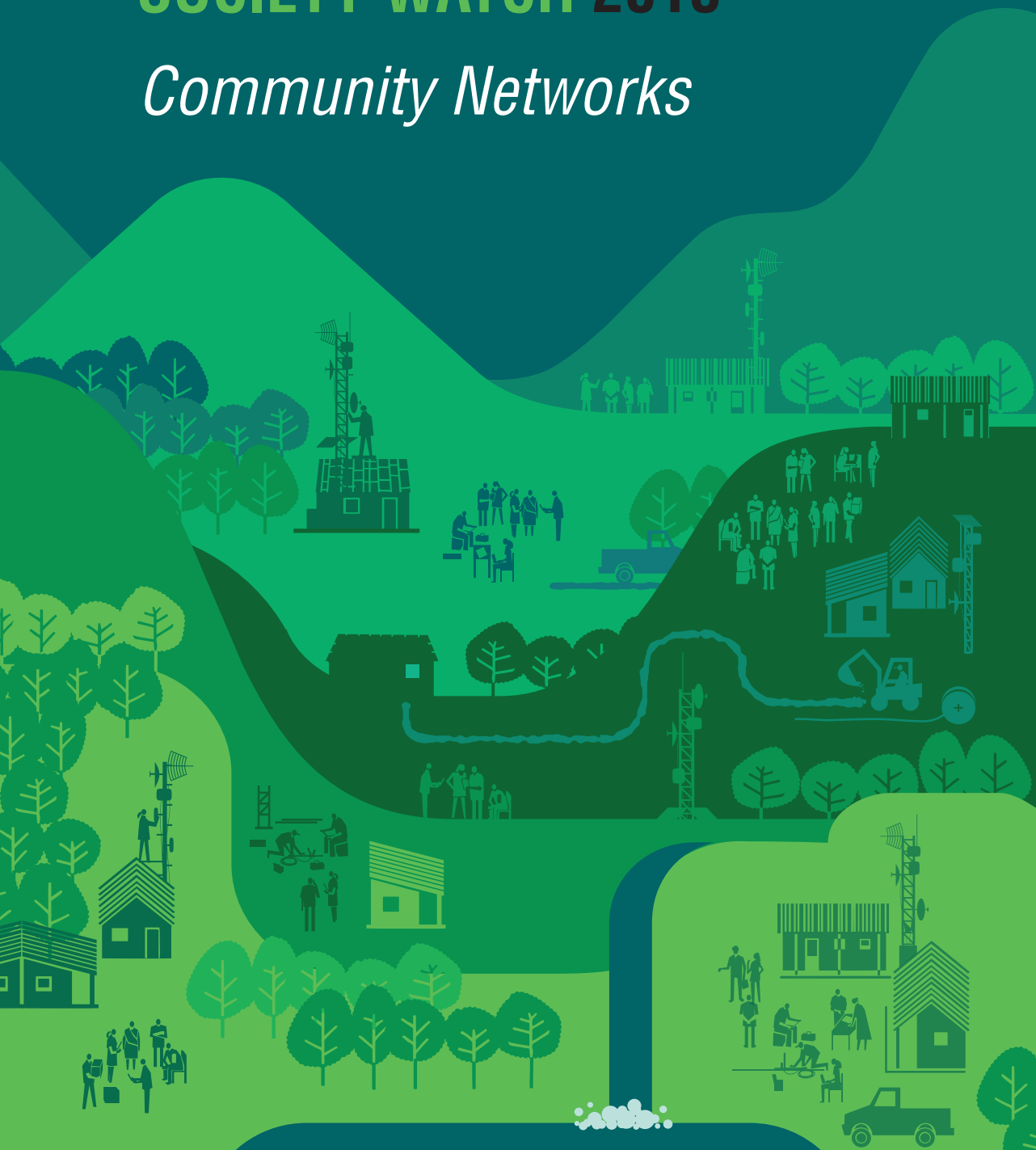
GLOBAL INFORMATION SOCIETY WATCH 2018

Community Networks



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

Global Information Society Watch

2018

APC

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

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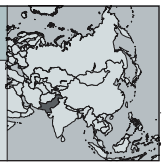
PAKISTAN

WIRELESS FOR COMMUNITIES (W4C) PAKISTAN



Wireless for Communities Pakistan
Naveed Haq
https://wforc.pk

Introduction

One of the key obstacles to improving internet penetration in rural and remote areas is last-mile connectivity. The lack of commercial viability, as well as huge network roll-out costs, worry operators who are reluctant to make the necessary investments. Although mobile broadband has emerged as an excellent alternative to wired last-mile connections, its usage is heavily weighed to benefit urban and semi-urban areas, rather the rural lands.

For example, in Pakistan, even with over 74.21% mobile penetration, only 28.14% of the population uses broadband internet.[1] In villages – where more than 55% of the population lives – the Pakistan Telecommunication Authority told us that internet usage is likely to be less than 8%.

Community networks are proven to be an excellent way to address the gap in last-mile internet connectivity for underserved communities.

Wireless for Communities (W4C) Pakistan is part of a larger community network programme managed by the Internet Society (ISOC) in Asia-Pacific, together with its partner organisations in India, Pakistan and Nepal. The programme involves deploying line-of-sight wireless technology and low-cost Wi-Fi equipment to create community-owned and operated wireless networks.

Established in December 2015, our pilot community network is situated in "Chak-5 Faiz". "Chak" is a term used for a scattered community that includes multiple small villages. Chak-5 Faiz is located 25 km from the city of Multan.

The network

Unlike the traditional, "top-down" commercial approach, in a community network environment, deployment starts from the end-user or the "last mile". However, your network does require reliable backhaul connectivity (either wired or wireless) in order to carry packets to and from the global internet. Typically, a telephone company or internet service provider (ISP) offers backhaul bandwidth.

To keep our operational costs at a minimum and to ensure robust backhaul, we preferred to partner with an existing local ISP to build our community network. This approach would not only save network running costs, but also minimise respective regulatory and/or policy processes including registration, licensing and compliance.

COMSATS Internet Services (CIS),[2] established in 1996 as a pioneer ISP in Pakistan, is our local partner, providing a dedicated 10 Mbps bandwidth for our community network, as well as on-ground technical support through its network engineers.

Our community network is centred around a 55-metre-high tri-pole tower holding sector antennas which gives a two-kilometre area of coverage in a scattered community comprising several small villages and local schools. The tower acts as base station, linking clients through both the 2.4 GHz and 5.8 GHz frequency bands – these are categorised as "free or unlicensed spectrum" in Pakistan, meaning that they can be used by anyone without having a licence or paying a fee. Following a point-to-multipoint (P2MP) topology, the base station broadcasts to several receiving antennas using time-division multiplexing for maximising bidirectional traffic flow over longer distances.

The base station set-up also includes network management devices to distribute the total allocated bandwidth (10 Mbps) to connected clients. These management devices also control the overall network access through MAC addresses and usernames/passwords. The access control is implemented to ensure optimum usage of this community network and prevent an open public Wi-Fi environment.

Connecting the community

Following the deployment of core network infrastructure, our next goal was to connect the community. In order to try to maximise the 10 Mbps bandwidth, we conducted a community survey to gauge the wireless signal strengths as well as the needs of the community.

1 https://www.pta.gov.pk//en/telecom-indicators

2 www.comsats.net.pk

Network base station tower; with attached wireless antennas (right).

Our survey identified a local government school for girls located within the network range. The school had a non-functional internet connection, running over a telephone line that had been disconnected for months. The school computer lab was equipped with computers – but because there was no internet nor teaching staff trained in computers, most of the machines were sheltered in beautiful protective covers that had rarely been removed. The situation was a bit ironic and sad: despite having computers, the school girls were not able to use the internet.

Since this is a government school, we first had to secure permission from the local district education department – this was given instantly. While we were installing the equipment, including a wireless antenna, the students were heard whispering with joy: "These people have come to connect us with the internet." Yes, the internet is a luxury and still a dream to many! According to a recent International Monetary Fund (IMF) report, Pakistan is among the top eight countries where the majority of the population cannot access or afford the internet.[3]

The connectivity for the school was established in a few hours and the whole computer lab was provided with internet access – our first client for our community network. After this the school started running computer and internet classes once a week.

We also found that a local polytechnic institute offering courses in agriculture technology needed connectivity. Agriculture constitutes the largest sector of Pakistan's economy. The majority of the population, directly or indirectly, is dependent on this sector. It contributes about 24% to the country's gross domestic product (GDP), accounts for half of the employed labour force, and is the largest source of foreign exchange earnings.[4]

The primary purpose of this institute is to organise diploma courses on agriculture sciences and promote research on agriculture matters. Here, again, we came to know that a computer lab exists, but that due to limited internet connectivity both students and staff were not able to perform basic internet functions such as email. The students had no choice but to rely on places outside their institute to complete assignments, either at their homes or at internet cafés in the nearby city.

3 International Monetary Fund. (2018). Chapter 2: Digital Government. *Fiscal Monitor, April 2018: Capitalizing on Good Times.* https://www.imf.org/en/Publications/FM/Issues/2018/04/06/fiscal-monitor-april-2018

4 www.pbs.gov.pk/content/agriculture-statistics

Project team installing network antennas at the agricultural institute.

Our community network project was warmly welcomed by the institute. They later told us that the first thing they did when they got connected was to open a Facebook account[5] and start publishing about their activities.

The third and last site connected through our community network was a nearby village of 20 to 25 households. Permission to install roof antennas and other equipment at both the school and the polytechnic institute was easy; however, we were a bit sceptical about how easy it would be in the case of the village. Our first challenge was to map the most appropriate house to sync with our base station, and then, the perhaps more difficult challenge of getting acceptance and permission to install an antenna – it may, for example, look strange to villagers.

However, all it took to secure their permission was to say that our community network would "bring internet to your village."

We got to know that many households in the village have relatives working in the United Arab Emirates (UAE), and the internet for them holds a great value in that it allows them to make free calls using Skype. They were facing limited connectivity: they had no access to wired internet, and the available mobile internet did not work because of weak signals. As a result they had to travel approximately two kilometres to use an internet signal. Although using the internet for Skype calls sounds like a bare minimum usage of the real potential of the internet, for the villagers the ability to talk every day for free with a family member is of huge value.

To avoid any misuse of the network through connecting through unknown devices, we donated a number of pre-programmed tablets to the village.

By the time we had completed our antenna installation and connectivity testing, the news of us "bringing internet" to communities had spread to several nearby villages. A number of villagers appealed for similar internet access, and said they would be willing to pay a monthly internet access fee. Unfortunately, these villages fall outside our network diameter, and we had to give them our regrets. Their requests showed that there is a strong need to find alternative and sustainable solutions to address the connectivity gap that exists between urban and rural areas – and that a community network is one solution.

Owning the network

The most important element to achieve the desired success from a community network is the ownership of the community network by the connected community. It is very important to ensure that those who are connected value the network and online services – in our case, supplementary educational content – provided over it. Community ownership of the network is also critical to ensuring the sustainability of the network, which in many cases can be large, complex, costly, and potentially fragile.

In the case of our community network, where operational costs are at a bare minimum (due to the in-kind contribution of backhaul bandwidth as well as technical support from our partner ISP), the prospect of the network being sustainable is greater. However, equally important is that users get to understand that the internet can be used for more than just browsing, sending emails and making free Skype calls. The sustainability of a community network is also about getting the community to understand the "value add" that the internet can offer.

Community training

For the first six months after providing our three clients with internet, we just let them use it in any way they wanted to. A team of engineers from our partner ISP would make monthly visits to resolve any

5 https://web.facebook.com/pg/Govt-Pak-German-Polytechnic-Institute-For-AgricultureChak-5-Faiz-Multan-936555679712809/posts/?ref=page_internal

Team installing antenna for connecting the village.

technical issues, and also to get regular input/feedback from the community. Yes, there were instances when wireless router cables were accidentally unplugged, resulting in a panic. These regular visits included basic troubleshooting exercises for users so that they could begin to resolve minor issues themselves.

Now, more than two years since deployment, the network has never had a major breakdown – our antennas and equipment operate under the supervision of the community, and users in the connected village have bought an uninterruptible power supply (UPS) unit to keep the internet running during power load shedding hours.

To develop the capacity of community members further, as well as to demonstrate the added value of the internet, we provided training to the school girls, students at the polytechnic institute and community members in the connected village. This training was designed using the "train the trainer" methodology – we train community members and build the capacity of a local trainer, who then can train others in the community, gradually reducing dependency on us.

The training of the school girls, who were in the 10-14 years age group, was about how to apply the internet in their learning processes. We had some interesting discussions with the girls and, yes, it is true that girls (especially in rural areas) lack ownership, access and control over the use of technology, in addition to cultural barriers that they face. Some of the girls have computers in their homes, but the males in their families do not allow them to use them. They also do not have permission to use mobile phones.

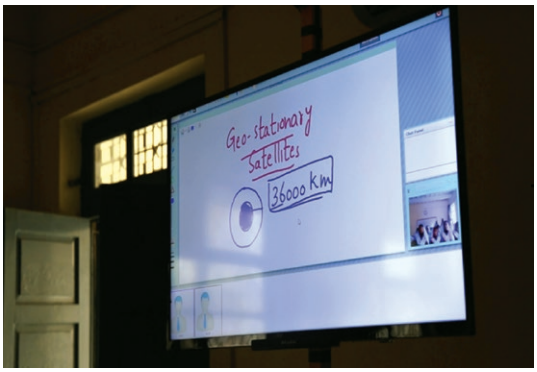
Because their exposure to the internet was very limited, it was imperative to include training material that offers a basic understanding of how the internet works and what it can offer.

The training provided to the polytechnic institute was about using the internet in agriculture research and studies. We also provided training to staff on advanced-level computer usage that helped them run a community training course for local residents using their computer lab.

The training provided to the village community was on retrieving useful information about crops, weather conditions and farming practices that can improve their harvest – wheat and cotton are two key crops in the area.

At this point, we have completed two different training sessions with the groups. We have produced 10 trainers who are ready to deliver their first training sessions in September and October.

Training sessions at the school, at the polytechnic institute and in the village.



School girls taking an online class.

Online supplementary education

Last year, after analysing bandwidth usage patterns, we saw an opportunity for running a small online project using unused bandwidth. Our desire was to do something that not only improves the use of our community network, but also brings value to the community.

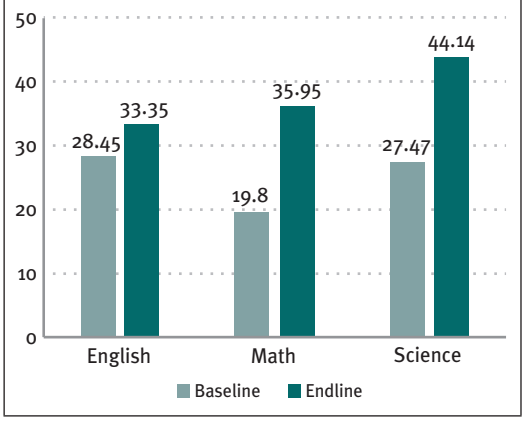
The quality of education in Pakistan's rural areas is not up to the mark in comparison to urban and semi-urban areas. The 2015 "Education for All" review report[6] by UNESCO and Pakistan's Ministry of Education lists the poor quality of education as one of the key challenges in Pakistan. The report further points to the poor quality of teaching due to an acute shortage of well-trained and motivated teachers.

Starting phase three of our community network project, we decided to run an interesting online test project offering supplementary education for the school girls. This project would provide extra academic help to school students to help them achieve a better understanding of their study material. Our objective was not to disturb their regular classes, but rather to design a different learning experience that complements their existing courseware.

To do this, we needed school teachers who preferably had experience in running an online class environment. The other requirement was to get approval from the district education department, since the permission we had was to connect the school to the internet only. This time we were also well received by the government department, and approval was given in a couple of days.

FIGURE 1.

Online classes baseline vs end-line scores



We ended up partnering with TeleTaleem,[7] a local commercial organisation experienced in tele-education. They delivered real-time, online lectures on English, mathematics and science for three months to grade six girls. The classes were completed a month before their final examination.

To record the impact, a baseline assessment was carried out before the course started and an end-line assessment was performed at the course end. The overall impact assessment results (see the graph in Figure 1) are really encouraging, with a substantial improvement in mathematics and science.

This truly was a great experience for us in capitalising on the potential of the community network, and moving beyond just access. We have plans to run similar classes this year too, as well as offering online classes to the polytechnic institute in the near future.

6 Ministry of Education, Training and Standards in Higher Education. (2015). *Education for All 2015 National Review Report: Pakistan*. unesdoc.unesco.org/images/0022/002297/229718E.pdf

7 www.teletaleem.com

Conclusion

According to the UN Internet Governance Forum Dynamic Coalition on Community Connectivity:[8]

> Community networks [...] are a way to develop future business by creating "digitally savvy" communities, hungry for more local content and additional services. These often are not super high-tech networks. They serve a local community-driven purpose to connect within and to connect from the village or community "out". They might be local open-source 2G solutions, or Wi-Fi mesh solutions using license-free spectrum. The aim is to build capacity for both the demand and the supply of digital tools.[9]

In countries like Pakistan, where around 70% of the population is still not online, community-owned networks are not widely seen as a way to bridge the digital divide and achieve internet access for all. While the country's Universal Service Fund Company[10] has embarked on projects to improve broadband connectivity in rural areas, the digital divide remains. It is not uncommon for villagers to have to walk two kilometres to get online, like the villagers in Chak-5 Faiz had to before we arrived.

Action steps

To promote community networks in Pakistan, the following steps are necessary:

- Streamline or eliminate related regulatory requirements, especially those that are not applicable to small, community-based networks.
- Expand universal service and other public funding opportunities and include community networks as eligible for funding from the universal service fund.
- Introduce approaches to provide spectrum access and innovative licensing for community network operators.
- Encourage community initiatives to build networks aimed at reducing the digital divide in Pakistan.

8 https://www.comconnectivity.org

9 Brown, K. (2017). Preface: Putting People at the Heart of the Internet. In L. Belli (Ed.), *Community Networks: The Internet by the People, for the People. Official Outcome of the UN IGF Dynamic Coalition on Community Connectivity*. https://bibliotecadigital.fgv.br/dspace/bitstream/handle/10438/19401/Community%20networks%20-%20the%20Internet%20by%20the%20people%2C%20for%20the%20people.pdf

10 https://usf.org.pk

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.

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