

# Nepal Wireless Networking Project

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Nepal Wireless Networking Project***

The Nepal Wireless Networking Project serves as an excellent example of how a community-based project can be implemented with few resources, but through a display of local leadership and vision was able to challenge existing policy frameworks to allow for the use of innovative technologies to provide ICT access to poor communities.

The project illustrates how low-cost and easy-to-maintain wireless networks can be used in harsh and remote locations to provide telephone and internet access to dispersed communities. Under local leadership and with strong community support, local communities are able to provide much-needed communications services as well as other types of services that are run as small businesses (communication centres) or as community services (telemedicine, school networks). Strong local capacity building efforts in ICTs have resulted in the development of a cadre of local experts who can provide technical assistance. In addition, the advocacy efforts of the local champion, Mahabir Pun, resulted in the government changing its restrictive telecoms policies that previously prohibited the use of wireless networks, while also dropping the costs of licences to under USD 2.

## Background

The Nepal Wireless Networking Project addresses the problem of access to information and communications technology (ICT) from a grassroots perspective. Since 2002, it has been extending ICT access to rural areas through wireless technology.

The Nepal Wireless Networking Project was not started as a result of the policies and decisions made by international organisations or the government of Nepal. It started with a need for better communication means between villages for implementing community development activities. It then unexpectedly turned into a wireless project in pursuit of finding ways to bring the internet and telephones to the Himanchal Higher Secondary School in Myagdi district, Nepal and to connect it to surrounding villages. It took almost seven years to make the dream come true in adverse working situations in Nepal. Political conflict in rural areas created a great deal of difficulty in setting up and running the network, while the autocratic rule of the king and restrictive trade regulations made acquiring the necessary technology extremely difficult. Regardless, the project has not only successfully overcome those obstacles and set up a pilot wireless network that brought the



benefit of information technology to the mountain people of Nepal, but has also influenced changes to national ICT policies.

The project's locations – mostly rural and isolated areas – are inhabited by indigenous people who are subsistence farmers. There are many marginalised or socially disadvantaged groups such as the Dalits, considered a "low caste" group for centuries. The project targets people living in isolated villages of the Himalayan region of Nepal where there is almost no modern means of communication. The project is introducing information technology to villagers, most of whom had never seen computers until a few years ago. Many of the villagers still have no idea as to what the uses of the computers are and consider a computer as no more than a "mysterious box".

### ***Moving beyond physical access***

The project is building wireless networks to connect mountain villages. However, sheer access to computers and the internet alone is not enough to make a lasting impact on the lives of the poor. Therefore, the project is trying to provide as many services as possible such as e-health, internet telephony, remittances and local e-commerce services that are useful for the villagers as well as creating jobs for local people. In addition, most of the available content on the internet does not help rural populations as it is not available in local languages. Because of this, the project also focuses on developing educational content in local languages that everybody can understand.

These services require other partners who can provide applications and content for the villagers. Current partners and supporters include E-Networking Research and Development for wireless networking and training; the Open Learning Exchange (Nepal) for developing educational content in Nepali languages; the Nepal Research and Education Network for research and network design; the Gandaki College of Engineering and Sciences and Kathmandu Engineering College for software development and technical support; the Kathmandu Model Hospital and Om Hospital Pokhara for the telemedicine programme; Thamel.com for e-commerce purposes; and the Nepal Library Foundation Canada for setting up computer labs with thin clients. Many more partners have shown interest in working together on the project, all champions in their fields.

### **The technology**

The Nepal Wireless Project uses a variety of wireless devices with 2.4 GHz and 5.8 GHz frequencies to maintain connectivity between the villages, relay stations and base stations. Most of the network backbone is connected with Motorola Canopy radios at 5.8 GHz, which is proprietary equipment, whereas last-mile connections to the villages use wireless Ethernet (802.11b/g standard) radios at 2.4 GHz from various manufacturers. The Motorola devices were used for the backbone connection due to their high reliability and robustness and to avoid signal interference. However, 802.11b/g radios were used for



village connections due to their lower cost and the compatibility between manufacturers.



Access to the services is provided mainly through desktop computers and used laptops. About 150 computers are connected to the network now; most are used Pentium computers that have been donated by people and businesses from Nepal and abroad. Several villagers have bought new computers and equipment using their own resources.

The project has added an internet telephony system using internet protocol (IP) network telephones in various villages. With this technology, users are able to dial a telephone number directly, as they would on any landline. The call is then routed through the network Asterix server, and placed on the Nepal Telecom public switched telephone network (PSTN). The project uses different brands of IP phones such as Sipura, GrandStream, Cisco and Polycom. In cases where network phone sets are not available, we are using client software (a "soft phone"), which can be downloaded from the internet for free.

For teleteaching and telemedicine programmes, different kinds of network cameras have been obtained. The teleteaching programme uses an Axis 210 camera, while the telemedicine programme uses Panasonic, Linksys, D-Link and normal webcams. At present the project is testing high-quality network cameras such as Polycom and Aethera that offer a video quality many times better than ordinary cameras. It has been possible to send high-quality video pictures through the network because broadband is available on the local wireless network. Depending on the distance of a village from the relay and base stations, the minimum bandwidth available in the local network is one megabit per second (Mbps), which is suitable for video conferencing. The network cameras are actually a camera and computer combined in one intelligent unit. Therefore they connect directly to the local area network (LAN) without requiring a computer. Moreover, the zoom, pan, and tilt features on these cameras can be controlled remotely. This has been useful for doctors to examine a patient from different angles. For viewing the video for teleteaching, the project uses open source software called VLC, which is capable of receiving, broadcasting and recording multicast MPEG-4 video streams, needs little central processing unit (CPU) power, and can use a large number of input devices.

## **The ongoing effects of the project**

The Nepal Wireless Networking Project is working on ways to maximise the benefit of wireless technology for the rural population of Nepal. Therefore, it has attracted the attention of several government and non-governmental organisations. Thus far the project has helped to create a better environment for the introduction of information technologies in Nepal. The following are some examples:

- After the restoration of democracy in Nepal in 2006, the project team members lobbied the government to liberalise IT policies. The team members gave three presentations to a parliamentary committee, the High Level Commission for Information Technology, and members of the parliament, requesting more liberal

policies. As a result the government of Nepal deregulated the 2.4 GHz and 5.8 GHz Wi-Fi spectrum in 2007. Moreover, the government of Nepal brought down the licence fee for starting up rural internet service provision from around USD 5,000 to a nominal amount of about USD 1.50 a year. This has encouraged private operators to start businesses in rural areas. Another effect of the lobbying has been that the government has legalised PC-to-PC and IP-to-IP voice over internet protocol (VoIP) calling.

- The project has successfully demonstrated a business case for rolling out services to the rural poor. As a result, several organisations and villages have shown interest in building wireless networks in their areas and providing services to villagers. This has led to the Nepal Wireless Networking Project providing full technical support to build seven small wireless networks for different organisations in different parts of Nepal, including one for a telemedicine application and a monitoring system for a fast-growing glacial lake in collaboration with Keijo University in Japan.

## **Sustainability**

Started as a not-for-profit social enterprise, the project now charges a service fee to rural communication centres to ensure sustainability and growth. The project does not collect revenues directly from end-users but instead bills rural communication centres on a monthly basis to cover the operating and maintenance costs of the network. The project employs a management structure that allows community organisations to make their own decisions to run their communication centres. This creates a system where the communication centres collect most of the revenue from end-users, while the project as a whole charges the village communication centres at an affordable rate for access. The project has been successfully sustained technically and financially for the following reasons:

- The wireless network has been developed with the active involvement of local communities and local governments. The local communities and community schools own the communication centres and maintain the relay stations. The Nepal Wireless Project provides management training to the stakeholders.
- For operational sustainability after the initial installation, the project provides full technical support until the local operators of the rural communication centres become able to maintain the network by themselves, which takes about two years. All technical staff are recruited locally.

Each communication centre and the project should be financially sustainable and generate enough monthly revenue to pay for the salary of the communication centre operator, electricity and telephone bills and internet connectivity fees. Some of the ways the communication centres raise money are as follows:

- Village cybercafés: The communication centres charge users around NPR 15 (about USD 0.20) per hour for using the internet.
- Computer labs in schools: The schools charge NPR 15 (about USD 0.20) per month to the students and NPR 30 (about USD 0.40) per month to the teachers as the fee for using the computers and the internet.

- VoIP telephone service: The project provides VoIP phone services for making local calls on the local network and for making international calls via the internet. Moreover, it has connected the Wi-Fi network to the nearest point of the PSTN line of Nepal Telecom through devices that will convert the Wi-Fi signals to the signals used by the PSTN line and vice versa. By providing such telephone services and charging for the calls, the communication centres and secondary schools are generating revenues to pay for their operations and maintenance costs.
- Photocopying, scanning, photography and secretarial work: Most of the centres have a photocopy machine and colour printers. They charge NPR 50 (about USD 0.75) for five copies of passport-size pictures and modest fees for printing and photocopying documents.
- Online money transferring/remittance service: The project is working with Thamel.com as a partner to carry out money remittance and credit card transaction services from abroad. It charges a 5% service fee for each transaction. Since some of the areas of the wireless project lie in the Annapurna region, there is great potential for generating income from tourists by providing credit card transaction services.
- Local e-commerce system: Each communication centre is helping villagers to provide information about their local products for sale such as buffaloes, oxen, goats, sheep, potatoes, corn, millet, vegetables, etc. The communication centre is teaching people how to do this and is not charging any fees; however, the communication centres will in future charge a nominal fee as commission for selling their products through the local network.
- Telemedicine service charge: The project has provided a free telemedicine service in four rural villages using the wireless network to connect to doctors in a city, as there are no health clinics and medical doctors available in the villages. The fully implemented telemedicine system will provide full e-health services for those unable to travel to the cities. In future the villagers will be charged affordable fees for checkups and consulting with doctors through telemedicine, for which they are prepared to pay without hesitation.



## Future plans and expansion

To date the project has been able to maintain its grassroots character and is working as a not-for-profit social enterprise. However, the project will not sustain itself and grow that way in the long term, and so it is working towards developing as a for-profit social business enterprise. The project was started with the financial support of donor agencies to purchase equipment, but the technical and management components of the project have been self-sustaining, and it is working on developing

a public-private business model. Potential public partners include local and district governments, local schools, rural clinics and local social clubs. Some of the local governments have already shown interest in investing from 5% to 10% of the yearly grant they receive from the Nepalese government to provide wireless networking to villages. This would come from the USD 14,000 granted each year to local governments to use for local development based on their needs. However, the project's focus will still be to provide education, health, communication and e-commerce services to poor people living in isolated and remote parts of Nepal. The project will also help to implement an e-governance programme that the government of Nepal is intending to introduce.

In order to develop the public-private partnership model the project will also mobilise local businesses and social entrepreneurs as far as it is possible and encourage them to invest in the business and make the project financially profitable.

## **Further information on the project**

Himanchal Higher Secondary School and Nepal Wireless Networking Project:  
[www.himanchal.org](http://www.himanchal.org) and [www.nepalwireless.net](http://www.nepalwireless.net)

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