

Consultation on a Uganda National Broadband Baseline Survey & Infrastructure Blueprint

Date: 16 February 2022

TO: PS/Ministry of ICT&NG for your attention

CC: Battery Operated System for Community Outreach (BOSCO) Uganda
Jennifer Okusia jokusia@boscouganda.com
Association for Progressive Communications (APC)
Carlos Rey-Moreno carlos@apc.org

Dear Madam or Sir,

Thank you for the opportunity to provide commentary on the important topic of the use of the draft National Broadband Baseline Survey & Infrastructure Blueprint. This document represents the consolidated input from BOSCO and APC. Details on BOSCO and APC can be found at the end of the document. Here follow our comments on the draft blueprint.

Jennifer Okusia

Battery Operated System for Community Outreach (BOSCO)

Carlos Rey-Moreno

Association for Progressive Communications (APC)

Table of Contents

Introduction	3
Licensing	3
Access to Spectrum	5
Spectrum for International Mobile Telephony (IMT)	5
License Exempt Spectrum	7
Television White Spaces (TVWS) Spectrum	9
5G / 6G	9
Fibre To The Home (FTTH)	9
Backhaul	10
Transparency	10
About the submitting organisations	11
About Battery Operated System for Community Outreach (BOSCO)	11
About the Association for Progressive Communications (APC)	11

Introduction

We applaud the efforts of the Ministry to develop a 10-year National Broadband Infrastructure Blueprint (2022-2032) that is intended to guide the planning, development, deployment, and management of broadband infrastructure in Uganda. Only by taking a longer-term perspective is it possible to envisage a path to a truly inclusive digital society. The baseline survey and infrastructure blueprint is an invaluable resource for understanding the broader policy and regulatory telecommunications ecosystem as well as the progress to date in achieving affordable access for all.

Communication technology is a natural amplifier of human activity. Those with affordable access to communication move forward while those without are quite literally invisible to the connected. Broadband networks are delivering ever greater utility, from education to commerce to social safety nets with the unfortunate side effect that the social and economic gap between those with affordable access and those without increases by default. The inescapable conclusion from this is that **inclusiveness**, making sure **everyone** has affordable access to broadband, must be a pre-eminent priority of policymakers.

With that in mind, we believe that the challenge of sustainable, affordable access in rural and low income areas in particular must be explicitly addressed in both policy and regulation in order to reverse the widening digital divide.

Licensing

Liberalisation and privatisation of the telecommunications market has led to massive investment in telecommunications infrastructure leading to the unprecedented spread of telecommunications networks around the world, not to mention the growth of the internet. But the growing value of "being connected" combined with slowing growth in poor and rural areas suggest that specific provisions need to be made to incentivise and lower the cost of access to the unserved and under-served. The GSMA have summed up the issue succinctly in their policy paper on Enabling Rural Access¹:

"The lack of coverage in rural areas is the consequence of a basic economic challenge: deploying infrastructure in remote areas can be twice as expensive, while revenue opportunities are as much as ten times lower, a combination that deeply affects the business case for MNOs to deploy infrastructure."

While the application of universal service funds in some countries have been able to mitigate this problem by subsidising the capital costs of rural deployments by MNOs, the operational costs in many cases still do not match the income levels in rural areas. Thus, even when coverage obligations are imposed on operators, it may yet not result in active service. It is hard not to conclude that there is now an urgent need to support alternative business models and regulation to ensure affordable service delivery in rural and remote areas

¹ Enabling Rural Coverage: Regulatory and policy recommendations to foster mobile broadband coverage in developing countries. https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2018/02/Enabling_Rural_Coverage_English_February_2018.pdf GSMA 2018

Conventional views of the universal access challenge treat the economy as a single entity but, in reality, the economies of the rural poor are significantly different from comparatively wealthy urban economies.

The economic contribution of small and medium-sized enterprises (SMEs) is already well recognised by governments around the world. In Uganda SMEs are estimated to contribute 33% of the country's GDP². We believe that enabling SME operators in Uganda, both for-profit and not-for-profit, could unlock sustainable business models in regions deemed unprofitable for large operators. Local operators serve a smaller and more distinct market. Being in direct contact on a day-to-day basis with their customers, they typically have a much deeper knowledge of and are able to serve them in a manner that a global company cannot. The economics of local SMEs are also different to those of global companies. Local operators are not burdened by having to maintain expensive headquarters in the capital city or outlets in shopping centres and don't require costly marketing campaigns.

We also believe that there is great opportunity for cooperative self-provision of connectivity infrastructures in the form of community networks. These local social-purpose operators take a number of different forms, such as a cooperative, a not-for-profit company, a civil society organisation, or even a municipal network.

For example, BOSCO Uganda's intervention in breaking isolation is based on use of the available 2.4GHz and 5.0GHz enabled network devices over a PtP and PtMP network infrastructure. This is basic wi-fi equipment driven by solar to connect buildings 50 kms or so apart in the Acholi/Lango sub-region typically for supporting school programs in rural areas, health facilities, radio stations, Community ICT centers and also access to local content over an inhouse built Intranet. With this approach, BOSCO-U has been able to reach out to its primary target user groups, who are the youth, schools, women, elders, people with special needs, among others.

The model has been a much cheaper alternative to satellite and other technologies in the past which has since increased lately due to market dynamics on acquisition of latest technology. We have tried and tested the model and believe it is still relevant especially where infrastructure sharing is also adopted for rural connectivity to facilitate rollouts for sharing local content and other online services in rural communities.

In the same way that SMEs deliver high value in other sectors, both commercial and non-commercial small operators have great potential to sustainably connect the unconnected but they require nurturing and a low barrier to market entry. Just as a new sapling planted in a forest must be protected until its roots can find purchase in the earth, small operators must have an enabling environment to thrive, especially in the early years of their operation.

We applaud the introduction of a Communal Access Provider license³ in 2020 by UCC, recognising the importance of community driven and owned infrastructure. However, we believe that financial and administrative burdens associated with this license as it currently stands are more than most early-stage community networks can bear.

² <https://www.ugandainvest.go.ug/smes-driving-economy/>

³ <https://www.ucc.co.ug/wp-content/uploads/2020/05/NEW-Telecommunications-License-Application-requirements-guide.pdf>

In both Kenya and Zimbabwe, community network operator licences have been developed which addresses many of these challenges. Some details of these license frameworks follow:

Kenya - Community Networks and Service Provider License

In 2021, Kenya adopted a Community Networks & Service Provider license⁴ under the unified licensing framework. The definition of a community is according to the Kenya Information and Communications Act, 1998 defines a community as “a geographically founded community or any group of persons or sector of the public having a specific, ascertainable common interest”. This license category is for a Community Based Organization (CBO), a Society or a Non-Governmental Organisation (NGO), and for this purpose is a non-profit group that operates at a local (sub-county) level to improve life for residents with a focus to build equality in access to ICT services, particularly where they are disadvantaged in access to ICT services. The license category:

- Has a fee waiver for non-protected access to lightly-licensed and license-exempt frequency bands by wireless access systems
- Have administrative authorization of spectrum for non-protected wireless access within a sub-county
- Has an application fee of USD 10 (KES 10), initial operating and annual fees of USD 50 (KES 5,000)
- Has a license period 15 years
- Simplified application and compliance forms
- Comprises both network facilities and application service provider license aspects resulting in a single license for operation.
- Exemption from USF contributions

Zimbabwe - Community Internet Service Provider license

In 2021, the Postal and Telecommunications Regulatory Authority of Zimbabwe ([POTRAZ](#)) published a new Statutory Instrument (SI) on Telecommunications licensing and regulations. The SI introduced a unified telecommunications license which authorises licensees to provide telecommunication network facilities, network services and application services under one license. Community Internet Service Provider license was introduced in the SI. The application fee for a community license is set at US\$50 and renewal of \$50. Community operators are exempted from paying annual license fee contributions and USF contributions.

Access to Spectrum

Comments on Section 8 on Spectrum Management

Spectrum for International Mobile Telephony (IMT)

Mobile Network Operators in Uganda have achieved remarkable results to date through national, exclusive-use, long-term spectrum licences. However, because there is limited incentive to build and operate mobile networks in rural areas, much of nationally licensed spectrum remains unused in rural areas.

⁴ <https://www.ca.go.ke/industry/telecommunication/market-structure/>

While the scarcity of spectrum as a natural resource is a fundamental principle of spectrum management, it is a principle that is more applicable to urban areas than rural areas, where large amounts of spectrum often remain unused. As spectrum licences for mobile services are typically national in scope, the business models of national mobile operators are naturally oriented towards investment in infrastructure in more densely populated urban areas where the customer base is larger and income levels are higher. The result is that spectrum in many rural areas lies unused, even though assigned to an operator.

For exclusively-licensed spectrum, a property-rights based approach that guarantees exclusivity to the license holder is the international norm for the IMT frequency bands. This model has enabled highly successful investment in national mobile telephony (and now mobile broadband) networks all over the world. However, as demand for spectrum has exceeded its administrative availability, the cost of access to IMT spectrum has risen dramatically. While this may be a boon to governments who see the telecom sector as a critically-needed influx to the treasury, the rise in the cost of spectrum has had the unintended consequence of establishing an insurmountable barrier to smaller operators who are the likely source of innovation needed to bridge the digital divide.

It is worth noting that the cost of eNodeB LTE base station technology has plummeted in recent years, with a wide ecosystem of manufacturers now producing LTE and 5G equipment for a fraction of the cost of what radio equipment cost even ten years ago. If affordable LTE and 5G technologies are within the financial reach of smaller operators, then all that holds them back is access to spectrum. Given that spectrum which is in high demand in urban centres often remains unused in rural areas, there is an opportunity for UCC to establish a win-win scenario with spectrum auctions that guarantee protections for successful bidders while unlocking spectrum in areas where primary license holders have little interest.

The key to opening up access opportunities lies in the framing of IMT spectrum licences. Nation-wide spectrum licences have historically provided a guarantee of exclusivity of spectrum access across an entire country. As such, any decision to share spectrum is then vested in the license holder who may not have significant incentive to share spectrum.

Things began to change however in 2012 with the publication in the United States of a presidential report on Realizing the Full Potential of Government-Held Spectrum to Spur Economic Growth⁵ which proposed that the right to exclusivity in spectrum licensing be transformed into a right to protection from interference. This subtle but profound change enables the regulator to implement spectrum sharing in a manner that preserves all the rights of the primary licensee but unlocks the potential of unused spectrum. An example of this kind of clause can be found in Section 4.2 of the OFCOM 800MHz and 2600MHz license⁶ which states:

4.2 For the avoidance of doubt the Licences will not guarantee exclusive use of the spectrum awarded. In the future we may grant additional authorisations to allow the use of all, or part, of the spectrum, including the spectrum that is the subject of this

⁵ https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/pcast_spectrum_report_final_july_20_2012.pdf

⁶ OFCOM: The award of 800 MHz and 2.6 GHz spectrum Information Memorandum. July 2012
https://www.ofcom.org.uk/data/assets/pdf_file/0022/32872/im.pdf

Award Process. We would develop and consult on the conditions of use under any such additional authorisations in order to manage the risk of harmful interference.

It can also be found in the renewal of the PCS license⁷ in Mexico:

"8.6. Services for secondary use. The Institute reserves the right to grant other authorisations for the use, development and exploitation of the frequency bands that are the subject of this Radio Spectrum concession, or portions thereof, for secondary use. In such case, the use of the bands subject to this Radio Spectrum concession shall be protected against harmful interference."

Clauses such as this extend spectrum sharing beyond generic sharing frameworks as they have in the UK with the Local License framework and in Mexico where the regulator has set aside spectrum for underserved regions. Clauses such as the above enable a “use-it-or-share-it” approach to spectrum licensing. This contrasts with “use-it-or-lose-it” policies which have proven challenging to implement given the significant sunk costs of the licensees

We propose that UCC consider the application of use-it-or-share-it provisions to national spectrum licences in order to unlock spectrum in regions where license holders have no intention to deploy infrastructure.

We further propose that UCC explore the use of more granular and dynamic assignment of some LTE bands, perhaps following the NZ managed spectrum park⁸ mentioned in the report. This would allow access to LTE spectrum for smaller, innovative operators targeting rural, underserved areas.

Both use-it-or-share-it license provisions and assignment of LTE spectrum on a more granular/dynamic basis could be explored through a national consultation⁹ on spectrum access in rural areas.

License Exempt Spectrum

License-exempt spectrum and, in particular the 5GHz range of license-exempt spectrum under consultation, has undergone profound changes in the last 15 years. Not only have WiFi technologies become ubiquitous in both public and commercial venues but WiFi has also evolved dramatically as a broadband Point to Point (PtP) and Point to Multipoint (PtMP) technology. Fixed wireless technologies using 5GHz license-exempt spectrum have gone from a few tens of megabits per second when first launched in 2008-2009 to now offering more than a gigabit per second¹⁰ thanks to improvements in radio and antenna design and new technologies such as MIMO. Not only has 5GHz radio equipment become more efficient in its

⁷ https://rpc.ift.org.mx/vrpc/pdfs/68531_190715125729_364.pdf Original text in Spanish.

"8.6. Servicios para uso secundario. El Instituto se reserva el derecho de otorgar otras autorizaciones para el uso, aprovechamiento y explotación de las bandas de frecuencias objeto de la presente concesión de Espectro Radioeléctrico, o porciones de las mismas, para uso secundario. En tal caso, el uso de las bandas materia de esta concesión de Espectro Radioeléctrico contarán con protección contra Interferencias perjudiciales."

⁸ New Zealand Radio Spectrum Management - Managed Spectrum Park <https://www.rsm.govt.nz/projects-and-auctions/expressions-of-interest/managed-spectrum-park/>

⁹ Worth noting that just a consultation has recently concluded in Canada. <https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf11718.html>

¹⁰ <https://www.ui.com/uisp/ptp-bridging>

use of spectrum for PtP and PtMP use but it has also become more effective at managing interference.

As such, WiFi has proven itself as an ideal complementary technology to the spread of terrestrial fibre optic networks. WiFi can extend access from a fibre network Point of Presence at very low cost. This can have particular impact in rural areas where cost of infrastructure is a significant factor in sustainability. As a non-profit organisation offering services to people in Internally Displaced People's (IDP) camps in northern Uganda, BOSCO has been able to leverage the power and affordability of these WiFi bands to deliver access services where commercial operators are either non-existent or unaffordable.

Similarly, 5GHz license-exempt spectrum has been vital for RENU in assisting in the build-out of campus wireless networks at universities across Uganda, creating affordable high-speed broadband networks which are the sine qua non of modern universities. RENU has been able to roll-out metro eduroam, a WiFi service that enabled many students within the metro to access connectivity while their campuses were closed throughout Uganda's country-wide lockdown.

WiFi has also been a significant catalyst for a growing number of small commercial ISPs which have been able to take advantage of license-exempt technologies to grow a wireless access business without having to surmount the now significant financial barrier that access to IMT spectrum represents.

Indeed, 5GHz license-exempt radio equipment has become so effective and affordable for PtP links that even mobile network operators are choosing to replace some licensed microwave links with license-exempt technologies.

Because license-exempt spectrum does not generate direct revenues for the government in the manner that licensed spectrum auctions do, its economic value is often underrated. A recent study¹¹ published by the WiFi Alliance suggests that WiFi currently generates \$1 billion in economic value in Uganda and that it is on track to generate \$4 billion by 2025. However, that prediction is predicated on the assumption that UCC will establish regulations that permit operators to extract maximum value from license-exempt spectrum.

We encourage UCC to build on the success and impact of license-exempt 5GHz use by maximising its potential use for PtP and PtMP use and to encourage its uptake.

We would also like to encourage UCC to actively explore the potential of additional frequencies for license-exempt use. This would revise 5GHz license-exemption upwards to include 5850-5925 GHz, as has been implemented in the United States¹² and elsewhere. Last but not least, we encourage UCC to expedite the adoption of 5925 - 6425 MHz for license-exempt use, consistent with ATU recommendation in July 2021¹³.

¹¹ Economic value of Wi-Fi® forecast in Africa, Middle East, and India. 14 Sept 2021 WiFi Alliance
https://www.wi-fi.org/download.php?file=/sites/default/files/private/Global_Economic_Value_of_Wi-Fi_2021-2025_202109.pdf

¹² FACT SHEET* Use of the 5.850-5.925 GHz Band Notice of Proposed Rulemaking – ET Docket No. 19-138
<https://docs.fcc.gov/public/attachments/DOC-360940A1.pdf>

¹³ https://www.atuat.africa/wp-content/uploads/2021/08/En_ATU-R-Recommendation-005-0.pdf

Television White Spaces (TVWS) Spectrum

In the ten years in which TVWS has been under consideration by regulators in Sub-Saharan Africa, WiFi as a technology continued to evolve in performance, even as WiFi costs came down, especially for PtP/PtMP broadband. The impact of this is that TVWS as a technology must be cost competitive with WiFi as well as have a similarly low administrative bar to access.

We encourage a toolbox approach to spectrum regulation which sees the regulator place a range of spectrum options at the disposal of operators so that they may select the most appropriate. TVWS should be seen as simply one of a number technology options that operators may select to provide the most resilient and affordable connectivity.

We encourage UCC to introduce TVWS regulation, as soon as possible, with a moratorium on fees until the technology is established in the sector. Access to TVWS should ideally be as simple as registering a WiFi PtP link. We also encourage expedited homologation mechanisms and ideally a temporary moratorium on import duties.

5G / 6G

Manufacturers and operators around the world have rushed to announce deployments of 5G technology in the last couple of years. We believe that 5G will be an important technology but, for the immediate future, LTE or 4G will be the most critical IMT technology. While network speed and latency are naturally important, developing an affordable network infrastructure that can reach everyone must be the first priority.

We also encourage technology neutral licensing of spectrum that will allow operators to select upgradeable network infrastructure and to upgrade to 5G and beyond as the demand for broadband makes such decisions appropriate. Ideally the transition from 4G to 5G will not entail the wholesale replacement of networks but rather cost-effective upgrades to existing networks.

Fibre To The Home (FTTH)

A seeming omission from the Blueprint document was any mention of fibre optic networks as a retail service and most importantly, more reliable last mile technology.

Only a few years ago, news of investment in FTTH services spoke of reaching only a few thousand customers. In 2021, FTTH services are encroaching on mobile markets¹⁴. It is worth reflecting on how big a change this represents to FTTH services breathing down the neck of MNOs most lucrative markets. Much of this is driven by demand for OTT services, although uptake of OTT service providers like Netflix, Showmax, and others is still hampered by high data costs. If fibre access costs can be brought in line with costs elsewhere in the world, fibre optic infrastructure will have at least as big an impact on African telecommunications as mobile has had.

We believe fibre optic technologies are a strategic long term investment for Uganda. We support investment in Fibre To The Home (FTTH) network infrastructure in all urban centres,

¹⁴ Revenge of the fixed lines: How fibre threatens mobile in South Africa. TechCentral. 20 July 2022 <https://techcentral.co.za/revenge-of-the-fixed-lines-how-fibre-threatens-mobile-in-south-africa/170652/>

even down to towns of a few thousand people. Fibre represents both extremely high-capacity broadband as well as a durable long-term technology solution.

Backhaul

While tremendous progress has been made in the roll-out of national fibre optic networks both by the government through NITA-U and private network operators, the relatively high cost of access to backhaul, particularly in rural areas remains a barrier to the uptake of broadband and the development of truly sustainable rural broadband.

We believe that the Government can realize increased economic benefit from the operations of the National Backbone Infrastructure (NBI) Network from increased uptake of services by driving down costs. In order to better understand this issue we encourage the government to publish utilisation figures on a periodic basis for the Government network as well as the privately owned networks.

To the extent possible, we encourage the government to adopt a geographically flat pricing strategy for network access, ensuring that service providers in Gulu or Kabale pay the same price for backhaul as in Kampala¹⁵.

We also encourage the government to undertake an exploration of options to reduce the cost of national backhaul routes. This may include the consideration of functional or structural separation for national license holders in order to increase competition in the wholesale markets and/or the regulation of wholesale network pricing according to long-run incremental costs.

We also encourage UCC to require fibre optic network backbone operators to operate on Open Access terms and publish a rate card¹⁶.

Transparency

Achieving affordable access for all means taking advantage of all available infrastructure and understanding where critical gaps/opportunities for investment lie.

Towards that end, we were heartened to see the emphasis placed on transparency in the Blueprint and encourage the government to adopt an Open Data policy for telecommunications infrastructure, making network infrastructure data publicly available so that:

- investors are better able to spot opportunities;
- municipalities/communities can understand how close they are to national backhaul points of presence;
- Coverage claims of network operators can be validated; and,
- Researchers can better interrogate the impact of ICT infrastructure investment on social and economic development.

¹⁵ The EdgeConnect model in New Zealand is an example of flattened backbone pricing by a state-owned operator.
<https://sp.chorus.co.nz/product/edgeconnect/overview>

¹⁶ The Botswana regulator is a good example of a rate card publication for the Bofinet backbone.
https://www.bocra.org.bw/sites/default/files/Tariff%20Pdf%27s/CORRECTION_OF_WHOLESALE_PRICES_AS_AT_END_SEPTEMBER_2015.pdf

About the submitting organisations

About Battery Operated System for Community Outreach (BOSCO)

BOSCO Uganda¹⁷ is a not-for-profit Organization (NPO) under the trusteeship of the Catholic Archdiocese of Gulu. BOSCO began in 2007 as an intervention to end isolation of people in the Internally Displaced People's (IDP) camps of northern Uganda in the aftermath of the Lord's Resistance Army war (1986-2007) by setting up ICT Centres in the camps to connect one camp to the other. BOSCO Uganda started its activities bringing Internet and Voice over Protocol (VoIP) telephony with the help of solar powered PCs to rural hard to reach areas of Northern Uganda. Since then, BOSCO Uganda is a leading NPO in the area of Information Communication Technology (ICT) and the only Community Network in Uganda.

The success of this initial project is one that has paved the way for the establishment of 55 community ICT & Development Centers in rural areas in Acholi, Lango and West Nile regions.

About the Association for Progressive Communications (APC)

APC¹⁸ is an international network of organisations that was founded in 1990 to provide communication infrastructure, including Internet-based applications, to groups and individuals who work for peace, human rights, protection of the environment, and sustainability. Pioneering the use of ICTs for civil society, especially in developing countries, APC members were often the first providers of Internet in their countries. APC continues to grow its worldwide network of NGOs which use the internet to make the world a better place. APC is both a network and an organisation, with UN ECOSOC status and ITU-D sector membership. APC members are groups working in their own countries to advance the same mission. APC has 58 organisational members and 28 individual members active in 74 countries.

¹⁷ <https://boscouganda.com/who-we-are/>

¹⁸ <https://www.apc.org/en/about>