

# DRAFT Mozambique National Broadband Plan

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# 1 Background and introduction

**The Government of Mozambique (GoM) also has aspirations for Mozambique to become a knowledge-based digital economy and recognises the benefits that investment in broadband and digital infrastructure can bring to its economy, citizens and businesses.**

## 1.1 Why a national broadband plan?

Governments in Sub-Saharan Africa are making significant strides to facilitate a shift towards the 'digital economy', as they realise that investment in ICT digital infrastructure can bring many benefits to their entire nation, such as economic growth and job creation. Specifically the GoM's objective is to offer broadband<sup>1</sup> services to the entire population by extending basic broadband service coverage (primarily through wireless / mobile technology) to rural areas of Mozambique that are currently unserved. In addition the GoM wishes to improve the availability of fibre based broadband connectivity to premises within urban areas of Mozambique.

Recognising that its broadband ambitions will not be achieved by the private sector alone and that it will need some form of government intervention, the GoM has developed a national broadband plan to improve broadband coverage across Mozambique. There are two purposes to this broadband plan; firstly the broadband plan should signal to the private sector that the GoM is serious about its intentions to improve broadband coverage in Mozambique; secondly the broadband plan should stimulate and coordinate further investment in underserved areas of Mozambique, particularly in rural areas.

A key aspect of national broadband plans is the development of broadband targets which in turn aid in the understanding of the costs and funding requirements to support that investment to achieve the broadband targets. Many governments have developed broadband targets that are simply too aggressive, given current levels of investment in broadband infrastructure and the relatively low levels of Internet maturity in those economies. Well-defined and realistic broadband targets will enable a better understanding of the range of technologies required to meet the targets, allowing a more accurate prediction of deployment costs. Knowing the costs will in turn allow Governments to establish the required funding contribution and allow operators to define their investment requirements.

This national broadband plan defines realistic broadband speed and coverage targets for Mozambique until 2025 and provides an estimate of deployment costs and state subsidy funding requirements to aid in the development of Mozambique's broadband and digital infrastructure.

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<sup>1</sup> The GoM defines broadband as being the ability to access internet enabled services at a minimum download speed of 1Mbit/s.

## 1.2 Benefits of broadband

Developed and developing countries are increasing their investment in digital infrastructure as a means to make the transition to a knowledge-based / digital economy as they seek to increase levels of employment and economic growth and thus generate greater social and economic benefits for their nation and its citizens. Investments are being made in broadband infrastructure and services in order to: facilitate improvements in digital literacy levels; achieve economic benefits; increase government participation; and promote eHealth, eEducation and eCommerce activities.

The World Bank has defined six key pillars to describe the various elements that make up a digital economy:

- **Digital infrastructure** – the provision of broadband networks, international connectivity, cloud computing, data centres and financial payment systems (domestic and international)
- **Digital policy** – a policy and regulatory environment that is enforced in law to encourage a competitive business environment and to provide consumers with protection from data privacy, cyber security, financial fraud, etc.
- **Digital government** – the provision of eGovernment services (such as eProcurement eGovernment, eHealth) and digital infrastructure to increase the efficiency and effectiveness of government and the way in which business and consumers interact with the government
- **Digital IT employment** – an environment that makes it easy for foreign ICT firms to invest locally, that encourages entrepreneurship and helps technology start-ups to expand internationally
- **Digital skills** – an environment that develops high levels of ICT literacy among school pupils, tertiary education students and citizens to undertake basic ICT tasks and ensures the suitability of their qualifications for the workplace
- **Digital commerce** – an environment that enables growth in eCommerce such as mobile payment solutions, the use of credit cards for secure online payments and supports the development of local eCommerce services.

These pillars are vital building blocks (digital infrastructure in particular) that need to be in place if Mozambique is to create a successful knowledge-based / digital economy and ICT ecosystem.

Broadband also has a significant economic impact which has been well document in publicly available literature. The impact is more significant in rural areas. Access to ICT and broadband gives farmers, for example, better access to weather forecasts, up to date crop prices and access to crop growing techniques and tutorials. Access to broadband also allows rural citizens to access online education and to apply for jobs. It also allows small rural businesses to sell their produce to a large online market place.

Broadband has also been shown to increase business competitiveness. Companies have reported increased profitability as a result of having access to high speed broadband services. Companies that adopt ICT to communicate with stakeholders internally and externally with suppliers and customers are more efficient and therefore less costly to run.

### 1.3 Background

This national broadband plan has been produced by Analysys Mason on behalf of the GoM, specifically for the Ministry of Transport and Communications. The broadband plan is based on a detailed report written by Analysys Mason in June 2016 for the INCM titled, ‘Elaborating Mozambique’s broadband strategy’. The GoM commissioned this study in December 2015 to elaborate its broadband strategy and to help the GoM understand how it can best achieve its broadband ambitions. The study was undertaken by Analysys Mason between December 2015 and May 2016, involving a combination of extensive stakeholder consultations, desktop research and cost modelling to inform the GoM of the potential subsidy required to build broadband infrastructure in rural areas. The study provided guidance to the GoM on its commercial strategy and investment models, its network integration strategy, and on improving the effectiveness of the regulatory and policy framework in promoting investment in broadband infrastructure.

This national broadband plan presents extracts from the final report summarising the government’s vision, the broadband landscape, the broadband targets and the key issues in achieving the vision followed by an action plan.

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## 2 Market overview

**A significant proportion of the population lives in rural areas, while broadband coverage is largely confined to urban areas. Thus there is a great need to encourage the development of broadband infrastructure in rural areas, whether through government subsidy or some other means.**

Mozambique is classified as an underdeveloped country and has a gross national income (GNI) per capita of USD600, compared with the Sub-Saharan average of USD1638.<sup>2</sup> Following the global financial difficulties, Mozambique's economy has shown strong growth, with real GDP increasing by approximately 7% per annum since 2011. Inflation rates have also been stable in recent years. However, Mozambique's economy has grown increasingly fragile over the past year, and economic growth slowed down in 2015. In addition, Mozambique is exposed to economic volatility, which contributes to an uncertain outlook for the future. In particular, there is a risk that much-needed aid may be suspended which would greatly reduce the state's access to financing.

Broadband coverage is largely confined to urban areas, and is predominantly mobile. The telecoms sector in Mozambique is dominated by the three mobile operators Vodacom, Movitel and Mcel. Mobile broadband penetration (3G HSPA) is currently estimated at approximately 25% to 30%, mainly in urban areas of Mozambique. Mobile broadband coverage is largely confined to urban areas. This is because most of Mozambique's inhabitants (up to 70%) live in rural areas where high costs and low returns make it commercially unattractive for mobile operators to roll out mobile broadband services across the rest of Mozambique (rural areas). New entrant Movitel has been rolling out its network aggressively in rural areas, but it mostly offers 2G-based voice services (not broadband) with limited 3G and FTTH coverage.

Some urban areas of Mozambique are likely to benefit from investment in fibre networks by commercial players, but this will be limited to very dense urban areas in a few cities. TDM is planning to build metro fibre networks in 12 provincial cities across Mozambique, but coverage will be confined to very dense urban areas which only represent around 1% to 2% of premises. In addition, Google is also considering building metro (backhaul) rings and fibre access networks, but its plans remain unconfirmed. Vodafone is currently conducting a fibre-to-the-premises (FTTP) pilot in Maputo, involving a few high-rise buildings in the centre of the city.

Significant investment has been made in backbone networks over the last few years, but this has been at the expense of rural expansion. Mobile operators Vodacom (see Figure 2.1) and Movitel, along with incumbent fixed operator TDM (see Figure 2.2) operate their own backbone networks, and so there is a significant amount of duplication in backbone network infrastructure. However, this has been at the expense of investment in access and backhaul networks in rural areas, which remain largely undeveloped and in need of investment. Mcel (owned by TDM) uses TDM's

<sup>2</sup> Source World Bank, based on 2014 data.

backbone capacity services. According to Movitel, it preferred to have direct control over the cost and operation of its network and so pursued its own core backbone network build.

Figure 2.1: Vodacom’s backbone network  
[Source: Vodacom, 2016]



Figure 2.2: TDM’s backbone network  
[Source: TDM, 2016]



Mozambique is well served by international connectivity from SEACOM and EASSy. In general there do not appear to be any concerns regarding the pricing of or availability of international connectivity. However, it can be expensive to access international connectivity through backhaul service providers (such as TDM and Movitel).

### 3 Challenges and barriers to investment

**Concerns with poor network quality, a lack of standardised network specifications, high backbone network pricing, spectrum charging mechanisms and a wide range of economic factors have resulted in a lack of infrastructure sharing, duplication of backbone networks and a lack of investment in broadband networks in rural areas.**

There is a common view among Mozambique's operators that TDM's infrastructure and services are of low quality and do not meet the expected service standards. Operators have also expressed concerns regarding the incumbent's pricing of wholesale services, with Mcel benefiting from volume discounts from TDM. It is thought that this discounting is a key reason why other operators have decided to build their own backbone networks.

Network sharing (the means to access other operator networks) is limited in Mozambique. Movitel and Vodacom offer limited 'active' high-speed capacity products to third parties. TDM has limited passive duct and fibre capacity available, and only offers ducts or fibre to operators which are willing to exchange ducts and fibre on a reciprocal or like-for-like basis. Vodacom and TDM are in the early stage of discussions to swap active transmission capacity on their networks. Other operators are reluctant to lease capacity on Movitel's network as it is perceived to be of poor quality. The lack of a standardised specification for mobile masts is another key reason why operators have not shared infrastructure with Movitel. During the consultation process Analysys Mason was informed that the INCM is in the process of developing the infrastructure network specification which includes towers, masts, shelters, ducts and aerial and underground fibre cables.

Some operators have commented that a lack of visibility of the INCM's spectrum plans prevents them from planning their networks in advance. However, the INCM has a spectrum plan in place, and this simply needs to be promoted more widely among stakeholders. Operators also believe that current site-charging mechanisms need to be rebalanced, so that lower charges are applied to sites in rural areas; this charging mechanism is also currently under review by the INCM.

Other factors that have held back investment in broadband include depreciation of the Metical relative to the US dollar, which has forced some operators to postpone their plans for further network expansion. In addition, it is considered that the duty on imported telecoms equipment is too high and increases network investment costs. Finally, the lack of suitable supporting economic infrastructure such as reliable roads and power networks in rural areas makes it expensive to deploy and maintain base stations.

## 4 Broadband speed and coverage targets

**Based on market feedback and regional benchmarking a set of broadband targets are proposed which reflect market expectations and are in line with targets adopted in other countries in Sub-Saharan Africa (SSA).**

A phased set of broadband speed and coverage targets are proposed for rural and urban areas in order to meet the GoM's broadband ambitions. The 2025 timeline allow a sufficient amount of time to attract investment and build the required infrastructure. The targets are set out in Figure 4.1:

Figure 4.1: Proposed revised broadband targets [Source: Analysys Mason, 2016]

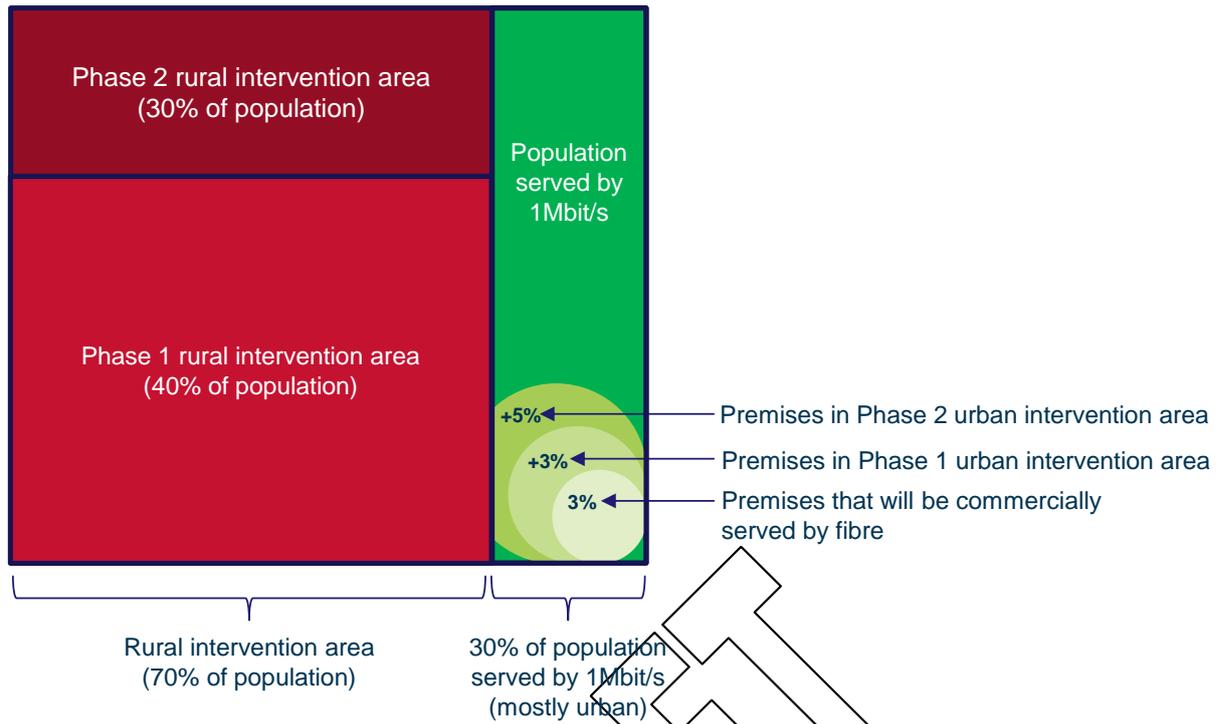
Target	Preferred technology	Speed	Coverage	Timing
Rural Phase 1	Wireless	1Mbit/s	70% population	2021
Rural Phase 2	Wireless	1Mbit/s	100% population	2025
Urban Phase 1	Fibre	Unspecified	6% premises	2021
Urban Phase 2	Fibre	Unspecified	11% premises	2025

Based on extensive market analysis, government intervention is needed to achieve the rural broadband targets. Based on market consultations, operators are unlikely to increase mobile broadband coverage beyond 30% of the population (largely in urban areas) in the short term. Therefore, in order to achieve 100% coverage there is a need to provide coverage to the remaining 70% of the population (in rural areas); in the remainder of this document this is referred to as the 'rural intervention area'.

Phase 1 of the rural intervention will deliver broadband coverage to 40% of the population (i.e. extending coverage to 70% of the population) to meet the rural Phase 1 target; Phase 2 of the rural intervention will deliver broadband to the last 30% of the population (i.e. extending coverage to 100% of the population). Figure 4.2 provides a graphical representation of Phases 1 and 2 of the rural intervention area.

Government intervention will also be needed to achieve the urban targets. The market consultations indicated that fibre coverage will be eventually become available to 3% of premises in urban areas on a commercial basis. In order to achieve 11% coverage it will be necessary to provide coverage to an 'urban intervention area' comprising 8% of premises. Phase 1 of the urban intervention area will deliver FTTP coverage to a further 3% of urban premises (i.e. extend fibre coverage to 6% of premises); Phase 2 of the urban intervention will deliver FTTP coverage to a further 5% of premises (i.e. extend fibre coverage to 11% of urban premises). See Figure 4.2 for a graphical representation of Phases 1 and 2 of the urban intervention area.

Figure 4.2: Rural and urban broadband intervention areas [Source: Analysys Mason, 2016]



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## 5 Broadband intervention strategy and key principles

**Based on international best-practice principles for government investment in broadband networks, the GoM will only intervene in areas that are unserved by broadband infrastructure or where there is no suitable network infrastructure in order to meet its broadband targets.**

### 5.1 Principles of Government intervention

It is useful to develop a framework around which a decision can be made as to whether government intervention is required to solve a bottleneck or address market failure. One such well referenced framework that is commonly used and considered best practice is the European Commission (EC) State-aid Guidelines for investment in broadband networks.<sup>3</sup>

The primary aim of the Guidelines is to encourage government intervention in areas that are currently **unserved** by broadband infrastructure and are unlikely to be served, i.e. where market failure has occurred. Government intervention can be justified in unserved areas as a way of improving the availability of broadband infrastructure. Areas where there is only one network operator are referred to as being **uncompetitive**, and need to be assessed very carefully to justify government intervention. It is possible that government intervention can be justified as a way of improving the availability of broadband infrastructure, if the operator provides suboptimal broadband capability. Where more than one operator offers similar infrastructure for the provision of broadband services, these areas are referred to as **competitive** areas. It can be assumed there is no market failure and accordingly government intervention is not justifiable.

This approach will ensure that the GoM does not distort existing competition or provide subsidies to areas where there is no ‘market failure’, but only subsidises network infrastructure in areas where it is most needed to achieve the GoM’s broadband targets.

An analysis of operator commercial coverage plans suggest that it is justifiable to consider a government intervention on the grounds that there is a lack of competitive broadband infrastructure to meet the GoM’s broadband targets. The purpose of government intervention will be to fund or subsidise the roll-out of backhaul and access networks in unserved rural areas (rural intervention area) and unserved urban areas (urban intervention area), using a special-purpose vehicle (SPV) or public–private partnership (PPP) structure.

It is proposed that these are undertaken as two separate initiatives, i.e. as a rural broadband network (RBN) and an urban broadband network (UBN) intervention and led by a technical partner such as an operator sourced through an open and competitive procurement exercise (see Section 11). The GoM will subsidise the building and deployment of the RBN in the rural

<sup>3</sup> *EU Guidelines for the application of State aid rules in relation to the rapid deployment of broadband networks*; see [http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52013XC0126\(01\)&from=EN](http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52013XC0126(01)&from=EN).

intervention area and the UBN in the urban intervention area. Once developed, operators should be able to buy backhaul and access network services on a non-discriminatory, open-access and wholesale basis based on best-practice principles.

There is sufficient competition to rule out the need for any government intervention in international or backbone networks.

## 5.2 Open access principles

The aim of open access is to allow end users to obtain communications services from a number of different suppliers over the same communications infrastructure.<sup>4</sup> The effect of open access is to promote effective competition in the communications market, as well as supporting public policy aims such as improving broadband coverage through consolidation of investment. Below we set out the key elements considered necessary for the RBN and UBN to be compliant with open access: a network which satisfies all of the criteria of being *effective*, *transparent* and *non-discriminatory* will qualify as open access.

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<sup>4</sup>

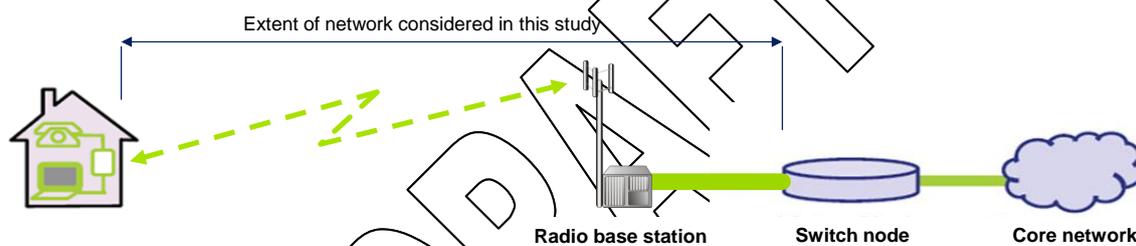
Open access: *Delivering effective competition in communications markets* (Ofcom, 2001).

## 6 Technical strategy

**The most cost-effective technologies are proposed to minimise the cost of meeting the broadband targets for the rural and urban interventions.**

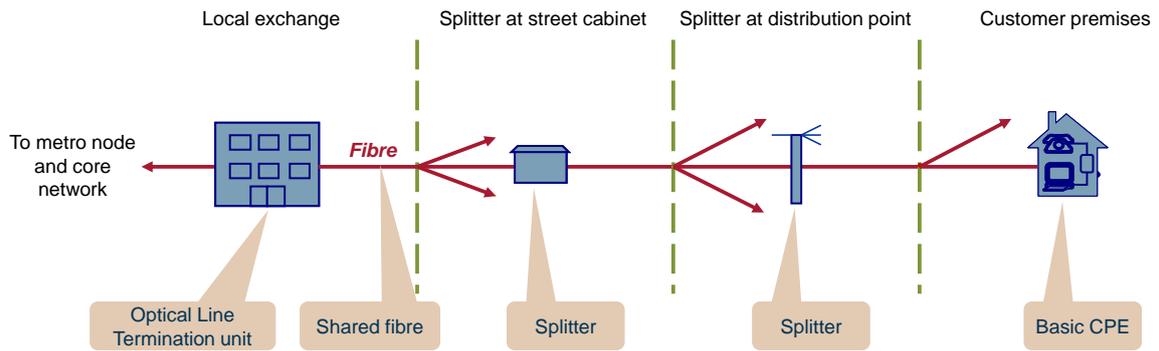
The use of ‘fixed-wireless’ 4G LTE is proposed as the access technology for deployment of the **RBN** to premises within the rural intervention area. Fixed wireless is considered the most cost-effective technology to meet the minimum 1Mbit/s speed target in rural areas. Spectrum has not yet been allocated for rural broadband, but it is assumed that operators will be allocated either 2×10MHz in the 800MHz spectrum band or 2×10MHz in the 1800MHz band. Point-to-point (P2P) microwave radio is assumed to be the most cost-effective way to provide backhaul connectivity to base stations. In addition, the recommended technical strategy takes account of the need to upgrade sites and towers, antennas and base stations and to provide wireless customer premises equipment (CPE) to households (see Figure 6.1).

Figure 6.1: Proposed scope of the fixed-wireless network [Source: Analysys Mason, 2016]



For the **UBN** within the urban intervention area, FTTP gigabit passive optical network (GPON) technology is proposed as the backhaul and access network, as this is more cost effective than other forms such as P2P. In addition, the recommended technical strategy takes account of the need to upgrade local exchanges, deploying fibre from the exchange or local point of presence (PoP) onwards to street cabinets or nodes, the fibre connection (final drop) to customer premises and providing CPE to terminate the fibre connection (see Figure 6.2).

Figure 6.2: Proposed FTTP/GPON network topology [Source: Analysys Mason, 2016]



\* A single splitter can have a split of up to 8:1, but we would propose an overall split of 32:1 across both the cabinet and distribution point (DP)

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## 7 Cost implications and deployment options

**The combined capital expenditure (capex) required to support deployment of the RBN and UBN is estimated to range between USD1.4 billion and USD1.5 billion.**

The total cost of achieving the rural and urban Phase 1 and Phase 2 targets is estimated to be between USD1.4 billion and USD1.5 billion, depending on which spectrum band is used in rural areas. Lower-frequency spectrum (e.g. 800MHz) has greater signal propagation (and so is ideally suited to rural areas), which results in the need for fewer base stations and reduces the costs. The converse is true for higher-frequency spectrum.

In either case, achievement of the rural and urban Phase 1 and Phase 2 targets will require significant capital investment. However, it is possible for the GoM to select which targets to prioritise and thus reduce its overall investment, as summarised in Figure 7.1.

Figure 7.1: Cost of broadband deployment options [Source: Analysys Mason, 2016]

Target	800MHz spectrum		1800MHz spectrum	
	Incremental cost (USD million)	Cumulative cost (USD million)	Incremental cost (USD million)	Cumulative cost (USD million)
Rural Phase 1	282	282	323	323
Rural Phase 2	331	613	378	710
Urban Phase 1	266	879	266	967
Urban Phase 2	492	1371	492	1459

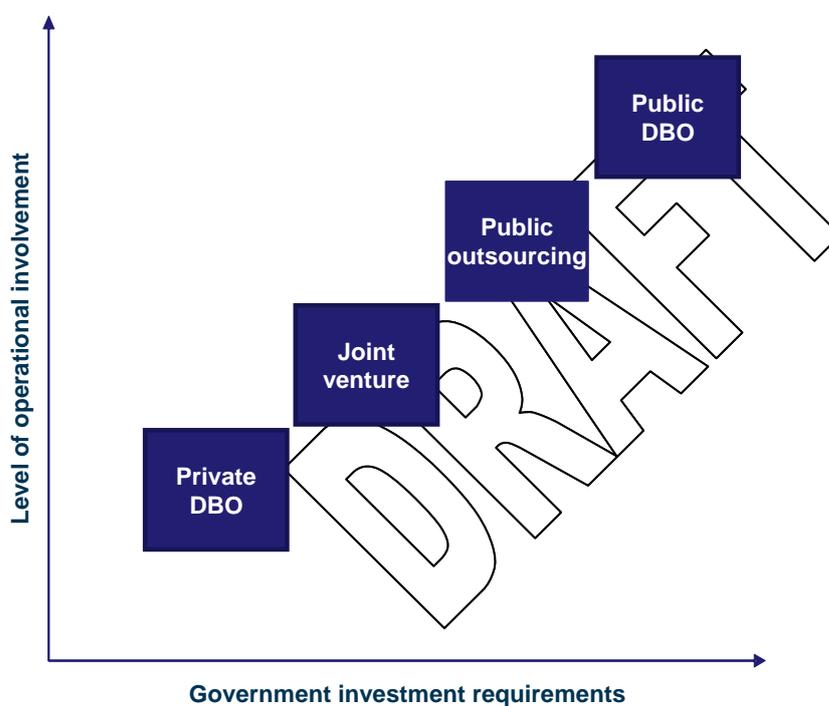
The **rural Phase 1 target** achieves the greatest coverage, the capital cost of which would range between USD282 million and USD323 million. The cost of **phases 1 and 2 of the rural intervention** would range between USD613 million and USD710 million.

It should be noted that not all of the capital cost would be paid by the GoM: the subsidy required from the GoM depends on the commercial investment PPP strategy which is adopted and the amount of private investment received.

## 8 Commercial investment strategy

**Given Mozambique’s current economic situation, a private design, build and operate (DBO) appears to be the most suitable PPP model to use, as this can minimise the need for state subsidy and maximise private-sector investment.**

The GoM will consider an investment strategy or PPP model which maximises private-sector contributions and minimises the requirement for government involvement. The PPP option which is selected for deployment of the RBN and the UBN will determine the contribution (in the form of a financial subsidy) that the GoM needs to provide. Four variants of PPP that have been used as a vehicle for government investments in broadband networks are identified (see Figure 8.1).



*Figure 8.1: Government investment and level of operational involvement required for individual PPP options [Source: Analysys Mason, 2016]*

A private DBO<sup>5</sup> (design, build and operate) is the most suitable PPP model for the GoM to use, as this can minimise the need for subsidy by maximising private-sector investment. Private DBOs will, however, still require government funding of the RBN or the UBN, to make it commercially attractive for operators to invest. Private DBOs may require a government to contribute up to 89% of the capital costs, although it can be less in areas that are not so rural. The exact amount of funding required will be determined during the implementation of this broadband strategy with full visibility of operator revenues and costs to support the deployment of the RBN and UBN.

<sup>5</sup> A private DBO is where the private sector (usually a network operator) designs, builds and operates the broadband infrastructure on behalf of the government

## 9 Addressing demand-side barriers

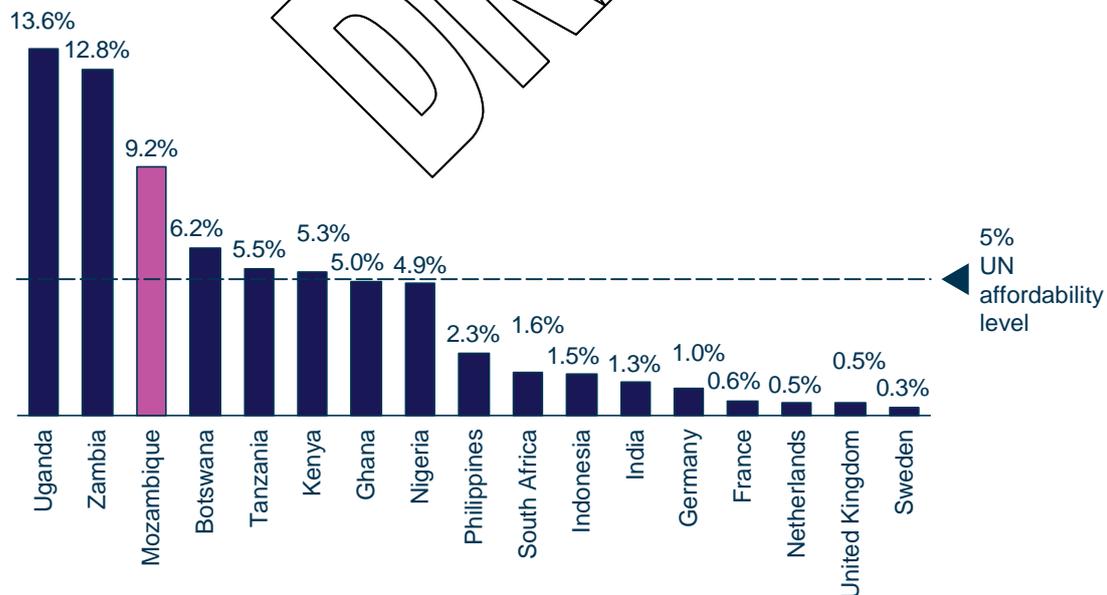
**A number of demand-side initiatives are necessary if Mozambique is to truly realise the economic benefits of broadband infrastructure investments.**

In addition to the availability of telecoms infrastructure that is required to provide broadband services, the take-up and adoption of broadband services can be attributed to three key additional factors:

- **Affordability** – the cost of broadband access and broadband services relative to income
- **Literacy** – the capacity to access the Internet, including skills, awareness and cultural acceptance
- **Relevance** – the availability of relevant content or applications in a local language and which adds value to end users.

**Affordability** of mobile broadband services in Mozambique represents a barrier to their take-up: according to the United Nations (UN), household telecoms spend needs to be a maximum of 5% of GNI in order to be considered affordable. As shown in Figure 9.1, mobile broadband spend in Mozambique is much higher than this.

Figure 9.1: Benchmark of mobile broadband spend as a % of GNI per capita,<sup>6</sup> 2014 [Source: ITU, World Bank, 2016]



<sup>6</sup> Mobile broadband spend is defined as the annual spend for a prepaid mobile broadband handset with 500MB.

The GoM may wish to consider reducing the tax burden on mobile devices to help increase adoption rates (an approach which has been used in Kenya, for example, where handset penetration increased from 50% to 70% of the population).

Both basic **literacy** and digital skills are at low levels in Mozambique, which prevents the full benefits of broadband from being realised. 59% of adults possess basic literacy skills, placing Mozambique below the SSA average of 64%. Digital literacy is even lower – standing at 6% of the population, compared to the SSA average of 15%.

Figure 9.2: Benchmark of adult literacy rate among population aged 15+ years [Source: Analysys Mason, based on data from UNESCO, ITU, 2016]

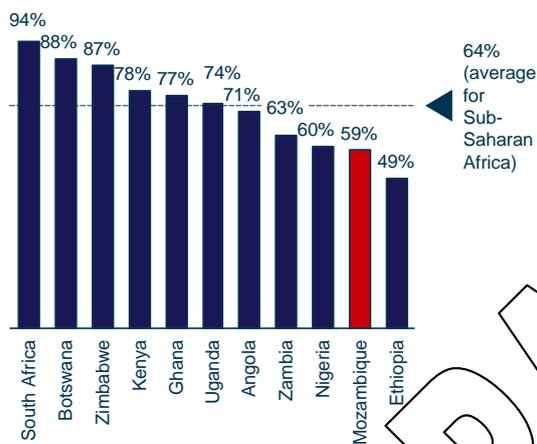
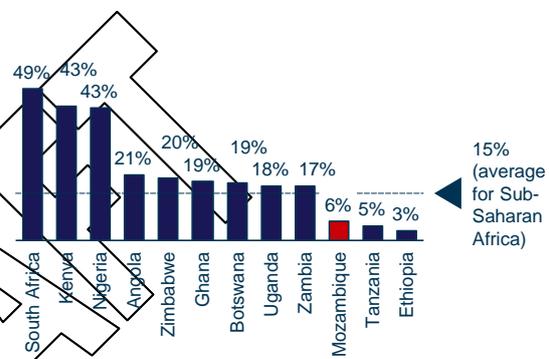


Figure 9.3: Benchmark of individuals using the Internet (% of population) [Source: Analysys Mason, based on data from UNESCO, ITU, 2016]



The GoM may wish to cooperate with operators, donors and educational institutions to encourage mobile learning and the adoption of tablets and personal learning devices. The ICT curriculum in schools can be strengthened, and teachers should be educated on the use and teaching of ICT. In Tunisia, Ooredoo’s mEducation initiative delivers content produced by teachers to support casual learning, revision and preparation for the job market.

With the exception of mHealth, there is limited local relevant content available in Mozambique. GovNet (online government services for the public), mobile money platforms and mobile TV services are still at an early stage of development. The GoM should continue to develop eGovernment services and increase the availability of online services, to drive citizens online and act as a catalyst for digital social initiatives. It can also organise industry fora with key stakeholders to discuss how key social problems can be solved (e.g. eEducation, hackathons<sup>7</sup>, etc.). Banglalink’s mobile agriculture service, for example, has enabled farmers to obtain a fair price for their goods as well as information on weather conditions.

<sup>7</sup> Hackathons are events which can last several days with the aim of bringing people together to engage collaboratively in computer programming or coding to develop solutions to industry problems

In addition to the above factors, previous work undertaken by Analysys Mason has suggested that Cybersecurity plays an important role in the improving user confidence which can increase the take up and use of eCommerce services.

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## 10 Legal and regulatory framework

**There are a number of steps that the INCM can take to facilitate network sharing and encourage operator investment in broadband infrastructure, particularly in rural areas. Further the INCM should take steps improve its effectiveness as an organisation.**

The Telecommunications Law (July 2004) ‘the Law’ has been updated by the new Law which was approved by Parliament on March 2016 and published on April 2016. This study has reviewed the Law and the amendments included in the new Law. Our comments on the legal framework relevant to the development of broadband can be summarised as follows:

- **Dispute resolution:** The Law gives the INCM the capacity to resolve disputes between service providers. However, the dispute resolution process is not documented and could be considered as an area for further development.
- **Competition:** The Law states that the INCM shall intervene in the market if an operator has significant market power (SMP), and the results of such analysis should be published. To date we are unaware of the INCM having intervened in an SMP case. In addition, the Law does not specify whether the INCM should periodically publish operator market data, which can improve transparency. This could be considered an area for further development.
- **Licensing:** The new Law states that telecoms service providers will be migrated to a unified licence or a licence per class. There is no specification as to what would be considered as a unified licence or a licence per class. The new Law also states that the licences issued will have their validity established on a case-by-case basis.
- **Interconnectivity:** The Law states that operators have the right to enter into private interconnection agreements, acting in good faith. INCM has informed Analysys Mason that they have intervened in two such cases to resolve an interconnect dispute between operators.

The existing regulatory framework is generally well developed, and where shortcomings have been identified, these aspects are already under review by the INCM. A number of key regulations relevant to the development of broadband are already in place and described in more detail below:

- Passive telecommunications infrastructures sharing and other network resources
- Public telecommunications quality of service (QoS) regulation
- Telecoms taxes and fees
- Spectrum charges
- Universal service access fund (USAF)
- Organisational structure of the INCM
- Functions of the INCM.

Regulation on **infrastructure sharing** adheres to the best-practice principles of openness, non-discrimination and transparency, but there is no legislation regarding wholesale services. Regulation on wholesale services can reduce infrastructure duplication and can encourage retail competition. The INCM has undertaken steps to address existing issues: in particular it plans to introduce mandatory infrastructure sharing (which covers towers, masts, shelters, ducts and aerial and underground fibre cables) as well as specific guidelines on price setting, with a wholesale market review planned for 2017. The INCM needs to communicate these planned changes to the market more to reassure them of its plans to improve infrastructure sharing.

The **QoS** framework regulates broadband, narrowband as well as other data services. It requires operators to submit QoS reports on a quarterly basis. However, when compared to best-practice principles, network testing and monitoring are not carried out on a regular basis; there is little transparency on QoS key performance indicator (KPI) performance; and there is no mechanism to measure consumer satisfaction levels. The INCM should set reasonable target values for key QoS KPIs, undertake regular network quality tests, publish monitoring reports to improve transparency, and launch a periodical consumer satisfaction survey.

The regulation on **fees** sets annual telecoms licence fees at 3% of operators' gross revenue, and so the regulator's funding is dependent upon operator performance. The licence fees are set with no regard to cost or market-based principles (which are considered the best-practice approach). In addition, spectrum charges are levied per site, with higher fees for 3G sites than for 2G. Charging more for 3G sites can reduce mobile broadband investment in rural areas, which may already be commercially challenging. The INCM has plans to address these issues, and in particular to revise the spectrum fee charging mechanisms and to align annual licence fees to market or cost-based principles.

We measured the **organisational effectiveness** of the INCM according to its:

- independence and effectiveness
- transparency
- structure and staffing
- funding.

The INCM is administratively and financially autonomous. The key decision-making authority – the administrative board – is appointed by the GoM. In practice, stakeholders perceive the INCM as an effective and independent organisation. However, there is a potential risk of government interference due to the process followed to appoint the key decision-making body of the regulator; consideration should be given to changing how the administrative board is elected, to guarantee its independence from government interference.

The INCM engages with market stakeholders on key issues, but there is limited public reporting regarding its activities, budgets and market KPIs. Annual reports and market KPIs are not easily accessible. There does not appear to be a structured consultation process for wider engagement

with stakeholders in the market. The INCM should report and publish key market KPIs, operational and financial reports, and improve the market consultation process.

The INCM's decision-making power is concentrated in the administrative board, rather than with the Director General. The INCM should increase the decision-making powers of the Director General, to improve accountability. At present, approximately 30% of the INCM's employees work in the technical department, and there is a need to strengthen the capacity of this department to meet the needs of a rapidly developing market.

The INCM's financing is dependent upon telecoms fees and taxes, which means it is not truly independent of external influence. The INCM should consider balancing its budget sources so that it is not entirely dependent on the performance of market players, and aligning telecoms fees with the cost of regulation.

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## 11 Action plan and next steps

This national broadband plan has been developed through extensive stakeholder consultation and analysis that aims to coordinate the deployment of and improve the availability of broadband services across Mozambique.

### 11.1 High impact activities

It is imperative for the GoM to rapidly enter into an ‘implementation phase’ to meet the Rural and Urban Phase 1 and Phase 2 interventions described earlier to support deployment of the RBN and UBN.

The primary purpose of the implementation phase will be to source a strategic and technical partner that will build the national broadband infrastructure (i.e. the RBN and UBN) in order to meet the broadband targets set for rural and urban areas.

Key activities to be undertaken by the government include:

- Recruiting an adviser to manage the procurement stages highlighted below
- Setting up setting up a formal procurement programme which will involve
  - developing a sourcing strategy to recruit a technical partner or partners, e.g. telecom operator or operators
  - undertaking pre-procurement market consultation by developing and issuing a request for information (RFI) and meeting with potential bidders for the RBN and UBN to gather early market interest in the proposed interventions and shortlist bidders
  - undertaking formal procurement exercise by developing and issuing a request for proposal (RFP) or invitation to tender (ITT) to selected bidders. This will also involve evaluating supplier responses and managing supplier clarifications and holding dialogue meetings if necessary
- Establishing the level of funding required to achieve the Rural and Urban Phase 1 and Phase 2 interventions through financial modelling and review of operator cash flow projections
- Appointing a project manager to oversee the implementation on the RBN and UBN once the procurement activities have concluded by the end of 2017

An independent advisor should be appointed and procurement activities should commence in September 2016 so that a technical partner can be appointed and implementation of the RBN and UBN can commence by the end of 2017.

## 11.2 Additional activities

Additional activities to be undertaken by the GoM during the implementation phase will include putting initiatives in place to improve the take-up and adoption of broadband services and to improve the effectiveness of the USAF. This will include

- Creating awareness of the GoM's broadband plan and ambitions among Mozambique's key stakeholders
- Improving economic infrastructure in rural areas such as roads, electricity, party capacities
- Addressing the impact of the devaluation of Mozambique's local currency
- Reducing tax on handsets to increase handset take up
- Improve the capacity at Maputo port, which currently makes it difficult for operators to import network components and delays their plans to roll out infrastructure
- Import duties on telecoms equipment to reduce the cost of building infrastructure.

In addition the INCM should consider acting on the recommendations set out in the report to improve its effectiveness as an organisation, to improve stakeholder communications, and to modify and implement new regulations. This will include:

- Reviewing the market for access to backbone services, to establish whether any of the backbone providers holds a dominant market position.
- Establishing clear regulation and guidelines on access to backbone networks, amending existing licences if necessary
- Establishing clear guidelines for resolving access or pricing disputes between operators
- Facilitating QoS improvements by collecting data from all network operators and enforcing QoS regulations
- Encouraging infrastructure sharing and promote open access to passive infrastructure
- Encouraging alternative operators to enhance market competitiveness in urban areas
- Providing Government intervention in unserved rural areas
- Reviewing the market for wholesale backhaul services to direct the market towards desirable outcomes.