granted Social Purpose GSM Licenses specifically to enable rural communities to provision themselves with mobile services.

In the state of Oaxaca in southwestern Mexico, there are 15 community networks and here CoFeTel has allocated 10 MHz of GSM spectrum for social use in small communities and indigenous regions.

Rhizomatica emerged as an organisation that supports those communities who want to build and maintain their own telecommunications infrastructure. It develops free and open-source software to facilitate small-scale deployments of autonomous GSM networks in a scalable way, and advises the networks on how to make them sustainable and self-funding.

The community networks will provide telecommunications services that were seen as being not commercially viable for regular mobile operators. The interested community will pay Rhizomatica MXN120,000 for equipment and installation, about one-sixth of what a commercial provider would charge for a similar rural installation. In a typical arrangement, subscribers to a community network pay MXN30 per month for all local calls and texts with the community itself taking any profits left after electricity and maintenance costs.

DBSA: Opportunity for Project Investment

The need for greater digital rural inclusion is clear. The Zenzeleni solution in Mankosi is ingenious and can be replicated to many other rural parts of South Africa, where connectivity is at its lowest, especially in the Eastern Cape, Mpumalanga and North West. Funding and project management expertise from a DFI could help to make such an initiative more widespread across the country and indeed in other areas of SADC for the many rural communities that would benefit. However, there is also an advocacy role that can be played.

Going beyond Zenzeleni-like deployments, the need to (re)use some of the spectrum allocated to the mobile operators becomes more pressing. In order to connect more efficiently to the rest of the country (and beyond) and provide resilient data access, networks like Zenzeleni need to gain access to some spectrum or wholesale capacity from the national telcos. The regulator should be able to allocate social purpose GSM spectrum more widely to holders of private communications networks and allocate specific funding mechanisms or channels (as in Mexico) for licensees to flourish.

Backbone Opportunity

If covering rural communities with reliable and affordable mobile networks is hard, connecting those communities to a fibre backbone is even harder. The roll-out of fibre backbone to rural areas significantly contributes to creating a high quality ICT network, and the need for this roll-out is increasingly recognised. It is the backbone that connects the last mile to the rest of the network and a fibre optic backbone will support a high volume of traffic and range of services amount to lower operational and capital expenditure (as compared to copper or microwave).

South Africa's backbone is dominated by Telkom and Broadband Infraco (BBI) which was originally set up with some government funding to be a challenger in this space, as shown below.

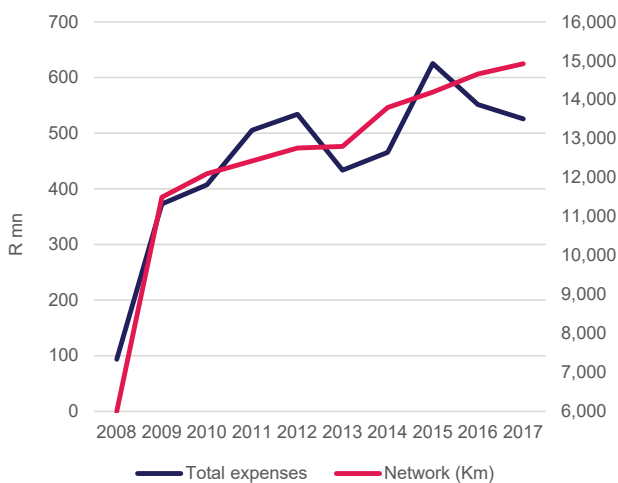
How South Africa's internet is controlled

Last Mile Access	DSL: Telkom 3G: Vodacom; MTN; Cell C; Telkom Mobile LTE: Vodacom; MTN; Telkom Mobile; Liquid Telecom Fibre: Liquid Telecom; Telkom; many smaller players
Internet Exchanges	NAPAfrica: owned/operated by Teraco with POPs in Johannesburg, Cape Town, Durban INX: operated by ISPA – JINX and CINX hosted by Internet Solutions and DINX hosted by Teraco
National Backhaul	Telkom: over 140,000km of national fibre BBI: over 15,000km of national fibre Others: over 10,000km of national fibre
International Connectivity: Submarine cables	SAT-3; WACS; EASSy: owned by telecoms consortia Seacom: independent, owned by non-telecoms consortium BRICS, SAFE, SAex

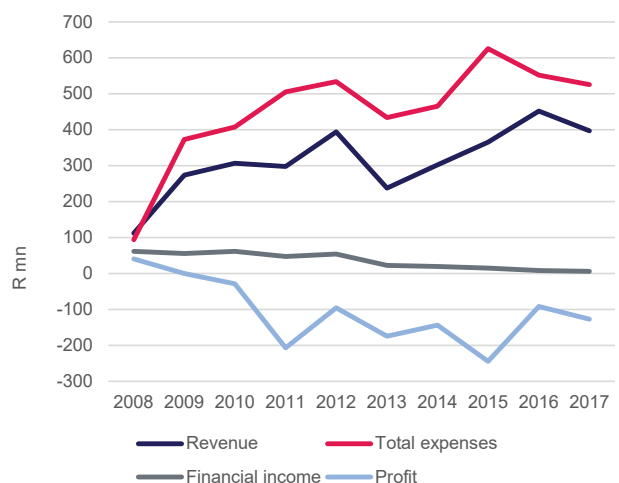
Source: mybroadband.co.za

Investment in South Africa's fibre backbone would greatly improve the quality of access to ICT services in rural areas. This is an area of investment in which DBSA should look to play a role. As the challenger in the market and running a fibre network of over 15,000km, BBI could be seen as a source for such investment. However, as an insolvent company, it is not an investment option for DBSA.

BBI Expenses vs Network (km)



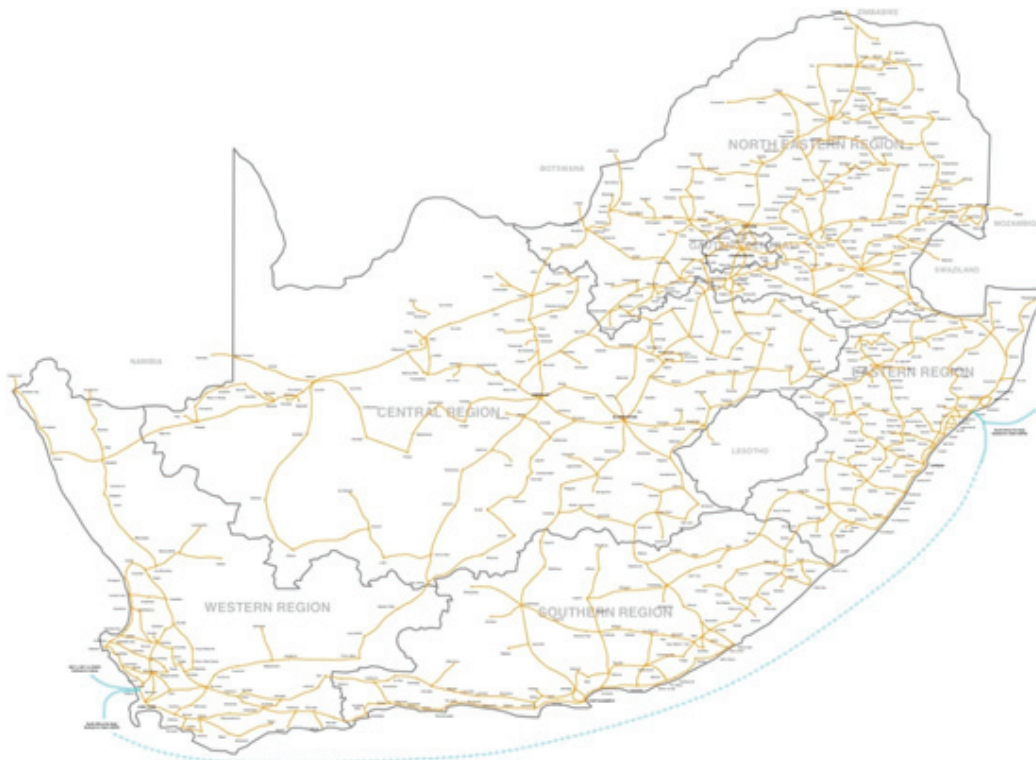
Broadband Infraco Financials



Source: Broadband Infraco, BMI

Funding opportunities to improve South Africa's fibre-optic backbone come from beyond Telkom and BBI. Each has failed to serve the rural population. But there are other private players that could utilise the incumbent's network and extend it to areas where Telkom's coverage is light (see map below). It is with these private sector entities that DBSA's role becomes potentially important.

Telkom's Fibre Map
2014



Source: Telkom

The case of India: regulatory support for extending infrastructure

Every village in India is within 25km of an optical fibre backbone. The reality is that many of these villages are not actually connected to the backbone and that the fibre is hugely under-utilised.

However, there are useful lessons to learn from India, and especially from a regulatory perspective. As competition was introduced into the Indian market, a system known as Access Deficit Charges (ADCs) was established. ADCs are funds given to operators to compensate for the difference between the actual cost of providing a service, and the (lower) tariff that the operator is obliged by a regulator to charge. The Indian operator BSNL was by far the largest supplier of rural customers, where the cost of providing services is usually more, and so ADCs worked strongly to its advantage.

In addition to ADCs, a Universal Service Obligation Fund (USOF) was established under the Department of Telecommunications in 2002. The obligation was strict collecting 5% of gross revenue of all operators, and within three years, the USOF had accumulated USD1.6bn, of which about 25% was spent or pledged. The fact that BSNL already had access to a low-cost backhaul fibre network gave it the edge and as a result, BSNL won the lion's share of the auctions and of the USOF funds.

DBSA: Opportunity for Project Investment

Investment towards a larger fibre-optic backbone would support the South African government’s “digital society” initiative. Regulatory incentives for investment could encourage smaller private ISPs to develop a strategy around connecting rural communities to fibre-optic backbones.

DBSA should look to invest in such an ISP that may already have laid some fibre, even if only on an urban level. Many of these will not have access to favourable financing arrangements to follow through with a strategic aim of connecting their fibre network to rural communities. Investment from a DFI such as DBSA will then give greater business in the short-term to current communities near their fibre backbone as well as the opportunity to access new subscribers from communities further afield. The table below highlights a number of potential companies that may be ripe for investment. We assess Fibreco as the best prospect with the others listed all interesting but offering challenges.

The current wave of consolidation in the South African fibre market bodes well for the development of the country’s high-speed fixed broadband sector. Vodacom is poised to buy 49% of open access fibre-to-the-home (FTTH) provider Vumatel. At the same time, open access FTTH provider Dark Fibre Africa (DFA), in a deal facilitated through its largest shareholder Remgro, will reportedly acquire the remaining 51% of the company. Vodacom is in the midst of building its fibre coverage through investment and partnerships with several open access players so as to tap into the wireline broadband market and lay the foundations for its convergence strategy.

Operator	Description	Regions	Notes
Dark Fibre Africa (DFA)	Aid and empower SMEs & large businesses to expand their infrastructure at minimal cost: conglomerates, big business, telecoms operators, Internet service providers, municipalities and governments. Over 10,000km of fibre and do lease backbone in some cases.	Including - Johannesburg, Pretoria, Cape Town, Durban, Port Elizabeth, Bloemfontein, George, Knysna, East London, Pietermaritzburg, Richards Bay, Polokwane	Between its capability, geographical remit and the business model, DFA is a great candidate for investment to connect rural centres. May be too large a player following its impending acquisition of Vumatel.
Fibreco	Established in 2009 as an equal partnership between CellC, Internet Solutions and Convergence Partners. In partnership with its clients, FibreCo provides bespoke connectivity solutions across South Africa and metro areas ranging from fibre ownership to high capacity and complex managed networking solutions in support of wholesale and enterprise clients.	Refer to <i>Fibreco Network Route Map</i> on the next page	FibreCo currently has metro rings in 8 cities. FibreCo will develop infrastructure where necessary and leverage already available fibre networks and other relationships to provide the most efficient route combinations. It also plans three major backhaul lines in the future.
MetroFibre Networkx	It is a carrier class Ethernet (CE 2.0) infrastructure company that provides highly managed fibre optic broadband connectivity. It serves ISPs, providers, resellers, residential and business properties, and consumers. It offers high speed broadband (up to 10Gbps) as well as a myriad of managed services.	Covers all SA’s main cities and some of the medium-sized cities.	As interested in managed services as physical infrastructure. As such, it may or may not be interested in working with DBSA to cover rural communities.
SADV	Specialises in the installation, operation and maintenance of last mile fibre optic networks.	DFA has a significant minority stake in SADV and as such leverages DFA’s national network to build and offer open access FTTH connectivity services to ISPs	As part of DFA business, it may be too large a player
Vox	In 2015, Vox acquired Frogfoot giving it roll-out capacity and fibre coverage.	Including Cape Town, Johannesburg, Durban, Port Elizabeth, Bloemfontein. Refer to <i>Vox Telecom Coverage</i> on the next page	Fibre coverage in all major cities. On the other hand, it is vertically integrated into the solutions where most of its business is. As such, it does not focus on the physical element, but rather uses it as an enabler. It has no backbone.
Vumatel Fibre	Vuma installs in selected neighbourhoods in partnership with the community.	Johannesburg, Cape Town, Durban	Coverage in only three major cities. Good experience and in community partnerships. On the other hand, no backbone experience is likely to be acquired by DFA and Vodacom.

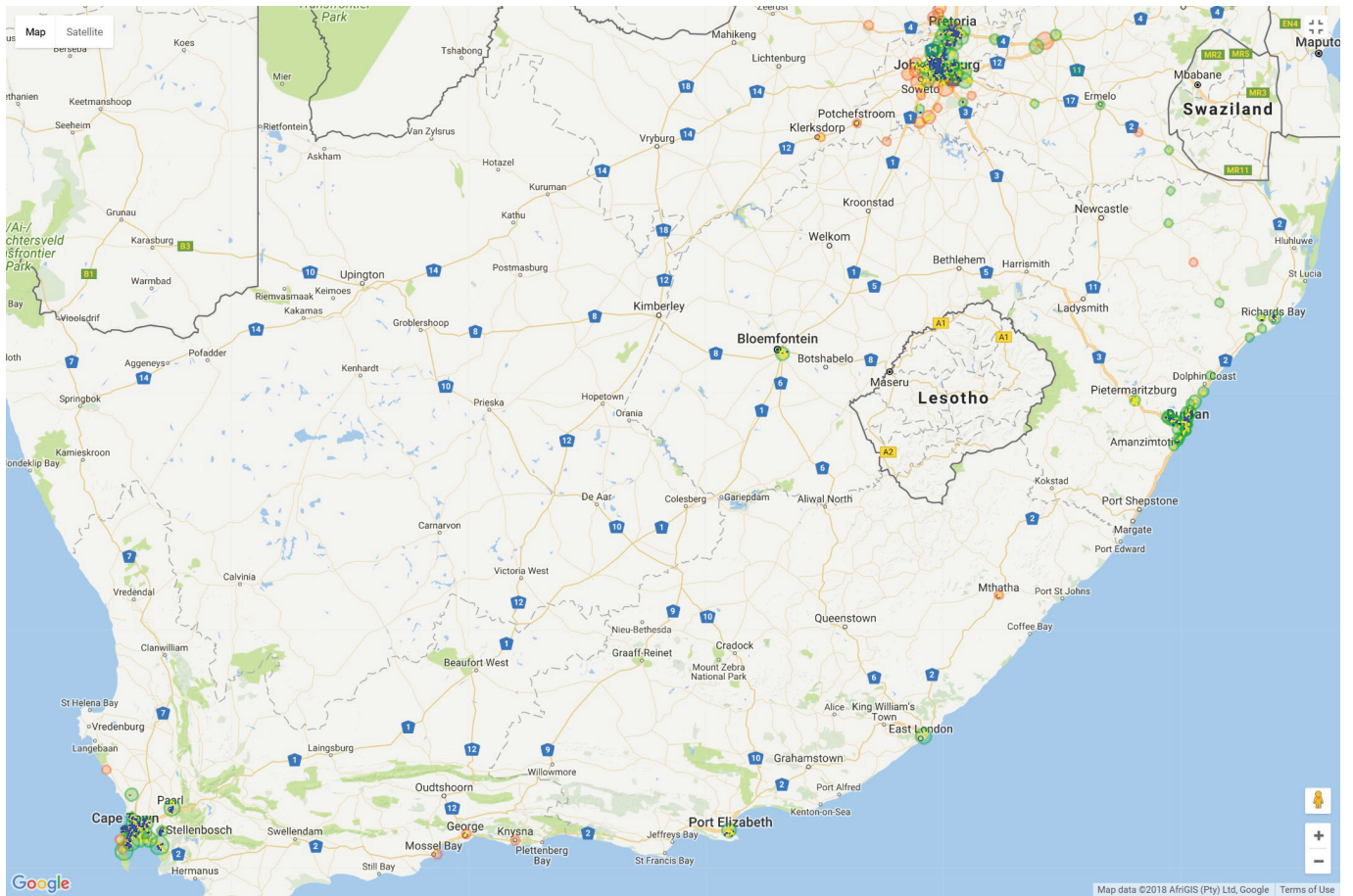
Source: BMI

Fibreco Network Route Map



Source: Fibreco

Vox Telecom Coverage



Source: Vox

Fixed-Line Opportunity

Growth in South Africa's fixed-line market is non-existent. The future for the fixed-line sector is important though, not for PSTN voice but for data intense consumer applications, and even more importantly for the corporate sector and last mile access to this segment. Mobile networks may be increasingly able to support higher speeds and larger data applications, but as they do so, they are becoming less economical for users and mobile services are increasingly throttling down supported applications and reducing the potential impact of telecoms on economic development.

In South Africa, this is a major issue. While other markets in SSA – Kenya, Nigeria, Mauritius – all have roll-out plans for FTTH or FTTC (the cabinet) - there is comparative sluggishness in implementing such network plans in South Africa.

Submarine cable operator SEACOM has identified this as a growth opportunity. In 2017, it expressed its interest in buying last-mile fibre assets in South Africa and across the continent. The more data it drives to international gateways, the bigger the opportunity for a fibre network to carry data to businesses and high-usage consumers.

South Africa's converging regulatory regime

In 2015 Telkom opened up 200 exchanges on a trial basis to competitors as a test of "democratising" broadband in South Africa. Local loop unbundling (LLU), which had long been seen as a critical enabler for a new competitive market, had been under the scrutiny of ICASA for several years. Rivals had argued that the introduction of LLU would facilitate fixed-line and wireless competition and act as a positive contribution to economic growth, aiding job creation and business investment as companies establish infrastructure complementary to the last mile.

Telkom called for access to the mobile operators' local loops as well, a move deemed as an imperative precursor to the democratisation of broadband in South Africa. Under a converging regulatory regime hundreds of alternative service providers have been able to enter the market to offer a range of services.

In addition to greater competition, the availability of bandwidth in South Africa has improved dramatically as a result of the emergence of submarine cables. Last mile access remains a problem. The difficulty remains bringing bandwidth to the end user, which is hindering businesses, and especially in business parks where multiple users need to make use of limited last mile infrastructure, thereby throttling speeds.

Telkom and Liquid Telecom are competing with municipal providers in the fixed-sector for last mile access. The major mobile networks, Vodacom, MTN and Cell C are also competing under a converged, service-neutral licensing regime. Some municipalities are also implementing their own metropolitan fibre and wireless broadband networks.

Where should DBSA invest?

In light of so many competitors in a liberalised, competitive and underserved market, the question of where to invest becomes harder to address. Such a level of competition is not sustainable and consolidation is expected to happen as more players move towards intercity and ultimately national coverage.

There are three potential scenarios for DBSA to support investment that will enhance fixed line coverage to meet the needs of last mile access:

Option 3: Replicate the success of initiatives applied elsewhere on the continent

Option 2: Invest in a privately-owned local operator capable of addressing rural coverage issues

Option 1: Invest in a government entity if it needs investment

Option 1: Government Entity - Telkom

This can be dealt with quickly – we do not see investment in Telkom as an option for DBSA. Its fixed line business is highly profitable, helped by its lack of focus on rural areas. Its decision as to whether it reaches out to meet the needs of businesses in more rural areas is a strategic and political decision rather than an investment decision.

Option 2: Privately-owned local operators

Earlier in the chapter – when looking at backbone opportunities – we examined a list of fibre operators that could be vehicles of DBSA investment to strengthen South Africa’s fibre backbone. What about such a list of local operators that may require investment support from DBSA to reach the last mile?

Operator	Description	Regions	Notes
Bwired	A joint venture between Ericsson South Africa and the City of Johannesburg that focuses on providing affordable Internet and broadband services across the City of Johannesburg. Its network consists of 900km fibre divided between two Terabyte capable rings.	Johannesburg	Extensive one-city coverage. Strongly recommended as investment target
Cybersmart Lightspeed	Entered the market in 2009. Promises 50Mbps uncapped for both businesses and residential users. Provides FTTB (building).	Port Elizabeth, Bloemfontein, Johannesburg, Benoni, Ermelo, Pretoria, Midrand, Germiston, Sandton, Randburg, Lyttelton, Centurion, Rosslyn, Brakpan, Secunda, Alrode, Boksburg	Good experience with good remit. Can easily replicate the work in smaller rural communities. Should be considered by DBSA.
Fibreco	Established in 2009 as an equal partnership between CellC, Internet Solutions and Convergence Partners. In partnership with its clients, FibreCo provides bespoke connectivity solutions across South Africa and metro areas ranging from fibre ownership to high capacity and complex managed networking solutions in support of wholesale and enterprise clients.	See map above (earlier in chapter)	Fibreco currently has metro rings in 8 cities. FibreCo will develop infrastructure where necessary and leverage already available fibre networks and other relationships to provide the most efficient route combinations. It also plans three major backhaul lines in the future.
MetroFibre Network	It is a carrier class Ethernet (CE 2.0) infrastructure company that provides highly managed fibre optic broadband connectivity. It serves ISPs, providers, resellers, residential and business properties, and consumers. It offers high speed broadband (up to 10Gbps) as well as a myriad of managed services.	Covers all SA’s main cities and some of the medium-sized cities.	As interested in managed services as physical infrastructure.
TT Connect	Investing substantially in South Africa, delivering fibre past 200,000 homes	Johannesburg	Extensive one-city coverage. Strongly recommended as investment target
Vumatel Fibre	Vuma installs in selected neighbourhoods in partnership with the community.	Johannesburg, Cape Town, Durban	Coverage in only three major cities. Good experience in community partnerships.

Source: BMI

Municipalities are also beginning to tackle the issue of last mile access. Some are laying fibre that addresses their connectivity needs and offering excess fibre capacity for sale to enable more widespread access. For example, the BWired project created fibre connectivity in and around Johannesburg while additional capacity is being sold on to ISPs who then use this capacity in their business. The same model can be applied in the corporate environment, creating open access networks. DBSA can proactively work with rural municipalities to apply the same model.

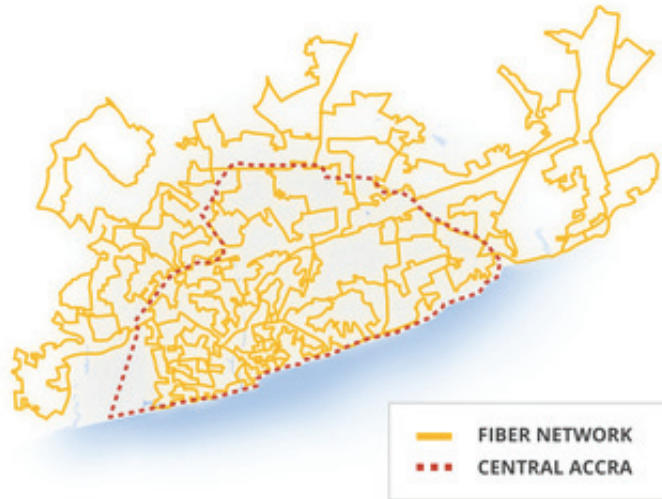
The corporate sector itself could also bring broadband connectivity to their own operations. If mining companies considered bringing broadband connectivity to their own operations, rural South Africa could gain access to broadband far quicker as a by-product. Banks and big enterprises could follow the same model. Corporates and the private sector could even look towards creating a ‘smart grid’ type of system, where excess bandwidth and capacity can be pushed back into a national pool. Companies in suburban areas can make capacity available after business hours to residents in the area as they do not need this capacity at that time. The revenues from residents will subsidise the cost of bandwidth to such companies.

Such an initiative may stand an even better chance than municipalities. However, it is a major co-ordination challenge that needs a central player in each region to run the process. As such, DBSA might need to look for a big firm or two in a region that can not only participate in such a funded initiative, but also lead it and facilitate its execution.

Option 3: Replicate successful initiatives

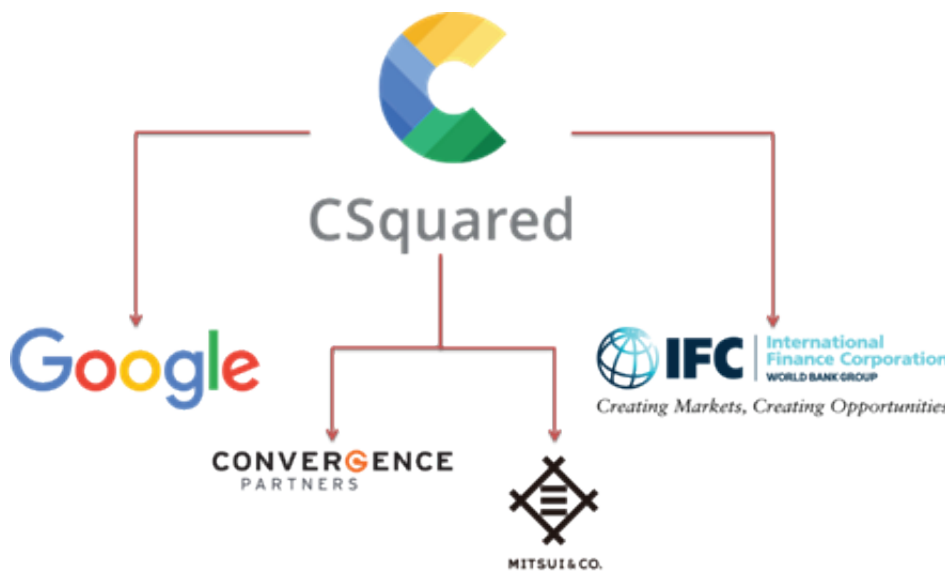
DBSA should look at CSquared as a potential initiative that could be replicated in South Africa. The specific initiative is studied closer in the Case Studies chapter. In 2013, Google launched Project Link in Uganda and built a fibre-optic network to enable ISPs and mobile operators to provide faster and more reliable broadband services in Kampala. Today, 800km of fibre laid across Kampala has made it possible for 13 ISPs and mobile operators to deliver faster connectivity speeds and to roll out 4G LTE services to the city.

Accra became the second city to benefit from Project Link (now known as CSquared), covered by 840km of fibre network.



Source: CSquared

CSquared has Liberia as its next target. The initiative continues to accumulate expertise in the field of last-mile connectivity. We believe CSquared is a potential investment angle for DBSA in South Africa – see below for the current investor picture.



Source: CSquared

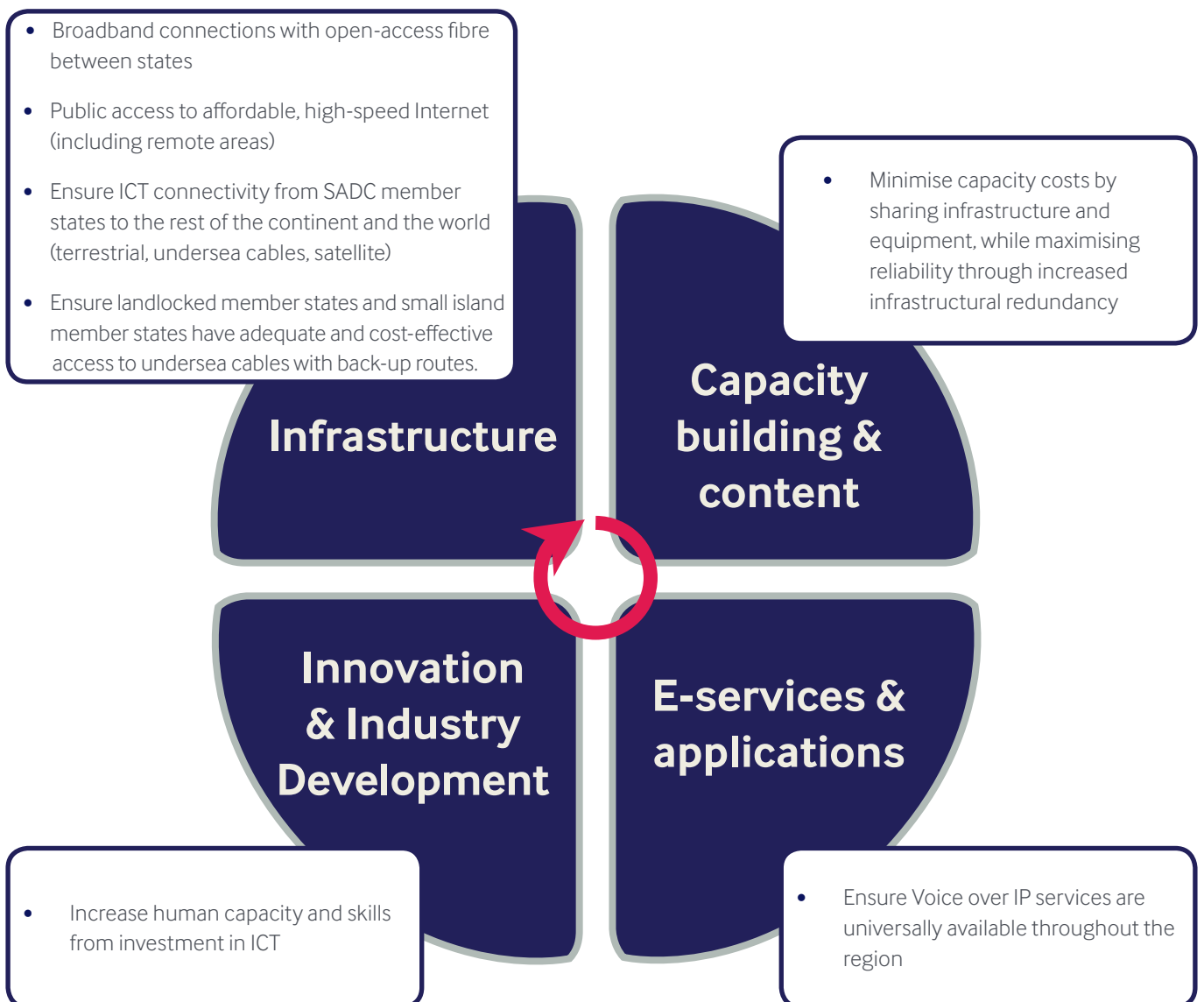
Chapter 2: SADC Opportunities

In 2001, the SADC passed its *Declaration on Information & Communications Technologies* (ICT) setting out its ICT policy for the region. The Declaration highlighted the importance of member states doing what they can to improve their regulatory environment so that each state encourages wide participation in ICT and investment in technological infrastructure. Within this broad policy aim, the Declaration emphasised the importance of using technology infrastructure to connect rural and remote areas, underprivileged urban areas and institutions of learning.

SADC released its *Regional Infrastructure Development Plan* in 2012 which sets out the region’s priorities for new infrastructure to 2027. The Plan itself acknowledges that there have been advancements in technology infrastructure within SADC’s member states, but that in many cases the implementation has been inefficient.

Penetration rates for mobile services across the member states are high and especially in South Africa, Seychelles, Mauritius and Botswana where it is over 100% (as of 2017) but in other markets such as Angola, DRC and Madagascar penetration is around 40% and will be considerably less in rural areas. Internet usage is patchy with penetration rates relatively high in South Africa (over 50%) and Botswana (40%) but still desperately low in DRC (6%), Madagascar (7%) and Malawi (9%).

To encourage the establishment of affordable and always-on connectivity, the *Regional Infrastructure Development Plan* has four strategic pillars: infrastructure; capacity building and content; e-services and applications; and innovation and industry development.



As noted in the Introduction chapter and in reference to the Index, across all four pillars there are opportunities for telecommunications development across many of the SADC markets (see below). In the rest of this chapter, we will focus on some of these needs, all of which will support the fulfilment of the SADC's *Regional Infrastructure Development Plan*.



Infrastructure: Connectivity to submarine pipes

A connection to a submarine cable offers the cheapest and fastest technology for international gateways. It should be the goal of countries across SADC to increase connectivity to submarine cables and distribute an enlarged capacity of data over an enhanced national backbone network (another development opportunity tackled in this section). The result will not just be an increase in availability of bandwidth and competition between cable operators but a much needed reduction in internet prices. To demonstrate, in Zimbabwe which has poor connectivity to submarine cables, internet costs are US\$30 per GB, compared to Mozambique (linked to Seacom and EASSy submarine cables) where the cost is US\$3.

Tanzania, Malawi, Zambia and Zimbabwe all have limited access to submarine cables (5-6 Tbps of capacity) compared to South Africa (110 Tbps), Angola (91 Tbps) and Namibia (50 Tbps). In the case of Tanzania, this poverty in access to submarine cables comes in spite of its proximity to the TEAMS cable. In all cases the lack of international submarine access reflects the prices of internet services in these countries and ultimately Internet penetration, which in the case of Malawi is less than 10%.

DBSA has an opportunity to play a role in investing in a link from Tanzania to the existing TEAMS cable or investing in a new submarine cable with a new landing point in the country itself. For landlocked countries, DBSA has a potential role to play in investing in links between existing submarine cables in South Africa or Kenya with the national backbone networks of Zimbabwe, Zambia and Malawi.

Tanzania Opportunity

Tanzania only has modest international connectivity capacity (6 Tbps) despite being on the East African coast and next to Kenya, which has access to capacity of 47 Tbps, via the East African Marine System (TEAMS). Despite the liberalisation of its international gateway in 2005 followed by the landing of SEACOM and EASSY submarine fibre cables in 2009 and 2010 respectively, Tanzania has failed to connect to more cables since this time, and the lack of capacity is resulting in expensive Internet costs and for many, unreliable Internet connectivity.

TEAMS is a 5,000-km fibre-optic undersea cable which links Kenya's coastal town of Mombasa with Fujairah in the UAE. It was built at a cost of US\$130mn as a joint venture between the government of Kenya and Kenyan operators, who hold 85% shares, and UAE incumbent operator Etisalat, which has a 15% share.



Source: TEAMS

The cable is connected to Kenya’s national fibre backbone network and other major backhaul providers, thereby extending the gigabit submarine capacity to other countries in East Africa including Tanzania through cross-border connectivity arrangements. However, the comparison between internet speeds in Kenya and Tanzania show the paucity of bandwidth available from this cable for Tanzania.

Speed Tests: April 2018	Mobile Broadband	Fixed Broadband
Kenya	Download: Mbps 15.6 Upload: Mbps 7.57	Download: Mbps 14.31 Upload: Mbps 8.71
Tanzania	Download: Mbps 9.03 Upload: Mbps 4.82	Download: Mbps 11.3 Upload: Mbps 10.63

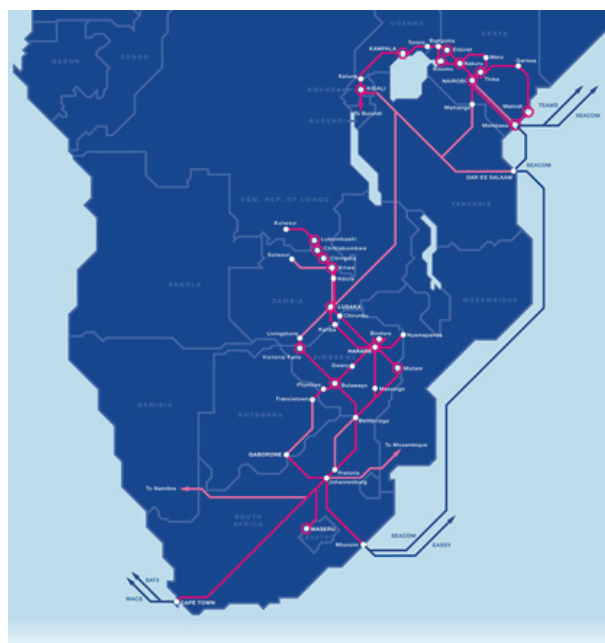
Source: Ookla

DBSA Role

DBSA should work with TTCL on increasing capacity that Tanzania has from TEAMS. If this is not possible for political rather than financing reasons (e.g. Kenya throttling what it is giving to Tanzania in terms of bandwidth on TEAMS) then the focus of this co-operation should change to building a similar cable towards the UAE, the closest hub for high bandwidth international access, with Tanzania as a landing point.

The case for such a new submarine cable is greater when taking into account the needs of other landlocked countries, which could benefit from increased connectivity to submarine cables via countries like Tanzania or Mozambique. Malawi has access to just 5 Tbps of capacity and has one of the lowest Internet usage penetration rates in Africa. Zambia is another land-locked market with a similar capacity issue with internet connection speeds considerably slower than either Kenya or Tanzania (at just Mbps 2.3) for mobile broadband. Working with the incumbent operators in Malawi, Zambia and Zimbabwe, DBSA should look to connect access for these countries to submarine cables landing in Kenya or South Africa, or potentially Tanzania.

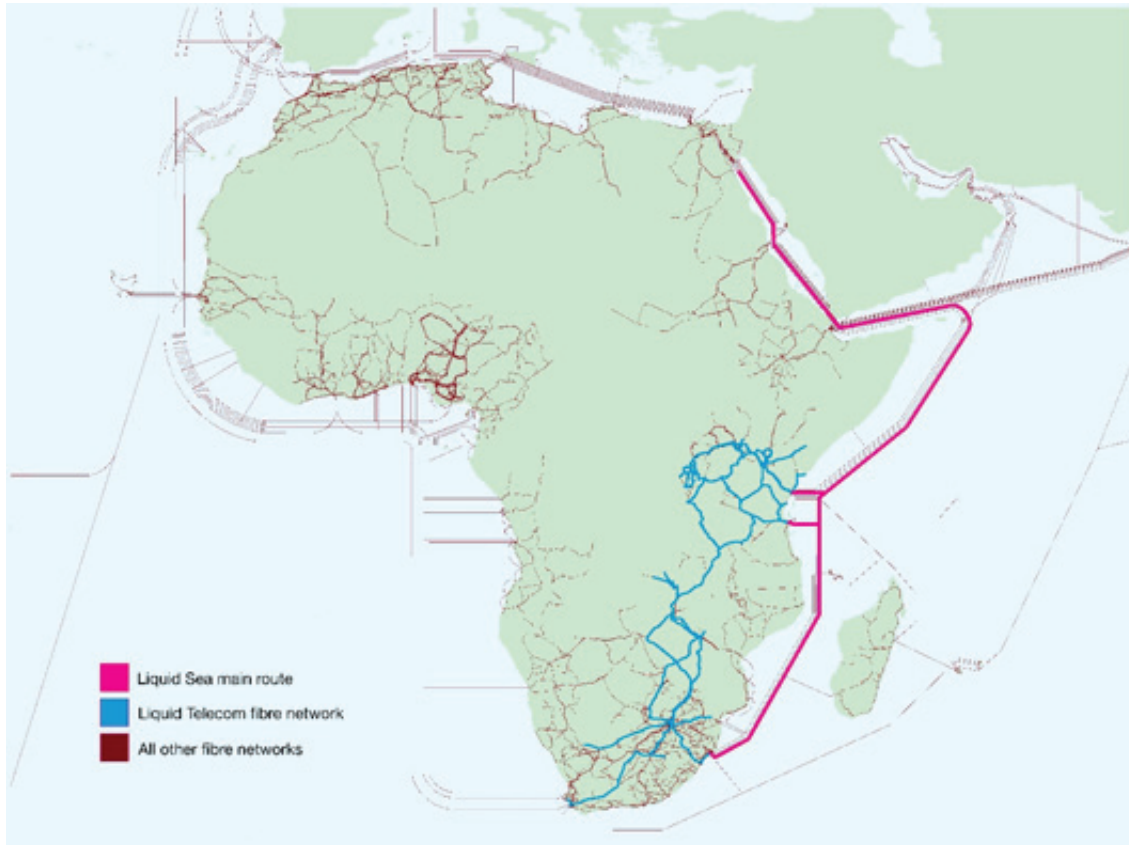
A connection through South Africa is becoming more attractive as a result of Liquid Telecom’s ongoing terrestrial expansion in southern Africa (see below map). DBSA could support access to the above landlocked country’s backbones via SAex (a proposed submarine cable with 40 Tbps of capacity linking South Africa with Brazil and due in 2019) and WASACE (a proposed submarine cable of 40 Tbps of capacity linking South America with Nigeria and then linking South Africa).



Source: Liquid Telecom

Liquid Telecom also plans to connect its terrestrial African network to the Middle East with a 10,000km submarine cable, known as Liquid Sea, which will carry data traffic between Africa, the Middle East and Europe. An investment into Liquid Sea (see map below) could also be an opportunity for DBSA.

If this is not a suitable opportunity, connecting Tanzania with TEAMS or putting in place a submarine cable with Tanzania as a direct landing point becomes a priority. This will not only help improve internet connectivity to Tanzania (and lower prices) but also in the landlocked countries of Malawi, Zambia and Zimbabwe, connecting Dar es Salaam to Lilongwe, Lusaka and Harare via terrestrial cables. For this to happen, lobbying with local operators and ministries needs to begin.



Source: Liquid Telecom

Infrastructure: Backbone

A strong backbone infrastructure provides faster and more reliable data and internet services to ensure better connectivity for rural areas, and is necessary if landlocked markets are to benefit from submarine landing points in coastal countries.

Some governments – as an example, Ghana, Kenya, Ethiopia and Uganda – have announced plans to invest in fibre backbones. Yet only half the population in SSA lives within a 25km range of a fibre network and the percentage of those living within proximity to two fibre networks is much lower making the idea of competition unlikely.

According to research carried out by *Hamilton Research*, the total inventory of terrestrial transmission networks (microwave and fibre networks that are operational, under construction or planned and proposed) has increased to 1,254,413km by June 2017. Once the network that is being constructed or is planned or proposed, nearly 6 out of 10 will live within 25km of a fibre network. The amount of operational fibre network alone was just over 820,000km, up from 410,000km in 2012. A further 120,000km of fibre network is under construction, 100,000km planned and over 50,000km under proposal. Once the network that is being constructed or is planned or proposed, this will increase to nearly 6 out of 10 being within 25km of a fibre network.

In our Index, the backbone infrastructure is measured by (a) national backbone network transmission type (VSAT, Point to Point links, fibre), (b) population coverage by technology (2G, 3G, 4G) and broadband speeds. DRC scores the lowest of the 20 countries, just behind Madagascar, Mozambique, Namibia and Zimbabwe.

Below we look at two opportunities: DRC and Zimbabwe.

DRC Opportunity

The country suffers from the absence of basic national and international connectivity. This leads to unaffordable ICT services for many with internet costs per GB hitting US\$13, compared to US\$2.3 in Tanzania.

The African Development Bank is working on a Central African Backbone (CAB) that will implement terrestrial fibre connections linked to an undersea optical fibre cable system on the Western African Coast (SAT3). This will link several Central African countries. The planned broadband backbone would leverage the fibre optic infrastructure laid along the oil pipeline between Kribi (Cameroon) and Doba (Chad), and will interconnect in its phase 1 three countries, namely Cameroon, Chad, and Central African Republic.

The project will expand and will include Gabon and Congo Brazzaville. If it does also include DRC, it will pass through a few cities connecting them to the CAB, which will provide much needed regional and international connectivity through submarine cables. But the country needs more than this. It needs an extensive national network with rings that connect all major cities to each other and to rural communities as well.

In October 2017, China International Telecommunication Construction Corporation (CITCC) and DRC's regulator, Congolese Society of Post and Telecommunication (SCPT) completed the second phase of its national fibre-optic network project, with the completion of a 3,300km link connecting the capital Kinshasa with Kasumbalesa on the Zambian border. Construction took 3 ½ years and cost US\$221mn, financed via an agreement with the China EXIM bank.

The regulator has already said that it needs a further injection of US\$4mn to increase the capacity of its fibre-optic backbone infrastructure. Currently, the capacity that arrives at Muanda (by the coastline where the submarine cables land – see image below) is 100Gbps, but the transmission from Muanda to Kinshasa is only 10Gbps. Here is potential for DBSA to invest in the upgrade of this national backbone.



Source: Google Maps

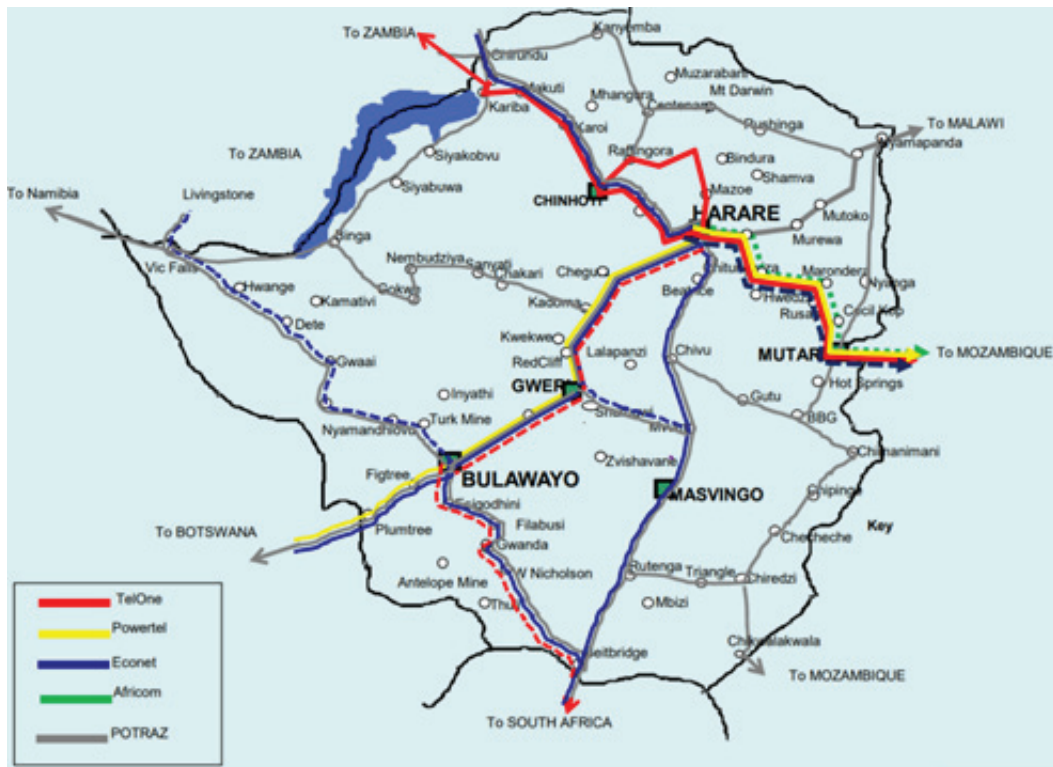
Zimbabwe Opportunity

Zimbabwe needs faster internet and greater internet coverage. The will is there for this to happen.

In 2011, the regulator outlined its plan for a backbone fibre network in Zimbabwe (see below). A number of operators also have a plan for fibre networks (as shown below). Such a fragmented approach makes it difficult to operate a single national backbone.



Source: POTRAZ (Postal and telecom regulator)



Note: Dotted line represents a planned network, solid lines are operational networks. Source: POTRAZ (Postal and telecom regulator)

The Western rural part of the country remains largely unserved.

Investment from DBSA into fixed line incumbent TelOne could serve to bring this partial fibre backbone into a single national network. A co-ordinated plan with the regulator, which already owns some of the network should ensure any such investment comes to fruition.

Capacity Building: Rural Mobile Broadband

According to the results from our scorecard, the five countries offering the least access to rural areas are DRC, Madagascar, Tanzania, Mozambique and Angola. In three of these countries – DRC, Mozambique and Tanzania – there is some government appetite to improve access to rural areas for mobile broadband services.

In DRC, the government has launched a fund for access and universal service to improve connectivity. The plan is for this fund to enable the provision of communications infrastructure and services in rural and landlocked areas of the DRC, and is an active step being taken by the government in conjunction with the industry's stakeholders to address poor network coverage and poor quality of service in the country. However, is it enough? The success rate of such Universal Service Funds (USF) is patchy at best. In a similar vein, Mozambique has initiated a US\$3bn national broadband investment plan at the heart of its initiative to improve rural coverage. In either case, there could be more practical investment to push coverage of mobile broadband to rural areas.

Tanzania offers an example. Here, the government has introduced a project encouraging the use of ICT in secondary schools. The Digital Schools Initiative will be implemented in 40 such schools in Tanzania with the first phase of the project covering Morogoro and Coast regions. The initiative is being implemented by the government in conjunction with the Global e-Schools and Communities Initiative (GeSCI). It will run for three years and aims to transform these secondary schools into Digital Schools of Distinction (DSD).

In this part of the report, however, we focus on two examples of practical initiatives that go over and above government investment, to make access to rural areas a reality. The first is the result of a partnership between the government of Zambia and Chinese network equipment manufacturer Huawei Technologies, whilst the second is a project initiated by Google. These both represent opportunities for DBSA in one way or another, either as potential replicable projects elsewhere or as a future partnership opportunity in the private sector.

Zambia: ZICTA/Huawei Initiative

Whilst the country's mobile network coverage reaches 99% of the population in urban areas, this figure falls to 84% in rural areas. Added to the poor coverage are issues around affordability and the extent of digital illiteracy, making parts of rural Zambia very poorly served in terms of internet access. Furthermore, erratic and expensive electricity represents an obstacle to access in rural areas, where less than 6% of residents have access to electricity.

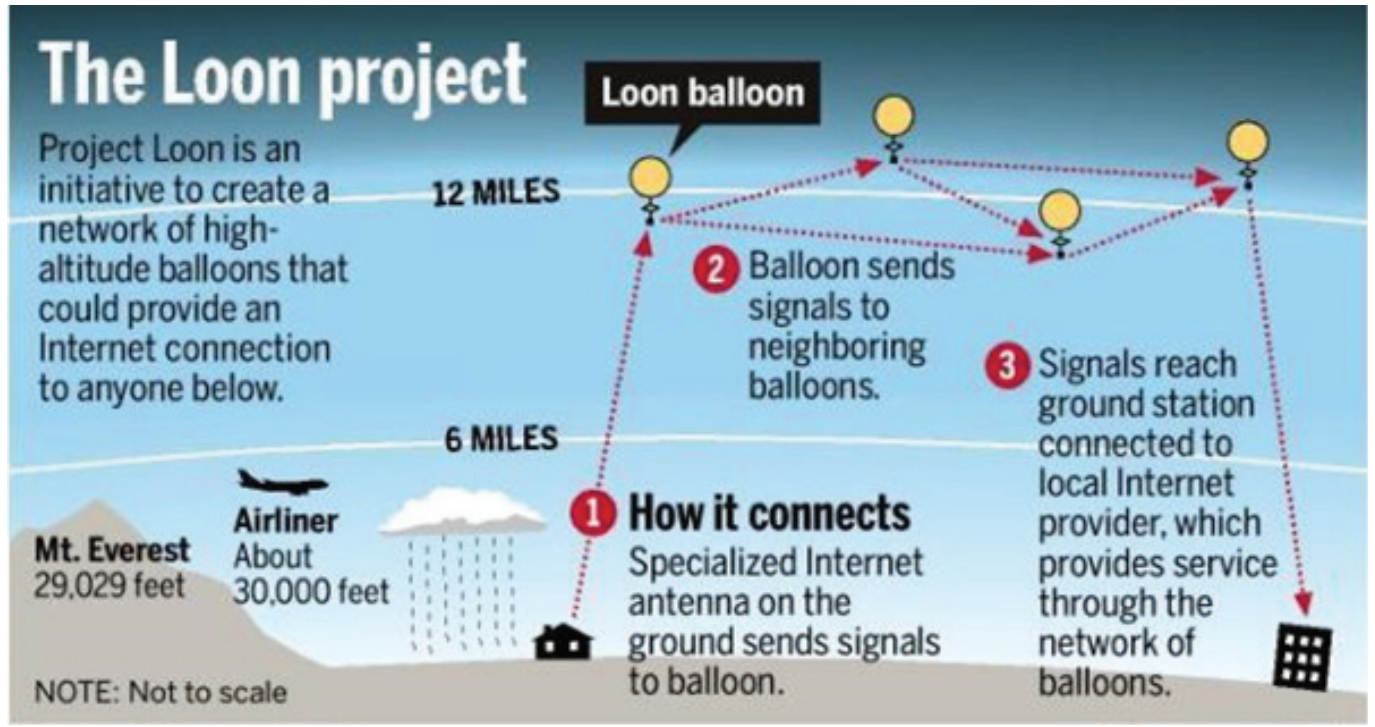
In collaboration with Zambia Information and Communication Technology Authority (ZICTA) and the government owned mobile operator Zamtel, Huawei Technologies launched a first phase of a communication network coverage project in 2014 which resulted in the installation of over 200 telecoms towers in rural areas across the country's 10 provinces, and connecting for the first time 200,000 people living in rural Zambia.

In a second phase of this project initiated in 2016, Huawei Technologies plans to connect more rural communities to mobile phone networks through the building of over 800 communications towers, to be operated by Zamtel. Huawei has stressed the importance of its relationship with the government in making this initiative a reality. It also has committed to ensuring the project is economically and financially viable and that it provides a long-term sustainable solution to lifting the urban-rural divide in Zambia. Huawei views its social responsibility program as pivotal to its plan to integrate local communities in Zambia (and elsewhere in SSA) into the global community.

The first phase of work took two years to complete. The second phase is more ambitious as it involves the installation of four times as many towers. It may be that there is room for further investment in this program with Huawei in Zambia. But if not, such a scheme should be replicable elsewhere with the support of the government. A relationship with Huawei over such an initiative could become a very powerful way of improving internet access to rural communities in other parts of SADC, beyond Zambia.

Project Loon

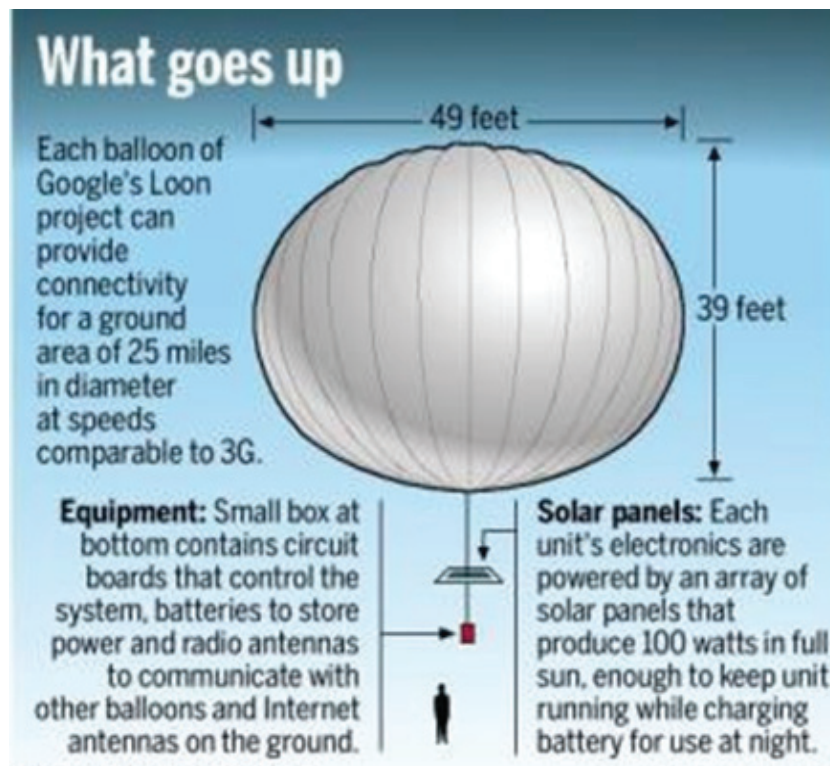
Put simply, Project Loon is a network of balloons in the stratosphere designed to extend Internet connectivity to people in rural and remote areas. High speed internet is transmitted to the nearest balloon from a telecommunications partner on the ground, and relayed across the network of balloons and back down to users. Connection speeds can be up to 10 Mbps. Developed by Google X, now known as just X, the project is owned by Alphabet.



Source: Google.com/loon

There is an appetite for the project to be operational in Africa. There have been test flights in Kenya and Ghana and according to Alastair Westgarth of Project Loon, “we look forward to working with some of the operators in the continent to figure out how to extend their networks to provide connectivity to the unconnected.”

The balloons are powerful in that they can provide coverage of up to 5,000 km², twice the size of Cape Town and the surrounding area. The balloons are also self-sustaining, both solar powered and with a battery so that they can operate at night. The technology has been developed to steer the balloons at different altitudes when the wind is blowing in different directions, or to cluster the balloons together, or hang them over a specific spot to provide prolonged coverage.



Source: Google.com/loon

Project Loon has already seen active service when it provided Internet connectivity in Peru and Puerto Rico after natural disasters knocked out telecommunications infrastructures in each country. In Peru – working with Telefonica – a network of balloons covered an area of 40,000km². Project Loon would always work in collaboration with telco partners with users seeing their network as their usual brand, rather than Loon. As such Project Loon enables an extension of a user's existing network.

In Puerto Rico, following a number of hurricanes, Project Loon worked with T-Mobile and AT&T to restore connectivity to rural and remote areas. The initiatives in Puerto Rico and Peru both demonstrated that Project Loon can work at scale by covering significant distance, connecting hundreds of thousands of people, providing LTE from 20km above.

Project Loon forms an investment opportunity for DBSA. SSA represents an important area for coverage from Loon. The balloon network could support a solution to bridge the digital divide by connecting the underserved in rural areas. Loon will need to work with telecoms operators and governments or regulators. A partnership with DBSA could help to give infrastructure project management and capacity building relationship muscle to Project Loon.

E-Services & Applications: Empowering local communities

Ensuring strong ICT connectivity on the supply side is half the battle. It is quite possibly the more time-consuming and expensive half, but nevertheless only a part of the issue. Without a plan to use this connectivity to provide relevant services to communities, a robust and strong infrastructure is worthless. Such relevant services could include allowing connectivity to improve access to education or healthcare, or advice around agriculture practices or empowering local entrepreneurship.

The following are the types of projects that DBSA could become involved in either as stand-alone projects or indeed as projects accompanying larger infrastructure initiatives with a focus on ensuring internet access to rural areas. All these projects could be replicated across SADC.

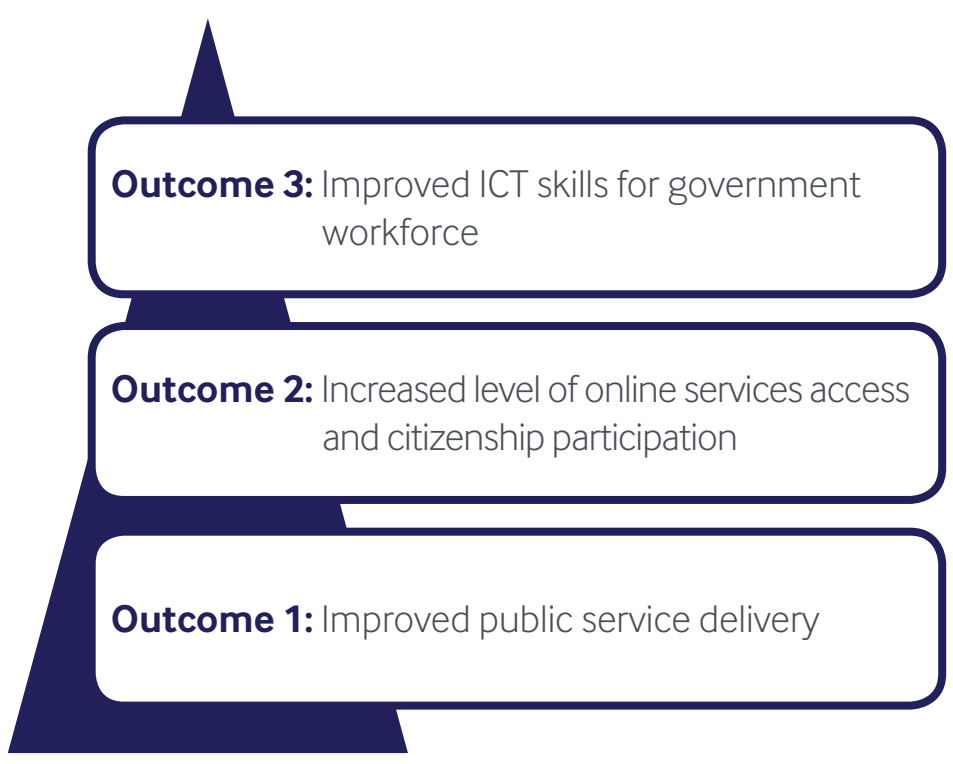
Project Type 1: Lesotho eGov Infrastructure

Funded by the African Development Bank, the project aims to improve the country's public service delivery through the establishment of a modern core e-Government infrastructure.

Its aim is to strengthen access to government shared services, including data centres and portals, and facilitate access to e-applications such as automated administrative services including e-payroll, civil registration, e-health, e-procurement, e-customs and revenue management.

The project has been allocated approximately US\$12.8mn, the majority of which is coming from African Development Bank and the rest from the Lesotho government. The project started in 2014 and is primed for conclusion at the end of 2018.

The project set out to achieve three outcomes.



Outcome 3: Improved ICT skills for government workforce

Outcome 2: Increased level of online services access and citizenship participation

Outcome 1: Improved public service delivery

There is more detail on this project in the Case Studies chapter below.

Project Type 2: Pan-African Women Entrepreneur Platform

Again, this is a project funded by the African Development Bank, this time in co-operation with the Common Market for Eastern and Southern Africa (COMESA), the East African Community (ECA) and the Economic Community of West African States (ECOWAS). The aim of the platform, known as “50 million women speak” is to improve the ability of women entrepreneurs to access finance and find relevant financial and non-financial information that will assist them to grow and sustain their businesses.

At its broadest level, its purpose is to create a dynamic and engaging exchange of ideas among women entrepreneurs, connecting them with one another in ways that will foster peer-to-peer learning, mentoring and the sharing of information and knowledge within communities, and access to market opportunities.



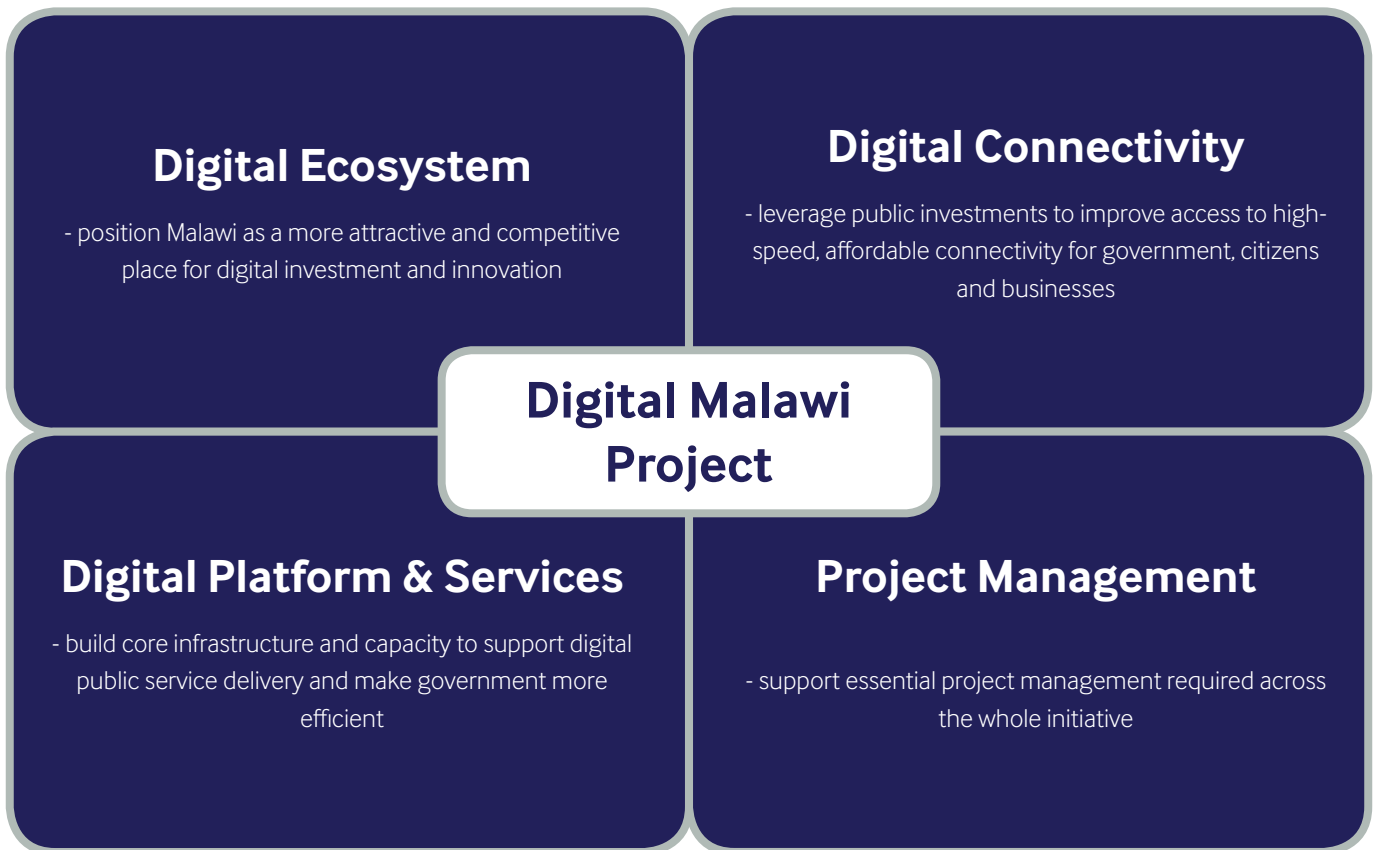
Source: The African Development Bank

The project has been allocated US\$12.4mn and will result in a platform covering 36 countries and accessible by mobile devices. Launched in 2016, the number of monthly platform users is expected to reach 50,000 in 2022. The platform should help those women that are facing challenges accessing financial and non-financial services - across SSA, it is estimated that the financing gap for women is approximately US\$20bn and is likely to be greater amongst younger women entrepreneurs. The African Development Bank projects that the rate of women entrepreneurs with access to banking loans could jump from 4% to 10% by 2022 as a result of this platform.

Project Type 3: Digital Malawi

Funded by the World Bank, the Malawi “Digital Foundations Project” aims to increase access to affordable, high quality internet services for government, businesses and citizens and to improve the government’s capacity to deliver digital public services.

There are four components to the project as illustrated below. In itself it is a microcosm of SADC’s *Regional Infrastructure Development Plan*, focused on infrastructure, capacity building, innovation and e-services.



The project has been allocated over US\$70mn, all of which is coming from the World Bank. Starting in 2017, the initiative is planned to conclude in 2022.

Project Type 4: eGabon

Another World Bank funded initiative (to the tune of US\$57.5mn), this initiative started in 2016 and is scheduled to be completed in 2022.

It has two specific objectives:

- 1. Public health services:** To improve the timeliness and availability of information to support delivery and management of public health services
- 2. eHealth applications:** To foster development and roll-out of eHealth applications and services, and ICT services more generally

The project will have the following outcomes:

- Strengthen the National Health Information System (NHIS) by including electronic medical records and clinical decision support capability
- Stimulate the development of local content, applications and services with an emphasis on eHealth through the creation of business incubators in Libreville and other major cities
- Implement missing links of regional and national fibre optic backbone to improve access to connectivity to government institutions (especially health facilities).

Project Considerations

There are a number of factors that need to be taken into account before initiating any of the above projects that should be taken into account.

1. To what extent are government institutions and residential areas outside the big cities home to reliable Internet connectivity?
2. Do consumers or workforces have the requisite digital literacy to make the most of the benefits afforded by these projects?
3. How easy is it to encourage investors given the low disposable income potential of many of the beneficiaries of such projects?
4. Do the appropriate legislative, financial and regulatory frameworks exist to encourage digitally-inspired initiatives such as these?

Innovation & Industry Development: Digital technology parks

ICT connectivity status should be used as a means to foster, encourage and enrich economic development. The use of technology parks can create an ecosystem to catalyse ICT-based innovation and development. DBSA's involvement in the funding of such a technology park would go well together with more infrastructure-focused development (submarine pipes, backbone or rural mobile).

In Chapter 4, we look specifically at the proposed outcome of a digital technology park being created in Senegal, which is being part-funded by the African Development Bank. Here, we look at two other examples.

Project 1: Konza City, Kenya

In 2008, the Kenyan government approved the creation of Konza Technology City as part of its flagship Kenya Vision 2030 project. The plan is for Konza to be a sustainable, world class technology hub and major economic driver for Kenya. It was initially conceived to capture the growing global Business Processing Outsourcing and Information Technology Enabled Services (BPO/ITES) sectors in Kenya.

Only a few African countries, including South Africa, Egypt, Morocco, Ghana and Mauritius, have made an effort to develop their BPO/ITES industries. Given its robust technology industry, Kenya has a significant opportunity to capture a sizable amount of the growing global BPO/ITES industry.

The first phase of Konza City is expected to create over 20,000 direct and indirect jobs. The city will be developed as a public private partnership, in which the government will take a minimal role, developing the public infrastructure and regulatory guidelines. In the longer term, Konza is being planned to accommodate 260,000 people.

The creation of this technology city is part of the government's long-term commitment to the ICT sector, which started with developing the necessary policy and legal frameworks (ICT Regulatory Guidelines, 2010, Special Economic Zone Policy 2012) to support the sector's growth and continued with infrastructure projects such as TEAMS and the National Optic Fibre Backbone Infrastructure, which upgraded and strengthened the country's broadband and communications systems.

As a result Kenya already has a network of public and private sector ICT research and development hubs, such as the University of Nairobi's Fab Lab, Strathmore University's iLab Africa and private sector hubs such as iHub. The creation of Konza fits well into the government's ICT policy of making Kenya a technological hub for Africa.

Development Program, Phase One	
Catalyst Program	
	End of Phase One
Office	81,000 m ²
University	194,000 m ²
Life Science	35,000 m ²
Hospital	50,000 m ²
Subtotal Catalyst Program	360,000 m²
Accessory Program	
	End of Phase One
Civic and Services	14,000 m ²
Schools	47,000 m ²
Hotel	6,000 m ²
Retail	65,000 m ²
Residential	1,032,000 m ²
Residential Units	9,400
Subtotal Accessory Program	1,173,400 m²
Total Program	1,524,000 m²

Source: Konza City

International companies including Google, Toyota, Huawei and Shapoorji Pallonji Group have all registered an interest in setting up in Konza.

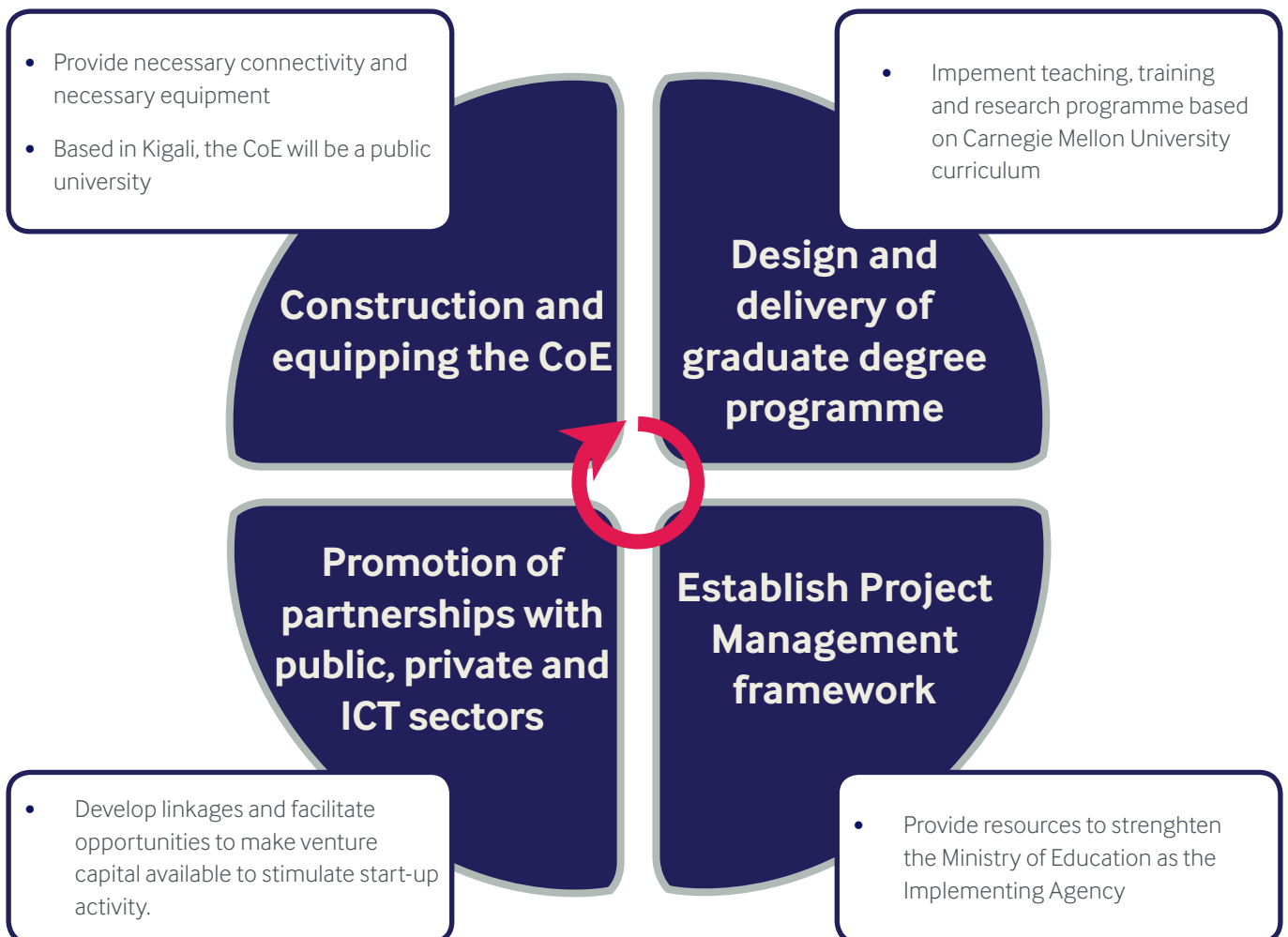
Project 2: Centre of Excellence, Rwanda

Funded by the African Development Bank (US\$12mn), the implementing agency will be Rwanda’s Ministry of Education, Science, Technology & Scientific Research. Started in 2012, the objective of the project is to strengthen high level ICT skills in Rwanda to improve the company’s productivity and its competitiveness. The bank sees this project as pivotal to the establishment of sustainable institutions that encourage skills development and research and innovation to support Africa in its quest to compete in the knowledge economy. As such, it fits well with the bank’s mandate and with government commitments.

The CoE will build capacity in Rwanda in the following ways.

- Hundreds of graduates with strong ICT skills will become available to the workforce.
- A climate of incubation will be fostered encouraging local entrepreneurship.
- The development of the ICT sector will lead to an improvement in the delivery of social services (health, education, public services).
- Within 10 years, the CoE will create well over 1,000 job opportunities in the ICT sector
- Advanced ICT skills taught in the CoE will lead to improved research and development in mobility, security and other applications that will help to bridge a digital divide.
- More women will participate in ICT learning and research.

The project itself will support the construction and equipping of a CoE, provide academic teaching and a research programme based on an international standard curriculum with the express aim of promoting entrepreneurship and making links between the CoE and the private sector. There are four components to the initiative.



Chapter 3: Case Studies

In this chapter we go into more detail on five specific projects, some funded by the African Development Bank, and others by the private sector. In all cases, we assess the project's objectives, describe the project itself and evaluate the desired results of each initiative. Most are ongoing. These are chosen based on the opportunities described above. All are the type of projects that DBSA should consider in terms of playing a funding or project management role. All meet some of the gaps identified in this report.

Rural Communications: Zenzeleni - Mankosi

Project Overview

- In the most remote areas of South Africa, often only either Vodacom or MTN (not both) offer communications services as neither sees the business benefit in both covering rural areas.
- A lack of competition in rural areas means communications prices are higher in the areas where there is the least coverage and the greatest affordability issues.
- Rural communities can set up their own mobile services to reduce costs. Zenzeleni Networks Mankosi Ltd, a fully licensed (PECN/ECSLE) telecommunications co-operative owned and operated by local people, did just this.
- The service provides free internal calls and discounted rates to call mobile phones and landlines from a set of public phones spread in the community connected via a network of WiFi access points.

Project Description

Mankosi lies in the Eastern Cape Province. Most of its 3,500 residents live on less than US\$2 per day. However, these same residents choose to spend about a fifth of their income on communications services even though mobile network coverage is poor, as shown by fewer than a quarter of the residents being online in any given month.

In 2012 a partnership began between the Mankosi community and the University of the Western Cape (UWC). The partnership resulted in a locally-owned, not-for-profit telecommunications cooperative, Zenzeleni Networks Ltd.

The network of WiFi access points worked reasonably well, especially in those host houses (and neighbouring homes), which formed part of the mesh network. Many carried on using their own mobile devices, however.

In addition to free internal calls and discounted rates for calls made from a set of phones connected via a network of WiFi access points, charging stations deployed in the community have contributed to a 55% reduction in the price people pay to keep their mobile phone charged. This was transformational for many and really changed the dynamics of how local residents used their phones.

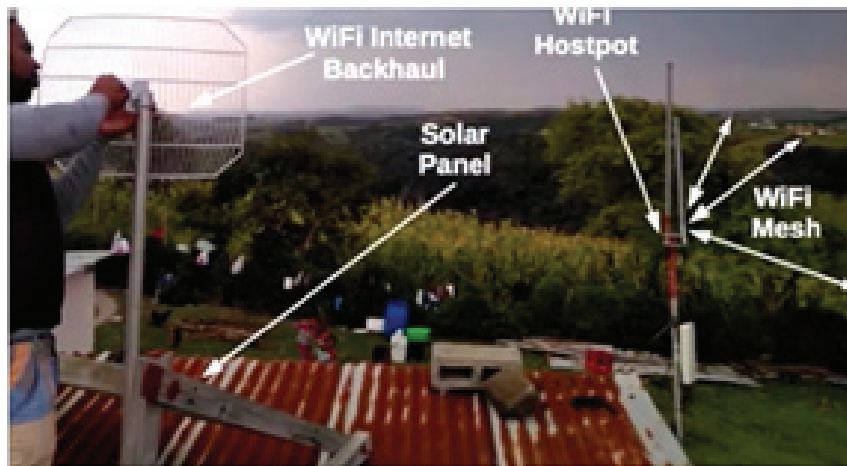
Tests are being run to offer cheaper Internet access to local schools and to local businesses. This forms part of the sustainability principle of the initiative, which aims to use the proceeds of the network to support the local community.

A map with installed WiFi antennas across Mankosi



Source: zenzeleni.net

Installation of point-to-point WiFi antennas on roofs of homes in Mankosi



Source: Internet Society

In 2012, researchers from the UWC proposed mesh networking, a cheap and low-energy system of scattered node devices rather than central masts or beacons

The community named a committee to register the co-op, open a bank account, and to manage the running of the service, including proceeds

A member of each host household took training in installation and operation of the node equipment

Zenzeleni agreed with a South African VOIP company to place calls to other networks (cellular or landline) for 17% of the normal cost of such calls

Project Funding

The project received initial funding from the UWC and the local community itself. However, to sustain itself, it charges 50% of MTN's rate, although the cost of out-of-network calls is 17% of the MTN per minute cost. The retained difference is used for Opex and any investments required in a network upgrade. So, in April 2017, the co-operative was able to upgrade its network as a result of a saving of US\$10,000 in cost through a reduction in its Opex.

The Internet Society's South Africa Gauteng Chapter is benefiting from its "Beyond the Net Funding Programme" and supporting Zenzeleni in its efforts to upgrade the network system.

Project Benefits

The project is a true community initiative in that it supports local residents gain greater access to communications services, but also from the running of a co-operative network, it has been possible to support various community activities, such as connecting local schools and providing grants for local children to continue their education beyond Mankosi.

The most immediate benefits from the running of the Zenzeleni network have been:

- Free calls within Mankosi itself
- Calls outside Mankosi of half the price compared to MTN network
- Solar panels powering the network also being used to charge mobile phones at a fraction of the costs paid previously and to the greater convenience of local residents

Project Future Aims

The next step for Mankosi could be to set up its own local mobile network using unlicensed GSM spectrum, similar to Rhizomatica in Mexico (as discussed in Chapter 1). It hopes to set up a backhaul to a fibre network in the nearest city through a series of relay towers. This would support a robust, reliable and affordable Internet connection, made available to local schools and the community as a whole.

The Internet Society of South Africa views Zenzeleni as an effective first phase towards connecting other rural communities. What has been done in Mankosi is replicable, and aligns closely to the Society’s Development Plan of having all South Africans connected and using the Internet by 2020.

For Zenzeleni, future investment is likely to go towards one of the following areas of focus:



CSquared

Project Overview

- Ongoing project, following successful initiatives in Uganda and Ghana (Project Link)
- Sources of Finance: The World Bank; Google; Convergence Partners and Mitsui & Co.
- The companies have pledged US\$100mn for future investments
- Project initiated in 2013
- Company now has over 800km of Metronet fibre in Kampala and Entebbe (Uganda) and more than 840km of Metronet fibre in Accra, Tema and Kumasi (Ghana)
- Partnership in place with USAID and Liberian government to build a Metronet in Monrovia, Liberia
- Further projects could include Metronets in Maputo, Mozambique and Abidjan, Nigeria
- CSquared is run as an independent company, headquartered in Nairobi

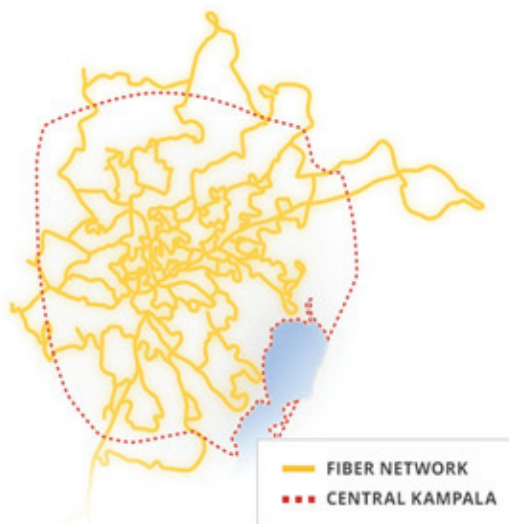
Project Description

To serve mobile operators and ISPs in Africa with high speed and reliable optical fibre networks. Its first metro fibre network was in Kampala, Uganda, converting a dense urban centre that was limited to pre-broadband speeds. Last-mile WiFi access was made available to MNOs and ISPs with the CSquared network leveraged by homeowners, small businesses and mobile users.

Google created CSquared so as to co-invest with partners that could bring local knowledge and expertise, or specific technical know-how. It has approximately 30 customers (MNOs and ISPs) and supplies broadband connectivity to 1,300 towers and commercial buildings.

Central to the project is the belief in shared infrastructure of sufficient quality. CSquared is a neutral, wholesale business that is not guilty of overbuild. Local service providers rollout new services – 4G or public WiFi zones – with Google opening access to the last mile that links to the more extensive long-distance fibre network.

Metro fiber in Kampala
1 of 2 metro areas served in Uganda



Source: CSquared

Launched CSquared in Kampala, home to 1.6 million people and many small businesses. Fibre and Wi-Fi infrastructure helps meet city's network demands.

CSquared has since expanded to Ghana with fibre network driving internet growth in Accra, Tema and Kumasi.

CSquared network is available to all local providers, supporting access and bandwidth demands with the aim of bringing all closer to fast and reliable Internet access.

Project Funding

Google was the initial sponsor of Project Link in 2013. CSquared was formed when Google joined with ICT investment companies Convergence Partners and Mitusi, and the International Finance Corporation (IFC) in 2017. The company has funds of US\$100mn to support the expansion of networks in other markets, similar to Kampala.

As far as the IFC is concerned the investment falls into its *Digital Infrastructure Initiative* program, which falls into these three categories:

- 1.** Mobile: to support the expansion of mobile operators in frontier countries. IFC's program role is to provide longer term financing and mobilize other financial investors
- 2.** Infrastructure Sharing: to support the use of technology and shared resources to provide greater efficiency and competitiveness, and to encourage open access models. IFC's program role is to fund acquisition financing and growth capex.
- 3.** Broadband: to support increased universal and affordable access to the internet and to bridge a growing infrastructure gap in SSA. IFC's program role is to fund projects, co-develop projects and support under-utilized assets to provide open access.

Project Benefits

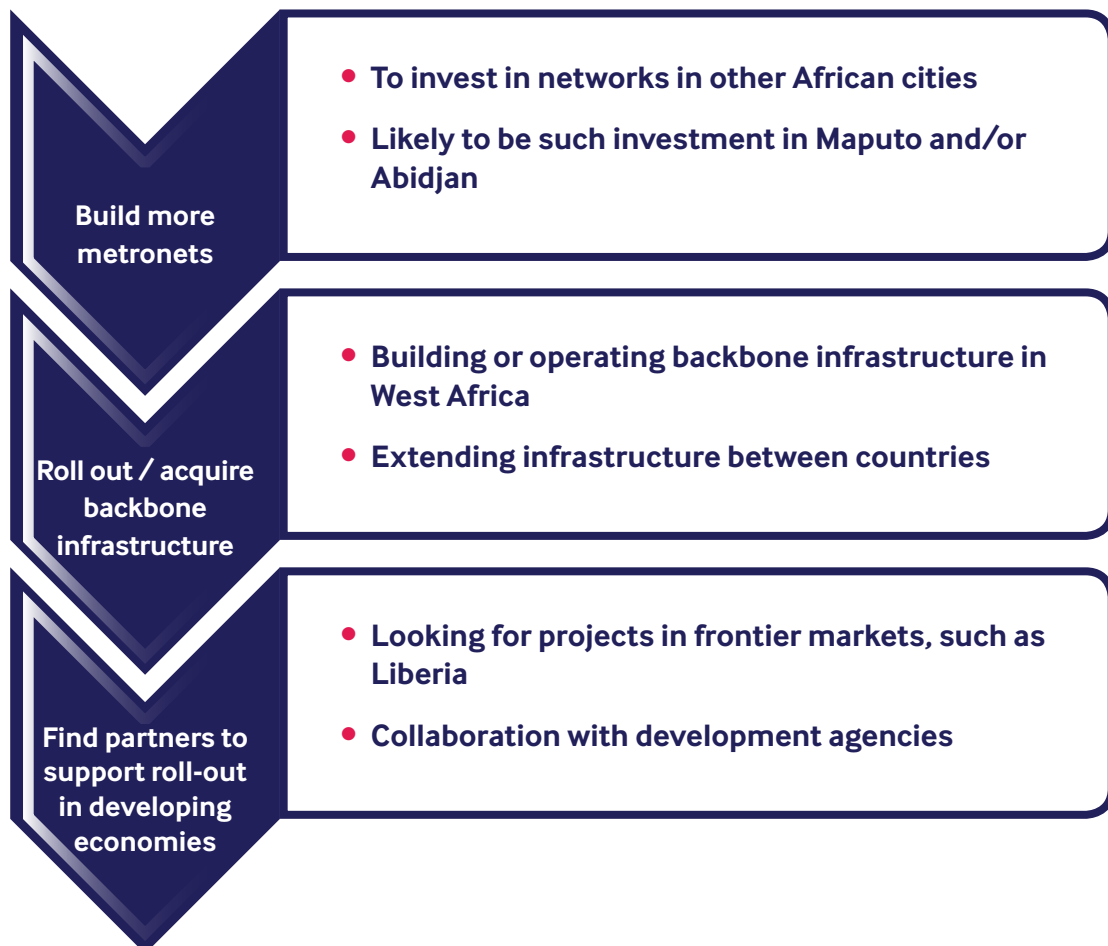
According to IFC’s own Digital Infrastructure Initiative aims, its Broadband funding exercise will be critical to any reduction in the digital divide between developed and developing economies, as highlighted by a 5% increase in broadband penetration leading to at least 0.1% increase in productivity, and a 10% increase in broadband penetration leading to at least 1.4% increase in GDP.

Illustrated below are the benefits to the inhabitants of Kampala, as highlighted by three stakeholders representing large international business, local entrepreneurs and the education sector.

Expanding capacity	New opportunities	Accelerating growth
<p>Contribution: Providing greater Internet capacity giving greater opportunity for commerce and education.</p>	<p>Contribution: Introducing first class network has allowed entrepreneurs greater opportunity for innovation and collaboration.</p>	<p>Contribution: Fibre network can support large amounts of data and scales so that more people can come online allowing for more reliable connections.</p>
<p>Impact: “The CSquared network ensured high availability, which was important as we sought to break into a competitive environment.”</p>	<p>Impact: “The CSquared network is bringing data cost savings allowing us to invest more in product innovation.”</p>	<p>Impact: “Research and education collaboration among universities and research institutions in Uganda is important for national development. CSquared provides last-mile connectivity that enables us to build a network that is scalable and resilient”</p>
<p><i>Derrick Sebbaale, CTO of Vodafone Uganda</i></p>	<p><i>Timothy Musoke, CTO of software development company in Kampala</i></p>	<p><i>Isaac Kasana, CEO Research & Education Network of Uganda</i></p>

Project Future Aims

Future investment is likely to go towards one of the following areas of focus:



Within the next three years, CSquared expects to have presence in two or three other countries (as well as Uganda and Ghana) and backbones between countries in West Africa, such as Nigeria, Ghana and Senegal. The network will provide FTTH on a wholesale basis in Ghana and Nigeria, and will work with mobile network operators as anchor customers.

Infrastructure Backbone & Capacity Management: Central African Backbone (CAB)

Project Overview

- A massive regional backbone project of six different phases
- Funded by the African Development Bank at commitment amount of US\$256mn
- Total project cost is US\$331mn
- Phase 1 started in September 2009 and the projects needs 10+ years to complete
- Countries affected: Cameroon, Central African Republic (CAR), Chad, São Tomé and Príncipe, Congo, Gabon and Democratic Republic of Congo (DRC)
- Expected Completion Date: December 2019

Project Description

The project aims to contribute to the increase in geographical reach and usage of regional broadband network services and to reduce their prices. It is based on an Adaptable Program Loan (APL).

Phase 1A - Cameroon, CAR, Chad	Phase 1B - CAR, Chad	Phase 2 - Sao Tome and Principe
<ul style="list-style-type: none"> • Finance technical assistance, training and equipment • eGovernment and flagship ICT applications • Promote public access to administrative services and facilitate the use of ICT 	<ul style="list-style-type: none"> • Finance a public private partnership structure to support the deployment of interconnected networks 	<ul style="list-style-type: none"> • Technical assistance and capacity building for legal and regulatory reform • Develop and launch a second global telecommunications operator license • Financing for the Africa Coast to Europe
Phase 3 - Congo	Phase 4 - Gabon	Phase 5 - DRC
<ul style="list-style-type: none"> • Enabling environment at the regional and national level • Development of the ICT legal framework and capacity development • Implementation of a broadband national network • Promotion of ICT sector • Creation of IT MSMEs, incubators and IT parks 	<ul style="list-style-type: none"> • Technical assistance to promote and implement open access regime • Financing the national infrastructure for the CAB including fibre optic cables • Good governance and transparency • Establishment of government Virtual Private Networks (VPNs) to collect all the government communication needs 	<ul style="list-style-type: none"> • Support the Ministry to enable and accelerate the emergence of an information society and the growth of digital economy • Construction, management, and commercialisation of the infrastructure • Enabling environment and regulatory effectiveness • Support the regulator to reinforce and strengthen its regulatory tools

Project Objectives

The objectives for each Phase are described below.

Phase 1A

Enabling environment

- Modernize ICT policy, legal, and regulatory environment
- Strengthen key public institutions
- Promote a competitive environment and restructure incumbent operators

eGovernment and flagship ICT applications

- Promote public access to administrative services
- Facilitate use of ICT through the establishment of online administrative services

Phase 1B

Connectivity

Finance a public private partnership structure to support the deployment of interconnected networks to form a regional network, and add support for the effective management and monitoring of CAB networks.

Phase 2

Enabling environment

Technical assistance and capacity building for legal and regulatory reform, to develop PPP arrangements for the infrastructure to be developed and to launch a second global telecommunications operator license to provide fixed and mobile services.

Connectivity

Financing for contribution (a consortium fee) for participating, via a special purpose vehicle company, in the Africa Coast to Europe (ACE) cable on an open access basis using PPPs, leveraging private sector investment, and associated investments such as the setup of an Internet Exchange Point (IXP).



Source: World Bank

Phase 3

Enabling environment at national level

Supporting the development of the ICT legal framework and capacity development of the regulatory authority ARPCE.

Connectivity

Supporting the implementation of a broadband national network.

Promotion of ICT sector

Supporting the creation of Information Technology (IT) for Micro, Small and Medium Enterprises (MSMEs), incubators and IT parks.

Phase 4

Enabling environment

- Hiring legal and business experts to advise Government of Gabon on negotiations with private sector operators
- Financing technical and financial audits of the structures to be setup and through workshops on Promoting PPP investment in the telecommunications sector
- Supporting tender design and audit of national backbone and Internet Exchange Points (IXP) to access the international and national connectivity
- Design a strategy and action plan to support the increase of broadband access, especially to rural areas, as well as the further liberalisation of Gabon including a regulatory regime for Internet Service Provider (ISPs)
- Support the establishment of an Internet Exchange Point (IXP) and to implement a management policy for Internet domain names

Connectivity

- Financing the national infrastructure including fibre optic cables (with a potential contribution for a submarine cable), terminal equipment, switches, to guarantee the establishment of an open access network (open to all operators) on the basis of PPPs, leveraging private sector investment
- Financing the purchase of capacity on the CAB for targeted users (schools, universities, hospitals, eGovernment use) with discounted capacity prices. Support to extend ICT in rural areas on the basis of PPPs and/or with competitive award of subsidies (including country-specific innovative demand stimulation programs such as Digital Villages and the SMS eService programs).

Good Governance and Transparency

- The establishment of government Virtual Private Networks (VPNs) to collect all the government communication needs (voice and data) to be routed via the CAB and the establishment of national and regional Internet Exchange Point (IXP).
- Support the relevant government or public authority to ensure that it is being administered in the public interest, within the framework of its national public policy and relevant laws and regulations.
- Deploy flagship applications for which commitments have been identified to improve internal systems and to deliver services more efficiently and effectively

Phase 5

Digital initiative

- Support the Ministry to enable and accelerate the emergence of an information society and the growth of digital economy by supporting ICT skills, create new business opportunities for local ICT firms, and promote ICT sector and digitalisation

Connectivity

- Construction, management, and commercialisation of the Phase 5 infrastructure through a PPP scheme will, which support deployment of interconnected networks to form a regional network

Enabling environment and regulatory effectiveness

- Support the regulator to reinforce and strengthen its regulatory tools and capacity to promote further sector reform.

Project Funding

Phase	Countries	Approval Date	Closing Date	Status	Total Project Cost	Portion spent on Fibre	Commitment amount
Phase 1A	Cameroon, CAR, Chad	24.09.2009	15.03.2016	Completed	US\$26.73mn	na	US\$26.2mn
Phase 1B	CAR, Chad	30.06.2011	17.12.2012	Completed	US\$58mn	US\$50m (CAR – US\$20m, Chad US\$30m)	US\$50mn
Phase 2	Sao Tome & Principe	20.01.2011	31.12.2014	Completed	US\$14.9mn	US\$14.9m	US\$14.9mn
Phase 3	Congo	25.05.2011	29.06.2018	On-going	US\$30mn	US\$15mn	US\$15mn
Phase 4	Gabon	28.03.2012	30.06.2018	On-going	US\$109mn	US\$58mn	US\$58mn
Phase 5	DRC	16.07.2014	31.12.2019	On-going	US\$92.1mn	US\$80mn	US\$92.1mn

Source: African Development Bank, BMI

Project Benefits

The CAB aims to build high-speed internet infrastructure across Central Africa, enhancing existing businesses and creating a plethora of new economic opportunities across the region. The table below shows some specific benefits by countries covered in this project.

Country	Benefits
DRC	<ul style="list-style-type: none"> • Extended optical fibre
CAR	<ul style="list-style-type: none"> • eGovernment platform including Emergency Warning System • 10,000 women will start to use ICT tools each year • Private operators will extend services to all localities served by optical fibre capabilities improving last mile connectivity
Cameroon	<ul style="list-style-type: none"> • Improve life of rural residents with improved capacity • New employment opportunities • Development of agricultural activities • Improved connectivity in schools and health clinics
Chad	<ul style="list-style-type: none"> • Link neighbouring countries to optical fibre backbone • E-government platform • 30,000 women trained in use of ICT tools • Private operators will extend services to all localities served by optical fibre capabilities improving last mile connectivity

Senegal Digital Technology Park

Project Overview

- Ongoing development project
- Source of Finance: African Development Bank; Senegal Government
- Implementing Agency: Ministry of Post & Telecommunications, Senegal
- Approval Date: October 2015
- Start Date: April 2016
- Expected Completion Date: December 2019

Project Description

The project is the establishment of a Digital Technology Park in the rapidly urbanizing Diamniadio Commune, 35km outside Dakar. The park will occupy an area of 25 hectares.

Construction and equipping ICT service buildings	Construction and equipping public buildings and facilities	Project management and capacity building
<ul style="list-style-type: none"> • 3 enterprise towers used by local, regional and international ICT companies • Tier 2 Data Centre with cloud computing facilities • BPO Centre • Training Centre, Research Centre, Incubation Centre 	<ul style="list-style-type: none"> • Commercial Centre accommodating retail, medical and recreational outlets • Administrative block for management of the park • Residential building for core staff 	<ul style="list-style-type: none"> • Strengthen capacity of stakeholders in implementation of digital technology park • Strengthen operational and technical capacity of project management team • Conduct detailed architectural design and supervision of works
87% of funding	8% of funding	5% of funding

Source: African Development Bank

Project Objectives

The overall project objective is to contribute to the economic growth of Senegal through the support of its local ICT industry. More specifically, the three main objectives are:

1. To establish Senegal as a hub for ICT investment and BPO
2. To create information economy jobs
3. To encourage ICT innovation and applications that contribute to the social and economic development in Senegal.

Central to the government of Senegal's 2035 Plan is growth through diversification and economic integration. Job creation – especially for women and young people – and the improvement of the business climate for private investment and economic diversification lie at the heart of the country's business strategy. The creation of the Digital Technology Park will serve to improve the contribution of the ICT sector to the economy and encourage youth employment, greater gender equality and foreign direct investment. The Technology Park project is one of 37 flagship projects that form part of Senegal's Emergent Plan for 2035, and is set to create 35,000 direct jobs in the ICT sector and over 100,000 indirect jobs, and will attract multinationals to relocate their activities to Senegal. This will form an important plank in the government's aim to increase the contribution of ICT to the economy from 6% to 15% by 2022.

African Development Bank has financed other similar projects such as the Cape Verde Technology Park (due to be ready in 2019 and will include a data centre and incubation centre) and regional ICT Centres of Excellence in Mali and Rwanda. The project will also build on other infrastructure projects financed by the bank, such as the Dakar-Diamniadio toll road (the so-called “Highway of Hope”) and the new Blaise Diagne International Airport.

Project Funding

Finance Plan	
African Development Bank	EUR 60.96 mn (Project Loan)
Government of Senegal	EUR 9.65 mn (Counterpart Funding)
Total	EUR70.61 mn

ADB Key Financing Information	
Interest type	Floating
Interest rate margin	60pb + Bank’s contributing margin
Loan payment	Half yearly
Maturity	20 years
Grace period	5 years
FIRR, NPV (base case):	7.32%, NPV EUR42.06m
EIRR (base case):	16.6%

Source: African Development Bank

Project Aims

Project Impact	Indicator	Baseline	Target	Risks / Mitigation Measures
Contribution to country's economic diversification, modernisation and private sector development through development of ICT sector	Contribution of ICT to GDP	XOF517bn (2015)	XOF1,018bn (2025)	Infrastructure Risk: inadequate supply of electricity.
Increase in ICT-enabled services jobs	Additional number of direct and indirect persons employed in ICT Sector	30,000 direct jobs (2015 – 30% women) and 35,000 indirect jobs (2015 – 25% women)	65,000 direct jobs (2025 – 40% women) 140,000 indirect jobs (2025 – 35% women) 17,000 women trained in ICT services jobs (2025)	
Increase foreign investment in ICT-enabled services	US\$	US\$5mn (2015)	US\$200mn (2025)	Market Risk: Failure to attract international anchor companies.
Increase number of ICT companies involved in applications and services	Number of companies	200 (2015)	700 (2025)	Capacity and Retention Risk: Lack of adequate training and business management capability. The project will conduct ongoing entrepreneurship and technical training
Create and equip new ICT services facilities	Number of IT Business towers; Incubation Centres etc Tier III data centre processing and storage capacity	0	3 IT Business towers; 1 Incubation Centre; 1 Training Centre; 1 BPO Centre; 1 Research Centre; 1 AV Production Centre by 2019 2564 Core 20 Terrabyte RAM 1 Pentabyte storage – by 2019	Implementation Risk: Late award of civil works and supervision contracts. Need to recruit experienced contractors and supervise closely Data Centre Service Level Risk Need to secure SLAs with major IT service providers
Create and equip new administrative building and facilities	No of staff residence and management buildings	0	1 Residence Buyilding 1 Park Management building 1 Security Facility – by 2019	

Capacity Building: E-Government Infrastructure, Lesotho

Project Overview

- Ongoing development project
- Source of Finance: African Development Bank; Lesotho Government
- Implementing Agency: Ministry of Communications, Science & Technology, Lesotho
- Approval Date: September 2013
- Start Date: December 2013
- Expected Completion Date: December 2018
- Enhance good governance through the deployment of modern and secure e-government broadband infrastructure

Project Description

The project was created to enhance the co-ordination of public service delivery, strengthen government data centres and improve access to e-services for government buildings. The cost of the project is US\$12.825mn, of which 56% is a grant and 32% is a loan from the African Development Bank. The remaining 12% funding comes from the Lesotho government.

Project Component	Component Cost (as % of Total)	Description
1 Strengthen core government infrastructure	66%	<ul style="list-style-type: none"> • Construction of fibre over Lesotho Electricity Company power lines • Acquire government controlled dark fibre metropolitan network • Tender and install Virtual Landing Point for international access • Tender to install BTS in 4 new rural areas
2 Strengthen Data Centres	9%	<ul style="list-style-type: none"> • Upgrade energy supply facilities • Restructure and renovate data centres • Provide IT equipment and software • Configure servers and storage area network
3 Improve Government E-portal	7%	<ul style="list-style-type: none"> • Redesign government portal • Develop and link portal of ministries • Renovate office space and equip call centre • Construct service centre building in 4 rural areas
4 Skills Development	9%	<ul style="list-style-type: none"> • Renovate office space capacity • Purchase and install equipment for VC facility and multimedia training lab • Purchase and install computer lab equipment, networking and software
5 Project Management	9%	<ul style="list-style-type: none"> • Design and optimize core government infrastructure • Design fibre cable system on power lines • Design facilities for e-government services in 4 rural areas • Supervise works and annual audits

Project Objectives

The main objective is the promotion of good governance by the deployment of a modern and secure e-government broadband infrastructure. As such the project will focus on using ICT to enhance governance frameworks and to develop institutions and processes that allow the private sector to provide these services.

The project is aligned to the following:

1. **Lesotho National Vision 2020** – to be a stable democracy with a well-developed human resource base and a mature technology base
2. **Lesotho National Strategic Development Plan 2016-17** – to develop key infrastructure, democratic governance and effective institutions
3. **Lesotho Country Strategy Paper 2013-17** – to support infrastructure development and institutional capacity building
4. **African Development Bank 2013-22** – to support infrastructure development with specific ICT operations
5. **Regional Integration Paper for Southern Africa 2011-15** – to focus on ICT regional infrastructure

The African Development Bank is committed to support ICT applications including e-government as a key strategic thrust, and especially in the way it can stimulate economic growth. But an e-government initiative can also help to foster good governance. Lesotho was 137 out of 144 in the Global Competitiveness Report 2012 with the major constraints of the country's investment landscape including inadequate infrastructure, slow business procedures and skills gaps in certain economic sectors amongst the factors dragging them down the list. An e-government project such as this shows the government making progress in addressing such challenges.

Project Funding

Finance Plan	
African Development Bank Grant	US\$ 7.2 mn
African Development Bank Loan	US\$ 4.05 mn
Lesotho Government Counterparty Funding	US\$ 1.6 mn
Total	US\$ 12.85 mn

ADB Key Financing Information	
Commitment Fee	0.5% yearly on undisbursed portion of the loan, starting 120 days from signing of loan agreement.
Other Fees	0.75% service charge yearly on disbursed and outstanding portion
Tenor	50 years
Grace Period	10 years
EIRR (base case)	29% real (USD5.34mn) at 12% real

Source: African Development Bank

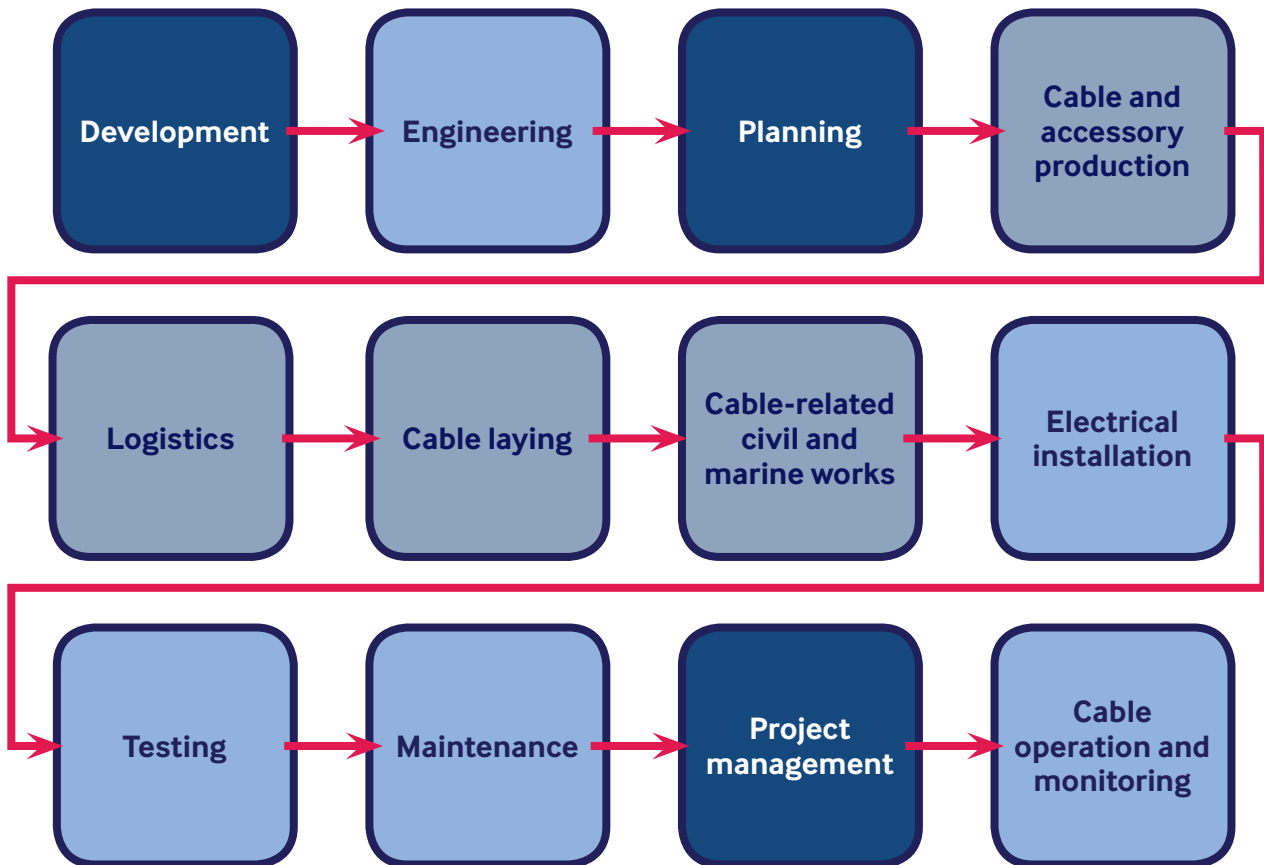
Project Aims				
Project Impact	Indicator	Baseline	Target	Risks / Mitigation Measures
Improved investment climate and public service delivery	Global Competitiveness Index	137 (out of 144) 2012	125 (out of 144) 2017 Reached 131	
Increased levels of online services access and citizen participation	Country Online Index	0.3007	0.4	
Improved ICT skills for government workforce	% of ICT projects success	40%	75%	
Core network infrastructure established	km of fibre cable constructed	0km	100km	Technological Risk: Damage to the fibre with little redundancy available Mitigation: Installation of fibre in power cables not in ground
	network speed improved	4-10Mbps	10-20Mbps	
	No of towers installed in rural areas	0	4	
	No of Service Centres established	0	4	
Data centres strengthened	No of servers & software upgrade	4 servers	10 servers	
	Security features, renovation & cooling system upgrade	0	2 data centres	
Government E-Portal established	No of online services	4 (passive)	8 (6 interactive, 2 transactional)	Risk: Lack of content or government does not maintain content leading to reduced reliance of portal Mitigation: Technical training to support update of portal to ensure up-to-date information is uploaded
	No of hits on government portal	50 / week	5,000 / week	
	No of ministry portals	4	8	
	% e-service users, women	20%	45%	
Skills development	No of ICT professionals trained	0	500	Risk: Labour mobility to private sector Mitigation: Government retention policy including incentives for government sponsored for government training programmes
	No of awareness campaigns	0	18	
	Training facility & video conference	0	1	

Source: African Development Bank

Chapter 4: Value Chains

In this chapter we look at the value chains for international connectivity (submarine cables), backbone, telecommunications and the Internet. Throughout the chapter, we assess these value chains with DBSA in mind. Each block that is shaded darker is where DBSA should consider playing a funding or project management role.

Submarine cables value chain



Source: BMI

The submarine cable value chain is vast and complicated. However, DBSA can play a role in many parts of this value chain, especially around development/planning and project management. Development would involve idea origination and necessary co-ordination with all stakeholders, both in source and destination countries.

Funding will be necessary for many links of the chain, and in particular cable production, logistics and cable laying and marine works. The heaviest investment in submarine cables is in producing them all the way until they are laid on the sea bed. This part will be conducted by expert companies (see below) with DBSA contributing to the funding.

Link of Chain	DBSA Role	Stakeholders
Development	Idea Creation Stakeholder Liaison	National Operator(s) – source and destination; Governments
Planning	Stakeholder Liaison	National Operator(s) – source and destination; Governments
Cable Production	Funding	Including: Hengtong Marine Cable System; AEI Cables; Alcatel-Lucent; Corning Cable Systems; Ericsson; Fulgor; Hefibel; Jainsen Cables; LS Cable & System; NEC; Nexans; NKT Cables; Pyramian
Logistics	Stakeholder Liaison	Including: Cable Hellenic Cables; General Cable; NKT Cables; Norddeutsche Seekabelwerke
Cable Laying	Funding	Including: Global Marine; Durocher Marine; Ecosse Subsea Systems; E-Marine; LD TravOcean
Civil and marine works	Funding	Including: Briggs Marine; Falmouth Divers
Project management	Stakeholder Liaison	National operator(s); Governments; Suppliers working across the value chain

Source: BMI

Backbone value chain

Governments usually supervise backbone infrastructure initiatives as part of their national broadband network plans. Regional backbone networks are often at least partly supervised and funded by DFIs in co-ordination with the governments of the countries where the regional backbone passes. In rare cases, a pan-regional operator will have a license for several neighbouring countries and will spread its regional network across that particular region.

Regional backbone (exceptional): a pan-regional operator ties together national networks into a single regional backbone, eg Liquid Telecom

Regional backbone (standard): supervised by international entity; executed by consortium of regional incumbents or international operators

National backbone: owned/run by government and executed by incumbent operator.*

* An exception is Zimbabwe's mesh of operators that supervised portions of a national backbone in different regions

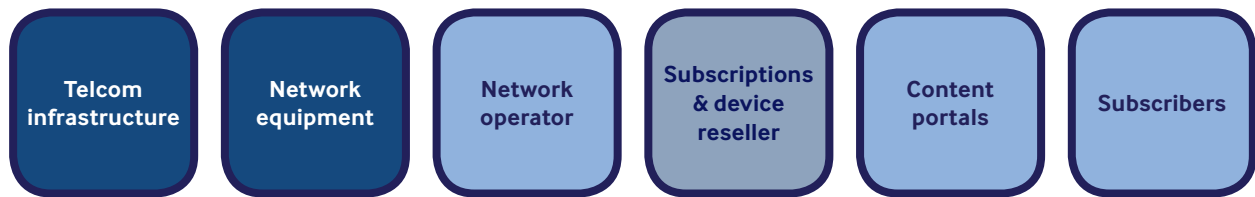
This value chain is similar to that of submarine cables. Terrestrial backbone is more expensive and has more complexities due to rights-of-way issues and digging at optimal depths to lay the fibre. The cost of producing the cable itself, however, is cheaper as it does not have to withstand the pressures confronted at ocean beds.

Below is an illustration of the potential role played by a DFI, such as DBSA.

Link of Chain	DBSA Role	Stakeholders
Development & Planning	Idea Creation Stakeholder Liaison	National Operator(s) – source and destination; Governments
Cable Production	Funding	Including: Hitachi Cable America; Oman Fibre Optic; HFCL; Optral; PDR World
Logistics	Stakeholder Liaison	Including: Nexans; Promax
Cable Laying	Funding	Including: International Network Systems; Leonhard Weiss; Huawei; Sagem
Project management	Stakeholder Liaison	National operator(s); Governments; Suppliers working across the value chain

Source: BMI

Telecoms value chain (fixed & mobile)



Source: BMI

DBSA's mandate is focused on infrastructure. The greatest need for SADC markets is last mile connectivity.

This starts with the passive network elements: towers for mobile operators and cabinets for fixed operators. The value chain for fixed services also features the need for domestic fibre or copper wire to run by all the premises to be covered by the network, i.e. in all the streets of the cities and villages. For mobile services, this need translates to sector antennas.

The active element is the next link in the chain. This is the equipment that uses the passive physical infrastructure to relay the live communications between end users. This is the second most expensive element for fixed services and the most expensive for mobile services.

The third part of the chain where DBSA has a potential role to play is in enabling the prices of smart mobile devices remains affordable to rural populations so they too can benefit from broadband services. This does not need to happen through direct investment, but perhaps by enabling the bulk purchasing and imports of cheaper devices or by funding the manufacturing and assembly of basic smart devices locally.

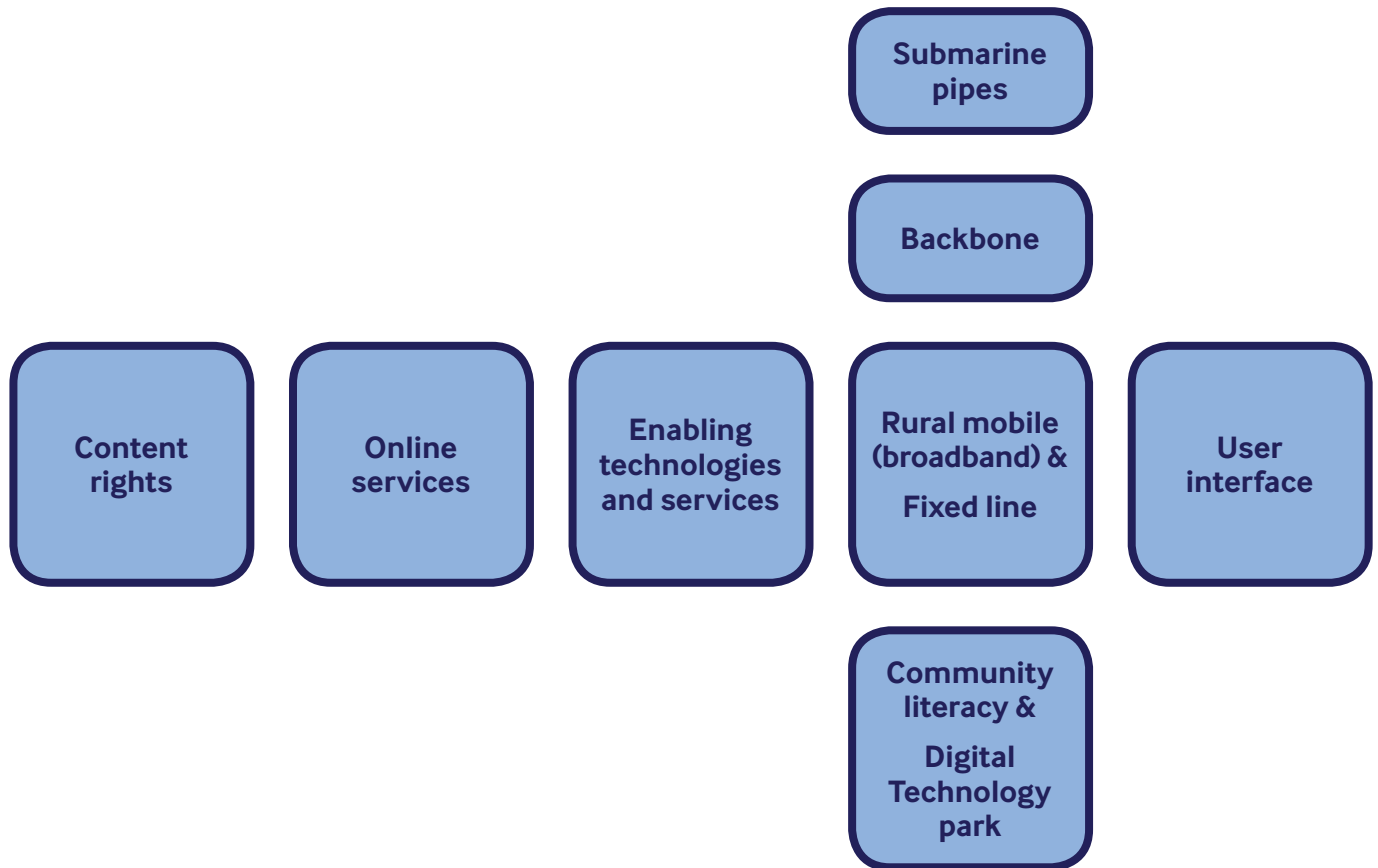
Below is an illustration of the potential role played by a DFI, such as DBSA, across this value chain.

Link of Chain	DBSA Role	Stakeholders
Telecoms Infrastructure	Funding	Including: HIS Towers; Helios Towers Africa; Eaton Towers
Network Equipment	Funding	Including: Nokia; Huawei; ZTE; Ericsson
Device Resellers	Stakeholder Liaison; Project Management; Funding	Including: Centro Wireless; Snapcraze; 3gmobile.com; aspiredist.com

Source: BMI

Physical infrastructure lies at the heart of what has been reported across the report. However, progress has been made around physical infrastructure – what is sometimes accentuating the rural divide is not just lack of coverage, but the paucity of content, the shortage of relevant services or the digital illiteracy if users. It is therefore useful to see where the telecoms and internet value chains intersect.

The intersection between Telecom and Internet chains



Source: BMI

DBSA can contribute to several of the links in the internet value chain, with the greatest contribution around connectivity. But encouraging local content and services, and promoting technology parks are other important links in the chain. Let us address the internet value chain in its own right.



Source: BMI

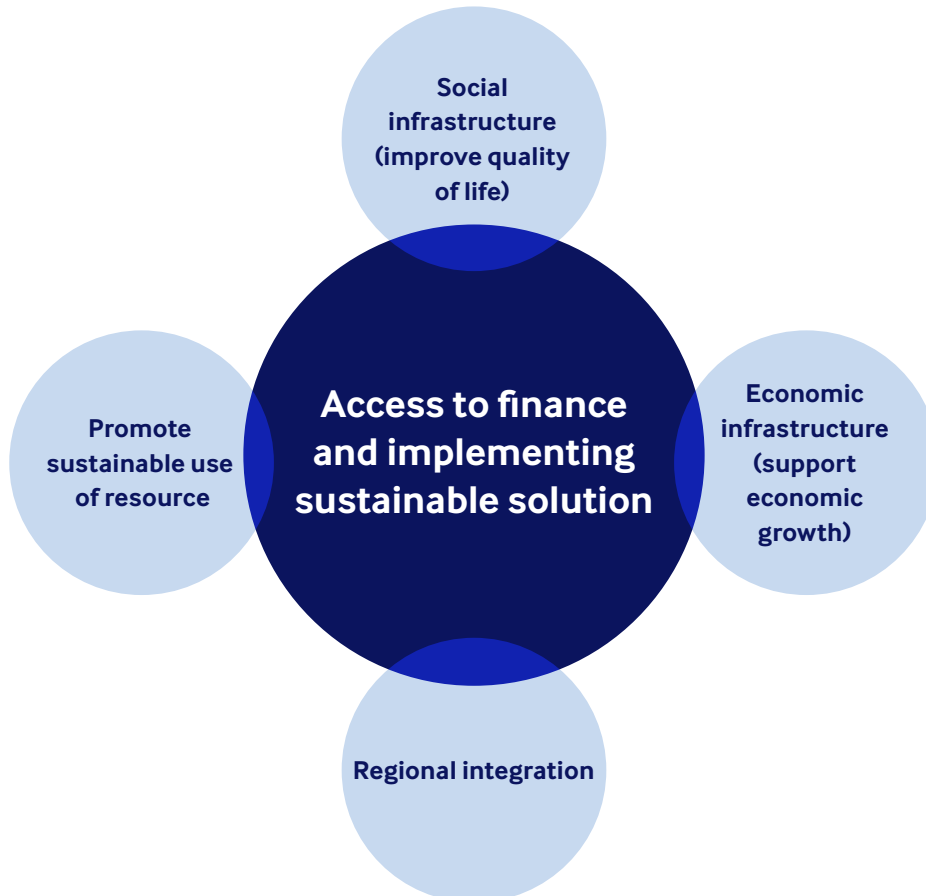
Content rights is divided between media right owners (e.g. TimeWarner, BBC) and user-generated content. DBSA can encourage and promote the creation of local content through its potential investment in creating technology hubs and initiatives to enable local communities and entrepreneurs to generate relevant content.

Online services include communications (e.g. skype), general content (e.g. Wikipedia, FT), search (e.g. Google, Bing), entertainment (e.g. YouTube) or ecommerce (e.g. eBay, Amazon). This part of the internet value chain is already very well taken care of by global players. There is no point in re-inventing any of these services locally, as they have already been localised. However, through the promotion of innovation and technology parks, DBSA can foster the creation of accelerators like Rocket Internet so as to create local market places and e-commerce platforms.

The final area in which DBSA can contribute is around user interfaces, where digital technology funds can act as the right ecosystem for technology start-ups. Investment in devices – and in particular enabling the availability of smart devices at affordable prices – is pivotal to the telecoms value chain intersecting with the internet value chain, and local communities taking the benefit of any funding in large infrastructure projects. Content rights, online services and user interfaces may be at the end of the value chain but are the final pieces in the jigsaw providing full connectivity and allowing ICT to empower local communities and foster economic growth.

Conclusion

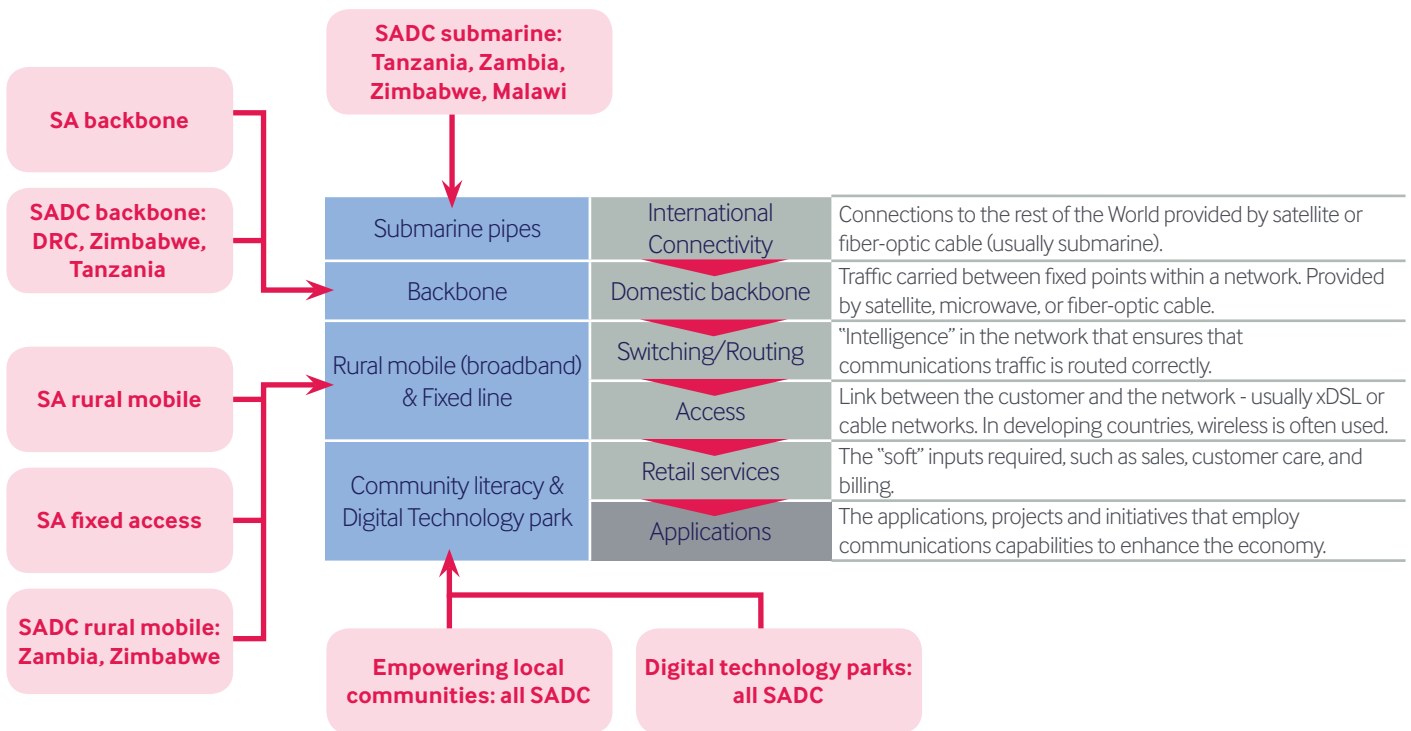
The DBSA aims to play a pivotal role in delivering developmental infrastructure in South Africa and right across the African continent. It does this by giving access to development finance and implementing sustainable development solutions that do one or some or all of the following, as shown in the diagram below.



DBSA's remit ranges from financial structuring and project preparation to the management and design of key flagship projects. The list of clients is broad including the public sector (central government, local municipalities), state-owned enterprises, public-private partnerships and the private sector. In putting this report together and making suggestions of where DBSA can play a role in Africa's ICT sector, we have borne in mind the type of services DBSA can provide and the type of entities with whom it works.

The ICT sector represents rich pickings for DBSA in terms of future funding opportunities. It is very much in the public interest that DBSA flexes its muscles in this space, not least as partial access, poor service quality, high costs and digital illiteracy is still present in too many parts of SSA. This has caused a social disconnect: too many people on the continent are missing out on the power of technology that can improve their lifestyles, drive economic growth and support social development. Governments, regulators, the private sector and DFIs such as DBSA all need to play their part in doing what they can to invest in the telecoms infrastructure across SSA, and from there enable access to new services for many citizens and empower local innovation in many communities.

The approach needs to take into account the whole telecoms value chain so as to provide a fully integrated set of solutions. There have been too many individual projects seeking to implement initiatives that help certain communities. It is time for a shift from a focus on ideation to scaling up and replicating solutions that have proven to be successful. Digital enablement projects need to be built for scale and industrialisation. A value chain such as that below can help this way of thinking.



Source: BMI

All the links fit together and DBSA should seek to play a role in as many of them as possible. By doing so DBSA will support SSA's social and economic infrastructure, promote sustainable solutions and play a part in regional integration (much needed in the ICT sector). The scope of projects is broad:

- to improve international connectivity via submarine cables (in Tanzania)
- to enhance national backbones to provide last mile access (in DRC)
- to bring mobile and broadband services to all rural areas in South Africa and SADC (Mankosi solution)
- to improve digital literacy in rural communities (as in the Malawi Digital Foundations Initiative)
- to foster the next generation of technology start-ups and entrepreneurs (by building technology parks in Senegal).

These are all examples of how DBSA can play an integrated role in providing access to finance and implementing sustainable solutions, and fulfil its mandate of delivering developmental infrastructure in South Africa and the rest of the continent.