COMMUNITY NETWORKS FOR DIGITAL INCLUSION IN RURAL AREAS

WHAT ARE THE OPPORTUNITIES FOR CAMEROON?

Authors
Sylvie Siyam
Josephine Miliza
Carlos Rey-Moreno

Contributors
Emile Lando-Yemeli
Cynthia El Khoury
Mike Jensen

Translation
Gwynneth Kably

Proofreading
Lori Nordstrom (APC)
Lynn Welburn

Graphic design and illustrations
Gustavo Nascimento

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The Local Networks (LocNet) initiative is a collective effort led by APC and Rhizomatica in partnership with people and organisations in the global South to directly support community networks and to contribute to an enabling ecosystem for their emergence and growth.

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ACRONYMS

ANTIC	Agence Nationale des TIC (National Agency for Information and Communication Technologies)
APC	Association for Progressive Communications
ART	Agence de Régulation des Télécommunications (Telecommunications Regulatory Agency)
CAMPOST	Cameroon Postal Services
CAMTEL	Cameroon Telecommunications
CAN	Centre Agricole Numérique (Digital Agricultural Centre)
CTD	Collectivités Territoriales Décentralisées (Decentralised Territorial Units)
ENSPT	Ecole Nationale Supérieure des Postes et Télécommunications (National Higher School of Posts and Telecommunications)
FST	Fonds Spécial des Télécommunications (Special Telecommunications Fund)
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (German Agency for International Cooperation)
ICT	Information and communications technology
ITU	International Telecommunication Union
MINDDEVEL	Ministry of Decentralisation and Local Development
MINFI	Ministry of Finance
MINPOSTEL	Ministry of Posts and Telecommunications
DAP	Digital Access Point
PRADEC	Programme d'Appui au Développement Communal de la GIZ (GIZ Communal Development Support Programme)
CRS	Community Radio Station
TCP	Télécentre Communautaire Polyvalent (Multipurpose Community Telecentre)
VSAT	Very small aperture terminall

EXECUTIVE SUMMARY

Inequalities in access to telecommunication services, particularly the internet, are long-standing and continue to increase, highlighting the social and economic gaps between the connected and unconnected. However, affordable and reliable internet access is increasingly proving to be a vital asset for development, particularly with the lockdown requirements related to the recent COVID-19 pandemic, which led to considerable developments in e-solutions (telework, online learning, telemedicine, and so on).

In order to clarify and facilitate appropriation in Cameroon of a particular connectivity solution that is supported by the International Telecommunication Union (ITU) and has already been adopted in several countries to reduce the digital divide, this paper was prepared as part of a bipartite partnership between the Association for Progressive Communications (APC), through its Local Networks (LocNet) initiative, and the Programme d'Appui au Développement Communal (Communal Development Support Programme, PRADEC), implemented in Cameroon by Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ). One of PRADEC's areas of intervention involves work in collaboration with the Ministry of Posts and Telecommunications (MINPOSTEL) on the provision of digital services to citizens via Télécentres Communautaires Polyvalents (Multipurpose Community Telecentres, TCPs).

This paper highlights the ever-increasing importance of access to electronic communications services in Cameroon as, today, the sector is an important lever in national economic development.

However, despite an internet penetration rate of approximately 37.8%, and teledensity of 87.2%, the significant imbalance in internet access between urban and rural populations is a major constraint to use of the opportunities offered by government initiatives built on information and communications technologies (ICTs) including the internet.

Within the framework of its obligations, the state has implemented certain measures defined by the regulations to ensure access to telecommunication services by all. These consist of specific network expansion constraints for concessionaires (the historic operator Cameroon Telecommunications, CAMTEL, as well as Orange Cameroon, MTN Cameroon and Nextel) via their specifications, and also a vast programme to deploy TCPs across the country. The 231 TCPs deployed in this way offer their hosting communities a wide variety of services suited to their needs, such as internet, telephones, office automation, internet and office automation training, ICT education and awareness-raising sessions, information (television, radio), marketing of telecommunications operators' products, and hiring of space for meetings, among others.

However, major access gaps persist, despite (i) implementation of the TCP programme, (ii) the 20,000 kilometres of fibre optic cable traversing the country and (iii) the multitude of services offered by telecommunications operators (fixed line and mobile telephony, internet access, transport) and the national coverage rates for these services (97% of the population has 2G coverage, 90% has 3G and 70% had 4G in 2022 with MTN Cameroon, while 79%

of the population had 3G coverage in 2020 with Orange Cameroon).

In fact, on average, there is more or less one public access point for approximately 49,000 inhabitants in rural areas (out of a rural population in Cameroon evaluated at 11.2 million in 2020), very far from the regulatory standards which stipulate one public access point for any community of over 200 inhabitants.

Among the options explored by the ITU Council Working Group-Internet on "Expanding internet connectivity", the increasingly important role of community networks in meeting the rising demand for affordable connectivity was highlighted.

Community networks are complementary access networks created in areas where traditional operators do not provide access services owing to their low economic appeal. These bottom-up, citizen-driven communication networks are deployed, operated and maintained by communities for their own use.

In Africa in particular, the experiences presented in the paper – such as those of BOSCO in Uganda, Pamoja Net in the Democratic Republic of Congo, Zenzeleni in South Africa and TunapandaNET in Kenya – highlight the fact that, besides providing telecommunications infrastructure, community networks contribute towards supporting economic and social activities, promoting local capacity building and creating and distributing relevant local content.

In Cameroon, where the regulations provide for the establishment of independent networks as well as the expansion of network operator coverage and the establishment of public access points to serve rural areas, this opens a door to community network development.

Two initiatives to establish complementary networks, already tried at the national level, have been presented. The first is that of PRADEC, established as part of an agreement with MINPOSTEL for the installation and commissioning of access points around four pilot telecentres. It enabled development around the telecentres in Mandama and Bibemi (in the North region) of two mesh networks that offer various services such as internet access within a radius of approximately two kilometres around the telecentre and non-internet-based access to local content (educational resources and municipal services). The second is that of CYBERVILLAGE, a private entity which has deployed mesh networks in Bandjoun and Bafoussam in the west region of Cameroon, Douala on the coast and Limbé in the southwest, to provide access to the internet and services such as offline access to Wikipedia. This enterprise also offers training to young Cameroonians in the installation and deployment of electronic communications networks.

In order to make the national environment more favourable to the development of this type of network, the paper presents regulatory and operational recommendations.

In fact, at regulatory level, based on the recommendations of the ITU and other international and regional organisations,

particularly the CEMAC directives, recommendations have been made for a more complete definition of the typology of electronic communications networks, including community networks and the scheme under which they operate; the introduction of a specific licence for non-profit entities who wish to provide telecommunications services to under-serviced communities; redefinition of conditions for access to spectrum that are more favourable to digital inclusion solutions; expansion of provisions governing access to financing from the Special Telecommunications Fund; and development of the regulatory system to facilitate the involvement of Collectivités Territoriales Décentralisées (Decentralised Territorial Units, CTDs) in the promotion of citizen access to electronic communications.

Operationally, the recommendations focus on the effective development of a universal service strategy as provided for in the regulations, regular revision of the contents of the “universal service” bundle so that it also encompasses mobile broadband, implementation of a multistakeholder platform for dialogue on ways to facilitate the deployment of digital inclusion solutions for significant universal connectivity in Cameroon, and classification of telecommunication services as basic services, not unlike water.

1. INTRODUCTION

Access to electronic communications services poses a major challenge to achievement of the Sustainable Development Goals (SDGs), the deadline for which is 2030. In addition, the COVID-19 pandemic has reinforced the essential role of meaningful, reliable and affordable access to broadband in our daily lives. It has contributed to stimulating connectivity, moving from basic connectivity to more bandwidth-intensive technologies. However, the COVID-19 pandemic has also exposed the long-standing existing digital inequalities which continue to grow and the consequent amplification of the social and economic gaps between the connected and unconnected.

In Cameroon, the government is obliged to provide access to electronic communications services to the entire population, irrespective of geographic location.[1] This access has become even more essential as the sector is now an important lever for national economic development.

In fact, the government places special importance on the role of information and communication technologies (ICTs) and the internet in consolidating initiatives for youth employment creation, improvement of the educational system, business competitiveness, tourist appeal of the country etc. To this end, several initiatives have been launched, specifically a vast digital economic promotion programme, an online tax declaration system, an online public official career management app, the online availability of upper secondary school lessons and many others.
It should also be noted that the efficacy of these initiatives resulting from government efforts are strongly dependent on citizen access to the telecommunications service, particularly internet, which is recognised to be highly unbalanced to the detriment of rural and isolated areas.[2]

This paper was prepared to promote adoption of a connectivity solution that is supported by the International Telecommunication Union (ITU) and has already been adopted in several countries to reduce the digital divide, namely community networks.

It begins with a snapshot of the current situation of telecommunications access in Cameroon and an overview of solutions that have already been implemented to address the remaining gaps, and proposes community networks as a solution for digital inclusion. This will be supported by the presentation of developments in other African countries. The paper closes with recommendations to facilitate the adoption of the community network model in Cameroon.

1 Article 4 of Law no. 2010/013 of 21 December 2010 governing electronic communications.

2 MINPOSTEL. (2017). Plan stratégique Cameroun numérique 2020. https://www.minpostel.gov.cm/index.php/fr/les-grands-chantiers/138-plan-strategique-cameroun-numerique-2020

ACCESS TO TELECOMMUNICATIONS SERVICES IN CAMEROON

2.1 STATUS OF ACCESS TO TELECOMMUNICATIONS SERVICES

The main telecommunication services to which citizens have access are: fixed line and mobile telephony, internet, transport, value-added services (VAS), interconnection and access, passive infrastructure and services based on Global Mobile Personal Communication by Satellite (GMPCS) systems.

These services are offered by numerous operators including Cameroon Telecommunications (CAMTEL), the historic operator, Orange Cameroon, MTN Cameroon and Viettel Cameroon, all four of which are concessionaires, as well as internet service providers, content providers and fewer than 10 players in the cable television domain.

The above-mentioned operators report impressive coverage rates. MTN Cameroon's existing network infrastructure covers 97% of the population with 2G, 90% with 3G and 70% with 4G in 2022. Orange Cameroon estimates its 3G coverage of the population at 79% in 2020.

Furthermore, Cameroon currently has a total of approximately 20,000 km. of fibre optic cables – including 12,000 installed by the government (interurban) and 8,000

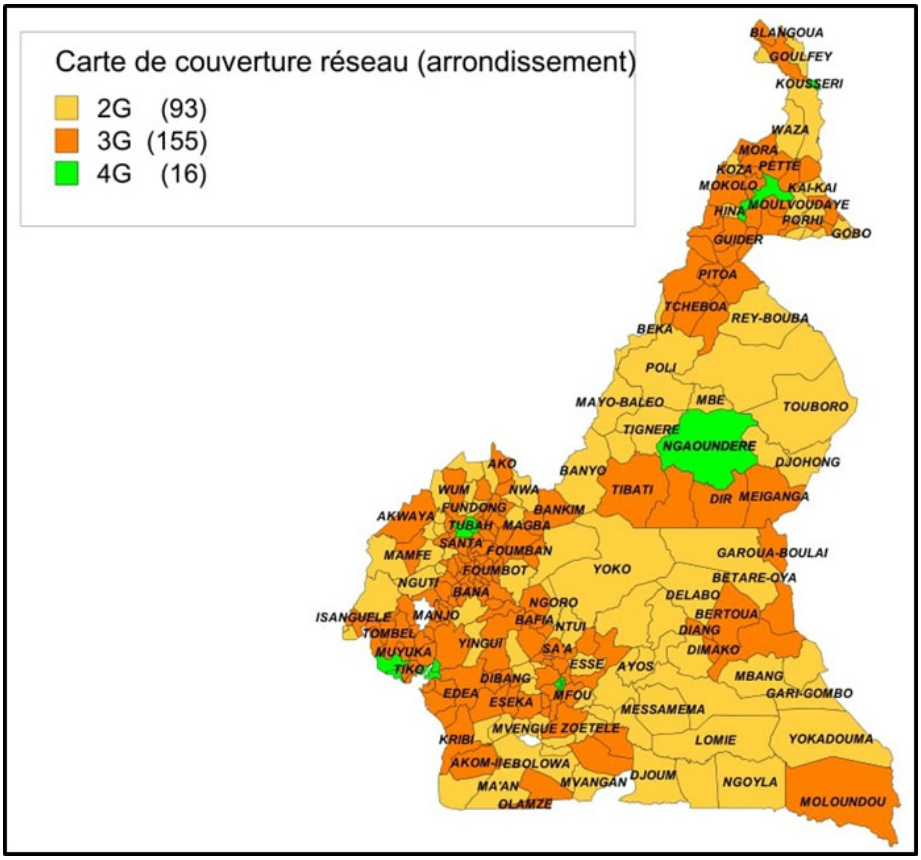


Figure 1 - Orange Cameroon network coverage

by the private sector – which serve 209 districts of the 360 in Cameroon and 52 out of 58 departments, with entry ramps to neighbouring countries including Chad, Gabon, Equatorial Guinea, the Central African Republic and Nigeria.

Despite this progress, fixed line teledensity was estimated at 3.61% in 2020 (ITU), while mobile teledensity, rapidly increasing, was evaluated at 84.20% (ITU). For the same year, the internet penetration rate is approximately 37.8% (ITU, ART). In fact, the number of internet users is estimated at approximately 7.87 million, which is 30% of the total population. It should be noted that 90% of these internet users connect via mobile.

2.2 IMPROVING ACCESS TO TELECOMMUNICATIONS SERVICES: PRESENTATION OF THE TÉLÉCENTRES COMMUNAUTAIRES POLYVALENTS (TCP) PROGRAMME

To guarantee access by the entire population to telecommunications services, the states implement universal access and/or service policies targeting at individual access to electronic communications services by every person or household.

2.2.1 ESTABLISHMENT OF UNIVERSAL SERVICE IN CAMEROON

Law no. 2010/013 of 21 December 2010 governing electronic communications

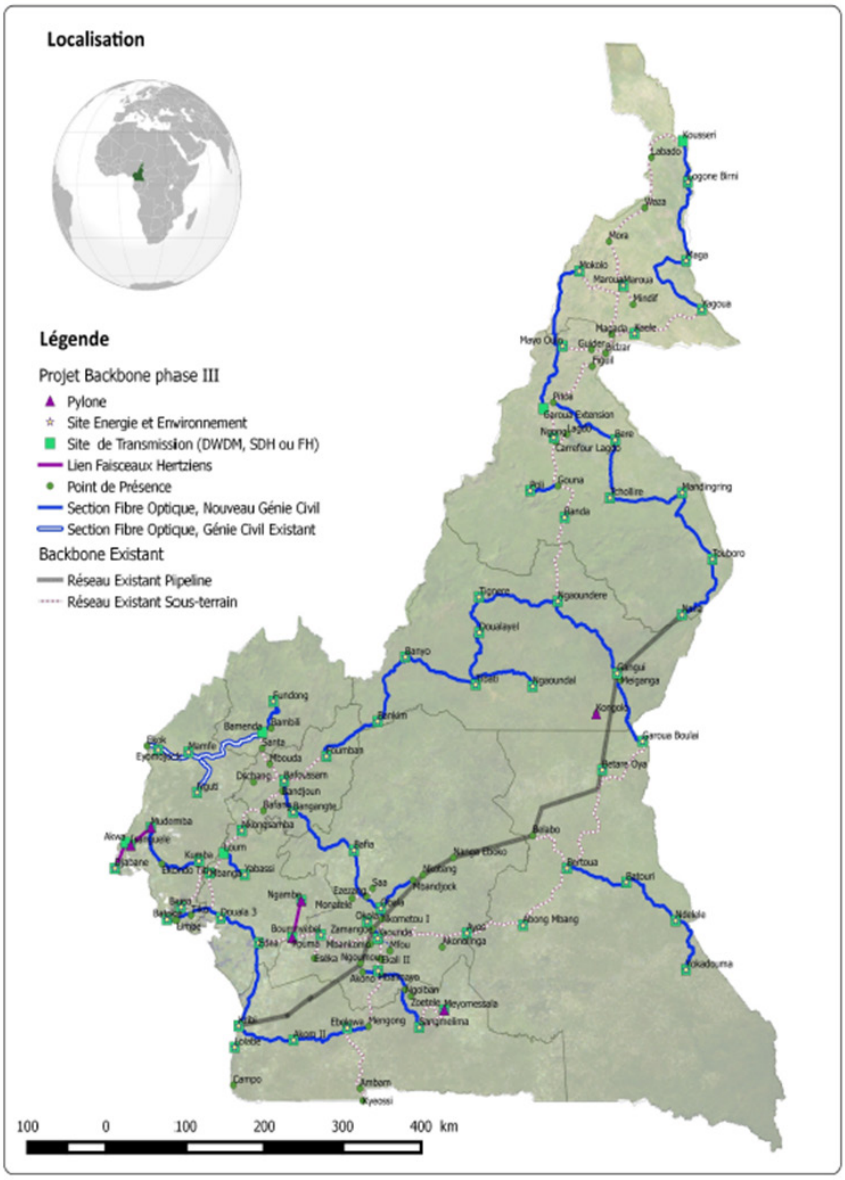


Figure 2 - National fibre optic backbone project phase III (CAMTEL 2019)

in Cameroon defines universal telecommunications service in Article 5 as “a minimal set of defined good quality services that are accessible to the entire population under affordable conditions irrespective of geographic location” and specifies in Article 28 that “The universal electronic communications service obligation means continuous and affordable provision of high quality electronic communications to all.”

In order to implement universal service, the prevailing regulations in Cameroon require the telecommunications authority to oversee the establishment of a deployment schedule to ensure that any community of more than 200 inhabitants has a public access point for electronic communications services and specifies that no individual should need to travel more than three kilometres for access.[3] Furthermore, the regulations stipulate that rural areas should be served through expansion of operator network coverage (certain constraints imposed in their licences), the establishment of independent networks, public access points or community telecentres.[4]

The Télécentre Communautaire Polyvalent (Multipurpose Community Telecentre, TCP) programme was deployed in line with these provisions.

2.2.2 PRESENTATION OF THE TCP PROGRAMME

In order to promote universal telecommunications service and to contribute towards significantly reducing the digital divide between urban and rural areas, the Cameroonian government embarked on a programme in the early 2000s to establish TCPs, Data Access Points (DAPs) hosted by post offices, Community Radio Stations (CRSs) and Centres Agricoles Numériques (Digital Agricultural Centres, CANs) throughout the country. TCPs are “infrastructures

TELECENTRE MANDAMA

3 Article 8 du décret n°2013/0398/PM du 27 février 2013 fixant les modalités de mise en œuvre du service universel et du développement des communications électroniques.

4 Article 18 du décret n°2013/0398/PM du 27 février 2013 fixant les modalités de mise en œuvre du service universel et du développement des communications électroniques.

intended to provide telecommunications, IT, audiovisual and internet services from one or more terminals made available to a community, to enable affordable, discrimination-free communication."

Implementation of this programme mobilised several partners, including the Ministry of Posts and Telecommunications, the project manager, the Ministry of Finance, the Ministry of Agriculture and Rural Development (MINADER), the Agence de Régulation des Télécommunications (Telecommunications Regulatory Agency, ART), the historic operator CAMTEL as consulting engineer in charge of installation, supervision and maintenance of commissioned access infrastructure, the Ecole Nationale Supérieure des Postes et Télécommunications (National Higher School of Posts and Telecommunications, ENSPT) and the Collectivités Territoriales Décentralisées (Decentralised Territorial Units, CTDs) hosting the TCPs.

Funded from the outset by debt repayment funds (HIPC funds), the programme mainly benefits from the Fonds Spécial de Télécommunications (Special Telecommunications Fund, FST), operational since 2006.[5]

Daily administration of the TCPs is handled by managers recruited by MINPOSTEL and trained by the ENSTP; they are assisted by two individuals recruited from the community. Management committees headed either by the administrative authority (prefect, sub- prefect) or by the mayor were set up to ensure the objectives assigned by the government were met.

Extreme North
20 TCPs
8 DAPs
3 CRSs

North
13 TCPs
6 DAPs
3 CRSs

Adamaoua
11 TCPs
3 DAPs
1 CRSs

Northwest
10 TCPs
7 DAPs
4 CRSs

Southwest
16 TCPs
3 DAPs
2 CRSs

West
21 TCPs
3 DAPs
3 CRSs

Coast
14 TCPs
8 DAPs
2 CRSs

Centre
28 TCPs
5 DAPs
2 CRSs

East
15 TCPs
6 DAPs
3 CRSs

South
29 TCPs
6 DAPs
2 CANs
7 CRSs

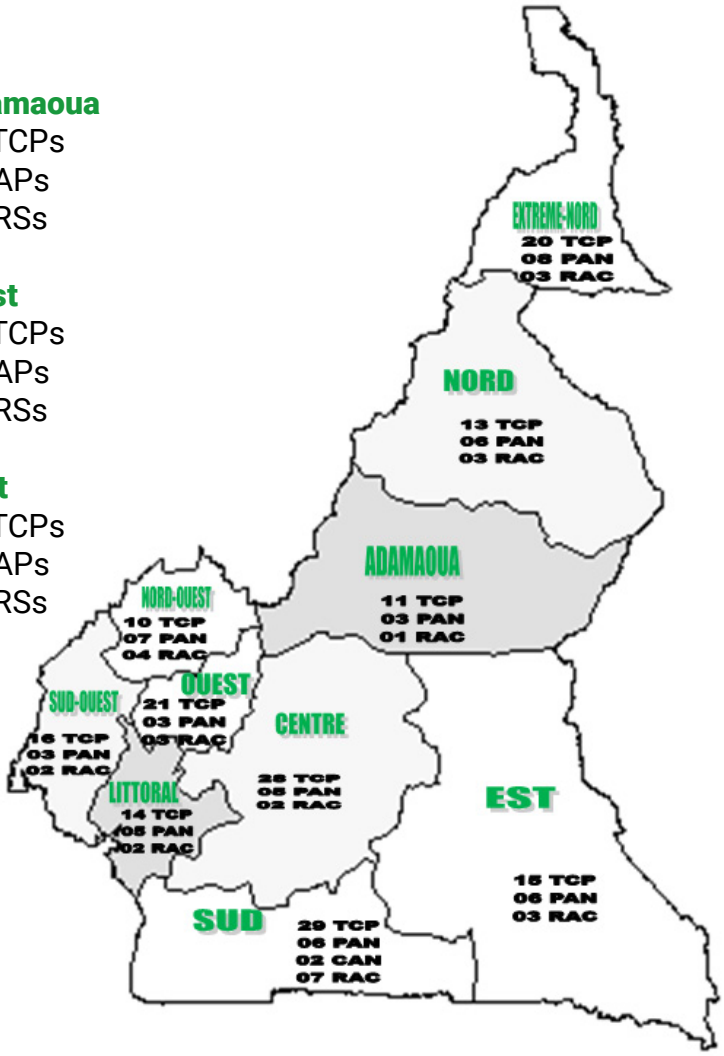


Figure 3 - TCP, DAP, CAN and CRS location map

5 A universal service fund with contributions from all concessionaires and network operators and telecommunication services, at 3% of their annual turnover.

A varied range of services adapted to the needs of the communities is offered within the TCPs: internet, telephones, fax, office technology (data entry/ printing, photocopying, proofreading, etc.), document scanning, reprography, digital photography, internet and office technology training, ICT education and awareness-raising sessions, information (television, radio), marketing of telecommunications operators' products, hiring of space for meetings etc. TCPs are generally connected to the internet via VSAT, and some via fibre optic or operator networks.

a) HAVE THE OBJECTIVES BEEN ACHIEVED?

The assessment conducted in 2016 showed that since its pilot phase launched in 2002 in Cameroon, the programme has enabled the establishment of 231 TCPs throughout the country, with 52 DAPs, two CANs and 30 community radio stations deployed in some of these facilities (Figure 4).

It should be noted that very few studies have been conducted to identify the impact (positive and negative) of TCPs by sector: education, health, governance, public participation and gender disparity.

However, a study conducted in 2019 by PROTEGE QV[6] in five TCPs (Jakiri, Bangang, Makenene, Bankim and Ambam) and on a sample of 1,015 secondary level pupils and 235 teachers, all users of these TCPs, showed that TCPs enabled 46.8% of student users to improve their academic performance, not repeat a grade, improve their knowledge and computer or internet skills, gain self-confidence and become better informed. At the same time, TCPs have had an overall positive impact on almost 50% of teacher users, who have seen an improvement in the academic performance of their students, an improvement in their teaching practice, gaining of self-confidence and an improvement in their professional career.

Furthermore, the 2017 audit report ordered by the Prime Minister showed that only 57 TCPs out of 231 were functional, which is less than 25%, for various reasons: incomplete work, suspended or abandoned by some contractors, no internet, irregular salaries, lack of electricity etc. The most commonly requested services in the TCPs are office technology (40%), internet (33%), training (14%), games and troubleshooting (13%). In general, in each town hosting a TCP, 92.45% of the population know about the existence of the TCP or DAP; 76% of these populations make use of the facility and 30.7% have reported complete satisfaction with the services offered.[7]

Despite the mixed review of the TCP programme, it should be noted that it has had the following positive effect on the lives of beneficiary populations:

- The creation of direct employment in the towns in question, specifically to manage the TCPs/DAPs/CRSs, or indirect employment (emergence of other activities around the TCPs and DAPs).
- The discovery of ICTs by rural populations and improvement in the level of use due to training in the use of IT tools.
- Increased social cohesion due to the use of TCPs as recreational spaces with television and broadcasting of films.
- A reduction in the rural exodus, as a result of the possibility of using

6 Siyam, S., et al. (2015). The Contribution of Five Télécentres Communautaires Polyvalents to Cameroon's Rural Secondary Education. In Francisco J. Proenza (Ed.), Public Access ICT across Cultures: Diversifying Participation in the Network Society. Centre de recherches pour le développement international. https://www.idrc.ca/sites/default/files/openebooks/569-4/index.html#ch06

7 Rapport d'audit comptable, financier et stratégique du programme de mise en place des télécentres communautaires polyvalents (TCP), mars 2017.

electronic communication services such as the internet, telephones etc. without having to travel to the urban centres.

b) DIFFICULTIES ENCOUNTERED AND PROSPECTS OF THE TCP PROGRAMME

Since 2016, numerous difficulties have emerged in managing and operating the TCPs, specifically related to affordable internet access, availability of electricity, low level of involvement of local populations, non-suitability of human resources and insufficient funding.

Moreover, use of the TCPs by local populations has greatly decreased owing to the high penetration rate of mobile services provided by operators in rural areas, enabling access to basic electronic communications services (voice and data).

In light of the recommendations of the audit performed in 2017 to increase the programme's efficacy and efficiency, the direction taken by the telecommunications authority consists of deploying TCPs within a broad framework of cooperation, bringing together potential partners to pool the resources necessary for the construction, equipment, training and operation of these centres. This discussion has been the subject of several multistakeholder meetings.

In addition, the following prospects are under consideration:

- High-speed connection of communes,[8] given the importance of fibre optic for connectivity in remote areas.
- Renewal and strengthening of existing partnerships.
- Transfer of TCP management to the CTDs who will consequently receive multidimensional support in their operation.
- Availability of online public services through the TCPs.
- Provision of connectivity around TCPs due to long-range Wi-Fi hotspots or other types of radio station, for example.

Studies are ongoing at the Ministry of Telecommunications to ensure that TCPs are henceforth positioned as value-added service providers (VASPs) or internet service providers (ISPs) in the area.

2.3 WHAT GAPS NEED TO BE ADDRESSED?

The different indicators of access to telecommunication services presented above hide major disparities. Based on the coverage rates announced by operators, it could be believed that access to telecommunications services is not a problem in Cameroon. However, use of services related to these coverage rates depends on the availability of electricity.[9]

The electricity access rate in Cameroon is 62.6%, but with a significant imbalance in the rural areas where it is under 20%. Moreover, a presentation by the Minister of Energy to the deputies in 2021 revealed that out of the 13,104 towns in Cameroon, 9,000 still have no access to electricity. However,

8 https://en.wikipedia.org/wiki/Communes_of_Cameroon

9 Mbodiam, B. R. (2021, 5 July). Électricité : 9 000 localités sur 13 104 broient encore du noir au Cameroun, en raison du manque de financements. Investir au Cameroun. https://www.investiraucameroun.com/energie/0507-16597-electricite-9-000-localites-sur-13-104-broient-encore-du-noir-au-cameroun-en-raison-du-manque-de-financements

there are disparities that should be noted between the regions. In the Northern region, 74.5% of towns are not electrified, 68.6% in the Southwest and 21.7% in the Eastern region.

It is clearly seen that despite the substantial coverage rates presented by operators, several towns have no access to electronic communications services due to a lack of electricity.

Furthermore, in terms of the size of the rural population in Cameroon, the number of TCPs/DAPs/CRSs installed, which is 231, and despite regional disparities, on average there is about one public access point for approximately 49,000 inhabitants in rural areas,[10] very far from the stipulated regulatory standards (one public access point for every community of more than 200 inhabitants).[11] However, it should be noted that access to service in rural areas was covered in the current regulations through expansion of operator network coverage (certain constraints imposed in their licences) and the establishment of independent networks, public access points or community telecentres.[12]

Would it not be possible for the independent networks mentioned here to expand via community networks to help address the noted gaps? An option strongly supported by the ITU consists of planning the deployment of these networks around already existing TCPs.[13] This option will be explored in further detail later in this paper.

10 The rural population in Cameroon was estimated at 11,266,065 inhabitants in 2020. https://data.worldbank.org/indicator/SP.RUR.TOTL?locations=CM

11 Article 8 of Decree no. 2013/0398/PM of 27 February 2013 setting the terms for implementation of universal service and the development of electronic communications.

12 Article 18 of Decree no. 2013/0398/PM of 27 February 2013 setting the terms for the establishment of universal service and the development of electronic communications

13 Giga & Boston Consulting Group. (2021). Meaningful School Connectivity: An assessment of sustainable business models. ITU. https://giga.global/bcg-report

ADDRESSING DIGITAL EXCLUSION

The importance of access to affordable broadband is a now commonplace insight from the COVID-19 pandemic. However, the pandemic has revealed something even more important for policy makers and communications regulators; it highlighted the fact that inclusion must be a top priority if the internet is not to become an amplifier of inequality. Furthermore, it is clear that not just any kind of access will be sufficient to ensure that the internet lives up to its potential as a social and economic enabler. In fact, populations must have access to broadband of adequate capacity and affordability, as well as affordable devices that allow them to take full advantage of the available resources. In addition, there is a need for capacity-building to help users develop the level of independence that will ensure they extract maximum value from the internet.

3.1. WHAT SOLUTIONS HAVE BEEN TRIED TO ADDRESS THESE GAPS? IS THIS SUFFICIENT OR DO WE NEED SOMETHING ELSE?

In a context where many have access to a mobile signal but are not using it, there is consensus within different organisations including the ITU, who recognise that connectivity must not only be universal but also meaningful. For the United Nations Broadband Commission "meaningful universal connectivity" encompasses broadband that is available, accessible, relevant and affordable, but also that is safe, trusted, user-empowering and leads to positive impact. Doreen Bogdan-Martin, recently elected ITU's Secretary General, added that to achieve meaningful universal connectivity, "business as usual" will not work.

Among the options explored by the ITU Council Working Group-Internet on "Expanding internet connectivity", a "number of general policy issues related to expanding internet connectivity were highlighted [...] including complementary access solutions such as community networks." In the COVID-19 era, community networks are playing an increasingly important role in meeting the rising demand for affordable connectivity.

In Africa, community networks are usually more than telecommunications infrastructure providers; they exist in support of economic and social activities, often managing to minimise the outflow of economic value leaving the community to pay for connectivity services. Beyond access, they also create a platform that promotes building local capacities, as well as the creation and distribution of locally relevant content. They thus contribute towards providing universal and meaningful connectivity. This contribution has been acknowledged within the context of the ITU-D Study Groups, in particular in part of the 2018-2021 report from Question 5/1: Telecommunications/ICTs for rural and remote areas. As such, these community networks are considered as a solution in the Last Mile Connectivity Guidelines from the ITU.

14 ITU. (2021, 29 November). 2.9 billion people still offline. https://www.itu.int/en/mediacentre/Pages/PR-2021-11-29-FactsFigures.aspx

15 https://www.itu.int/en/ITU-D/bdt-director/Pages/Speeches.aspx?ItemID=244

16 ITU. (2021, 21 January). At Davos, UN Broadband Commission advocates for financing inclusive meaningful connectivity for sustainable impact. https://www.itu.int/en/mediacentre/Pages/PR01-2020-Broadband-Commission-Meaningful-Universal-Connectivity.aspx

17 https://www.itu.int/en/council/cwg-internet/Pages/consultation-sep2020.aspx

18 https://www.itu.int/en/myitu/Publications/2021/07/22/13/20/Telecommunications-ICTs--for-rural-and-remote-area

19 ITU. (2020). The Last-mile Internet Connectivity Solutions Guide: Sustainable Connectivity Options for Unconnected Sites. https://www.itu.int/en/ITU-D/Technology/Pages/LMC/LMC-Home.aspx

REMOVING BARRIERS FOR THE DEVELOPMENT OF COMMUNITY NETWORKS IS ROOTED IN INTERNATIONAL AND REGIONAL RESOLUTIONS. FOR INSTANCE, ITU MEMBER STATES HAVE REACHED CONSENSUS TO:

- "Invite Member States, Sector Members and other stakeholders to work collaboratively [...] to encourage innovation and entrepreneurship in local populations, including by encouraging community support for entrepreneurship and locally based programmes, including those for complementary solutions and networks."[20]
- "Invite Member States to consider inclusive and innovative policies to close the digital divide, taking into account national initiatives and telecommunications/ICTs complementary access networks and solutions," something that it has instructed the Director of the Telecommunication Development Bureau to support where requested.[21]

This has been further elaborated within the framework of best practices developed by the ITU's Global Symposium for Regulators 2021, which, as part of the regulatory tools to bridge funding gaps, make the recommendation to:

> Promote local innovation ecosystems and provide incentives for the participation of small and community operators in deploying low-cost rural networks, including specific licensing measures, access to key infrastructure and funding, and social coverage promotion programs.[22]

Already in 2019 and at the regional level, the African Union Commission was instructed by its members to "promote the formulation of strategy and pilot projects for unlocking access to basic infrastructure and services for rural and remote areas including [...] community networks."[23]

In addition, in its Digital Trends in Africa 2021 report, the ITU included as "Possible considerations for the Africa region to address affordability and meaningful connectivity" the need to:

> Review universal service fund (USF) models and approaches, including exploring new community network access models and public community access points (Wi-Fi hubs) for underserved and rural communities.[24]

Finally, the report entitled Connecting Africa Through Broadband: A strategy for doubling connectivity by 2021 and reaching universal access by 2030 published in 2019 by the Broadband Commission for Sustainable Development states:

> One approach can be to better use existing USAFs [universal service and access funds] to subsidise device costs for underserved groups such as

20 ITU. (2020). The Last-mile Internet Connectivity Solutions Guide: Sustainable Connectivity Options for Unconnected Sites. https://www.itu.int/en/ITU-D/Technology/Pages/LMC/LMC-Home.aspx

21 Provisional Final Report of the World Telecommunication Development Conference 2022. https://www.itu.int/md/D18-WTDC21-C-0103/en

22 ITU Global Symposium for Regulators 2021 Best Practice Guidelines. https://www.itu.int/en/ITU-D/Conferences/GSR/2021/Documents/GSR-21_Best-Practice-Guidelines_FINAL_E_V2.pdf

23 2019 Sharm El Sheikh Declaration from the African Union's Specialized Technical Committee on Communications and Information Technologies (STC-CICT). https://au.int/sites/default/files/decisions/37590-2019_sharm_el_sheikh_declaration_-_stc-cict-3_oct_2019_ver2410-10pm-1rev-2.pdf

24 ITU. (2021). Digital Trends in Africa 2021. https://www.itu.int/dms_pub/itu-d/opb/ind/D-IND-DIG_TRENDS_AFR.01-2021-PDF-E.pdf

women as part of initiatives aimed at improving last-mile access solutions. This can be done in partnership with mobile network operators and other ISPs, including community networks.[25]

3.2. DESCRIPTION OF COMMUNITY NETWORKS

3.2.1 WHAT ARE COMMUNITY NETWORKS?

Community networks are complementary access networks created in areas where traditional operators do not provide access services owing to the low economic appeal of these areas. These bottom-up, citizen-driven communication networks are deployed, operated, and maintained by communities for their own use. Institutionally, community network models and community involvement vary from one community or country to another due to differences in sociocultural contexts.[26]

3.2.2. INSTITUTIONAL AND GOVERNANCE MODELS

Community networks governance and institutional models are dependent on local contexts. In Africa, many are initiated by a champion who can be from the community or an external person collaborating with the community. Known institutional models bring together non-profit organisations, community-based organisations or cooperatives. In all instances there is usually support from the local authority. For example, Zenzeleni Community Networks in South Africa work together with the headmen from Mankosi and Zithulele villages (local tribal authorities) and in DRC Pamoja Net works together with the Mwami/King in Idjwi. This sense of community ownership has seen local community members and local authorities playing a key role in mobilisation and advocacy at local, national and regional levels. Local authorities from different communities have participated in the annual Africa Community Networks Summit events. For example, in 2018 the Mankosi headman was one of the participants to the summit hosted by the Zenzeleni Community Network and in 2019 the late Chief Kariuki from Kenya (Lanet Umoja) and other local municipal representatives from Cameroon attended the summit which was hosted by the University of Dodoma in Tanzania. In terms of network operations, there is a community-led anchor organisation whose role is:

- To provide services by acting as a gateway to help people access the services they need such as the internet, locally hosted content, online learning and online health.
- To mobilise the necessary resources to support network establishment costs, from capital expenditure to operating costs.
- To create local and external partnerships.
- To advocate for improvements in policy and the legal and regulatory framework.
- To build capacities for community members.
- To strengthen community participation and involvement for improved appropriation.

21 Broadband Commission Working Group on Broadband for All. (2019). Connecting Africa Through Broadband: A strategy for doubling connectivity by 2021 and reaching universal access by 2030. ITU & UNESCO. https://www.broadbandcommission.org/publication/connecting-africa-through-broadband

22 Bidwell, N., & Jensen, M. (2019). Bottom-up connectivity strategies: Community-led small-scale telecommunication infrastructure networks in the global South. APC. https://www.apc.org/sites/default/files/bottom-up-connectivity-strategies_0.pdf

3.2.3 TECHNOLOGIES

Most community networks use licence-exempt 2.4/5 GHz Wi-Fi spectrum bands for service provision. This choice is because of the relatively low cost and availability of Wi-Fi-based equipment which brings down network start-up costs. The networks are centrally managed with the core network hosted at anchor organisation sites within the community. From the core network, the community networks set up point to multipoint connections using partner organisations with a geographical advantage as relay sites. In the network access layer networks, there are three main models:

- Public community spaces such as youth and women empowerment centres. Some of these centres have computers while other users access the internet via mobile phones.
- Public Wi-Fi hotspots, public access points in designated places in the community where residents can access the internet.
- Private Wi-Fi hotspots to connect homes, local businesses and institutions such as schools, NGOs and health centres.

The two main backhaul technologies used by the community networks are Wi-Fi in the 5 GHz range and fibre. The backhaul cost is the largest expense for networks and may account for up to 60% of the network's operation costs. The cost of backhaul capacity varies from one network to another but is considerably higher for community networks, not just because of their geographical location but also the fact that they purchase at retail prices due to their low consumption or capacity to pay. Individually, community networks cannot reach the wholesale capacity threshold.

3.3. EXAMPLES OF THESE COMPLEMENTARY SOLUTIONS IN AFRICA

3.3.1 BATTERY OPERATED SYSTEMS FOR COMMUNITY OUTREACH (BOSCO) – UGANDA

BOSCO is a non-profit NGO under the auspices of the Catholic Archdiocese of Gulu. BOSCO is registered with the Uganda Communications Commission (UCC) and uses the 802.11 licence-exempt spectrum for its operations in order to reach communities. Launched in 2006, BOSCO started operation in six internally displaced persons (IDP) camps in the two districts of Gulu and Amuru, providing VoIP, internet and intranet services for the connected camps, with the primary aim of ending the severe isolation being experienced by camp residents.

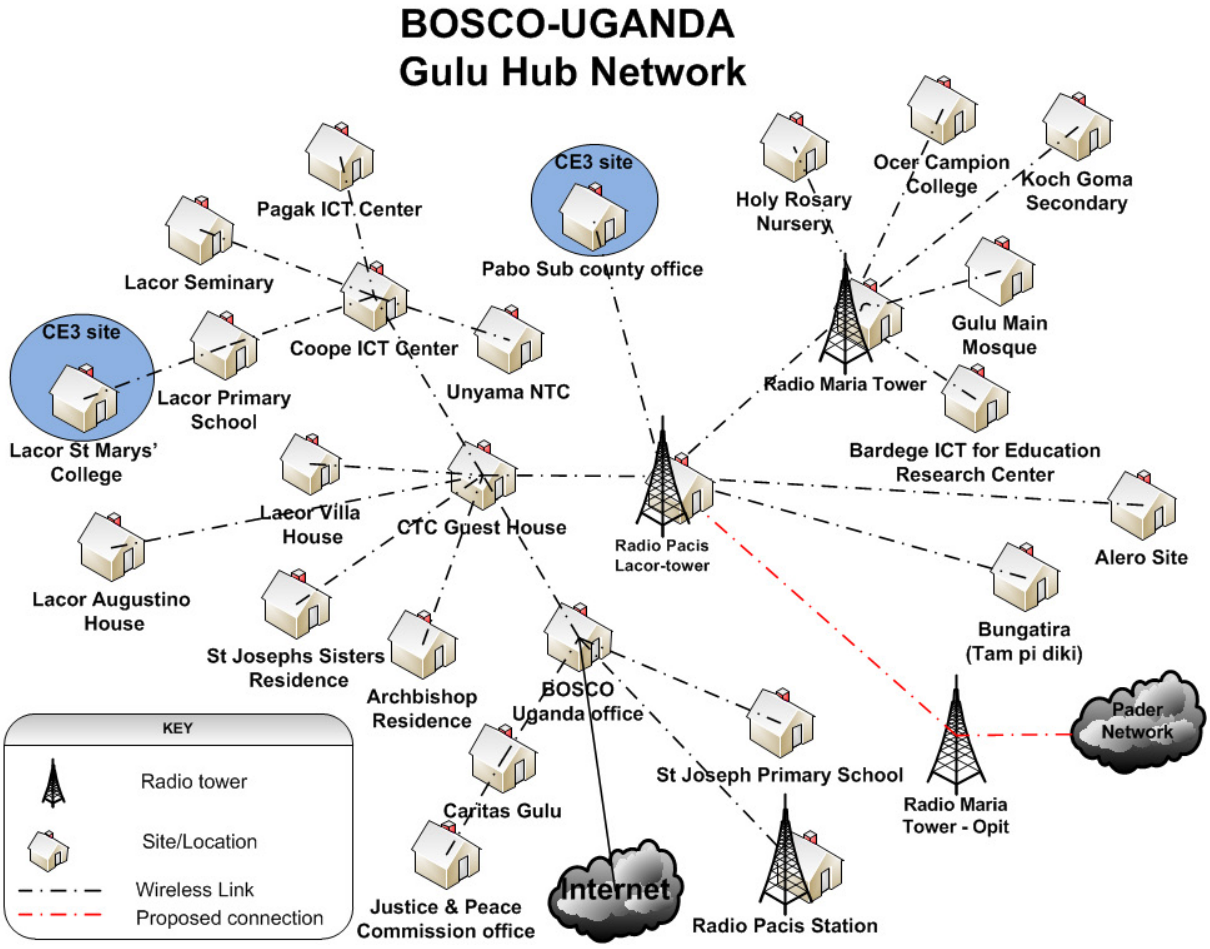
As people resettled back in their communities after the war in northern Uganda, the network expanded to provide services to 13 districts in the Acholi, Lango and West-Nile sub-regions with about 50 community-owned ICT centres that focus on building digital literacy and entrepreneurship skills. The network, which now spans over 80 km of backhaul, is built using the licence-exempt Wi-Fi spectrum in the 2.4 GHz and 5 GHz bands. The organisation owns nine towers but also collaborates with community radio stations, giving them access to FM broadcast towers. Most areas in northern Uganda have not been connected to the country's electrical grid thus BOSCO relies on solar energy to power the network. Through its CE3 (Connectivity, Education Entrepreneurship and Electricity) project, the organisation has helped local communities set up and manage large solar energy systems (6 KW, 30 KW) in secondary schools, ICT centres and local

businesses. In addition to internet and solar power, ICT content is translated into the local Acholi language and training of trainers is provided to youths and women who run ICT centres.

3.3.2 PAMOJA NET COMMUNITY NETWORK – DEMOCRATIC REPUBLIC OF CONGO (DRC)

Pamoja Net, a community network located on Idjwi Island in Lake Kivu, has been supported by La Différence, an NGO focusing on social and economic development support to the local population of this remote island in the DRC.[27] The network was launched in 2017 following a request from the King (Mwami) of the northern region to create opportunities for the local youth. Idjwi Island has no electrical grid and limited 2G network coverage. After setting up a 40 km link across Lake Kivu to the nearest town of Bukavu, Pamoja Net was able to offer solar power-based internet connectivity to the island residents and local organisations using fixed wireless connections and public Wi-Fi hotspots, along with a public access kiosk. The network is planning to use Open Cellular GSM base stations to enable the use of low-cost voice and SMS services through ordinary phones, as well as interactive voice response applications. To boost affordability, the network provides free off-peak Wi-Fi access (4:00 to 11:00 p.m.) which is 80% subsidised by income generated from services provided to businesses and NGOs.

Figure 4 - Network diagram of BOSCO Uganda (used with the permission of BOSCO Uganda)



27 https://www.la-difference.com/innovation-article-community-internet

The network is now used by more than 5,000 people. Pamoja Net is also a deployment platform for digital services designed with the local community and which meet the daily needs of individuals in terms of education, health, savings and even physical safety. In fact, women going to the fields or their place of business on the island were regularly attacked coming and going. The SALAMA security app created by Pamoja Net was deployed on their telephones, which allows them to contact the police or their relatives more easily in case of an attack. A toll-free number has been created for this purpose. This has promoted women's business activities on the island. Several women have also been trained in the use of smartphones and internet use on phones, which were given to them free of charge to facilitate this training.

3.3.3 ZENZELENI NETWORKS NPC – SOUTH AFRICA

The Zenzeleni Community Network was the first cooperatively owned internet service provider in South Africa.[28] The community network is located in a rural area in the Eastern Cape where 93% of the population is unemployed while 90% has not completed school. Most of the residents live on a USD 1 daily threshold, with up to 25% of their monthly disposable income spent on telecommunications prior to the establishment of the community network. The network started as a postgraduate doctoral research project at the University of the Western Cape (UWC), in partnership with the Mankosi community, over 10 years ago. Since then, the initiative has developed into a set of independent entities utilising a two-tier operational model with Zenzeleni Networks NPC as the first tier.

This non-profit umbrella organisation supports two local cooperatives (Zenzeleni Mankosi Cooperative and Zenzeleni Zithulele Cooperative) as the second tier, who in turn provide internet services to their respective communities. The network uses the 2.4 GHz and 5 GHz licence-exempt spectrum as well as fibre for backhaul capacity. Zenzeleni cooperatives' services include prepaid hotspot vouchers and dedicated access for anchor clients, such as a district hospital. The network operates a total of 74 hotspots and 18 fixed anchor clients. In 2021, Zenzeleni established a "Solar Learning Lab" in partnership with Computer Aid International,[29] where it provides digital literacy training to the community.

3.3.4 COMMUNITY NETWORKS IN KENYA

The community network movement in Kenya has grown in recent years. There are currently four existing community networks with eight community-based organisations undergoing training and mentorship to deploy others. These four networks are:

- The Dunia Moja Community Network, supported by Lamuka Hub, a social enterprise based in Mtondia Village in Kilifi County. The organisation's initiatives are geared towards closing the digital divide by training the youth and teachers in the digital culture and by ensuring connectivity.

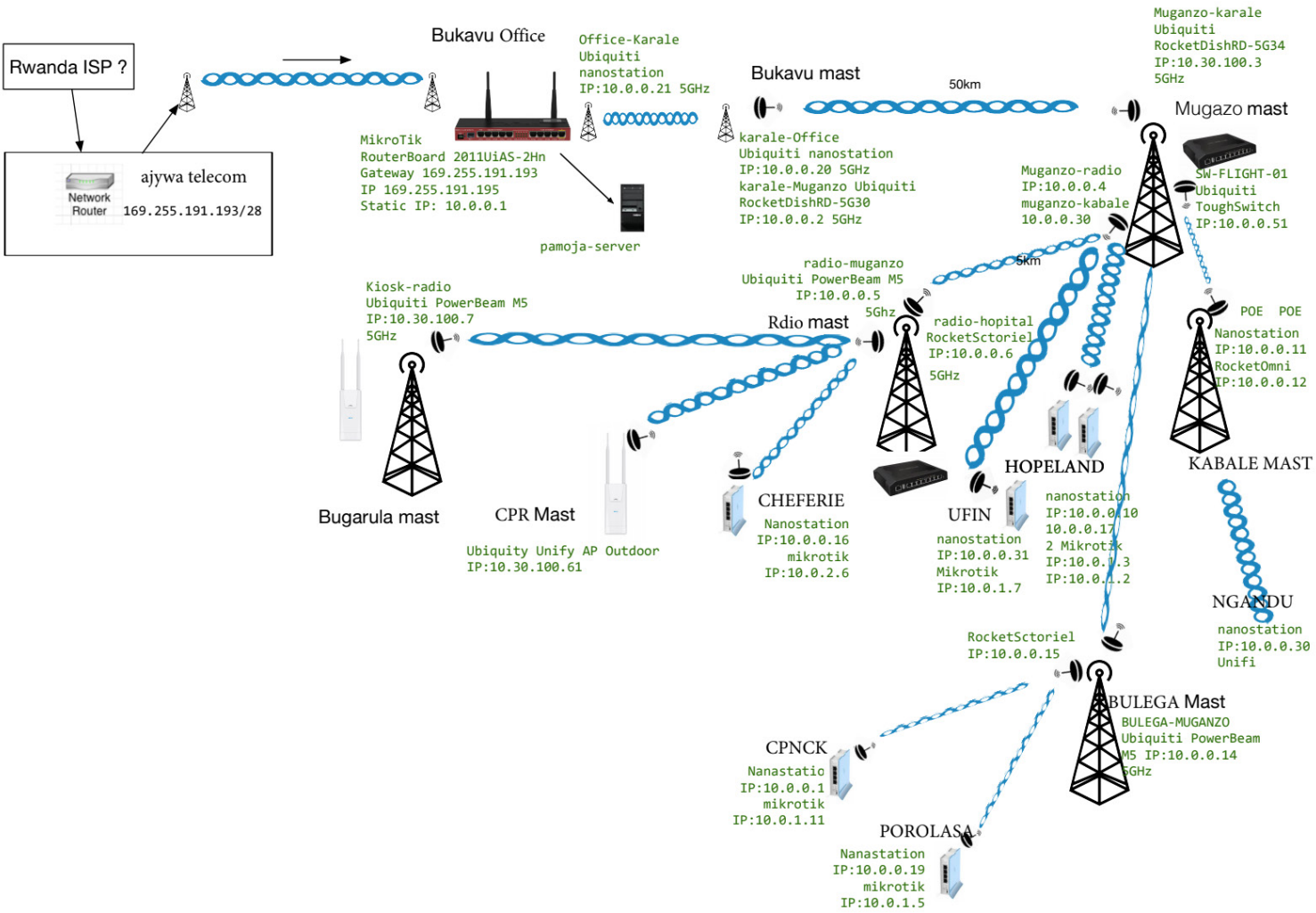
- The AHERI Community Network, run by the Africa Higher Education Research Institute (AHERI), an organisation established over 30 years ago. In 2020, AHERI launched its community network of the same name, which provides connectivity to technical and vocational education and training centres and community-based organisations.

- The Lanet Umoja Community Network, supported by the women's network,

10 https://zenzeleni.net

11 https://solarcommunityhubs.com/new-lab-deployed-in-mankosi-south-africa

Figure 5 - Network diagram of the Pamoja Net community network (used with the permission of La Différence)



AFCHIX,[30] and the late Chief Kariuki with support from USAID.[31] Launched in 2018, the Lanet Umoja community network provides connectivity to public schools in Lanet, a community in the district of Nakuru North with 30,000 inhabitants, and also has public Wi-Fi hotspots providing internet access to communities near the school. Additionally, this network has provided training on network management and maintenance to the youth in the community.

- The TunapandaNET Community Network,[32] supported by the community organisation Tunapanda Kibera, whose goal is to build a digital ecosystem to address digital inequalities for the socially and economically disadvantaged living in Kibera, an informal settlement in Nairobi, Kenya. The network addresses these inequalities by focusing on access to connectivity, building digital capacities, digital platforms and the creation of locally relevant content by, with and for the community. The network has connected a total of 40 nodes including schools, community public spaces, institutions, organisations and health centres.

The common motivation for the establishment of community networks is the provision of affordable internet access. Except for TunapandaNET in Kibera, where internet service providers are already active, the other three networks exist in areas where broadband is only available via national commercial mobile operators offering data bundles. All the community networks use licence-exempt 2.4/5 GHz Wi-Fi spectrum bands to provide services. This choice is because of the relatively low cost and availability of Wi-Fi-based equipment which brings down network start-up costs. The networks are centrally managed with the core network hosted on the premises of anchor organisations within the community. From the core network, the community networks set up point to multipoint connections using partner organisations with a geographical advantage as relay sites. In the access layer, Tunapanda, AHERI and Dunia Moja provide services to community public spaces (centres for women and youth), public Wi-Fi hotspots and private Wi-Fi hotspots located in private concessions, local businesses and schools, NGOs and health centres.

Across all four networks, the community hosts, powers and provides security for the network equipment. Owing to their bottom-up approach, community networks understand the socio-economic reality at local level and adopt a holistic approach towards closing the digital divide. This is evident in the development of local technical expertise through capacity-building activities for members of the community. In Kibera, Tunapanda launched a network technician internship programme that identifies and trains interested youth from the community in networking. In Lanet Umoja, AFCHIX partnered with the Internet Society to offer technical training in community networks.

3.4 EXPERIMENTS WITH IMPROVING DIGITAL INCLUSION IN CAMEROON

In Cameroon, apart from the deployment of TCPs which are the primary solution for digital inclusion, two community-serving experiments developing electronic communication networks have been identified, led by public or private organisations. In fact, in line with the involvement of several partners in improving citizen access to electronic communications services, MINPOSTEL has linked up with the Programme d'Appui au Développement Communal

30 AFCHIX is a network of women in technology who consider gender diversity in the computer science and ICT industry as highly critical for increased creativity and innovative performance of the industry. https://afchix.org

31 https://www.womenconnectchallenge.org/round_one

32 https://tunapandanet.tunapanda.org

(Programme to Support Communal Development, PRADEC), which is leading one of the experiments. The second is that implemented by TIC AFRICA under the label Cybervillage.

3.4.1 EXPERIMENT IMPLEMENTED BY PRADEC

The primary objective of PRADEC, implemented by Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ) under the supervision of the Ministry of Decentralisation and Local Development (MINDDEVEL), is "to build community capacity so as to operate more efficiently for sustainable communal development." One of the programme's fields of action centres around the development of digital services that suit citizen needs, particularly in rural areas, using infrastructures such as TCPs and the Centres multimédias communaux (CMM).

Within the context of this field of action, two agreements were signed between MINPOSTEL and GIZ. The objective of the first was to establish and commission access points around four pilot telecentres (Mandama and Bibemi in the North region, and Idenau and Bakingili in the Southwest region) further to studies that were conducted in 2018 on digital connectivity, management and services. The second MINPOSTEL-GIZ/PRADEC partnership agreement signed in April 2021 aims at replicating the pilot experiments around 20 additional TCPs.

Pursuant to the first agreement, the Mandama and Bibemi telecentres became the core of two mesh networks, providing various services such as internet access within a radius of approximately 2 km around the TCP and non-internet-based services through the GOON digital platform hosting local content (educational resources and municipal services). The deployed technology consists of Ubiquiti equipment, using the 2.4 Ghz and 5 GHz Wi-Fi frequency bands. The project was conducted as part of a fruitful five-party partnership between:

- MINPOSTEL, the telecommunications authority (at central and decentralised level), which was responsible for facilitating use of the 2.4 GHz and 5 Ghz spectrum, as well as equipment installation, issuing of licences, facilitation of access to fibre and sharing of infrastructure with the Nextel operator.
- The communes of Mayo Oulo and Bibemi, who mobilised citizens and prepared the buildings hosting the TCPs.
- The University of Ngaoundéré, which took part in designing and deploying networks and the GOON platform.
- The ActivSpaces tech hub, which took part in designing and deploying the GOON platform.
- PRADEC, which handled equipment procurement, network installation, consolidation of telecentre equipment and training of managers. PRADEC also supports monitoring and maintenance of these networks.

a) MANDAMA TCP

Mandama's signal comes from the fibre available at the DAP installed in the Mayo-Oulo CAMPOST building, located approximately 40 km away. To establish the link between Mayo Oulo and Mandama, the necessary equipment was installed on towers set up by Nextel.

Solar generators were installed at various points to supply the equipment with electricity.

STUDENTS IN MANDAMA

The installed network connected the Section Artisanale Rurale SM, farming station, technical high school, bilingual high school, integrated health centre and two student accommodation camps. Each of these sites has at least one Wi-Fi access point and is connected to the TCP by a long-range Wi-Fi link.

b) MAYO-OULO DAP

In Mayo-Oulo, the capital of the commune with approximately 150,000 inhabitants, a network connecting four sites was deployed. The town hall, bilingual high school, technical high school and hospital were each equipped with at least one Wi-Fi access point, connected to the DAP by a long-range Wi-Fi link.

c) BIBEMI TCP

In the Bibemi commune with approximately 156,000 inhabitants, the installed network gives Wi-Fi access to eight sites connected to the TCP by a long-range Wi-Fi link. These include the Town Hall, technical high school, traditional high school, Youth Centre, hospital, integrated health centre and municipal camp.
The TCP was equipped with a solar generator to mitigate the instability of the electricity coming from the interconnected network. If there is a power cut, it becomes a point of convergence for administrative authorities for all office technology services, and for citizens who come to charge their telephones.

d) WHAT EFFECTS ARE OBSERVED?

Although no study has yet been conducted to assess them, interactions with users at the three sites have revealed that the deployed networks have had positive as well as negative effects.
Positive effects primarily include

improvement in the education service because of:

- Greater interaction between pupils and teachers who now spend more time at school.
- Better quality education enriched by the broader references offered by the internet and the opportunity to view practical experiments.
- Access to composition tests and examinations in all subjects offered in other institutions or other countries (including on the GOON platform).
- Continuity of the educational service during the lockdown caused by the COVID-19 pandemic, the Africa Cup of Nations 2021 or the student strike.

Secondly, and not to be overlooked, is an improved quality of life for students who, through the internet connection, have access to recreational activities (watching films, documentaries, web-streamed sporting competitions, etc.) and have better contact with their families (VoIP) who generally live in another town. In addition, students can now pursue their careers online without having to travel. Other important effects are continuity of administrative services even during power cuts due to the availability of electricity from solar panels, and also the opportunity for local health managers to send regular medical reports to their superiors at the Department capital without having to travel in person.

The negative effects mainly include:

- A safety risk because the installed equipment includes items of value which are appealing to criminals.
- Exposure of students to safety risks because, even at late hours, they remain close to the access points to stay online.
- Distraction of students who, able to stay online all the time, are busier with social networks, downloading videos and visiting inappropriate sites than studying.

3.4.2 NETWORKS DEPLOYED BY TIC AFRICA

TIC AFRICA[33] is a private, one-man institution created in 2016, sponsored by Josselin Youmbi, a telecommunications engineer. Its primary objectives are: provision of telecommunication services, IT training, renewable energy, design and development of telecom kits for wireless networks.

Its main activities conducted since it became known as TIC AFRICA Cybervillage are training of young Cameroonians in installing and deploying electronic communication networks. TIC AFRICA uses a participatory approach to needs identification within communities to be serviced. Its services are chargeable and investment funding resources come from the company.

The technology used for its networks comes under standard 802.11. Its equipment is imported from China and the very high customs duties represent on average 40 to 50% of the acquisition cost. TIC AFRICA obtained a second category licence when its activities were launched.

This company has deployed networks in Bandjoun, Bafoussam in western Cameroon, Douala on the coast and Limbé in the south-west, to provide access to the internet and services such as Wikipedia off-line. These include:

33 Information provided by Josselin Youmbi, sponsor of TIC AFRICA Cybervillage. For more information, see: https://tic-africa.blogspot.com

In Bandjoun:

- A 1.8 km network serving Soung-Centre-ville-Paroisse Pété-Centre TIC Africa / Cybervillage (on average 22 users per day).
- A 2 km network serving the mini-cities of Mandela, King-Bell, DéoGracia and Abraham as well as the courtyard of the campus of the Institut Universitaire de Technologie Fotso Victor (IUT FV) (on average 178 users per day).
- Service to the Collège Polyvalent Calasanz and the Catholic parish;

In Bafoussam, service to the Madelon district over 800 m (approximately 56 users per day) and the Catholic parish of Tamdja over 600 m (approximately 23 users per day).

In Douala, service to Bonamoussadi, locality of "Labo-Meka" over 800 m, Logpom-Carrefour Basson over 800 m and Pk16 near the École Polytechnique over 2 km (on average 54 users per day); service to the Nkolbong district over 1.7 km for approximately 78 users.

In Limbe, service to the Hiptop district at the Centre Linux Friends for approximately 21 users.

However, despite these promising examples, there are many challenges to the deployment of community networks in Cameroon.

3.5. CREATING A FAVOURABLE ENVIRONMENT FOR COMMUNITY NETWORKS

In the COVID-19 era, community networks are playing an increasingly important role in meeting the rising demand for last-mile connectivity. They offer affordable internet access for low-income communities, thus resolving one of main obstacles represented by the high cost of connectivity. For example, users of the Zenzeleni networks spend only 10% to 40% of what they had previously spent on mobile data, considerably extending the time they can access information.
Beyond access, community networks create new socioeconomic opportunities through building individual digital capacities, enabling previously disconnected populations to not only become consumers but also producers of locally relevant online content, applications and services. These new digital products and services are tailored to meet local needs, stimulating local economies.

The community network movement has grown slowly despite the constraints created by an unsupportive policy and regulatory environment. These networks should not be viewed as competing with traditional commercial operators but as complementary to both private and public sector strategies to close the digital divide. Despite their positive impact on connecting the unconnected, community networks are yet to become part of the policy and regulatory discourse in many African countries. The financial, technical and reporting requirements are cumbersome and beyond the capacity of community network operators. There is a need to create a policy and regulatory environment favourable to the emergence and growth of small-scale non-profit operators, as recommended by the ITU Symposium for Regulators in 2021.

ICT TRAINING IN MANDAMA

INSTALLING WI-FI NETWORK IN BIBEMI

3.5.1. CHALLENGES ENCOUNTERED BY COMMUNITY NETWORKS:

Some of the regulatory bottlenecks include: licensing frameworks, spectrum conditions of use, access to basic infrastructure and financing options.

a) LICENSING FRAMEWORKS

Community networks require infrastructure deployment and service provision licences to operate in the telecommunications sector. In the majority of African countries, licence categories exist only for national operators and are also costly. Additionally, a licensing category for non-profit network operators does not exist in the current frameworks. The financial, technical, and reporting requirements are also often beyond the reach and capacity of community network operators.

b) SPECTRUM LICENSING AND FEES

The majority of community networks use Wi-Fi for both access and backhaul networks. Although Wi-Fi is licence-exempt, some countries require operators to pay. Additionally, those deploying Wi-Fi-based networks are still required to comply with regulations such as not exceeding the stipulated maximum output power and ensuring that the radio equipment being used consists of type-approved devices. The widespread adoption of Wi-Fi also presents a problem of interference with other transmitters, especially for backhaul links, affecting the network quality. In addition, Wi-Fi does not work well in environments without line of sight, and not all user devices are equipped with Wi-Fi.

Similarly to operator licensing, mobile broadband spectrum assignment also takes place at national level in exchange for high fees. Although licences allow for exclusive use of the allocated subset of the spectrum, no mechanisms have been put in place to ensure its use. This exclusive and broad regulatory framework results in inefficient use of the spectrum, where either the assigned spectrum is not used in rural and remote areas, or regulators do not find enough companies interested in paying such fees and have unassigned mobile broadband spectrum.

c) BACKBONE AND BACKHAUL INFRASTRUCTURE

Africa has more than a million kilometres of terrestrial fibre optic cables, with 584 million people living within a 25 km radius of an operational node. National backbone networks are an integral part of the supply chain in the provision of broadband connectivity. Access to connection capacity remains the largest expense for community networks. The cost of minimum volume purchases for wholesale fibre backbones is high and limits communities' ability to obtain affordable backbone capacity. The current backbone network infrastructure is owned by vertically integrated and wholesale operators, as well as some government-owned fibre infrastructure. In all cases, the backbone network is not treated as a public utility, and access is generally chargeable, based on demand from national commercial operators. National Research Education Networks (NRENs), which are managed as a public utility, are not allowed to provide backbone services to complementary access networks.

The lack of effective infrastructure sharing and dig-once policies increases the cost of deployment and dissuades operators from deploying fibre infrastructure or granting access to passive infrastructure such as masts and poles. There is also a lack of access to information such as the nearest

34 ITU Global Symposium for Regulators 2021 Best Practice Guidelines. https://www.itu.int/en/ITU-D/Conferences/GSR/2021/Documents/GSR-21_Best-Practice-Guidelines_FINAL_E_V2.pdf

point of presence and tower locations, which complicates communities' efforts to plan and design their networks and the ability of governments to identify connectivity gaps.

d) LIMITED ACCESS TO FINANCING

The majority of community networks in Africa exist in low-income areas, making it challenging to access the financing and human capacity required to deploy, operate, and maintain these networks. The initial start-up financing for most community networks has been through private funding programmes. The locations of these networks make it unlikely for them to receive loans from traditional lending institutions and investors. Additionally, because of the lack of an enabling licensing environment, they do not qualify to access universal service funds. It should be noted that community networks would have been eligible for financing from local communities if jurisdiction over telecommunications services had been one of the basic services transferred to these communities through the corresponding laws and regulations. Unfortunately, this is not the case.

MANDAMA TELECENTRE

3.5.2. CREATING AN ENABLING POLICY AND REGULATORY ENVIRONMENT FOR COMMUNITY NETWORKS

a) INCLUSIVE LICENSING FRAMEWORKS

At national level, other countries in the region have already created community network categories in their licensing frameworks. Zimbabwe,[35] Uganda,[36] Ethiopia[37] and Kenya have all introduced such a framework for community networks.

In particular, in Kenya the Communications Authority of Kenya (CAK) published the Community Network and Service Provider Licence in October 2021. This licensing arrangement was a result of technical assistance requested by the regulator and commissioned to APC. The technical assistance process included a strong stakeholder consultation component to ensure broad industry buy-in.[38] The licence is exclusively for non-profit cooperative societies, community-based organisations and non-governmental organisations. Licence holders are expected to provide service within a sub-county. The licence includes aspects related to network facilities and the provision of application services, resulting in a single licence for operation. The application fee amounts to USD 10 and the annual operating fee is USD 50. The licence period is 10 years and licensees are exempted from USF contributions.[39]

In Zimbabwe, 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 licence which authorises licensees to provide telecommunication network facilities, network services and application services under one licence. District and community internet service provider licences have also been introduced. The application fee for a community licence or licence renewal is set at USD 50. District and community operators are exempt from paying annual licence fee contributions and USF contributions.

In South Africa, a public consultative process is ongoing to create a regulatory framework for community networks.[40]

b) MOBILE BROADBAND SPECTRUM FOR COMMUNITY NETWORKS

Best practice guidelines developed in 2021 by the ITU's Global Symposium for Regulators recognise that "Spectrum innovation is key for the digital future," and recommend that regulators:

> Adopt a multifaceted approach to freeing up additional spectrum in the low, mid, and high bands for a variety of business plans to successfully meet the need for additional network capacity

35 Postal and Telecommunications Regulatory Authority of Zimbabwe Licence Fee Categories. http://www.potraz.gov.zw/wp-content/uploads/2022/03/Licence-Categories-Including-Fees.pdf

36 Uganda Communications Commission's Communal Access Provider Licence. https://www.ucc.co.ug/wp-content/uploads/2020/05/COMMUNAL-ACCESS-PROVIDER-LICENSE-25-05-2020.pdf

37 Ethiopian Communication Authority's Telecommunications Licensing Directive 792-2021 https://eca.et/2022-03-24T06-45-04.775ZTelecommunications%20Licensing%20Directive%20No.%20792-2021%20(English).pdf

38 Public Consultation on Draft Licensing and Shared Spectrum Framework for Community Networks in Kenya. https://www.ca.go.ke/public-consultation-on-draft-licensing-and-shared-spectrum-framework-for-community-networks-in-kenya

39 Communications Authority of Kenya's Community Network and Service Provider Licence. https://www.ca.go.ke/wp-content/uploads/2021/10/Community-Network-and-Service-Provider-CNSP-License.pdf

40 https://www.dcdt.gov.za/documents/legislations/policies/file/211-next-generation-spectrum-policy.html

41 ITU Global Symposium for Regulators 2021 Best Practice Guidelines. https://www.itu.int/en/ITU-D/Conferences/GSR/2021/Documents/GSR-21_Best-Practice-Guidelines_FINAL_E_V2.pdf

while facing finite spectrum resources, including releasing spectrum for the establishment of community networks on a technology-neutral basis.[41]

Different countries are considering new or renewed national mobile broadband spectrum licences, framed as a "right to protection from interference" rather than the traditional "right to exclusivity", which allows for the introduction of a use-it-or-share-it clause in spectrum licences. For instance, following recommendations from an APC contribution, in South Africa, when assigning new mobile broadband spectrum bands, the regulator recognised the need for the radio frequency spectrum to be shared with infrastructure licensees in areas that the spectrum is not used, to stimulate competition, promote SMEs and cooperatives. This resulted in spectrum sharing clauses in newly issued spectrum licences. This practice is consistent with mobile broadband spectrum licensing in Mexico[42] and the United Kingdom[43] where community networks share spectrum with mobile network operators.

In parallel, other countries are introducing non-competitive local licensing of mobile broadband frequencies in bands where low-cost equipment is available, such as the 2,300 MHz band. Regulators around the world[44] have been introducing new non-competitive local spectrum licence frameworks in order to unlock this potential.

c) BACKBONE AND BACKHAUL INFRASTRUCTURE

In some African countries, governments have deployed national wholesale open-access backbone networks. Multiple service providers can use the infrastructure by purchasing bulk bandwidth capacity for service delivery to their customers.[45] Uganda's National Data Transmission Backbone Infrastructure (NBI) is an example of a public wholesale open-access backbone network.[46] Private companies such as Liquid Telecom[47] and CSquared[48] use a wholesale model in several African countries. This model facilitates infrastructure sharing and ensures the use of existing infrastructure.

NRENs are also a potential solution for affordable backhaul for community networks because of their public utility-based model and extensive national fibre infrastructure.[49] Some NRENs have provisions to connect community networks in their existing policies which support connections to non-profit entities serving educational, research or community engagement ventures. TENET in South Africa,[50] KENET in Kenya[51] and InnovaRed in Argentina[52] are examples of NRENs that have provided access to backhaul for community networks at subsidised costs in their respective countries.

42 https://rpc.ift.org.mx/vrpc//pdfs/68531_190715125729_364.pdf

43 https://www.ofcom.org.uk/__data/assets/pdf_file/0022/32872/im.pdf

44 The United States, United Kingdom, Germany, France, Canada and New Zealand have all implemented a system of non-competitive mobile broadband spectrum licences.

45 https://www.itu.int/en/ITU-D/Conferences/GSR/2020/Documents/APC-Local-Operators_contribution-GSR20.pdf

46 https://ict.go.ug/projects-programmes/national-backbone-infrastructure-project

47 https://www.liquidtelecom.com

48 https://www.csquared.com

49 APC, Redes A.C., & Universidad Politécnica de Catalunya. (2020). Expanding the telecommunications operators ecosystem: Policy and regulatory guidelines to enable local operators. https://www.itu.int/en/ITU-D/Conferences/GSR/2020/Documents/APC-Local-Operators_contribution-GSR20.pdf

50 https://www.tenet.ac.za

51 https://www.kenet.or.ke

52 https://www.innova-red.net

d) ACCESS TO FINANCING

The African country that has made the greatest advances in terms of institutionalised support for community networks is Kenya, which, through the CAK, has included support to 100 community networks in its draft USF Strategy 2022-2026.[53]

In Zimbabwe, during the conference on "Community networks, the conduit to the local communities' contribution towards national socio-economic development through ICTs, harnessing local resources" organised in Murambinda by the Ministry of Communications from 6 to 9 December 2021, with the participation of the Minister himself and representatives from the Postal and Telecommunication Regulatory Authority of Zimbabwe (POTRAZ), a roadmap for the development of community networks in Zimbabwe was created.

In other countries, such as Nigeria, the Universal Service Provision Fund (USPF) supported a community network in Kafanchan in 2008. Other countries have already institutionalised this support, such as Argentina where community networks have been able to apply for funding from the Argentinian USF since 2021.[54]

Besides these examples where the USF has also been used to support community networks, other mechanisms for public support have been also established. For instance, in South Africa, a social innovation award to Zenzeleni Networks led to support being received from the Department of Science and Innovation.[55] Given the lack of recognition of community networks by many communications and telecommunication departments, seeking support by engaging with other ministries and departments who oversee portfolios such as Science and Technology or Social and Economic Development has proven to be a good alternative to harness funding from the public fiscus.

53 Communications Authority of Kenya's Draft USF Strategic Plan 2022-2026. https://www.ca.go.ke/wp-content/uploads/2022/04/Draft-USF-Strategic-Plan-2022-2026-.pdf

54 https://enacom.gob.ar/redes-comunitarias-roberto-arias_p5049#contenedorSite and https://enacom.gob.ar/programa-barrios-populares_p4615#contenedorSite

55 https://www.uwc.ac.za/news-and-announcements/news/zenzeleni-project-wins-social-innovation-award-727

ZENZELENI COMMUNITY NETWORK IN SOUTH AFRICA. PHOTO: ZENZELENI NETWORKS

THE PAMOJA NET COMMUNITY NETWORK IN THE DEMOCRATIC REPUBLIC OF CONGO. PHOTO: LA DIFFERÉNCE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NEXT STEPS

4.1 TCPS AS TOOLS FOR COMMUNITY NETWORK DEVELOPMENT

As stated above, studies are ongoing at the Ministry of Telecommunications to ensure that TCPs are henceforth positioned as VASPs or ISPs in the area.

In terms of implementation of community networks in Cameroon, options to be considered include deployment of a mesh network (long-range Wi-Fi) around each TCP, to become the network core for coverage of surrounding areas, so that even shared access with other TCPs and facilitation of the connection between different TCPs can be considered. In fact, a mesh network around telecentres will be easy to deploy and maintain. It will offer the advantage of decreasing the digital divide in an environment marked by technological progression and a high smartphone penetration rate. However, consultation of the regulations to find out if they allow the creation of such networks is a prerequisite.

There are plans for the handover of TCPs to the CTDs. Draft agreements have been prepared to this effect at MINPOSTEL level, in collaboration with MINDDEVEL, initially to assign use and operation of a TCP sample to the Communes. If TCPs move over to community networks, there will be many questions concerning their new status, licensing requirements, frequency use, data storage, infrastructure sharing, funding by the USF or other public funds.

4.2 PROPOSALS TO IMPROVE THE LEGAL AND REGULATORY FRAMEWORK TO ENABLE COMMUNITY NETWORK DEVELOPMENT

This section is devoted to regulatory and operational proposals to motivate and promote the deployment of community networks in Cameroon in line with recommendations from the ITU and other international and regional organisations. It should be noted that not all Decentralised Territorial Units have a TCP. However, communities living there or not in proximity to a TCP may wish to benefit from this opportunity for digital inclusion. Recommendations in terms of the regulations should be taken into account.

4.2.1 IN LEGAL AND REGULATORY TERMS

The suggestion is to consider integrating in the laws and regulations changes relating to:

- The typology of electronic communication networks to specifically define community networks and the scheme under which they operate as stipulated in Article 3 paragraph 1 of CEMAC Directive no. 08-UEAC-133-CM-18 of 19 December 2008 harmonising legal systems for electronic communications. In this case, a bridge could consist of assimilating community networks with independent networks[56] covered in the regulations.

56 Article 8 of Decree no. 2013/0398/PM of 27 February 2013 setting the terms for implementation of universal service and the development of electronic communications.

- The registration system, currently limited to authorisation and reporting, to make way for a "free" or licence-exempt system. In fact, the above-mentioned CEMAC directive suggests a "free" system[57] to govern electronic communication networks or services that are not expressly subject to authorisation or reporting systems, with the sole condition of their subject to the prevailing relevant laws and regulations in the member state.

- Establishment of a specific licence for non-profit entities wishing to provide telecommunications services to unserved and underserved communities. This type of licence is already operational in African countries such as Zimbabwe[58], Uganda[59], Ethiopia[60] and Kenya. The principle of a "universal service licence" has already been introduced in Article 10 of CEMAC Directive no. 08-UEAC-133-CM-18 of 19 December 2008 establishing the system for universal service in the electronic communications sector in CEMAC member states.

- Redefinition of the conditions for frequency spectrum access, the availability of which is critical for community networks, especially as wireless technologies are as effective as wired connections for access networks, which are by nature widely dispersed, in particular in rural and remote areas where cable installation is difficult. It is also important to stipulate specific conditions for the payment of contributions, duties, expenses and fees to ensure their affordability for the above-mentioned non-profit entities.

- Revision of the provisions governing access to financing by the Special Telecommunications Fund in order to open up to entities or projects implementing digital inclusion solutions other than TCPs.

Moreover, in order to encourage involvement by CTDs in promoting citizen access to electronic communications, the regulatory framework should be enhanced with regulations allowing ministers of decentralisation and telecommunications to easily support the CTDs in this dynamic. In fact, due to their proximity to populations, they are not only used to participatory processes (fundamental in the development of community networks), but they are also most likely to have a good understanding of citizen needs. Opening up has already taken place through the concession agreement with CAMTEL which, in its Article 8.4.2 makes provision for cooperation with local communities.[61]

4.2.2 ON THE OPERATIONAL LEVEL

In order to facilitate the development of community networks, the following measures are recommended.
For the telecommunications authority (MINPOSTEL):

57 Article 17: Electronic communication networks and services subject to the "free" system; the establishment and/or operation of electronic communication networks and the provision of electronic communication services that are not expressly subject to authorisation or reporting systems are licence-exempt, subject to compliance with the relevant national regulations.

58 Postal and Telecommunications Regulatory Authority of Zimbabwe - Licence Fee Categories. http://www.potraz.gov.zw/wp-content/uploads/2022/03/Licence-Categories-Including-Fees.pdf

59 Uganda Communications Commission's Communal Access Provider Licence. https://www.ucc.co.ug/wp-content/uploads/2020/05/COMMUNAL-ACCESS-PROVIDER-LICENSE-25-05-2020.pdf

60 Ethiopian Communication Authority's Telecommunications Licensing Directive 792-2021. https://eca.et/2022-03-24T06-45-04.775ZTelecommunications%20Licensing%20Directive%20No.%20792-2021%20(English).pd

61 CAMTEL is responsible for the "availability of public access points in collaboration with the Collectivités Territoriales Décentralisées."

- To effectively develop the universal service strategy as stipulated in the regulations (Article 2 of Decree no. 2013/0398/PM of 27 February 2013). The strategy will highlight the important role of community networks in universal service provision.

- To make arrangements for regular revision of the contents of the "universal service" bundle, as stipulated in the prevailing regulations (Article 28, paragraph 3 of law no. 2010/013 of 21 December 2010), specifically so that it encompasses not only telephone services but also mobile broadband.[62]

- To establish a multistakeholder platform for dialogue that must involve the decentralisation, finance, education, health and women's promotion authorities as well as the regulatory agency, concessionaires, civil society organisations (CSOs) involved in the sector and development partners, in order to discuss ways to facilitate the deployment of community networks as a solution for significant universal connectivity in Cameroon.

- To adopt incentives to promote investment in broadband infrastructure in unserved or to underserved areas, as stipulated in the prevailing regulations (Article 26 of Decree no. 2017/2580/PM of 06 April 2017)..

For the decentralisation authority (MINDDEVEL):

- To study the possibility of classifying telecommunications services as a basic utility, similar to water, particularly in view of the fundamental role of internet access in meeting the basic needs of citizens (a role that was especially highlighted during the lockdown imposed by the COVID-19 pandemic, during teacher strike periods, during the Africa Cup of Nations 2021, for continuity of the education and health service, etc.).

For the regulator:

- To regularly compile the list of communes with no coverage, as stipulated in the regulations.

- To provisionally set the internal rules for reviewing community network installation requests, pending revision of the laws and regulations. This approach was used in Zimbabwe by POTRAZ and in Kenya by CAK, which enabled a review of specific licensing conditions.

62 Article 5 of Decree 2013/0398/PM of 27 February 2013 setting the terms for implementation of universal service and the development of electronic communications; the only issue here is access to sufficiently fast internet.

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