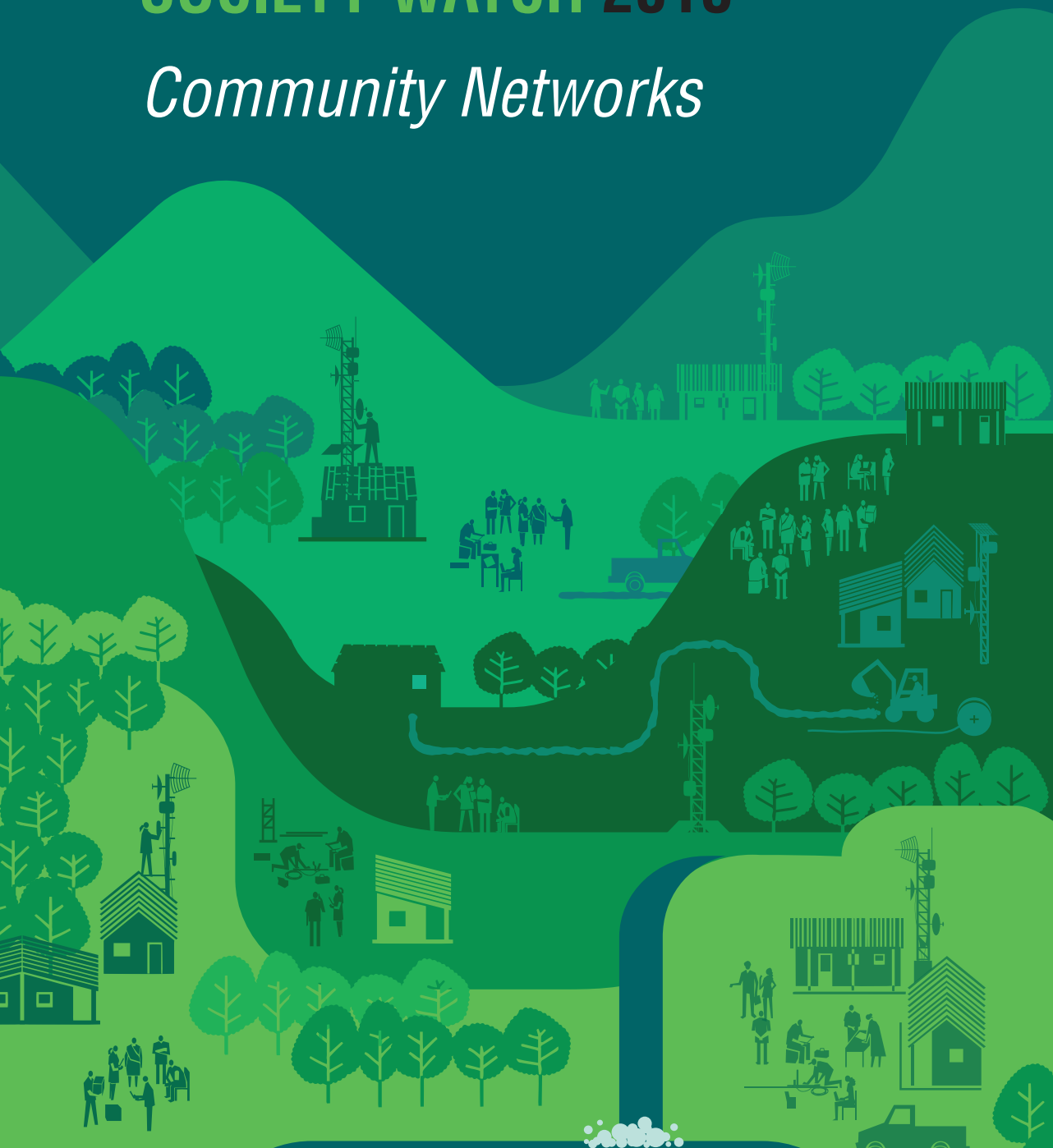
GLOBAL INFORMATION SOCIETY WATCH 2018

Community Networks



Association for Progressive Communications (APC)
and International Development Research Centre (IDRC)

Global Information Society Watch

2018

APC

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This work was carried out with the aid of a grant from the International Development Research Centre (IDRC), Ottawa, Canada, as part of the APC project "Community access networks: How to connect the next billion to the Internet". More information at: https://www.apc.org/en/project/local-access-networks-can-unconnected-connect-themselves
The views expressed herein do not necessarily represent those of IDRC or its Board of Governors.

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Financial support provided by
Sida

This edition of GISWatch came into being alongside a brand new baby boy. Welcome to the world, Ronan Diga!

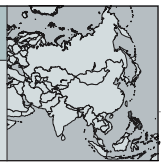
Published by APC
2018

Printed in USA

Global Information Society Watch 2018 web and e-book
ISBN 978-92-95113-06-0
APC-201810-CIPP-R-EN-DIGITAL-296

PHILIPPINES

CONNECTING COMMUNITIES THROUGH MOBILE NETWORKS: THE VBTS-COCOMONETS PROJECT



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Introduction

Despite the rapid expansion of mobile coverage throughout the world, roughly 10% of the world's population lives beyond the reach of a cell tower.[2] This is particularly problematic in the Philippines, with just under 70% mobile phone penetration.[3] Because these isolated and relatively poor communities are not considered commercially viable within the current business and technology model of commercial operators, bridging this "last mile" connectivity gap requires innovative technological solutions.

To combat this, our team, in partnership with a local telco and local communities, has developed and deployed GSM community cellular networks (CCNs) in the rural Philippines. The CCNs deliver basic mobile telephony at a fraction of the capital and operational expenses of traditional cellular networks by including local agents in the operation of the network.[4] To prove the importance of cellular access, we are also evaluating the impact of cellular connectivity in our partner communities, specifically across gender and social networks, through the use of a longitudinal randomised control trial and participatory qualitative research.

Our CCNs are deployed in the rural and isolated *barangays*[5] of Aurora Province, Philippines. Each barangay has a cell site that provides cellular coverage to the entire community. The system is powered via solar and is connected to a VSAT backhaul to route calls and SMS to the broader public telephone network. The network, dubbed "VBTS Konekt Barangay", has been in operation for over seven months and with more than 1,200 subscribers. To date, four out of the seven pilot sites have been launched (Brgy. Umiray in September 2017, Brgy. Dikapinisan in October 2017, Brgy. Dibut in February 2018, and Brgy. Diotorin in May 2018). All seven pilot sites are expected to be operational by the end of 2018.

Policy, economic and political background

Our biggest challenge is the lack of an operational framework that supports last-mile service delivery in the context of community networks. The Public Telecommunications Policy Act of the Philippines,[6] which governs the development and delivery of public telecommunications in the country, states in its policy declaration that "expansion of the telecommunications network shall give priority to improving and extending basic services to areas not yet served." Since our network uses regulated GSM frequencies to operate, another large challenge is the lack of available spectrum that can be assigned to CCNs and allow them to operate legally. In the Philippines, all channels on GSM mobile cellular bands (900/1800/2100 MHz) have been allocated to incumbent mobile network operators. On top of this, licences cover the entire country with no "use-it-or-lose-it" provisions, forbidding local actors. As such, even in areas where these telcos have no presence, small-scale cellular networks cannot just operate without coordinating with the regulatory agency and the assigned frequency owner. The creation of policies to support rural connectivity (such as a universal access fund or spectrum sharing) would help in extending basic communication services in the country and is actually part of the

1 The Village Base Station Project - Connecting Communities through Mobile Networks (VBTS-CoCoMoNets) is a collaborative research project between the University of the Philippines and the University of California, Berkeley, with linkages to the University of Washington, University of California, Davis, and Aurora State College of Technology. It is being carried out through a project grant from the Philippines Commission on Higher Education, through the Philippines-California Advanced Research Institutes initiative.

2 GSMA Intelligence. (2015). *Rural coverage: strategies for sustainability.* https://www.gsmaintelligence.com/research/?file=53525bcdac7cd801eccef740e001fd92&download

3 https://www.statista.com/statistics/570389/philippines-mobile-phone-user-penetration/

4 Heimerl, K., Hasan, S., Ali, K., Brewer, E., & Parikh, T. (2013). Local, Sustainable, Small-Scale Cellular Networks. Paper presented at the International Conference on Information and Communication Technologies and Development (ICTD), Cape Town, South Africa, 7-10 December. https://kurti.sh/pubs/vbts_ictd_13.pdf

5 The *barangay* is the smallest political unit in the Philippines. It is abbreviated as Brgy.

6 Philippine Republic Act No. 7925. (1995). An Act to Promote and Govern the Development of the Philippine Telecommunications and the Delivery of Public Telecommunications Services.

mandates of the law. The Philippine Department of Information and Communications Technology and the country's regulatory agency, the National Telecommunications Commission (NTC), have yet to formulate a new policy on "refarming" and redistributing the spectrum that will foster better delivery of communication services in the country[7] or on the creation of a universal service fund.[8]

The current framework presents myriad barriers for small, community players to participate. To be able to operate telecommunications services, an organisation will have to first secure a congressional franchise and a certificate of public convenience and necessity (CPCN) which will prove their financial, technical and legal capability to offer the proposed services.[9] On top of this, carriers (including small local operators) also have a number of other licences they must acquire for operation, including environmental clearance certificates, height clearances, and the local mayor's permit. All in all, there are as many as 25 permits needed for each cell site.[10] The sheer number of required permits is very difficult for a small entity to complete.

In the past, access initiatives in the Philippines have concentrated on providing internet access to remote and rural parts of the country. These networks typically employ point-to-point, long-range Wi-Fi links to connect institutions, such as schools, to the nearest internet point of presence. One example is the Digital Provide initiative,[11] where secondary schools in Batanes were connected to the internet service provider using long-range Wi-Fi links. These initiatives were largely "top-down" in nature and focused on basic IP connectivity rather than community ownership. Over time, the expansion of mobile internet access in suburban and provincial areas has rendered some of these networks inactive.[12]

Engaging partners and community participation

Our first major innovation is our public-private partnership for sharing cellular spectrum with a large mobile operator. Given the absence of regulatory support and spectrum access for community cellular networks in the Philippines, we found it necessary to find a partner that shares the project's vision and that would allow the community network to operate under their frequency licence. We found that partner in Globe Telecom,[13] a major telecommunications company in the Philippines. Since our sites have a smaller subscriber base than what it would consider viable, our community network deployments are placed under its corporate social responsibility programme.

Our engagement on the ground is founded on the sustained collaboration between several institutions: higher education institutions such as the University of the Philippines (UP) and Aurora State College of Technology (ASCOT), the telecommunication company (Globe), local government units at municipal and barangay levels, and operational cooperatives in the area. Through top-level agreements, Globe consented to the use of 2G frequency under their franchise. In addition, Globe allowed us to use their SIMs and cloud services which provide the interconnect from the VBTS network to other phone networks. Globe is also assisting the project to comply with the required NTC permits, such as radio station licences and pricing approvals.

Partnership with local government units at the municipal level is crucial because of their administrative authority over the project sites. In rolling out the infrastructural requirements of the CCNs, municipal mayors facilitated the legal appropriation of lands where the towers were allowed to be built, and helped expedite the issuance of various permits and clearances for construction of the village base stations within their areas of jurisdiction. The municipal governments helped mobilise local labour that assisted university-based engineers and also helped identify potential partner cooperatives based on track record in project management. In due course, the municipal governments allocated funds in their annual budget for the maintenance of the village base station towers and for the mobilisation of community-based civilian security forces to protect the towers and CCN-related equipment from possible theft and vandalism.

Cooperatives with municipal-wide operations are one of many types of organisations at the

7 Marcelo, P. (2018, 4 March). DICT drafting policy on frequency reallocation. *BusinessWorld*. bworldonline.com/dict-drafting-policy-frequency-reallocation

8 National Economic and Development Authority. (2017). Philippine Development Plan 2017-2022. pdp.neda.gov.ph/wp-content/uploads/2017/01/PDP-2017-2022-07-20-2017.pdf

9 King-Dominguez, R., & Acebedo, R. (2013). Philippines. In L. Garzaniti & N. Good (Eds.), *Telecoms and Media: An overview of regulation in 44 jurisdictions worldwide*. London: Law Business Research Ltd. www.syciplaw.com/Documents/T2013%20Philippines.pdf

10 Camus, M. (2018, 20 January). Gov't pushes new cell tower scheme for level field, better service. *Philippine Daily Inquirer*. business.inquirer.net/244506/govt-pushes-new-cell-tower-scheme-level-field-better-service

11 Ramos, M. C. Jr. (2008). Addressing the digital divide in Philippine education. Paper presented at the 1st Workshop on Wireless Broadband Access for Communities and Rural Developing Regions, Karlstad, Sweden, 11-12 December.

12 Gonzales, C. (2018, 5 May). Batanes now LTE-connected. *Rappler*. https://www.rappler.com/technology/news/201837-batanes-lte-4g-smart-connection

13 www.globe.com.ph

ground level, alongside tribal councils for the indigenous peoples' communities, and associations of fisher folk and farmers. Municipal-level cooperatives were chosen as acceptable project partners, especially for telecommunications, because of their established juridical personality which made them eligible to establish business transactions with Globe, and because of their familiarity with administrative requirements in managing income-generating activities. They were enjoined to handle the day-to-day operations, business management, and maintenance of the community network, while systematically building the capabilities of community-level associations so that these associations may eventually exercise greater control and accountability over the CCNs.

The cooperatives are in charge of the SMS-based electronic load (e-load) distribution from Globe to the local retailers. The cooperative orders the e-load from Globe on a monthly basis. After the cooperative's mobile number has been topped up, the cooperative then distributes it to authorised local resellers in the communities. The cooperative receives a wholesale discount from Globe, which in part is also passed on to the community retailers. Finally, the gross revenue from all charged calls and texts on the network are split based on an agreed revenue-sharing scheme between Globe and the communities. In the revenue-sharing scheme, the cooperative gets 80% while the remaining 20% goes to Globe. Earnings are used by the cooperative to pay the honoraria of community personnel and as savings for operating expenses beyond the subsidised first year.

The majority of our retailers are women (eight out of ten) and are already running their own *sari-sari* or general merchandise stores. Aside from the retailer's discount, the retailer also charges an additional convenience fee per transaction to the subscriber, which is a common practice in the Philippines. On top of e-load sales, some retailers grabbed the opportunity to sell mobile phones and mobile phone accessories in their area.

During onboarding, local stakeholders are first oriented on the goals of the project, with emphasis on community ownership and public service over profit. Prior to launch, social science researchers facilitated social enterprise training sessions with cooperatives that had no prior experience in conducting business-related activities pertaining to the selling of SIM cards and cellphone load. VBTS engineers conducted trainings with community maintenance personnel (Level 1) and with ASCOT engineers (Level 2). The scope of Level 1 revolves around daily maintenance and basic troubleshooting of the CCN tower and equipment, which will be performed by community site operators. The scope of Level 2 consists of tasks which require intermediate technical knowledge or tools to complete. Technical personnel will coordinate with higher levels for incidents or issues that they cannot resolve at their level. It was later clarified during a technical breakdown that municipal engineers will need to be closely involved in troubleshooting hardware-related concerns, which will aid in the efficiency of the CCN system.

On the day of the network launch, we hold a small programme wherein we introduce the community network, its capabilities and limitations. The launch events are well attended by community members, and become useful venues to introduce our on-ground partners (retailers, maintenance) and address questions and concerns from the community. Post-launch, we also open an SMS-based support hotline. This SMS-based service is free and open to all subscribers in the community. Aside from being a channel for community members to send network-related inquiries, this is also being used to send questions, suggestions or other feedback to the project team.

Usage trends

Currently, we have more than 1,500 subscribers, equivalent to more than 81% of the total eligible population (15 years old and up) across all operational sites. About 40% of the subscribers top up monthly, spending USD 1.20 per month. Monthly average revenue per user is around USD 0.60. We have seen strong usage and adoption in sites that are tremendously isolated and where the VBTS network is their only means to communicate out of the barangay. In areas where an alternative service is less challenging to access, subscribers are not dependent on the community network, as they can get an incidental signal from other networks by walking several kilometres.

In terms of network traffic, we have observed that subscribers take more inbound calls than they make outbound calls – the number of inbound call minutes is six times greater than the number of outbound call minutes. This is indicative of a "call-me" behaviour where subscribers in the community let their outside contacts call them instead of making a call themselves, taking advantage of the fact that receiving inbound calls is free. SMS traffic, on the other hand, has the same volume in both directions. Over time, we have observed a general trend of outbound calls and bidirectional SMS traffic reaching a steady state, but the level of incoming calls continuing to increase. Subscribers are also

budget-sensitive and, as a result, there is a request for value-for-money promos, such as the "unlimited" call and text bundles offered by conventional networks.

Technology platform

The second innovative part of this project is the technology platform. We have chosen to leverage the CommunityCellularManager[14] (CCM) stack, a novel IP-based cellular core. CCM allows for multiple individuals to run separate community networks under one technical domain and is split into two technical portions: the client and the cloud. In our case, Globe manages the CCM cloud installation and provided us an account for our networks. We manage the client installations, porting the client to a variety of compatible hardware platforms (Nuran Litecell, Endaga CCN1, Fairwaves UmSITE). We developed additional software-based client features that are necessary for field operations and to assist with the implementation of our research and evaluation needs, including call and text promo support. The CCM cloud handles the routing, interconnect, and phone numbers for our network (and other Globe community-style installations) – generally anything having to do with the integration into the Globe network. This is the first large-scale CCM deployment in the world. Our team led the integration work with Globe and assisted it in the installation and operation of both the cloud and client inside of its network.

Social impact

Our mixed-methods approach to social impact evaluation of the installations, using a randomised control trial and participatory qualitative research, is another novelty of this network. In the past decade, roughly four billion individuals in developing countries have started using mobile phones for the first time. While qualitative evidence of the impacts of network access is abundant and clear, outside of a few well-cited papers[15] about phones and agricultural market inefficiencies, there is a lack of rigorous (e.g. randomised control trial) empirical evidence[16] on how mobile phones affect the social and economic outcomes of individuals and households.[17] This is in part due to the difficulty in measuring the causal effects of mobile phone adoption, since the market-driven spread of mobile phones is not typically exogenous to economic outcomes. Together with a team of economists and social scientists, we are working to develop a rigorous body of evidence of the social and economic impacts that the mobile phone network brings to communities in the rural Philippines.

Though much of the evaluation has yet to be completed (with the endline survey expected six months after the installation of the last site), we have noted some immediate effects. The most obvious impact is in the enabling of communications in the communities. Prior to the arrival of the network, locals would need to travel several hours by boat or rough roads before they could reach an area with a cellular signal. Now they enjoy a more accessible and convenient way to get in touch with family and contacts outside their barangay. The community cell service has also helped the barangay council report faster to the municipal government and vice versa.

But more than communications, the CCNs also enabled social capital formation. The presence of the CCN has the potential to contribute to a more vibrant local economy as alternative sources of income are spurred through the selling of mobile phones and mobile phone accessories, and the provision of repair and maintenance services. Also, the community cellular service has the potential to connect previously disparate communities into an established network of value chains.

Our trainings are not only limited to transferring technical knowledge, but are conducted on different levels and on different dimensions that involve imparting the message of community benefit and ownership. Aside from training the partner cooperatives and on-the-ground personnel, we also extended our training to the local government units and to nearby higher education institutions. More than being respondents to the technical difficulties of the installations, the advancement of their skills and knowledge is crucial for their future research and interventions that would attend to the needs of the community. The collaboration of knowledge and skills from the institutions brings new ideas and appropriate applications that matter to the local community, which is the goal of this inclusive effort.

Our experiences in the implementation of the project render more visible the social infrastructure

14 https://github.com/facebookincubator/CommunityCellularManager

15 Jensen, R. (2007). The Digital Provide: Information (Technology), Market Performance, and Welfare in the South Indian Fisheries Sector. *The Quarterly Journal of Economics, 122*(3), 879-924; Aker, J. C. (2010). Information from markets near and far: Mobile phones and agricultural markets in Niger. *American Economic Journal: Applied Economics, 2*(3), 46-59.

16 The is largely due to the immense level of coordination between academic researchers, government regulators, and commercial operators that is required to conduct a careful randomised roll-out.

17 Aker, J., & Mbiti, I. (2010). Mobile Phones and Economic Development in Africa. *Journal of Economic Perspectives, 24*(3), 207-232.

requirements for replicative and sustainable CCNs. We have encountered challenges in setting up the business model and structure, as well as creating a feasible trade and distribution network, as these sites are far away from traditional financial institutions like banks and remittance centres. Our partner telco also has internal vendor certifications, trade requirements and processes that our on-the-ground partners need to satisfy. Because of this there is a need to acknowledge the distinct nature and "business model" of CCNs which should be viewed differently from how traditional and large telecommunications organisations normally operate.

Conclusion

We believe our experiences contribute a unique perspective on community networks in three ways: 1) by involving a novel public-private spectrum licensing partnership between the UP, Globe Telecom and the local communities; 2) using the CommunityCellularManager cellular stack to provide 2G basic cellular service including voice, SMS and, eventually, data; and 3) a mixed-methods approach to social impact evaluation of the installations using randomised controlled trial and participatory qualitative research.

These factors have allowed us to sustainably provide cellular coverage to one of the most remote areas of the Philippines, and an area that incumbent telecoms are unable to profitably serve. It has also allowed us to help empower the communities themselves to own and operate their own telecom equipment. We plan to continue to scale the CCN solution in the Philippines and hope to continue to have deployment experiences to share.

Action steps

Our experiences in rolling out CCNs showed that more needs to be done for small network operators to thrive in the country. As it currently stands, it would still be difficult for small communities to set up their own CCN without intervention, such as from our project, or with a public-private partnership with a mobile operator. We would therefore propose the following action steps:

Formal and legal institutionalisation of CCNs as a mode of community-based social entrepreneurship telco service delivery

The current legal framework has no category where community networks could fit in. As a result, small operators are forced to adapt to the model used for telcos and other large organisations. There is a need to acknowledge the distinct nature and "business model" of CCNs which is a different model altogether from traditional and large telecommunication organisations. We suggest providing community networks with a legal character that is bound by regulatory parameters, entitlements, and sets of applicable national and local government standards for their facilitation and growth.

Designation of an exclusive frequency licence for CCNs

Our biggest challenge in starting up our CCN deployments is the lack of a dedicated spectrum licence that can be used for last-mile service delivery. Other countries have taken the initial steps of opening up some spectrum so that small networks can operate legally. For example, the Netherlands has set aside a portion of the 1800 MHz band for licence-exempt mobile communications.[18] Mexico has set aside 2 x 5 MHz of spectrum in the 800 MHz band for "social" use.[19] While our networks are able to operate through our partnership with Globe, we believe that it would empower Philippine community networking in the long run if a swath of frequencies were available for development, research and social efforts. With the growth of LTE[20] and its support for over 40 different bands, it should be possible to provide access to CCNs.

Support for scaling up community networks

The number of permits and licences that need to be completed is already a large barrier that discourages new and small community operators from venturing out and starting their own networks. To foster more community networks, such barriers must be simplified and streamlined. It would also help if telecom equipment were more accessible in the country. Currently we import most of the telecom equipment from foreign suppliers and manufacturers. It would help support sustainability if parts could be easily sourced from a local distributor. Lastly, building a community network still entails some capital costs which may be out of reach for some community organisations. Access to seed funding or capital financing would help encourage the grassroots deployment of CCNs in other unserved communities.

18 Netherlands Ministry of Economic Affairs. (2016). Radio Spectrum Policy Memorandum. https://www.government.nl/documents/reports/2017/03/07/radio-spectrum-policy-memorandum-2016

19 Song, S. (2015, 17 April). How To Let GSM Serve The People That Other Networks Can't Reach. *Many Possibilities*. https://manypossibilities.net/2015/04/how-to-let-gsm-serve-the-people-that-other-networks-cant-reach

20 Long Term Evolution (LTE) is a standard for broadband wireless communication for mobile devices.

GLOBAL INFORMATION SOCIETY WATCH 2018

Community Networks

THE 43 COUNTRY REPORTS included in this year's Global Information Society Watch (GISWatch) capture the different experiences and approaches in setting up community networks across the globe. They show that key ideas, such as participatory governance systems, community ownership and skills transfer, as well as the "do-it-yourself" spirit that drives community networks in many different contexts, are characteristics that lend them a shared purpose and approach.

The country reports are framed by eight thematic reports that deal with critical issues such as the regulatory framework necessary to support community networks, sustainability, local content, feminist infrastructure and community networks, and the importance of being aware of "community stories" and the power structures embedded in those stories.

GLOBAL INFORMATION SOCIETY WATCH
2018 Report
www.GISWatch.org

ISBN 978-92-95102-07-1

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