



MAWINGU

EMPOWERING KENYAN LIVES THROUGH AFFORDABLE INTERNET ACCESS USING UNLICENSED SPECTRUM



A Mawingu Center in Kenya. Photo courtesy Mawingu Networks

EXECUTIVE SUMMARY

The Mawingu project is a joint undertaking by Mawingu Networks, Microsoft, and Jamii Telecommunications that provides affordable access to wireless broadband Internet as well as device recharge facilities in the rural Kenyan counties of Laikipia, Nyeri, Embu, and Meru. Launched in 2013, over 10,000 customers access its services through 300 Wi-Fi hotspots at less than US\$ 3 per month, with others in these districts -- a total population of about 300,000 people -- receiving free access through libraries, schools, and health centers. The project relies on a combination unlicensed spectrum and TV white spaces to provide last-mile connectivity as well as backhaul.

CONTEXT

With an Internet penetration of nearly 70%, Kenya has among the highest rates of Internet usage in Sub-Saharan Africa. Kenya's Internet usage rates rank among the highest in Africa with nearly 87.2% of the population having Internet access and 18.6% subscribed to broadband.

However, rural areas of Kenya still lag behind significantly, as broadband is not universally available, and those with access to signal still suffer from low incomes which makes connectivity cost prohibitive. Most rural networks are 50-100 kilometers from fiber, a distance that is economically nonviable for traditional telecommunications companies to serve.

In August 2013, Microsoft sought permission from the Communications Authority of Kenya to test the viability of TV white space technology to bring last mile connectivity to Kenya's rural areas. The Mawingu project conducted these trials in the rural counties of Nyeri and Laikipia by Jamii Telecommunications Limited, Adaptrum, and Ubiquiti Networks, along with support from USAID and OPIC.

The trials entailed setting up solar powered Internet kiosks or solar cafes so as to provide Internet access to locations with limited or no access to electricity.

Kenya is uniquely well-suited for these types of trials due to the high rates of Internet usage as well as ranking among the highest in Africa for digital literacy and computer skills. Kenya also has a strong record of ICT deployment in rural areas; in 2008, 45.8% of all fixed-line telephone subscribers were rural based, among the highest in Africa. Furthermore, Kenyans are intimately familiar with Internet cafes as the vast majority of the population primarily use computers or access the Internet at Internet cafes due to low household ownership of computers.

Country Statistics: Kenya			
Land area (sq. km.)	569,140	Mobile cellular subscriptions (per 100 people)	73.8 (2014)
Population	46 million (2015)	Number of active users (Mobile)	38 million (2016)

Population below the poverty line (as a % of total population)	42 (2012)	Number of active users (Fixed)	82,458 (2016)
Labor force	17.5 million (2014)	Broadband subscriptions	7.9 million (2016)

Sources: World Bank, International Telecommunications Union, Communications Authority of Kenya

CHALLENGES

Lack of consistent basic electricity provisioning: Access to reliable electricity from the grid is difficult, as a number of these communities lie in rural and off-grid areas.

High levels of inequality: A baseline study of incomes conducted by University of Southampton in Laipika county showed a Gini coefficient of 58, which is well above Kenya’s country average of 48. Moreover, 60% of households were found to be spending more than 5% of all monthly expenditures on communications, with 41% are spending more than 10% of their total net income. The study, which used surveys, enumerated interviews, and focus group discussions as part of its methodology, found that 89% of Internet users said that the cost of using the Internet is a barrier to expanding their usage and that 75% of Internet users expressed frustration over the speed of Internet access.

THE MAWINGU SOLUTION

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.

Jamii Telecommunications Limited provides the backbone link that transmits Mawingu's traffic to the Internet using a fiber optic network that belongs to the Kenyan Power and Lighting Company. 5GHz wireless links connect to form rings and distribute connectivity from the backbone to end points. TV white space technologies provide links in areas that conventional 5GHz links cannot serve due to terrain and are used for both completing the ring structure and providing last-mile connectivity. TV white spaces can penetrate rough terrain and reach up to eight kilometers. They cover 16 times the area of traditional Wi-fi, and nearly four times the distance.

IMPACT

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.

The evaluation study conducted by the University of Southampton overwhelmingly emphasized the positive benefits that Internet users perceived because of access: 96% of respondents said that the Internet could positively impact their communities and 92% thought that the Internet could positively impact their own lives.

KEY TAKEAWAYS

Low cost affordable access to the Internet facilitated by TV white spaces technology has the potential to connect rural, far-flung and low-income areas to the Internet.

Access to the Internet through schools has a real and significant impact on educational outcomes.

Innovative ways of providing access must account for the lack of consistent electricity in rural areas in their design.