



1 World Connected

Data-driven Research to Bring Billions Online

POLICY OPTIONS FOR CONNECTING AND ENABLING THE NEXT BILLION – PHASE II

CONTRIBUTION BY 1 WORLD CONNECTED

Connecting and enabling the next billion requires a data-driven approach to develop a nuanced understanding of both demand- and supply-side drivers of broadband internet adoption. At 1 World Connected, we compile case studies of initiatives that seek to improve adoption across the world. A preliminary (and growing) catalog of all such initiatives can be found [here](#).

This submission highlights some of our key learnings from the preliminary tranche of case studies that we have developed.

What are some of the barriers or limitations preventing people who do have Internet access from being enabled or empowered through such connectivity?

There are numerous demand-side barriers to Internet adoption that prevent those with access to be able to meaningfully connect to the Internet.

Relevance: Unconnected communities often do not understand how the Internet adds value to their lives, or why it is necessary to improve their standard of living.

Literacy: A vast majority of the unconnected do not have the skills to access the Internet in a meaningful way, which prevents them from leveraging the Internet

Cost: The cost of broadband remains a key consideration for people that remain offline in urban areas with the largest disparities in income.

Do you know of examples of success stories that can illustrate how Internet access can help to address real-world problems (in either developed or developing countries)?

Case 1: Rural Communications Project, Papua New Guinea

The Rural Communications Project was envisaged to provide Internet connectivity for rural and remote areas of Papua New Guinea. Financed by the World Bank and managed by the National ICT Authority of Papua New Guinea, the Rural Communications Project has deployed mobile base stations in 59 sites in remote areas in all four regions of the country, providing basic telecom services to about 500,000 Papua New Guineans. A one-time subsidy has been provided to the telecom operator Digicel in order to set up these stations.

The stations are often coupled with solar-powered charging stations to allow people to charge their cell phones in areas with minimal electricity.

The benefits of rural connectivity are felt acutely in villages like Kore, which previously had no access to any form of telecommunications services. Initially, villagers had to climb up a hill to receive weak mobile signals from a cell phone tower in Hula 25 kilometers away. The establishment of a base station in Kore allows farmers to order seeds and fertilizers using a cell phone instead of spending the extended time needed to travel to Port Moresby. Women entrepreneurs have started selling prepaid top-up cards to the villagers and set up solar-based charging stations for mobile phones. Access to services enhances economic opportunities for these communities.

One of the significant advances has been in emergency service delivery. Mobile phone services allow for people in unconnected areas to reach medical assistance far quicker, saving many lives.

Case 2: Comcast Internet Essentials, The United States of America

Comcast uses a multi-pronged approach that combines subsidized connectivity, access to low-cost devices, and digital training. Comcast partners with a low-cost laptop provider to ensure the availability of a low-cost laptop to every family eligible for Internet Essentials. It provides digital literacy training both online through its bilingual site as well as through a network of over 9,000 partners which include libraries, community organizations, and elected officials. It also provides broadband subscriptions at a low cost of US\$ 9.95 per month, which has remained unchanged since the launch of the program.

In terms of facilitating digital literacy training initiatives, Comcast covers the cost of providing the materials on its bilingual site for free to all users. As of August 2016, over 6.4 million users

have benefited from the website. Comcast has also spent over US\$ 300 million in printing materials and other facilitating digital literacy training by partner organizations and broadcast over 8.5 million public service announcements at US\$ 110 million. A dedicated call center set up for Internet Essentials users since 2011 has received 4.4 million phone calls as of August 2016. Furthermore, Comcast has provided more than US\$ 1.8 million in grants to create 14 Internet Essentials Learning Zones in 9 states, spread across 24 cities, provided in 110 partner organization locations. The strong investment in partnering with multiple organizations to provide digital literacy has proven to be critical to their outreach strategy.

Comcast offers Internet Essentials in 55,000 schools in 5,000 school districts that fall within Comcast's footprint. Surveys of Internet Essentials users indicate that over 95% of users have seen an improvement in their children's grades after signing up for this program, with over 98% using it for homework. A majority of Internet Essentials users indicated that they learned about the program from their school or local library and signed up in order to improve educational outcomes for their family. In addition, 63% of surveyed users said that the program enables creative pursuits, and 65% said it helps their children's reading ability.

Case 3: Wireless for Communities, India

The Digital Empowerment Foundation (DEF) and Internet Society (ISOC) launched Wireless for Communities (W4C) in 2010. The program provides connectivity using low-cost Wi-Fi based equipment and unlicensed spectrum (free spectrum) to rural and under-served communities.

There are three key components to the program. A training of trainers (ToT) project equips community members with the skills to deploy as well as maintain community infrastructure, which makes the project sustainable in the long term. The deployment of mesh networks in rural areas that use low cost Wi-Fi infrastructure forms the core of the project. Skills training and capacity building endeavors in the community enable community members to use the Internet for enterprise.

The first pilot project was launched in late 2010 in the Chanderi cluster, highly populated with marginalized handloom weavers, located in Madhya Pradesh. Relying on the Chanderi Weavers Information Resource Centre (CWIRC) as its base center, the network connected 13 schools and 40 panchayats (village councils), 2 Madarasas (muslim universities/schools), a

public health center, hotel, as well as a community radio station. The project set up a separate digital design resource centre called “Chanderiyaan” where ICT training, certification and diploma courses are offered to people. These efforts have allowed villagers to be able to access government services online, and set up online businesses.

The district of Baran in Rajasthan formed the second phase, where 7 night school-cum-libraries and 8 cluster centers were connected across 202 villages of the district. (Each cluster center covers 8-10 villages.) The third phase connected the village of Giridih in Jharkhand, Mandla, in Madhya Pradesh and Nangaon, rural North Tripura. W4C also conducted 18 workshops for the communities coming online. All of these phases rely unlicensed spectrum and very low cost Wi-Fi equipment, set up by “barefoot engineers” trained by the Digital Empowerment Foundation at Barefoot College, Tilonia.

Both campuses of Barefoot College are fully covered by wireless Internet. E-ticketing, email, and Internet service are provided to visitors, and staff use this connectivity to sell Tilonia crafts online.

A component of the project called Wireless Women for Entrepreneurship & Empowerment (W2E2) identifies women from self-help groups within these communities and provides them with targeted training. This training empowers these women, who come from varied backgrounds – artisans, weavers, and Anganwadi workers, to name a few – to become entrepreneurs by giving them the skills needed to set up and maintain websites for their services and goods.

The fifth and sixth phases of the project consolidate already existent networks in Guna, Shivpuri, and Baran, and expand the scope of the project to newer regions such as Narayanpet in Telengana.

Connectivity in rural areas has transformed information access in numerous ways for these communities. Wireless for Communities provided ICT training, certification and diploma courses on computer concepts, tele-health technology courses at Chanderiyaan. Eleven out of the 13 schools in Chanderi have Wi-Fi connections and computer centers. As a result of wireless Internet and broadband, the weavers of Chanderi are taking to e-commerce and Facebook to sell their crafts. In Baran, digitally enabled services include telemedicine, learning and education through video conferencing, and narrowcasting of community radio programs.

Barefoot College uses this connectivity to upload villages' water data online for the purposes of policy advocacy.

Community Information Resource Centers have helped villagers gain access to data, including exam results of students and online data of all mid-day meals in the district, as well as enabled people to open bank accounts and get printouts of Aadhaar (Unique Identification Number) cards. Unlike many other remote districts in Jharkhand, the school mid-day meal status is up-to-date in Birni, a block panchayat in Giridih, as its office uses broadband Wi-Fi connectivity provided by the W4C program through a local organization called Nav Jagriti Mandal to keep this information current.

The project has also enabled Sahariya tribal community members in Mandla to understand the importance of education. A foundation called Sankalp reaches out to this community using the Wireless for Communities network in education outreach.

Another benefit of W4C is the availability of telemedicine services at local public health centers (PHC). The project has provided seamless internet connectivity that has enabled health care centers in rural Jharkhand and Tripura to provide telemedicine services and receive expert advice from doctors through Skype calls.

Case 4: Rhizomatica

In 2013, Rhizomatica began providing technical and legal support to communities interested in deploying user-owned and operated networks using open-source technologies. Inspired by an ad hoc initiative to connect underserved communities in Nigeria, Rhizomatica provides unconnected communities in Oaxaca with appropriate technology deployed using a community-led, consensus-based administration model in order to provide telecommunications access.

There are three infrastructural components to the Rhizomatica system: a Radio Access Network, a computer suite administrative system, and an internet connection. The Radio Access Network uses the 850MHz band to connect users to the network. The Internet connectivity is provided through a partnership with Protokol, which also routes external calls through VoIP. Equipment design is in conjunction with inventors and manufacturers and

leverages open source technologies such as OpenBTS, which brings down the network set-up costs to US\$ 2,500.

Rhizomatica leverages the strong community organizing structures in rural Mexico, with leaders required to submit a formal petition to work with Rhizomatica following a unanimous community vote. This is to ensure that the community as a whole agrees to the use and maintenance of the network, creating a sustainable model for its use in the long term. Communities must also make an initial investment of MXN 30,000 to cover installation costs as well as costs of training for community members to operate the equipment. Rhizomática receives a percentage of monthly subscription fees from the community upon deployment of the full network, which amounts to MXN 8-10 per user depending on the size of the community and the number of subscribers. Community members are trained to maintain the networks, with Rhizomatica only playing a supporting role after initial network setup. Rhizomatica provides training materials and workshops, as well as guides on its wiki for those interested in deploying OpenBTS.

The pilot programs in Sierra Juárez of Oaxaca and Santa Maria Yaviche have provided up to 500 and 700 individuals with Internet access. In five years, Rhizomática aims to reach at least 200 sites serving approximately 150,000 people and to create a conducive regulatory framework within Mexican telecommunications law to enable access to the necessary frequency spectrum in rural areas.

Rhizomatica presently serves sixteen rural communities of 2,500 or fewer inhabitants, providing the first Internet access to these communities. This connectivity facilitates mobile and internet services for banking and healthcare, communication in case of emergencies home delivery services, and community-wide messaging by local leaders.

Case 5: Mawingu

The Mawingu network uses photovoltaic solar power and TV white spaces as well as other license-exempt radio technologies to deliver commercial Internet access to people through Wi-Fi hotspots in villages as well as transport interchanges. Mawingu, a word that means “cloud” in Swahili, connects rural communities where barriers to Internet use are significant, both

because of the lack of infrastructure and the lack of affordability. Mawingu targets low income earners by providing access at the cost of US\$ 1 per week and US\$ 3 per month.

The Mawingu network provides last-mile connectivity through low cost, high capability solar powered 5 GHz point-to-point and point-to-multipoint license-exempt radios manufactured by Ubiquiti Networks, as well as low-power second-generation radios manufactured by Adaptrum that allow for extension of the network to off-grid locations. The solar panels that power these radios also produce power for device recharging services.

A non-commercial arm of the business provides Internet access to primary care centers, schools, and other public services through partnerships with local organizations such as the Kenyan Red Cross and Nanyuki library. It is also connecting 20 schools near the Ol Pejeta conservancy.

At present, Mawingu has about 10,000 commercial users of its monthly and weekly flat-rate offerings in the four counties where it is present. The Mawingu network has to date provided connectivity to Male Primary and Secondary Schools, Nanyuki Red Cross Office, Tambuzi Farm, Tithigi Boys Secondary School, Thome Boys Secondary School, Gakawa Secondary School, and the National Library in Nanyuki absolutely free of cost. Microsoft provided ICT labs in Gakawa Secondary School, Male Primary School, and Male Secondary School as well as relevant technology training for all the teachers and administrators, which has had a real impact on educational outcomes. Gakawa Principal Beatrice Ndorongo reports that in the two-and-a-half years since the connection was established, students at Gakawa Secondary School have improved their scores in *every single subject* on the Kenya National Exam.

Further, Mawingu enables entrepreneurs to flourish by allowing them to set up “Solar-cybers,” which are low-cost Internet cafes that provide device recharging services. Mawingu agents, as they are called, have flourished in parts of rural Kenya and provide a range of services to clients.

About 1 World Connected (1worldconnected.org)

1 World Connected is a research project based out of the University of Pennsylvania's Center for Technology, Innovation and Competition. The project seeks to catalog, analyze and disseminate information about innovative approaches to connect the unconnected.