

International Telecommunication Union

# **Global ICT Forum for the Least Developed Countries**

## **Forum for ICT Stakeholders**



**Mauritius**  
**7-9 July 2004**

### **Vision**

*The Special Programme for the Least Developed Countries (LDCs) will be valued for its **quality** and **timely service** aimed at integrating LDCs into the world economy through telecommunication development, and its ability to positively impact the delivery of assistance to LDCs. As part of this effort, we work together with other like-minded players to promote partnerships and sustainable development in LDCs.*

**For more information, please contact:**

**Cosmas L. Zavazava, Ph.D.**

**Head, Unit for LDCs**

**Chief a.i., Business Development Unit**

**Telecommunication Development Bureau**

**International Telecommunication Union**

**Tel.: +41 22 730 5447**

**Fax: +41 22 730 5484**

**E-mail: [cosmas.zavazava@itu.int](mailto:cosmas.zavazava@itu.int)**

**[www.itu.int/itu-d/lcd](http://www.itu.int/itu-d/lcd)**

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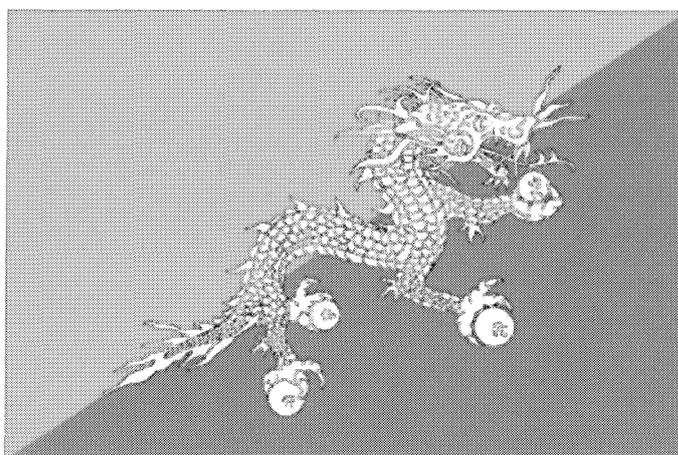
**Telecommunication Development Bureau**



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# PROJECT DOCUMENT

## BHUTAN









# **ICTization of Schools-cum- Communities in Bhutan**

**June 2004**

**Ministry of Information & Communications  
Royal Government of Bhutan**

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## **1. Introduction**

The Kingdom of Bhutan lies in South Asia, in the Eastern Himalayas. It is landlocked, between the Tibetan Autonomous Region of China to the north and India to the east, south and west, with a total surface area of 46,500 sq km and a population of about 700,000. The country is almost entirely mountainous, with land rising from about 160m above sea level in the south to the high Himalayas in the north that rise to over 7,500m.

The process of modern development in Bhutan started as recently as 1961. Until then, Bhutan had been isolated from the rest of the world. Bhutan is still a monarchy, but the King is no longer head of the government. Instead this responsibility now rotates annually among the Chairman of the elected Council of Ministers.

Since the 1970s, Bhutan has embarked on a very distinctive approach to development - achievement of Gross National Happiness (GNH). This concept articulates that development has more dimensions than those associated with GDP or GNP, and that development should be understood as a process that seeks to maximize happiness rather than economic growth. The five themes of GNH - human development, good governance, balanced and equitable development, preservation of culture and heritage, and environmental conservation - serve to direct change in Bhutan.

Telecommunications (telecom) and Information Technology (IT) in Bhutan is also a fairly recent development. The Government established the first telecom network in 1963 consisting of three separate analogue networks. Modern telecom development process began only in the early 1990s. By 1998, a fully digital national telecom network interconnecting all the 20 districts and major towns was established.

Internet services were introduced in June 1999 with the establishment of DrukNet, the first and only Internet Service Provider (ISP) so far. The 77<sup>th</sup> Session of the National Assembly passed the Bhutan Telecommunications Act 1999 (the Act). Provision of cable TV services was subsequently regularized. Division of Information Technology (DIT) was created to promote IT development and Bhutan Telecom Authority (BTA) to regulate the telecom sector, in January 2000. The erstwhile Department of Telecom (DoT) was transformed into a wholly government-owned corporation, Bhutan Telecom (BT), in July 2000.

Recognizing information and communication technology (ICT) as a tool for social, cultural, political and economic development, the Royal Government established the Ministry of Information and Communications (MoIC) in July 2003. A Department of Information and Media has been established. BTA has been renamed as Bhutan Communications Authority (BCA), expanding its mandate to regulate postal, media and information services.

## **2. Project Background and Needs**

BT has expanded the national network to provide services to several rural and remote areas. However, as 79% of our people still live in rural areas, teledensity in these areas is less than 1%, as compared to 15% in urban areas. The overall teledensity is about 4%. All the public secondary and private schools are located in urban or semi-urban areas whilst

most public community and primary schools are located in rural areas. Teaching and learning still take place predominantly within the domain of textbooks and with minimal interaction with the outside world. These disparities call for the need to establish mechanisms to bridge the gap between the rich and poor, the information 'haves' and 'have-nots', the urban and rural. The objective of the telecom sector during the Ninth Five-Year Plan (2002-2007) is to provide 10 telephones for each of Bhutan's 201 Geogs<sup>1</sup>, to enhance communications, promote e-governance and accelerate private sector participation. Facilitating access to and enabling use of ICT for schools and associated communities would underpin achieving these national goals.

In the fifth year of its establishment, DrukNet has about 2,500 subscribers nationwide. There are about 10,000 computers in the country. ICT in Bhutan is developing rapidly; however, most computers are under-utilised, there is lack of capital and ICT human resources, information management systems are slowly developing, computer literacy is still very low, and concrete organizational ICT plans are yet to be fully developed. The need to establish reliable access infrastructure, facilitate hardware and software availability, educate and encourage people, especially the youth, to use ICT for education and life-long learning, and raise awareness among ICT users, justify the need to implement this project.

The Internet and World Wide Web (WWW) allows access to countless resources, including community, national, and world facts, reference materials, and information on any topic. Creating a motivating curriculum that uses these tools benefits not only schools, but also collaboration among students. Teachers can be facilitators of students' learning. But, simply providing access to computers for schools' use isn't enough. Past experiences show that technology must be integrated with curriculum if learning is to take place, meaning that teachers must create lesson plans that make use of technology's powerful ability to gather data, expedite communication, and analyze information. The Ministry of Education must lead and undertake initiatives to integrate ICT into the national education curriculum.

ICT is paramount to school education, both from the perspective of the students' future as well as providing tools to improve teaching and learning and easing school administration and management. With emphasis on providing wholesome and relevant education, integrating ICT for education will prepare our future citizens for the Information Age.

### **3. Previous Projects and Existing Research Results**

BT has successfully implemented an IP-based rural access pilot project, in 2002, with some valuable assistance from the International Telecommunication Union (ITU). B-Mobile commenced cellular mobile operations in November 2003 with the commissioning of the first phase of the mobile cellular project. BT has also secured funds in the form of Mixed Credit Scheme to implement the rural telecommunications project (Rural Project) starting September 2004. BTA has successfully coordinated a capacity building programme for new technologies and management, with the ITU, which trained 20 BT middle and senior level technical and management staff during 2003. BTA has also

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<sup>1</sup> A geog is the smallest administrative block and is comprised of several villages.

coordinated mobilization of funds required for complementing the Rural Project in close collaboration with the ITU during the first half of 2004.

BT had conducted numerous field surveys of various sites and feasibility studies across the country prior to implementation of the National Telecommunications Network Plan in 1998. These reports are available for reference. BT has valuable data and information on several remote and rural sites identified in the process of drawing up the Rural Telecom Master Plan 2000. This Plan document, updated recently, is also readily available.

DIT has conducted a nationwide IT survey in March 2001. The findings of this survey are useful and informative. A report to this effect is also available.

The MoIC also compiled, during 2003, the e-Readiness Report and conducted the Media Impact Study, as necessary input documents to the process of drafting the Bhutan Information, Communication and Media (ICM) Act 2004.

Private ICT firms are steadily developing their capabilities – manpower, technical and financial – to undertake ICT projects. Some of these firms have successfully implemented fibre-optic based local and wide area networking projects in the country.

#### **4. Project Objectives**

This project is designed to complement the concerted effort of the Ministry of Education to integrate ICT into the national education curriculum through facilitating access to ICT in 20 schools and associated communities located in different parts of the country. The main objectives of the project are to:

- Enable and encourage use of ICT for education and life-long learning;
- Educate and raise awareness on ICT among all stakeholders;
- Encourage participation of local people, especially women and youth, in ICT activities;
- Create a favourable ICT environment for local human development through training of trainers, and training users;
- Promote development of local content and applications;
- Study and evaluate the viability and cost-effectiveness of new wireless access and networking technologies; and
- Demonstrate the reliability of solar power supply systems, for access and networking purposes;
- Explore business opportunities for potential partners in ICT development;
- Study the impact of ICT on the Bhutanese education system; and
- Contribute towards maximization of Gross National Happiness (GNH).

#### **5. Design Parameters**

The following design parameters have been considered:

##### **5.1 Government Policy**

Using ICT as a development tool is a priority policy of the Royal Government. Decentralization programmes are being implemented. The draft ICM Act and associated regulations are being polished. Liberalization initiatives are already underway.

The Ministry of Education (MoE) is fully committed to ICTization of schools and induction of ICT classes into the school curricula at all levels by 2010. This is clearly spelt out in the MoE's "IT in Education Implementation Strategies 2003".

### **5.2 Infrastructure**

Access through BT's existing networks will be provided, where feasible. A suitable secondary technology will be deployed to facilitate access to rural schools and associated communities. Proposed infrastructure thus takes into account universal access requirements, through connecting rural schools using viable access and networking technologies.

Costs and risks of deploying suitable primary architecture (where necessary) and suitable secondary technology are clearly identified.

### **5.3 Sustainability**

The schools identified and associated communities will work hand in hand to stimulate local demand for ICT services and create ICT employment opportunities. In essence, this partnership between and among schools and local communities is designed to be enterprising, sustainable and a viable business model, in the long-term.

### **5.4 Human Capacity**

Education and access to knowledge, training of young people and enhancement of skills are the key issues. Bhutan's literacy rate, in general, is low; ICT literacy is very low. Emphasis is therefore laid on raising ICT-user awareness, developing skills, supporting entrepreneurs and training of trainers, in the target schools and associated communities.

Investment in education is crucial and a prerequisite to building a knowledge-based society. In this project, the best possible use of synergies from all stakeholders is explored through pragmatic initiatives.

### **5.5 Content and Applications**

ICT users (teachers, students, local people, etc.) must be encouraged to initiate content and applications development relevant to the local and national development goals and their needs. The Government will establish ICT infrastructure through this and similar projects, and at an appropriate time mobilize funding for professional content and applications development. Content must be compatible with education, culture, tradition and language of a particular community. Most of these could be achieved if reliable infrastructure is in place and affordable access is ensured.

## **6. Project Beneficiaries**

Direct beneficiaries are the 20 schools located under 13 of the 20 Dzongkhags<sup>2</sup> that make the country. Of the 20 schools, 1 is higher secondary, 9 are middle secondary, 7 lower secondary, 1 primary and 2 community primary schools. The list of schools, their current utility status (electricity and telephone), enrolment 2003, and the proposed number of computers and printers is shown in Table 1. 10 schools will be provided with 20 desktops

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<sup>2</sup> A Dzongkhag is a district and is comprised of several geogs or blocks.

each, 4 schools with 15 each, and 6 with 10 laptops each. The total number of computers is 320. The average computer to student ratio is 1:35, in the schools where desktops are used. In the schools where commercial power supply is not available, 10 laptops will be provided to each school. The average computer to student ratio is 1:25.

Selection of schools for the project has been closely coordinated with the Ministry of Education in Thimphu. Most of these schools have been identified as resource centers for education and learning purposes.

**Table 1: List of schools identified for the project**

Sl. No.	School/Location	Electricity	Telephone	Enrolment 2003	Computers/Printer
1	Punakha HSS <sup>3</sup> Punakha	Yes	Yes	776	20/1
2	Trashigang MSS <sup>4</sup> Trashigang	Yes	Yes	940	20/1
3	Dala MSS Chhukha	Yes	Yes	1180	20/1
4	Chhumei MSS Bumthang	Yes	Yes	688	20/1
5	Chapchha MSS Chhukha	Yes	Yes	403	15/1
6	Pemagatsel MSS Pemagatsel	Yes	Yes	916	20/1
7	Trashi Yangtse MSS Trashi Yangtse	Yes	Yes	897	20/1
8	Tshenkarla MSS Trashi Yangtse	Yes	Yes	821	20/1
9	Yabilaptsa MSS Zhemgang	Yes	Yes	438	15/1
10	Wangdichholing LSS <sup>5</sup> Bumthang	Yes	Yes	1028	20/1
11	Paro LSS Paro	Yes	Yes	520	15/1
12	Jigme Losel LSS Thimphu	Yes	Yes	931	20/1
13	Samtengang MSS Wangduephodrang	Yes	No	645	20/1
14	Yadi LSS Monggar	Yes	Yes	490	15/1
15	Gasa LSS Gasa	No	Yes	225	10/1
16	Nobding LSS Wangduephodrang	No	Yes	423	10/1
17	Buli LSS	No	Yes	194	10/1

<sup>3</sup> Higher Secondary School

<sup>4</sup> Middle Secondary School

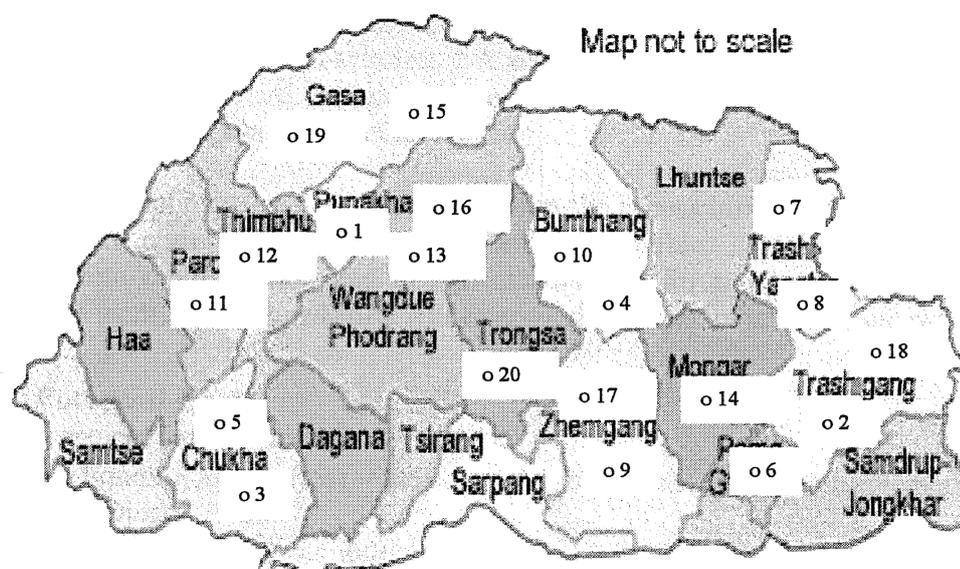
<sup>5</sup> Lower Secondary School

	Zhemgang				
18	Tshatsi PS <sup>6</sup> Trashigang	No	No	216	10/1
19	Damji CS <sup>7</sup> Gasa	No	No	107	10/1
20	Nimshong CS Trongsa	No	Yes	97	10/1

The local inhabitants of the associated communities are the indirect beneficiaries. These include the local general public, geog-based agriculture extension agents, basic health workers, animal husbandry personnel, visitors, tourists and guests.

The map below shows Bhutan's 20 Dzongkhags and gives the location of each of these 20 schools in the Kingdom.

**Figure 1: Site locations**



**Note:** Numbers 1 – 20 refer to the serial numbers in Table 1 above corresponding to the schools.

## 7. Project Methodology

The project objectives can be achieved through:

- Forging partnerships to build ICT access infrastructure, including establishing LANs in the 20 schools;
- Providing terminal equipment such as telephones, fax machines, computers, and printers;
- Training the trainers/teachers;
- Facilitating access to the Internet/WWW;
- Educating the faculty and students in basic computing, web browsing, e-mailing, etc.;

<sup>6</sup> Primary School

<sup>7</sup> Community School

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- Training the trainers/teachers;
- Facilitating access to the Internet/WWW;
- Educating the faculty and students in basic computing, web browsing, e-mailing, etc.;
- Designing websites for the 20 schools;
- Introducing IT classes as part of the school curriculum;
- Recruiting literate local community volunteers to supplement manpower requirements;
- Periodic monitoring and evaluation.

The capacity and competency to implement the project exists among the potential partners. Resources can either be pooled from among the participating entities to implement the project or it can be fully taken up by one organization (such as BT or DIT or BTA or private IT firms). It must however be borne in mind that resources, although available, are limited in all the partner organizations.

Three project teams will be established: one led by BT and comprised of members from BTA and DIT to build the telephony access network infrastructure (where non-existent) and two other teams for setting up LANs in the schools – one comprised of members from BTA, DIT and BT and the other led by a private IT firm. While the LAN project teams embark on establishing LANs in those schools with electricity and telephone facilities, the access network infrastructure team will work on establishing phone connections to schools that are not connected. It is proposed that the project will establish wireless LANs in a few sites, with varying geographic and climatic conditions, where commercial power supply exists, to test the reliability of the equipments currently available in the market.

Solar power supply systems are designed to run the access infrastructures and LANs in the schools where commercial mains supply is not available. Annex 1 shows solar power supply system configuration and design calculations for these project sites. A project coordinator from ITU and/or BTA will oversee the implementation of the project.

## **8. Detailed Project Budget**

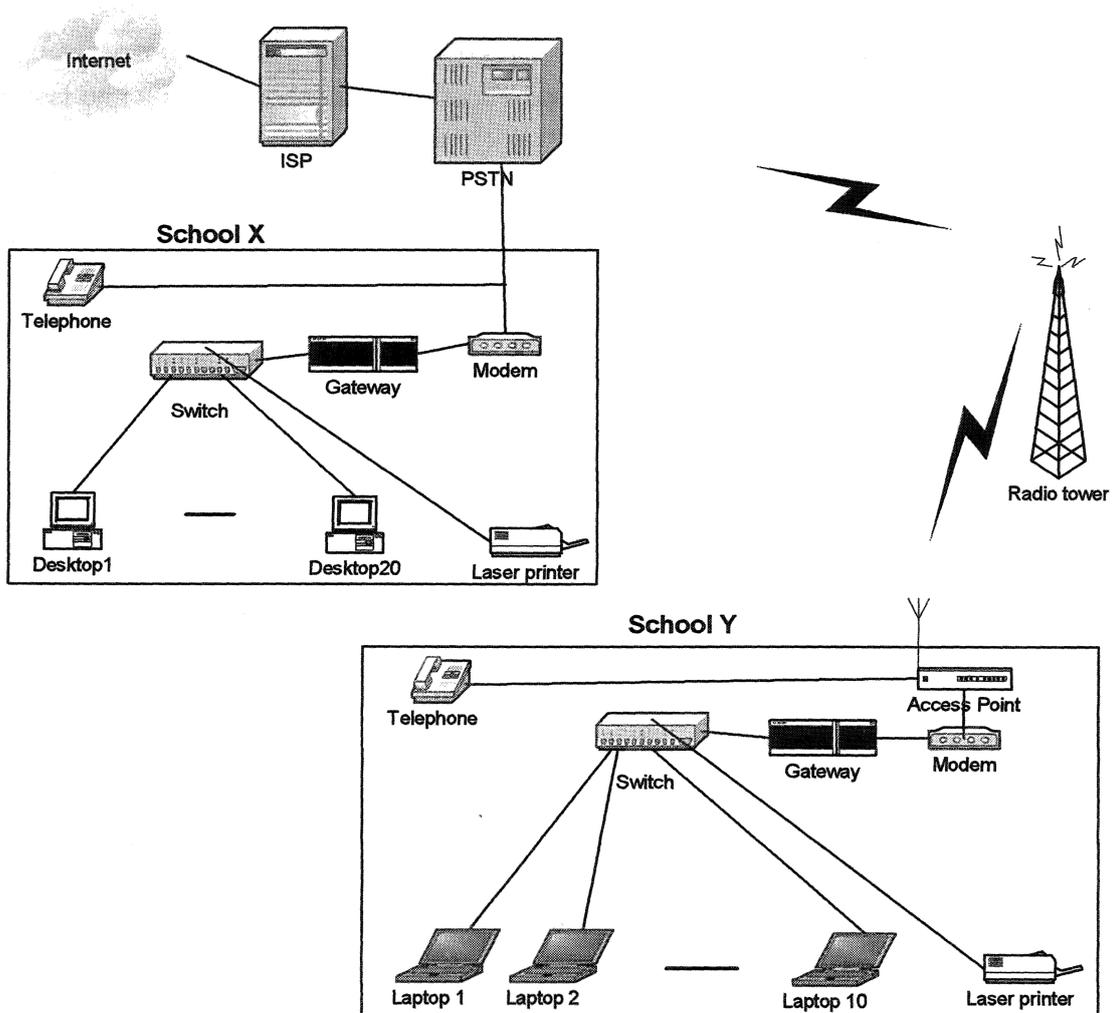
The generic schematic of the project is shown in Figure 2. The diagram depicts two extreme cases. School X categorizes those schools where both commercial power supply and telephone line are available; no computing facilities or LANs exist. School Y presents the scenario wherein schools will need to be provided with telephony access infrastructure,

deploying IP-based wireless networking technology, and LANs, both run on solar power supply systems.

The project, in essence, will provide the basis for comparison of commercial wired and wireless ICT economics in the Bhutanese geo-demographic setting. In the process, this project will also integrate and field test voice-data radios into the existing BT network in a few sites. Basically we are talking about transforming schools into ICT “demonstration” labs.

For simplicity of understanding, detailed budget and network schematic are drawn up for each school. However, common cost elements (such as tools, freight and insurance, installation, training/support, etc.) have been considered in the budget summary shown in Table 2.

**Figure 2: Generic Schematic of the Project**



**1. Punakha Higher Secondary School, Punakha**

encouraged to participate in ICT development programs in the context of their job responsibilities. ICT literate locals must be encouraged to share their know-how with their fellow villagers willing to learn and use ICT in their daily lives.

Backstop technical support can be provided either by the implementing agencies based on a contract agreement or a similar instrument. It is, however, strongly recommended that the MoE fully engage its existing ICT manpower in the installation of the project and recruit additional technical people. MoE must build and train a dedicated ICT team capable of installing, maintaining and expanding similar networks in future.

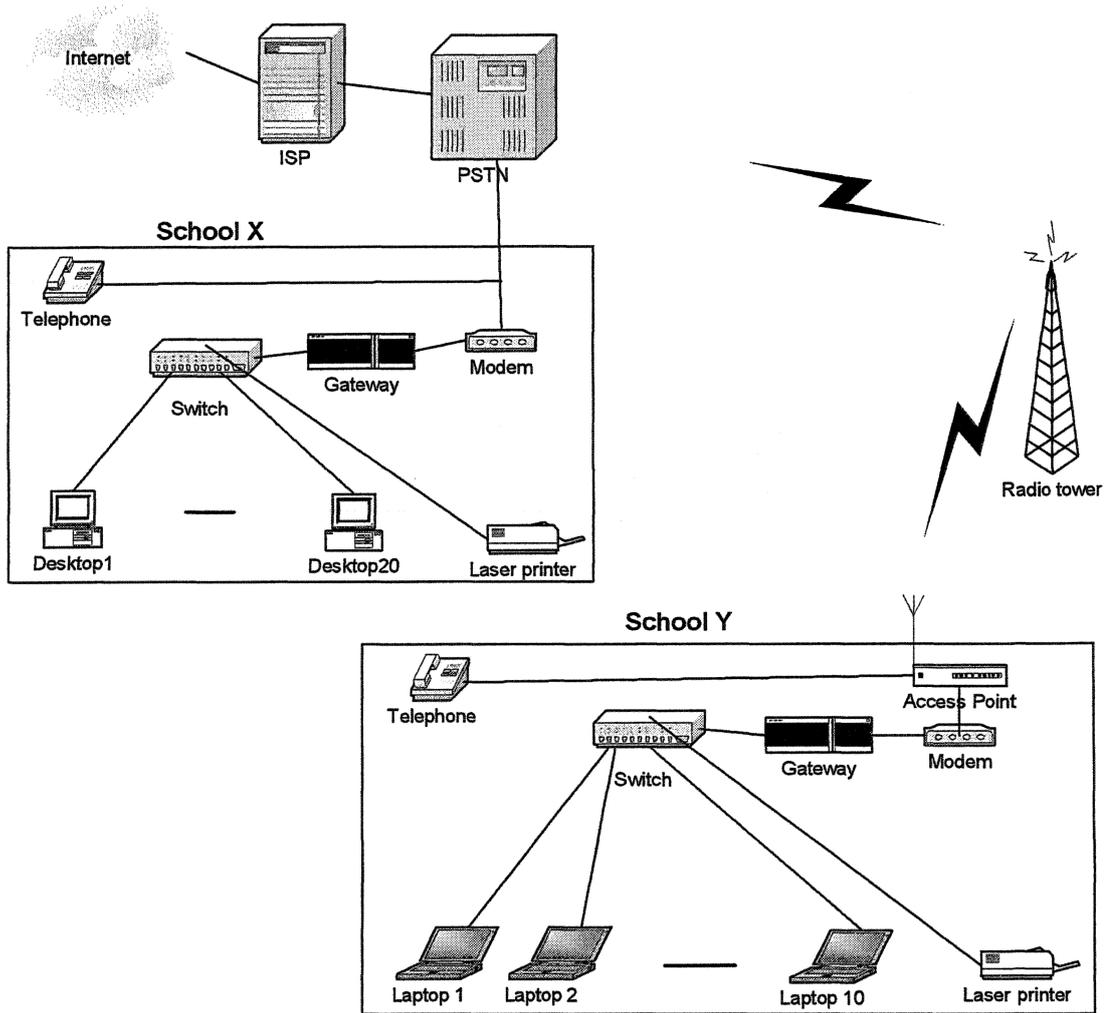
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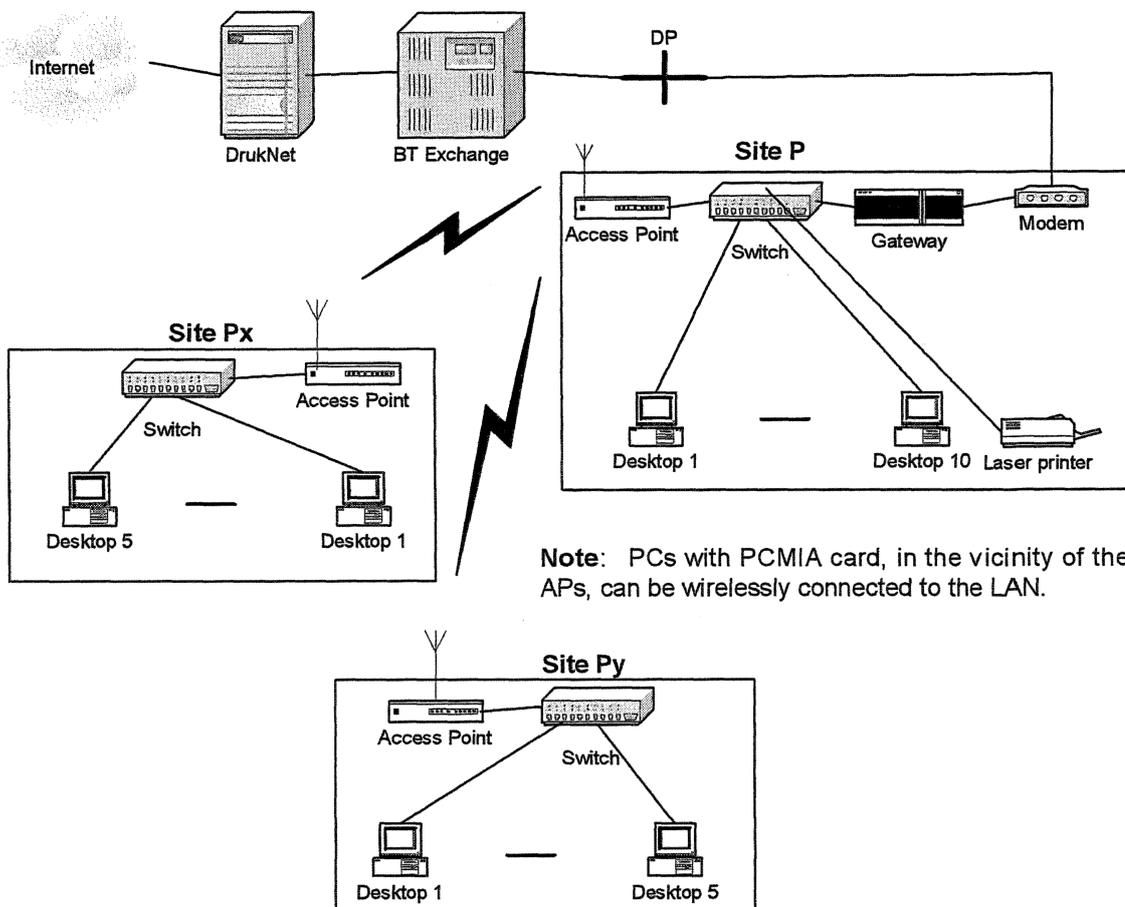
**1. Punakha Higher Secondary School, Punakha**

This school is located near the Punakha town area in western Bhutan. It has reliable electricity and telephone facilities. Under this project, a hybrid LAN will be established and Internet access provided in three selected points within the school. While the internal networks will be wired, the three access points are proposed to be connected deploying wireless LAN technology.

Component	Cost/Unit (US\$)	Quantity	Total Cost (US\$)	Additional Information
<b>Wireless LAN</b>				
Desktop Computer	1,000	20	20,000	39 students per PC
Switch (24-port)	700	3	2,100	
Gateway	1,500	1	1,500	Server
Modem (External)	150	2	300	
Access Point (AP)	1,000	3	3,000	
Antenna	500	3	1,500	
Printer (Laser)	1,500	1	1,500	
<b>Total 1</b>			<b>29,900</b>	

The network schematic for the school is shown in Figure 3. Site P is the primary site where the access point is established. The sites Px and Py are secondary access sites within the school compound connected to P using wireless networking technology.

**Figure 3: Network schematic – Punakha HSS**



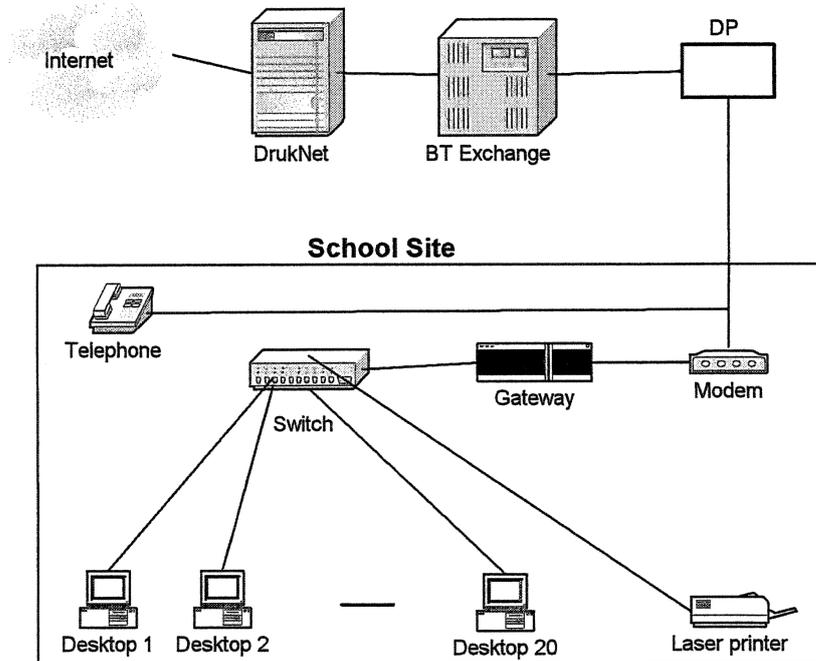
## 2. Trashigang Middle Secondary School, Trashigang

This school is located above the Trashigang town area in eastern Bhutan. It has reliable electricity and telephone facilities. Under this project, a LAN will be established and Internet access provided in the school.

Component	Cost/Unit (US\$)	Quantity	Total Cost (US\$)	Additional Information
<b>Wired LAN</b>				
Personal Computer	1,000	20	20,000	47 students per PC
Switch (24-port)	700	1	700	
Gateway	1,500	1	1,500	
Modem (External)	150	2	300	
Printer (Laser)	1,500	1	1,500	
<b>Total 2</b>			<b>24,000</b>	

The network schematic for the school is as shown in Figure 4. It is proposed to establish a wired LAN in a room (accessible to teachers, students and staff) of the main building of the school.

**Figure 4: Block Schematic – Schools with electricity and telephony facilities**



### 3. *Dala Middle Secondary School, Chhukha*

This school is located in Dala under Chhukha Dzongkhag in western Bhutan. It has reliable electricity and telephone facilities. Under this project, a LAN will be established and Internet access provided in the school.

Component	Cost/Unit (US\$)	Quantity	Total Cost (US\$)	Additional Information
<b>Wired LAN</b>				
Personal Computer	1,000	20	20,000	59 students per PC
Switch (24-port)	700	1	700	
Gateway	1,500	1	1,500	
Modem (External)	150	2	300	
Printer (Laser)	1,500	1	1,500	
<b>Total 3</b>			<b>24,000</b>	

The network schematic for the school is as shown in Figure 4.

### 4. *Chhumei Middle Secondary School, Bumthang*

This school is located in Chhumei under Bumthang Dzongkhag in central Bhutan. It has both electricity and telephone facilities. Under this project, a LAN will be established and Internet access provided in the school.

Component	Cost/Unit (US\$)	Quantity	Total Cost (US\$)	Additional Information
<b>Wired LAN</b>				
Personal Computer	1,000	20	20,000	34 students per PC
Switch (24-port)	700	1	700	
Gateway	1,500	1	1,500	
Modem (External)	150	2	300	
Printer (Laser)	1,500	1	1,500	
<b>Total 4</b>			<b>24,000</b>	

The network schematic for the school is as shown in Figure 4.

#### 5. *Chapchha Middle Secondary School, Chhukha*

This school is located in Chapchha under Chhukha Dzongkhag in western Bhutan. It has both electricity and telephone facilities. Under this project, a LAN will be established and Internet access provided in the school.

Component	Cost/Unit (US\$)	Quantity	Total Cost (US\$)	Additional Information
<b>Wired LAN</b>				
Personal Computer	1,000	15	15,000	27 students per PC
Switch (24-port)	700	1	700	
Gateway	1,500	1	1,500	
Modem (External)	150	2	300	
Printer (Laser)	1,500	1	1,500	
<b>Total 5</b>			<b>19,000</b>	

The network schematic for the school is as shown in Figure 4.

#### 6. *Pemagatsel Middle Secondary School, Pemagatsel*

This school is located under Pemagatsel Dzongkhag in eastern Bhutan. It has both electricity and telephone facilities. Under this project, a LAN will be established and Internet access provided in the school.

Component	Cost/Unit (US\$)	Quantity	Total Cost (US\$)	Additional Information
<b>Wired LAN</b>				
Personal Computer	1,000	20	20,000	46 students per PC
Switch (24-port)	700	1	700	
Gateway	1,500	1	1,500	
Modem (External)	150	2	300	
Printer (Laser)	1,500	1	1,500	
<b>Total 6</b>			<b>24,000</b>	

The network schematic for the school is as shown in Figure 4.

#### 7. *Trashhi Yangtse Middle Secondary School, Trashhi Yangtse*

This school is located under Trashhi Yangtse Dzongkhag in eastern Bhutan. It has both electricity and telephone facilities. Under this project, a LAN will be established and Internet access provided in the school.

Component	Cost/Unit (US\$)	Quantity	Total Cost (US\$)	Additional Information
<b>Wired LAN</b>				
Personal Computer	1,000	20	20,000	45 students per PC
Switch (24-port)	700	1	700	
Gateway	1,500	1	1,500	
Modem (External)	150	2	300	
Printer (Laser)	1,500	1	1,500	
<b>Total 7</b>			<b>24,000</b>	

The network schematic for the school is as shown in Figure 4.

#### 8. *Tshenkharla Middle Secondary School, Trashhi Yangtse*

This school is located in Tshenkharla village under Trashhi Yangtse Dzongkhag in eastern Bhutan. It has both electricity and telephone facilities. Under this project, a LAN will be established and Internet access provided in the school.

Component	Cost/Unit (US\$)	Quantity	Total Cost (US\$)	Additional Information
<b>Wired LAN</b>				
Personal Computer	1,000	20	20,000	41 students per PC
Switch (24-port)	700	1	700	
Gateway	1,500	1	1,500	
Modem (External)	150	2	300	
Printer (Laser)	1,500	1	1,500	
<b>Total 8</b>			<b>24,000</b>	

The network schematic for the school is as shown in Figure 4.

#### 9. *Yabilaptsa Middle Secondary School, Zhemgang*

This school is located in Yebilaptsa under Zhemgang Dzongkhag in central Bhutan. It has both electricity and telephone facilities<sup>8</sup>. Under this project, a LAN will be established and Internet access provided in the school.

Component	Cost/Unit (US\$)	Quantity	Total Cost (US\$)	Additional Information
<b>Wired LAN</b>				
Personal Computer	1,000	15	15,000	29 students per PC
Switch (24-port)	700	1	700	
Gateway	1,500	1	1,500	
Modem (External)	150	2	300	
Printer (Laser)	1,500	1	1,500	

<sup>8</sup> BT has now replaced the earlier MARRTS telephony by the more reliable corDECT.

<b>Total 9</b>			<b>19,000</b>	
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The network schematic for the school is as shown in Figure 3.

**10. Wangdichholing Lower Secondary School, Bumthang**

This school is located in Wangdichholing near the present Chamkhar town under Bumthang Dzongkhag in central Bhutan. It has both electricity and telephone facilities. Under this project, a LAN will be established and Internet access provided in the school.

Component	Cost/Unit (US\$)	Quantity	Total Cost (US\$)	Additional Information
<b>Wired LAN</b>				
Personal Computer	1,000	20	20,000	51 students per PC
Switch (24-port)	700	1	700	
Gateway	1,500	1	1,500	
Modem (External)	150	2	300	
Printer (Laser)	1,500	1	1,500	
<b>Total 10</b>			<b>24,000</b>	

The network schematic for the school is as shown in Figure 4.

**11. Paro Lower Secondary School, Paro**

This school is located, above the Paro Dzong overlooking the main town, in western Bhutan. It has both electricity and telephone facilities. Under this project, a LAN will be established and Internet access provided in the school.

Component	Cost/Unit (US\$)	Quantity	Total Cost (US\$)	Additional Information
<b>Wired LAN</b>				
Personal Computer	1,000	15	15,000	35 students per PC
Switch (24-port)	700	1	700	
Gateway	1,500	1	1,500	
Modem (External)	150	2	300	
Printer (Laser)	1,500	1	1,500	
<b>Total 11</b>			<b>19,000</b>	

The network schematic for the school is as shown in Figure 4.

**12. Jigme Losel Lower Secondary School, Thimphu**

This school is located in Chhubachhu under Thimphu Dzongkhag in western Bhutan. It has both electricity and telephone facilities. Under this project, a LAN will be established and Internet access provided in the school.

Component	Cost/Unit (US\$)	Quantity	Total Cost (US\$)	Additional Information
<b>Wired LAN</b>				
Personal Computer	1,000	20	20,000	47 students per PC
Switch (24-port)	700	1	700	

Gateway	1,500	1	1,500	
Modem (External)	150	2	300	
Printer (Laser)	1,500	1	1,500	
<b>Total 12</b>			<b>24,000</b>	

The network schematic for the school is as shown in Figure 4.

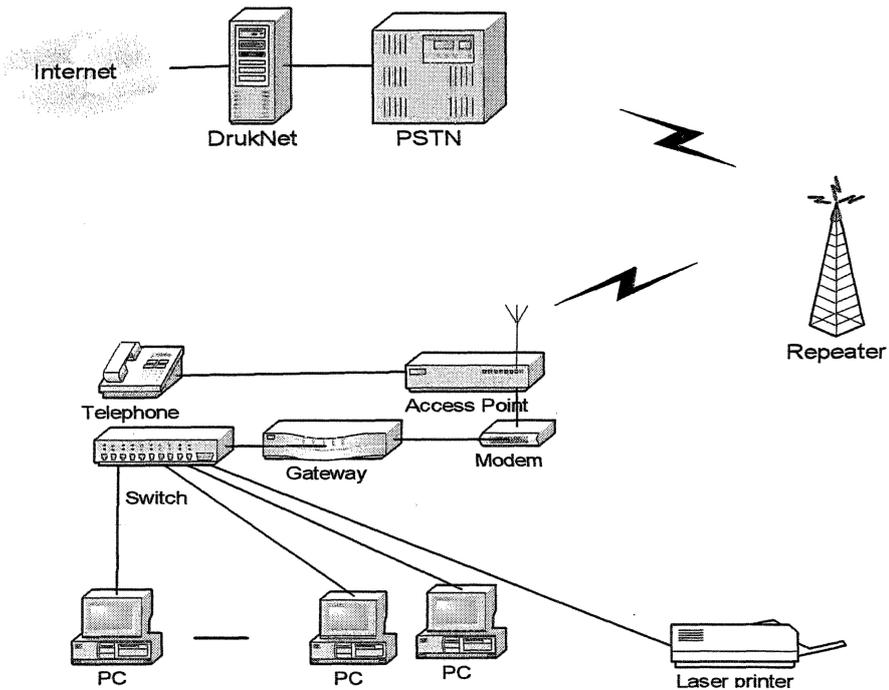
### 13. *Samtengang Middle Secondary School, Wangduephodrang*

This school is located in Samtengang village under Wangduephodrang Dzongkhag in western Bhutan. It has electricity but no telephone facilities. Under this project, a telephony access infrastructure will be built, a wired LAN established and Internet access provided in the school.

Component	Cost/Unit (US\$)	Quantity	Total Cost (US\$)	Additional Information
Access Infrastructure	3,500	1	3,500	Telephony access facility: Estimates based on pilot project implemented by BT. Includes CPE.
<b>Wired LAN</b>				
Personal Computer	1,000	20	20,000	32 students per PC
Switch (24-port)	700	1	700	
Gateway	1,500	1	1,500	
Modem (External)	150	2	300	
Printer (Laser)	1,500	1	1,500	
<b>Total 13</b>			<b>27,500</b>	

The BT-tested IP-based wireless access technology is proposed to be used to link this site. The BT pilot project focused only on providing voice services to rural areas; the reliability of this technology for data transmission and Internet access needs to be further examined. This remote school is chosen to test the scalability, throughput and reliability of the IP-based networking technology for both voice and data transmission. The block schematic for the school is shown in Figure 5.

**Figure 5: Block Schematic – Sites with electricity but no telephony**



**14. Yadi Lower Secondary School, Monggar**

This school is located in Yadi village on the Monggar-Trashigang highway and falls under Monggar Dzongkhag in eastern Bhutan. It has electricity but no telephony facilities. Under this project, a LAN will be established and Internet access provided in the school.

Component	Cost/Unit (US\$)	Quantity	Total Cost (US\$)	Additional Information
<b>Access Infrastructure</b>	3,500	1	3,500	As in 13 above, in the event that BT is not able to provide telephony within the project timeline.
<b>Wired LAN</b>				
Personal Computer	1,000	15	15,000	33 students per PC
Switch (24-port)	700	1	700	
Gateway	1,500	1	1,500	
Modem (External)	150	2	300	
Printer (Laser)	1,500	1	1,500	
<b>Total 14</b>			<b>22,500</b>	

BT has commissioned a 30 channel UHF link in Yadi. Thus, the network schematic for the school will be similar to the one shown in Figure 4.

**15. Gasa Lower Secondary School, Gasa**

This school is located under Gasa Dzongkhag in northern Bhutan. It has telephony facilities operating on solar power supply, as commercial power supply has not reached this very remote Dzongkhag. This site will serve as a test point for reliability of solar

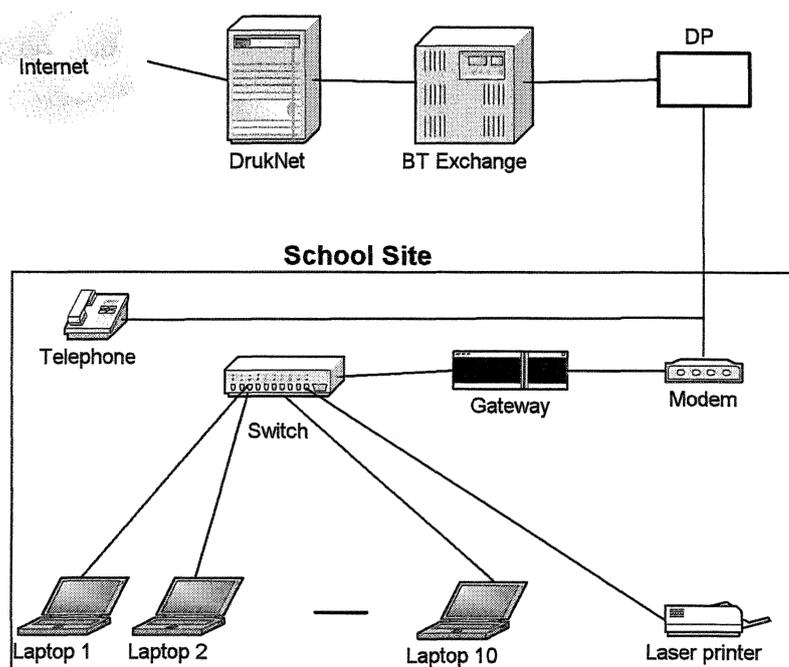
power supplies for running a LAN connecting several computers<sup>9</sup>. Under this project, a LAN will be established and Internet access provided in the school.

Component	Cost/Unit (US\$)	Quantity	Total Cost (US\$)	Additional Information
<b>Wired LAN</b>				
Laptop Computer	2,000	10	20,000	23 students per PC
Switch (24-port)	700	1	700	
Gateway	1,500	1	1,500	
Modem (External)	150	2	300	
Printer (Basic Laser)	1,000	1	1,000	
Power Supply	7,500	1	7,500	Solar panels, charger, batteries, Inverter, etc.
<b>Total 15</b>			<b>31,000</b>	

While BT has successfully tested the reliability of solar power supply systems for voice telephony access infrastructure and CPE, this project goes further to explore such power supply systems for running a LAN in rural Bhutan. Annex 1 gives the solar power supply system configuration to be used.

The network schematic for the school is shown in Figure 6.

**Figure 6: Block Schematic – Site with telephony but no electricity**



## 16. Nobding Lower Secondary School, Wangduephodrang

<sup>9</sup> The Dzongkhag Administration, Gasa, uses solar power supply systems to run PCs, printers and CPE in the Dzongkhag offices.

This school is located in Nobding village under Wangduephodrang Dzongkhag in western Bhutan. It has long-range cordless telephone connection (not reliable) and no electricity. Under this project, a reliable telephony access infrastructure will be built, a LAN established and Internet access provided in the school. However, it is proposed that the existing telephone connection be further tested for reliability of voice and data transmissions.

Component	Cost/Unit (US\$)	Quantity	Total Cost (US\$)	Additional Information
<b>Access Infrastructure</b>	3,500	1	3,500	As in 13 above.
<b>Wired LAN</b>				
Laptop Computer	2,000	10	20,000	42 students per PC
Switch (24-port)	700	1	700	
Gateway	1,500	1	1,500	
Modem (External)	150	2	300	
Printer (Basic Laser)	1,000	1	1,000	
<b>Power Supply</b>	7,500	1	7,500	Solar panels, charger, batteries, Inverter, etc.
<b>Total 16</b>			<b>34,500</b>	

The network schematic for the school is shown in Figure 6.

#### 17. *Buli Lower Secondary School, Trashigang*

This school is located in Buli village under Zhemgang Dzongkhag in central Bhutan. It is a day's walk from the motor road-head in Dakpai. It has no electricity facility. BT has extended telephony services to Buli using corDECT<sup>10</sup>.

Component	Cost/Unit (US\$)	Quantity	Total Cost (US\$)	Additional Information
<b>Access Infrastructure</b>	3,500	1	3,500	As in 13 above.
<b>Wired LAN</b>				
Laptop Computer	2,000	10	20,000	19 students per PC
Switch (24-port)	700	1	700	
Gateway	1,500	1	1,500	
Modem (External)	150	2	300	
Printer (Basic Laser)	1,000	1	1,000	
<b>Power Supply</b>	7,500	1	7,500	Solar panels, charger, batteries, Inverter, etc.
<b>Total 17</b>			<b>34,500</b>	

The network schematic is shown in Figure 5.

#### 18. *Tshatsi Primary School, Trashigang*

This school falls under Trashigang Dzongkhag in eastern Bhutan. It has neither electricity nor telephony facilities. Under this project, a wireless telephony access infrastructure will be built, a LAN established and Internet access provided in the school.

<sup>10</sup> corDECT is a wireless access system developed by Midas Communication Technologies and the Indian Institute of Technology, Madras, in association with Analog Devices Inc. USA.

Component	Cost/Unit (US\$)	Quantity	Total Cost (US\$)	Additional Information
<b>Access Infrastructure</b>	3,500	1	3,500	As in 13 above.
<b>Wired LAN</b>				
Laptop Computer	2,000	10	20,000	27 students per PC
Switch (24-port)	700	1	700	
Gateway	1,500	1	1,500	
Modem (External)	150	2	300	
Printer (Basic Laser)	1,000	1	1,000	
<b>Power Supply</b>	7,500	1	7,500	Solar panels, charger, batteries, Inverter, etc.
<b>Total 18</b>			<b>34,500</b>	

The network schematic for the school is shown in Figure 5.

#### 19. *Damji Community School, Gasa*

This school is located in Goen Damji village under Gasa Dzongkhag in northern Bhutan. It has neither electricity nor telephony facilities. Under this project, a telephony access infrastructure will be built, a LAN established and Internet access provided in the school. BT has initiated procurement of a QTEL system<sup>11</sup> for telephony service provision to the area.

Component	Cost/Unit (US\$)	Quantity	Total Cost (US\$)	Additional Information
<b>Access Infrastructure</b>	3,500	1	3,500	As in 13 above.
<b>Wired LAN</b>				
Laptop Computer	2,000	10	20,000	11 students per PC
Switch (24-port)	700	1	700	
Gateway	1,500	1	1,500	
Modem (External)	150	2	300	
Printer (Basic Laser)	1,000	1	1,000	
<b>Power Supply</b>	7,500	1	7,500	Solar panels, charger, batteries, Inverter, etc.
<b>Total 19</b>			<b>34,500</b>	

The network schematic for the school is shown in Figure 5.

#### 20. *Nimshong Primary School, Trongsa*

This school is located in Nimshong village under Trongsa Dzongkhag in central Bhutan. It has neither electricity nor telephony facilities. Under this project, a telephony access infrastructure will be built, a LAN established and Internet access provided in the school. BT proposes to cover this area using the Zhemgang corDECT by installing an additional Relay Base Station.

<sup>11</sup> QTEL system of Telemobile Inc. USA is a 64 Kbps point-to-point radio link operating in a 100 kHz RF channel. The system allows for simultaneous internet, voice, fax and data access, and are available in VHF (136-300 MHz) and UHF (300-520 MHz) frequency bands.

Component	Cost/Unit (US\$)	Quantity	Total Cost (US\$)	Additional Information
Access Infrastructure	3,500	1	3,500	Telephony access facility: Estimates based on pilot project implemented by BT. Includes CPE.
<b>Wired LAN</b>				
Laptop Computer	2,000	10	20,000	8 students per PC
Switch (24-port)	700	1	700	
Gateway	1,500	1	1,500	
Modem (External)	150	2	300	
Printer (Basic Laser)	1,000	1	1,000	
Power Supply	7,500	1	7,500	Solar panels, charger, batteries, Inverter, etc.
<b>Total 20</b>			<b>34,500</b>	

The network schematic for the school is as shown in Figure 5.

Table 2 gives the project budget summary. It takes into account the common costs associated with the project such as installation, freight and insurance, etc.

**Table 2: Project Budget Summary**

Sl. No.	Categories	US Dollars	Local Currency (In Million Nu.)	Additional Information
A	Capital Equipment			
1	Total 1 + Total 2 + ... + Total 20	532,400	25.023	
2	Miscellaneous	10,000	0.470	Includes cables and accessories, common installation tools, etc.
	<b>Total X (1 + 2)</b>	<b>542,400</b>	<b>25.493</b>	
B	Installation costs	81,360	3.824	15% of Total X
C	Freight and insurance charges	108,480	5.098	20% of Total X
D	Equipment accommodation, furniture, utilities, etc.	54,240	2.549	10% of Total X
E	Training/Support Services	54,240	2.549	10% of Total X
	<b>Total Y (B + C + D + E)</b>	<b>298,320</b>	<b>14.020</b>	
	<b>Total Z</b>	<b>840,720</b>	<b>39.513</b>	Total X + Total Y
F	Contingency	42,036	1.976	5% of Total Z
	<b>Grand Total (Total Z + F)</b>	<b>882,756</b>	<b>41.489</b>	

The funding agency(ies) bears the capital equipment cost X, international freight charges under C, training funds under E, and the contingency amount F. The cost components B, C (local transportation portion), D and E (support services) will be mobilised by the MoIC in close coordination with the MoE and other participating partners. This local costs component is about 25% of the total project budget.

The Ministry of Education is committed to providing equipment accommodation and furniture, power and telephone utilities (where available) and associated administrative and

management cooperation in implementing the project, monitoring and subsequent evaluation. These indirect costs have been reflected in the budget summary as D. Annex 2 gives the details of the contributions and responsibilities of the Ministry of Education in relation to the project.

## 11. Project Timeline

The following table shows the project timeline:

**Table 3: Project Timeline**

<b>Month 1</b>	<b>Month 2</b>	<b>Months 3 &amp; 4</b>	<b>Month 5 – Month 10</b>	<b>Months 11 &amp; 12</b>
ICT Stakeholders' Forum: Special Focus on LDCs	Further Negotiation	Tendering & Procurement	Installation & Commissioning	Monitoring & Evaluation

To keep up with the timeline, the following actions need to be undertaken:

1. Procure all equipment at a time. Procuring in bulk would save time and money.
2. Train 2-3 teachers/instructors in basic computing and web browsing for about 2 weeks, with any of the local ICT firms for a nominal fee. Hands-on experience can be achieved by the MoE's ICT team through active participation in the field installation and commissioning works.
3. Install, commission and hand-over the facilities to the management. MoIC will coordinate with the Ministry of Education and the respective schools for handing-taking over of the established facility.
4. Collaborate with private ICT firms and relevant Government organizations in designing websites for the schools. This process must begin as soon as the project is approved.
5. All schools will have access to voice telephony, the Internet and LAN facilities within 8 months from the date of approval of the project.

## 12. Project Sustainability

Given the commitment of the Royal Government to encouraging affordable access to ICT for all Bhutanese, and in particular the enthusiasm shown by the Ministry of Education, the sustainability of the project is assured. Power supplies (where available), equipment accommodation, furniture and other local requirements would be taken care of by the beneficiaries. Maintenance and servicing requirements would be met through annual budget appropriations by the schools.

Schools can access the Internet via a negotiated monthly flat rate DrukNet dial-up or leased-line connection. Nominal fees must be charged to all users to recover this subscription cost and monthly call charges and rental. These fees charged to users will also support costs for personnel, paper and other consumables, making the project fully sustainable immediately upon commissioning of the project.

Other resources in the local communities can lend assistance, and local businesses may underwrite some of the operational costs.

MoIC will monitor, assess and evaluate impacts and developments in and across these 20 schools, in close collaboration with the MoE. An evaluation report will be submitted to the funding and coordinating agencies and other interested parties latest by the end of the 12<sup>th</sup> month. See Table 3.

### **13. Project Agreement**

The Project Agreement will be negotiated and signed between the funding agency(ies), ITU and MoIC (representing the Royal Government).

### **14. Implementation**

Given the fast changing nature of the ICT sector, the project must be implemented within the shortest duration possible. The proposed implementation timeline is 8 months from the date of project approval. See Table 3.

Implementation can be done by a project team comprised of members from all the stakeholders or by one agency (such as BT or DIT or BCA or MoE or private ICT firms). The limited human resources across the local partner agencies favour pooling of resources from these agencies. Thus, two project teams will be established: one comprised of members from BT and BCA to build the telephony access network infrastructure (where non-existent) and another comprised of members from BCA, DIT, MoE, and private ICT firms for setting up LANs in the schools. While the LAN project team embarks on establishing LANs in those schools with electricity and telephone facilities, the access network infrastructure team will work on establishing phone connections to schools that are not connected. It is proposed that the project will establish wireless LANs in a few sites, with varying geographic and climatic conditions, where commercial power supply exists, to test the reliability of the equipments currently available in the market. A project coordinator from ITU and/or MoIC will oversee the implementation of the project.

At the end of the project, the ownership of the LAN and associated equipment will be transferred to the schools.

While the project is being executed, BT could explore into expanding its subscriber base in the areas surrounding the schools. Infrastructure built to facilitate telephony and Internet access for a school can be used (with less/without additional investment) to meet the demand for voice and/or data services within the locality.

Backbone transmission capacity requirements can be met using BT's existing microwave capacity (where available). However, some sites will need to be connected to BT exchanges using radio hops.

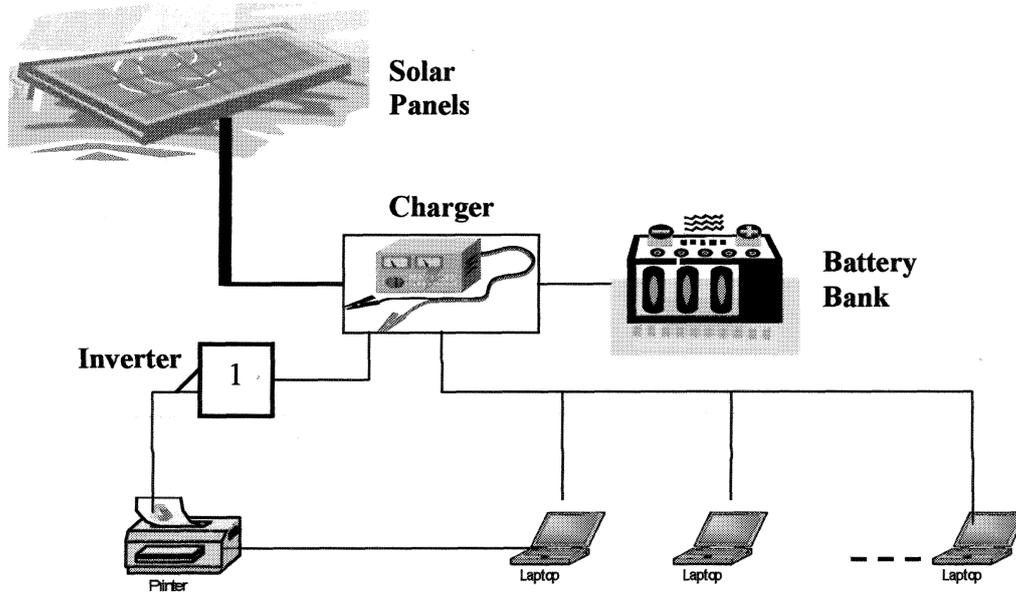
### **15. Monitoring and Evaluation**

MoIC, as the counterpart-coordinating agent, will monitor the project, through installation to commissioning, to ensure smooth and timely implementation. Commitments by partners will be tracked from time to time. A mechanism to monitor the technical performance of networks and determine who's benefiting the most out of the project outcomes will be put in place.

On completion of the installation works, MoIC will monitor project outcomes and evaluate the implications of the project to schools and associated communities. Project evaluation will be done within two months duration. See Table 3. Evaluation will be based on parameters such as patterns and numbers of users, problems with the network (outages, slow access, or other problems), etc. An evaluation report will be compiled and submitted to the funding agency and other interested partners on completion of monitoring and evaluation.

Changes to the networks, if necessary, will be made during the school breaks.

## Annex 1: Solar Power Supply System Configuration and Design



### Design:

**Solar Panel Specifications:** Panel wattage = 70W; Panel volts = 17V; Derating = 95%;  
Maximum usable = 80%; Charging efficiency = 75%.

**Battery Specifications:** Battery volts = 12V; Ampere Hour = 100.

**Laptop Power** = 20W. Therefore, current drawn  $I = P/V = 20/12 = 1.67A$ , for each laptop. For 10 laptops, total current drawn =  $10 \times 1.67A = 16.7 A$ .

Each battery supplies 100Ah for an hour or 1 Ampere for 100 hours. Therefore, total Ampere Hour =  $16.7A \times 12h = 200.4Ah$  per day, assuming that the current is drawn for 12 hours.

Assuming the battery autonomy period is 2 days, the total Ampere Hour autonomy is  $2 \times 200.4Ah = 400.8Ah$ . Therefore, battery bank-size = Ampere Hour of Autonomy / Percent usable =  $400.8 / 0.80 = 501Ah$ , and the number of batteries = Battery bank-size / Battery Ah =  $501 / 100 = 5.01 = 5$  batteries.

Taking into account the solar panel charging efficiency (to put more back into a battery than one can get out of it): Ampere hours to put back into the battery bank after a full 2 days of cloudy weather = Ampere Hour of autonomy / Charging efficiency =  $400.8Ah / 0.75 = 534.4Ah$

Amperes needed during the sunny part of the day, with 6 hours of sun per day = Total recharge Ah / Days of recharge / Hours of sun per day =  $534.4Ah / 3 / 6h = 29.69A$

Now, amperes the load will need during the sunny part of the day to break even the battery drain = Load Ah per day / Hours of sun per day / charging efficiency =  $200.4Ah / 6h / 0.75 = 44.53A$ . Therefore, total current needed during sunny weather = Recharging current during sun + Load current during sun =  $29.69 + 44.53 = 74.22A$ .

Current from each solar panel =  $0.95 \times 70W / 17V = 3.91A$ . Therefore, number of panels needed =  $74.22A / 3.91A = 18.98 = 19$  panels.

## **Annex 2: Ministry of Education's Contributions and Responsibilities**

The Ministry of Education will contribute to and be responsible for:

1. Providing space/accommodation/furniture for Local Area Networking (LAN) equipment and accessories;
2. Facilitating power supply (where mains commercial supply is available) at its own cost;
3. Facilitating telephone access (where connections exist) at its own costs;
4. Providing local equipment transportation;
5. Facilitating and enabling ICT trainings among teachers, students and staff;
6. Maintenance and upkeep of LAN and associated equipment;
7. Progressively building an ICT maintenance and support team;
8. Instilling in teachers and students a sense of responsibility and commitment in efficiently utilizing the resources;
9. Managing and utilizing the funds generated from ICT activity to cover recurrent operation and maintenance costs;
10. Providing security measures, where necessary;
11. Time-sharing ICT facilities with the local community and collaborating with them in ICT initiatives.

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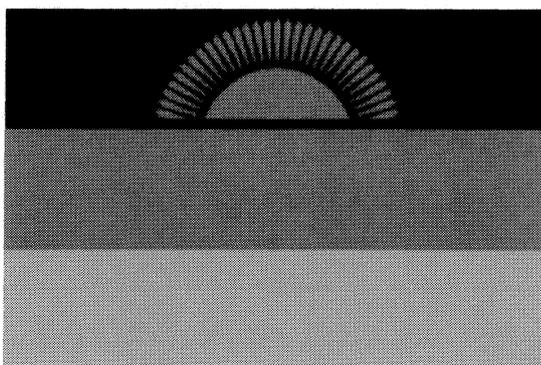
**Telecommunication Development Bureau**



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# PROJECT DOCUMENT

## MALAWI









**PROJECT No. 1**  
(Ref.: ML/01/03)

# Promotion of Multipurpose Community Telecentres in rural Malawi

Duration: 2 years

Project Executing Agency: **MACRA**

**Total Budget: \$552 000**

## I Introduction

The majority of rural communities in Malawi do not have access to any form of information and communication technologies (ICTs). Many rural people must travel long distances in order to access a telephone and there is an absence of ICT applications in their activities, which restricts national inclusion and limits the growth and potential of rural economic activities. The government of Malawi, through the Malawi Communications Regulatory Authority (MACRA), developing its strategy to support public access to ICTs in rural areas. These efforts are taking place within the context of Universal Service goals being supported by the government's Rural Telecommunication Policy and the National ICT Policy that are currently being finalised.

To assist in this process MACRA requested the International Telecommunication Union (ITU) provide technical assistance to undertake a feasibility study to establish a pilot network of public access ICT facilities (called Multipurpose Community Telecentres) in rural areas in Malawi. This included the development of a Multipurpose Community Telecentre licensing and promotion strategy that could be established in the country to provide the appropriate range of services to respond to the local needs of the public and its institutions, such as schools, hospitals, libraries, NGOs etc.

Two ITU experts undertook the study and site visits which produced the initial project proposal between Oct 8-18 '02, in close collaboration with MACRA staff and other Malawian and International agencies, in particular: The Ministry of Information, the Malawi Posts Corporation, Malawi Telecommunication Limited, UNDP and UNIDO-ICS. UNDP has been active in supporting the use of ICTs amongst its national partners in Malawi, and UNIDO-ICS has already proposed to help establish a pilot rural ICT access centre at a Rural Growth Centre (RGC). Subsequent discussion with both agencies during the mission resulted in agreement in principle to co-operate in this jointly supported project proposal to establish a range of 5-7 pilot projects in rural Malawi. As these pilots mature, the information provided will allow MACRA evaluate the strategy to improve universal access in the nation.

The draft project proposal was circulated amongst the co-operating agencies and other participants in the study, and then presented at the ICS-UNIDO regional workshop on 'Introduction of Information and Communication Technologies in Rural Areas', which was hosted by MACRA in Blantyre (Malawi), 16-17 December 2002. The workshop provided an opportunity to discuss the proposal and other rural communications strategies and its recommendations are expected to form a basis for effective strategies for policy makers, regulators, ICT based service providers and other relevant players. The workshop was attended by telecommunication operators, ISPs, sector regulators, UN agencies (UNIDO, UNDP, ITU, UNEP), regional representatives (Zambia, Uganda,

Mozambique), Malawi government officials and other private sector IT companies.

The proposed financial contributions by each of the co-operating partners listed above are indicative, and have not yet been finalised. ITU and UNDP already have funds in hand and UNIDO is approaching World Bank for possible funding. The project partners have also been in touch with Professor Takeshi Utsumi ([utsumi@columbia.edu](mailto:utsumi@columbia.edu)), who is aiming to assist in the establishment of community development networks in Malawi using spread-spectrum ("Wi-Fi") wireless broadband Internet, and is preparing to organize a workshop in Malawi whose outcome will be to form a committee which will prepare a comprehensive document to obtain Japanese ODA funds for the deployment of broadband Internet in Malawi.

## **II The environment for ICTS in MALAWI**

### **1) General**

Malawi is a small, landlocked and highly populated country of about 11 million people surrounding the deepest lake in Africa, bordering Mozambique, Tanzania, and Zambia. Over 80% of the population live in rural areas, and at an average of 126 people per square kilometre, Malawi's population density is amongst the highest in Africa (which averaged only 27 people per sq/km in 2001).

The country is one of the poorest in the world; ranked 163rd out of 174 countries in 2000 on the UNDP Human Development Index, and the average literacy rates was estimated in 1998 to be 58%. Malawi lacks economically exploitable mineral deposits, but has substantial tourism and agricultural resources. With about 18% of the total land being cultivated agriculture accounts for 40% of the GDP and 90% of export revenues. Almost 70% of agricultural produce comes from smallholder farmers on communal land. The main crops are maize (corn), tobacco, tea, sugarcane, groundnuts, cotton, wheat, coffee, rice and pulses. Severe droughts and price drops in Malawi's agricultural export commodities have contributed to economic difficulties and famine in some areas. Moreover, the country's social services have been burdened by government budget cutbacks of 25% following devaluation of the Kwacha and reduced export earnings, as well as hundreds of thousands of refugees from Mozambique.

The main local government administrative structure in Malawi is the District. There are 28 District Assemblies in Malawi, and a District Commissioner heads each District. Another 2 districts are expected to be demarcated.

The electricity supply is sometimes unreliable, even in the major towns, and most businesses dependent on electricity operate generators. Outside these urban areas the distribution of the electricity supply is much more limited.

There are no import duties for fully assembled PCs, only surtax is payable (20%). However if individual computer components, peripherals and communication equipment are imported there is a 30% duty. Combined with shipping costs and the small market size, a PC as a result which would for example cost \$900 in South Africa costs about \$2000 in Malawi.

The current exchange rate is approximately K83 / US dollar.

### **Telecommunication**

Historically, a combination of restrictive telecommunications policies, unsupportive political framework and financial constraints has meant that growth in the telecommunications sector in Malawi has been below the average for Africa (4.1% compound annual increases in teledensity between 1995 and 2001, compared to an 6.9% for Africa as whole. Although the situation has substantially improved recently, with only 59 000 fixed lines and 83 000 mobile subscribers in Sept 2002, at most only about 1.3% of the total population on average has direct access to either a mobile or fixed network.

However the concentration of telecom infrastructure greatly favours urban areas, in particular the political capital Lilongwe, the commercial capital, Blantyre (where 45% of the fixed lines are located), the previous capital – Zomba, and the town of Mzuzu. In Sept 02, the total fixed lines in these 4 cities (with a total population in 2002 estimated at 1.2million) was 51 005 lines, leaving 8130 lines for the remaining 9.56million people, giving a fixed line teledensity of only 0.08% for 89% of the population.

Since 2000 the telecommunications sector has been regulated by the Malawi Communications Regulatory Authority (MACRA), which falls under the Ministry of Information. MACRA has about 10 professional staff including a Director General, a Deputy Director General, and 4 Directors – Telecommunications, Frequency Management & Planning (who is also the Deputy Director General), a general council (legal), and a director of finance. The management answer to the MACRA Board of Directors, which reports to the Minister of Information. Appointed by the President (on advice from the Minister), the board members represent professionals from different sectors.

MACRA is responsible for regulating all forms of communication services including broadcasting and courier services, but not print media, which are unregulated. It has four sources of financing - subvention by treasury, licensing, fines, and disposal of assets from donors. So far all of the funding has been from licensing and donors (Danish government, World Bank and ITU). The World Bank is currently assisting with financing the establishment of a frequency monitoring facility which should begin operations within the next 12 months, and the ITU is assisting in the development of a national FM frequency management plan.

Recently separated from the Post Office (1997), Malawi Telecommunication Limited (MTL) is the sole operator of fixed line telecommunication services, but does not have a legislated monopoly. The government has authorised a second network operator's (SNO) license, but this has been delayed by MTL's privatisation process, which includes selection of strategic partner. Negotiations with Econet as a strategic partner for MTL reached an advanced stage and due diligence was carried out, but due to Econet's problems elsewhere on the continent the company has informed the Privatisation Commission that it no longer wishes to pursue the deal. With the current downturn in the sector worldwide, the prospects of a strategic partner for the second network operator are not encouraging. Also the duration of the SNO license has not yet been decided.

The terminal equipment market is fully liberalised and ISPs are allowed to use VSAT to obtain international bandwidth independently of MTL and to use wireless data links to service customers. Multi-branch companies such as Lever Brothers, Shoprite and Oilcom also use VSAT to service their internal data communications needs, including online connections directly to South Africa. A VSAT license costs \$5000/site initially and \$2500 per year subsequently. About 20 licenses have been issued. The uniform licensing regime may in future be reviewed to take into account the emergence of low-cost Ku-band two-way VSAT-based Internet services aimed at small businesses and residential users.

MTL has made substantial progress in digitising its infrastructure over the last two years and circuit capacity and reliability have improved markedly in the major towns. However long-distance dialup links from rural areas crossing multiple exchanges can have problems, which limit connection speeds to 9.6Kbps or less. The link capacity between Blantyre and Lilongwe is also constraint to network growth, as this is the main link from the rest of the country northward, including Lilongwe, into the upstream International gateways provided by MTL and the independent VSAT-based ISPs. The link is only 16Mbps and is already fully committed.

Other problems observed by users and ISPs:

- Not all the numbers on the WISS and MalawiNet 1800-number E1s work, requiring users to redial repeatedly to get a connection.

- There is congestion between fixed and mobile networks, and on the MTL international gateway used by Telekom Network Malawi.
- Data links provided by MTL not compatible with standard leased line equipment, requiring substantial local reconfiguration.
- Circuit filters don't allow dialup data links at full modem speed.
- MACRA does not regulate leased line tariffs. MTL officially charges \$14K /month for an E1, one ISP protested and managed to obtain a price reduction to \$250/ month.
- International calls and data links to neighbouring countries are too highly priced because traffic must pass via MTL's earth station, as none of its terrestrial infrastructure to the neighbouring countries is operational.

MTL provides some public telephones (about 600), however since last year this service has been augmented by small local businesses, most often called 'telephone bureau'. There are about 1850 "Public Call Office" (PCO) providers licensed by MACRA and an unknown number of informal unlicensed providers. The license requirements are to indicate the physical location of the premises, and is charged at 1000 kwacha/ annum (about US12.5). A full-time enforcement officer is employed to ensure compliance, and a national association of telephone bureau has been established, which helps to monitor the licensing of the informal bureau that emerge. The licensed PCOs receive a 20% discount on tariffs from MTL but are free to set their own tariffs. Many have difficulty in financing the cost of pulse meters for charging calls, necessitating the use of a stopwatch.

MTL's license obligations to improve access in rural areas requires the installation of 6 000 payphones, and is also being fulfilled through the establishment of MTL franchisee telephone bureau, of which there are now 21 with another 11 planned through a project with DANIDA. The MTL franchisees operate out of MTL premises, except for some of the bureau operating in supermarkets. Collecting bills from the rural telephone bureau is costly in fuel and human resources and distribution of pre-paid cards in the rural areas for the public phones are also a problem. MTL plans to move the telephone bureau to a pre-paid platform.

Two operators provide mobile telephone services. The first operator, Telekom Networks Malawi, began operations in 1995 and is a joint venture between Telekom Malaysia and MTL (which own 60% and 40% respectively). The second mobile operator, Celtel began service in late 1999 and is majority owned by Netherlands-based MSI International with local private partners.

Telekom Network Malawi (TNM) had about 43,600 subscribers in Sept 02, and Celtel had 39,300 subscribers. Celtel also operates an ISP and a cybercafe in Blantyre. Both have WAP facilities, but there are no local WAP enabled web sites as yet. A third cellular license has been issued to a

consortium lead by the South African based group, which operates Cell-C. The service is expected to be operational by early next year.

The fixed telephone line installation cost is K1000 (\$12.5), rental is K100/month (\$1.25), and local calls (within the same district) are tariffed at K1.5 per minute 6am-6pm, and K1/minute off-peak. There is no per-second billing for mobile or fixed lines, which are billed in according to the pulse-unit system – for fixed line local calls at peak rate this is a 1 minute increment and 90 seconds for off-peak calls. TNM mobile calls are billed in 30second increments. Call within the same region cost K3.75/minute peak, and K2.5/min off-peak. Interregional or national calls (including from Lilongwe to Blantyre) cost K7.5/minute peak and K5/minute off-peak. A local leased line data circuit costs \$160/64Kbps/month, Lilongwe-Blantyre costs \$314/64Kbps/month, Mzuzu-Blantyre is \$400/64Kbps/month. Mobile-fixed or fixed-to-mobile calls cost K5/min.

The private PCO/telephone bureau typically charge K15-20/3 minute local call, K10-15/min within same region, 15K/min to neighbouring region, K20-30/min to a distant region. Incoming calls and callbacks are supported by some of the telephone bureau, especially in rural areas, and are charged at standard rate for the outgoing call, and at K2.5/minute for the incoming call. PCO calls to mobile lines cost K90/3 minutes and within the SADC region cost K180/3 minutes.

## **Internet**

Until 1997 Malawi only had store-and-forward electronic mail systems, first provided by the University of Malawi in Zomba since 1993 and subsequently by a number of other private companies - BUMAS, Integrated Computers and Epsilon Omega, which began services in 1996.

In 1997 an ISP license was issued to MalawiNet, a joint venture between MTL(38%) US-based Comnet (42%) and local holding company BJ Trust (20%). The service operated as a monopoly until 1998, when a license was also given to the UNDP's SDNP project. In 2000 with the establishment of MACRA, a number of new ISPs were licensed, along with the Leland International Internet Gateway project, which was established at MTL with assistance from USAID.

The gateway operates a national backbone and POPs linking Lilongwe with Mzuzu (64Kbps) and Blantyre (128Kbps), and Blantyre with Zomba (64Kbps). The facility now provides access to 9 ISPs, 3 corporate clients (a bank, USAID and the British Council Library), 2 universities (University of Mzuzu, and University of Malawi which in turn links Bunda College of Agriculture in Lilongwe), Chancellor College in Zomba, the Polytechnic in Blantyre, the College of Medicine in Blantyre and the Schools of Nursing in Lilongwe and Blantyre.

To obtain a license, an ISP must submit a business plan and a license is issued for 5 years,

costing \$1000/year plus 5% of net revenues (after operating costs). A total of 23 ISPs have now been licensed but only 10 are active and most are concentrated in Blantyre. Aside from MalawiNet and SDNP, the other major providers are: Africa-Online, and Globe Internet. The operational smaller providers are Celtel (the mobile GSM provider), Clcom, EpsilonOmega, Licom, NCR and WISS.

The total number of dialup subscribers is estimated to be about 9 000, with SDNP having about 1800, Africa-Online 600, Globe 700, MalawiNet 2100, and the remainder spread amongst the other ISPs. Africa-Online operate 8 permanent wireless links in Lilongwe and about 25 in Blantyre. The total outgoing International bandwidth is about 1.5Mbps (SDNP 512Kbps, Leland gateway 512Kbps, MalawiNet 256Kbps, GlobeMw 256Kbps). It appears that none of the ISPs are using simplex satellite-based DVB downlinks to augment their international inbound capacity (usually the most congested part of their links).

It is generally recognised amongst the ISPs that the dialup market is tough and subscriber growth has not expanded as expected. Serving business customers has been problematic for ISPs who may have to wait months for additional lines to be installed at customer premises, and leased lines are often not offered because network-terminating equipment is unavailable and MTL does not allow the customer to finance equipment purchases. As a result most ISPs use spread spectrum 2.4GHz wireless data links, although these require line of site and higher setup costs for the customer.

Another problem experienced by ISPs is the lack of a direct Internet link to South Africa, which results in slow traffic via the satellite links to Europe, and causes VPNs and banking applications to time-out. South Africa is a more important destination than Europe for much commercial web traffic, as many corporate clients deal directly with South African suppliers and banks. Smaller ISPs have also commented that the license fee of \$1000 + 5% of revenues is a significant burden on their viability in the small Malawian market, however to date the 5% charge has not been levied on ISPs. There have also been comments that the Leland Gateway charges are 'high' and that technical support capacity at the gateway is limited.

Calls to the Internet outside Blantyre cost standard long distance rates, unless the subscriber is in Lilongwe and uses a local Lilongwe ISP, or if they use MalawiNet or WISS, which operate a national 1800-number service charged at K2.5/minute for calls irrespective of distance. This is cheaper than a long distance call, but subscribers inside the local calling area of Blantyre and Lilongwe must still dial the more expensive 1800 number, so many use the other local ISPs at the standard local call tariff of K1.5/minute (about \$1/hr). In addition, long distance calls between Blantyre and Lilongwe cost the same in off-peak periods as 1800 number, so many Lilongwe

subscribers dial long distance to Blantyre, tying up additional MTL circuits on this congested link. Direct dialling to Blantyre from Lilongwe is also encouraged due to the fact that the Leland link between the POPs in Lilongwe and Blantyre is only 128Kbps and is thus often congested.

There are relatively few cyber cafes or other forms of public access Internet facilities in Malawi. The major urban centres have a handful of private cyber cafes and some of the international agencies such as the British Council Library and USAID have facilities in Lilongwe. Celtel and Malawi Posts Corporation also operate cyber cafes in Blantyre and there is variety of cyber cafes at tourist destinations around the lake, such as in Nkhata Bay. Malawi Posts Corporation has established a pilot cyber cafe at its main premises in Blantyre and plans to operate telephone bureau and cyber cafes in many of its other premises (see below).

The amount of local Internet content and applications in Malawi is relatively small, confined mainly to tourism promotion and some brochure web sites for companies. The web site of the Daily Nation is one of the most popular sites (6000 hits a day on average), especially internationally, catering to the diaspora, notably in the US, the UK and South Africa. The University of Mzuzu is developing an e-education capacity and the Ministry of Education is keen to use ICTs at the Teacher Training Centres.

The Reserve Bank of Malawi contracted South Africa's Net1 Investment Holdings to provide a transaction switching and a smart card-based national payment system called Malswitch. The system is now in use and supported by a growing number of outlets, although there are some ongoing teething problems with the speed of the network. Transactions can take place off-line (with a daily dialup reconciliation) and on-line terminals can be used to top-up the cardholder's card reserve.

The country domain .mw is now administered by SDNP on behalf of MACRA. About 900 .mw subdomains are registered but most web sites still use a subdomain of their ISP, of which only two use a .mw address (WISS and SDNP).

ISP charges for dialup access range from about K1800-2500/month (\$22-\$32) for unlimited usage, to email-only services, which cost about K500/month. Some indicative charges not (including surtax) from ISPs include:

- Africa-Online: Corporate unlimited (2 dialup connections, 6 email addresses): \$80/month. Standard unlimited (3 email addresses) \$45/month, 10hrs /month: \$30/month. Email only: \$6/month. 33Kbps wireless link: \$1000 setup and \$250/month. All-day email, surf from 6pm-6am' package for K1000/month (12.5US). Webhosting: \$250/year for 5MB.

- Globe: Unlimited dialup: K2000/month. Leased line – 64Kbps: 600 US\$ /month, 128Kbps: 980 US\$ / month, 256Kbps: 1470 US\$ /month. Web hosting: \$960/year for 4Mb. Domain hosting: K8000/year.
- MalawiNet: Unlimited dialup prepaid for 12 months: K2400/month, 15hrs/month: K1000, 100hrs / 3 months email only: K1249, Off-peak (8pm-5am) 15hrs/month: K499, web hosting: \$60/3months up to 2MB. Leased line: \$1000/month/64Kbps
- WISS: Unlimited dialup: K1800. 64Kbps leased line: \$600/month from Blantyre/Zomba, \$920/month from Lilongwe. Web hosting: Up to 5MB: \$40/month.
- Leland International gateway (for licensed ISPs): \$1500/month

Typical cyber cafe charges are 3K/minute (about \$2/hr). Other charges: Typing: K15/page, printing: K10/page, photocopying K2.5 /page.

## **Broadcasting**

There is provision for public, private and community broadcasters in the broadcast licensing regime. The Malawi Broadcasting Corporation (MBC) is the only national radio broadcaster operating MBC Radio One and Two. MTL provides signal distribution. The stations broadcast for 19 hours each day in English, Chichewa, Tumbuka, Yao, Lomwe, Sena and Tonga on medium wave, short wave and FM. Radio 2 Broadcasts in English and Chichewa on FM stereo.

Television Malawi is a joint partnership between MTL (49%) and the Malawi Development Corporation (51%) and has yet to be licensed. South African based digital satellite operator Multichoice Digital Satellite Television has been operating in Malawi since the late 1990s.

Two private radio stations and eight community stations are operational with another 4 private and 3 community stations with pending licenses. Ministry of Information is promoting the use of community radio with support from UNESCO in Nkotakota, Likoma Island and Mangochi. UNDP is assisting the Ministry with studies on print and broadcast media and on the use of satellite for broadcasting.

The Ministry of Information has promoted the use of radio-listening clubs in rural areas, in particular as a means of distance education for HIV/AIDS awareness issues.

## **ICT Policies**

A Rural Telecommunication Policy (RTP) has been drafted with assistance from the Danish government/DANIDA and awaits final approval by the Ministry of Information, expected before the second quarter of the year. The RTP has a goal of ensuring that within 10 years 80% of the

population will have access to a phone no further than 5 km.

The policy envisions a Rural Telecommunication Development Fund (RTDF) to support expansion into 'unprofitable' areas and makes provision for local telecommunication operator licenses, including rural community owned operators. Although the precise details have yet to be worked out it is expected that this will only take place once the SNO license is issued. USAID is expected to assist MACRA in this process, by inviting the National Telecommunication Co-operatives Association (NTCA) to advise on the establishment of a community operator pilot project. There may be twinning of licenses, where a major urban centre licensee would be required to support a number of rural community licenses. Co-operating partners, telecommunication operators, MACRA and commercial lending programmes with government guarantees will provide the RTDF funds.

The Ministry is also expecting synergies between the RTP and the Rural Electrification Master Plan being supported by JAICA. The Plan makes provision for independent power producers and a levy on power consumers to fund rural electrification and areas will be prioritised according to the RTP. UNDP is also supporting rural electrification, and UNIDO-ICS is in the process of developing a proposal to support the use of solar power in off-grid rural areas.

A National ICT policy is also in process, supported by UNDP, which includes e-government as a major objective. This includes establishing a government WAN, spearheaded by the Ministry of Finance' Department of Information Management, which will link the national structures in Lilongwe initially, and then ultimately the districts, in support of the government decentralisation programme. Content development is also due to take place, to create applications for citizens interacting with government. It is unclear to what extent public consultation on the policy has taken place, as one of the major ISPs had not heard about it.

### **III Related Telecentre Projects**

There are a number of projects already taking place in Malawi that are expected to have a role to play in this project, as outlined below.

#### **1) UNDP**

There is an ICT component in the UN Development Assistance Framework (UNDAF) and UNDP has long been supporting the use of ICTs amongst its partner organisations in Malawi, providing many of them with computers and modems. UNDP is particularly interested in supporting access

to information in rural areas, in particular for small businesses and civic education, for which viewing centres are also being considered. As the lead agency in supporting the government decentralisation process, UNDP is also keen to support the establishment of ICT infrastructure in rural areas, which will encourage other agencies to come in with their projects, which can make use of the infrastructure.

UNDP has also been involved in a larger ICT project to assist the country establish Sustainable Development Network Programme (SDNP) Internet Service Provider at the Malawi Polytechnic. A significant information gap was identified in Malawi on issues related to sustainable development and environmental management. SDNP began in Malawi in parallel and in collaboration with Capacity 21 with the aim of building capacity to integrate sustainability, improved inter-sectoral coordination and the incorporation of environment management issues into the development process.

The broad objective of Malawi SDNP is to assist with the development of Internet and information services in Malawi with emphasis on sustainable development. An agreement between UNDP and the Government was signed in 1996 that combined Capacity 21 projects on Environment Management, Environmental Law and SDNP. Implementation was through National Execution with the National Research Council of Malawi (NRCM) as the Government execution agency. A Coordination Unit, to design and carry out the activities of the programme, was put in place in 1997 and housed at the Malawi Polytechnic, one of the constituent colleges of the University of Malawi. The Coordination Unit is supervised by a national Steering Committee consisted of members representing a wide cross-section of SDNP stakeholder organizations. The initial targets for SDNP in Malawi were as follows:

- To establish an organizational mechanism for networking stakeholders for sustainable development in Malawi;
- To develop and/or enhance communications and connectivity between the users and providers of information related to sustainable development in Malawi;
- Establish capacity to use and apply technologies for computer mediated communications for informed decision making;
- To obtain user and other forms of support, financial and otherwise, to sustain the SDNP;
- To develop information products and services, including a full Internet link and SDNP server that meet the needs and circumstances of stakeholders for sustainable development in Malawi.

There was little progress on the programme between 1996 and 1998 because the ISP sector had

not yet been liberalised. Malawi SDNP was subsequently granted an ISP license in December 1998. In addition to problems of obtaining a license, the programme did not initially receive counterpart support from Government. Despite these teething problems, SDNP has made significant progress. Starting with test services in early 1999, SDNP established full Internet services in August 1999, becoming the second Internet Service Provider in Malawi. SDNP started collecting sufficient revenue to cover its operating costs in the middle of 2000 and has since met most of its targets as set out in the programme document. The hand-over of SDNP as an independent entity is still awaiting UNDP formalities. The SDNP co-ordinator is Dr Paulos Nyirenda who established the first email connection in the country while at Chancellor College in Zomba in the early 90's. He is supported by 4 technicians, 2 accountants and 3 general admin staff.

UNDP worldwide has a least developed countries project to establish Cisco Network Academies, and in Malawi the national Cisco Academy has been established by SDNP, with a regional/local academy at the Lilongwe Technical College. SDNP were also contracted to establish the UN agency WAN in Lilongwe, using 11Mbps spread-spectrum wireless links which provide interconnectivity between the all the uN agencies in Lilongwe, and to the UN VSAT for international connections.

SDNP has been assisting UNDP in assessing options for community access with pilot projects in Nkhata Bay, Mchinji, Dedza, Mangochi, Thyolo and Nsanje. In addition a total of 12 district environmental desk officers have been connected via modems and dialup links, and all the National Initiative for Civic Education (NICE) offices in the districts have been connected. However government cut backs have made it difficult for many to pay the ongoing phone bills.

The Mchinji project is of particular interest to UNDP. On the border with Zambia, it is part of the Zambia/Mozambique/Malawi growth triangle private sector forum project to support access to ICTs for small businesses and artisans. The Lilongwe, Chipata and Tete Chambers of Commerce now support private sector forums. The first demonstration ICT access centre has ben established in the Ministry of Commerce premises in Lilongwe with UNDP support.

UNDP is also keen to support connectivity in the district hospitals to encourage the use of telemedicine, such as providing remote access to the medical expertise at the Medical College in Blantyre.

## 2) UNIDO-ICS

UNIDO-ICS has recently formulated a project to support the implementation of a pilot ICT Access

Centre targeting Rural Growth Centres (RGC) in Malawi. There are currently thirteen RGCs in Malawi set up in the 1980s. The main aim of the RGCs is to help discourage migration to urban areas by providing facilities that stimulate economic activities, as well as social interaction among people around the centres. Most of these centres have schools, clinics, a post office, a community hall and a market in close proximity of each other, as well as access to electricity.

Rural Growth Centres are being targetted in this project because they have a higher level of economic activities than the deep rural areas, and it is expected that these can be further enhanced through the application of ICTs.

The project is a pilot case aimed at installing a fixed wireless telecommunication infrastructure in a selected rural growth centre in Malawi connecting a number of phone access points as well as establishing an ICT centre for SME's, farmers, schools and other public services providers within the growth centre to benefit from ICT services such as internet, email, shared applications, faxing and training. To achieve this, the following methodology is envisaged:

- Conduct a survey to identify specific needs that will influence the choice of technologies to be used.
- Identify market opportunities by analysing the size of the target market, evaluating demand and affordability, evaluating user needs and profiles for services, and appraising the social and economic impact of the project.
- Business planning
- Network and services-offering design
- Network deployment, pilot service set up and implementation
- Training (capacity building) and community sensitisation on the benefits of applying ICTs in their social and economic activities.
- Marketing support
- Review of effectiveness of technical solutions and technology transfer

The proposed project partners and project management are as follows:

UNIDO-ICS -*Sponsorship and Technical backing*

Government of Malawi/Ministry of Information/MACRA - *Regulatory framework, trade promotion and Rural Growth Centres support*

Malawi Telecommunication Ltd - *Network support and maintenance*

Japanese Government - *grant*

MIRTDC, SMEs - *Franchises and ICT centre operation*

### 3) Post Office Telecentres

The Malawi Posts Corporation (MPC) currently operates 175 Post Office branches. Rural Post Offices provide stamps, money orders, Malawi Savings Bank transactions and mailboxes. Most also have two coin operated payphones and are close to MTL infrastructure (masts/antennae, switching).

Following its recent separation from MTL, MPC is still in the process of rationalising its operations and plans to restructure the 101 branches that have been found to be loss making. These are generally the branches outside the major urban areas and will be offered to local communities (rural Post Offices are often meeting places) and entrepreneurs as franchises, with MPC initially retaining ownership of the premises. This will take place once retrenchment packages can be arranged for the estimated 650 staff (of 1550), which have been found to be unnecessary.

In order to improve the viability of MPC as a whole, a variety of options are being examined to diversify its revenue base. Universal access objectives limit its ability to earn from the sale of stamps - the price for a local stamp has been frozen at K10 and costs are high - stamps and postal orders are imported because Malawi does not have the facilities to print forgery-secure quality. Operating costs are also high because the Post Office is required to carry out most of the activities of the Malawi Savings Bank. Productivity is also poor, due to low civil service wages and the absorption of excessive staff following the separation of Posts from Telecoms, when employees were given choice of positions – most elected to go with Posts.

A pilot franchise is operational at one of the branches of the Shoprite supermarket chain, in which the Post Office receives 20% of the revenues. Among the other options being proposed are to operate as an agency for the telecom operators to sell pre-paid fixed and mobile cards and to collect payments from subscribers, adopting the use of Malswitch smart cards in the Malawi Savings Bank, and to run cybercafes and public call centres. Epost is also being examined (email sent to a Box number is printed at the local post office and placed in the PO Box). The first cybercafe has been running as a pilot since mid September at the central Post Office in Blantyre with 5 PCs, a printer and a photocopier. An incoming fax service will also be added to meet customer demand. The Post Office has an IT officer and is also receiving technical support and connectivity from SDNP.

With the apparent immediate success of the pilot, the Post Office plans to open a further 10 cybercafes in the larger, profitable Post Offices, including in Mchinji, Nkata Bay, Mangoche, Salima, Nkhotakota and Limbe. These will probably start with 2-3 Pcs at each site, and are expected to be provided by the World Bank, which has already donated 29 Pcs for internal operations (some of which were used in the pilot cybercafe.) Three computer-literate secretaries made redundant by the restructuring process will be used to train staff at the Post Office branches.

#### 4) School Telecentres

Schoolnet Malawi was established this year as a registered NGO to encourage and assist schools wishing to obtain computers and Internet connectivity. Affiliated to Schoolnet Africa, Schoolnet Malawi has a Board of Trustees, chaired by Ms Bessie Nyirenda of ISP CLCOM, and an Advisory Committee comprising professionals and stakeholders with an interest in school connectivity. There are plans for two permanent staff comprising an executive director and a technician. Financing for these positions has yet to be obtained, however once the pilot project is underway it is expected that additional funding will be forthcoming. There are approximately 1600 secondary schools in Malawi.

The pilot project is being supported by the British Council and the Beit Trust which is providing a container of 200 recycled Pcs, expected to arrive from the UK in November. Six secondary schools (3 in Lilongwe and 3 in Blantyre) have been identified and 30 Pcs will be deployed in each location. University students will assist with the installation and the schools receiving the equipment will meet the cost of networking the PCs and Internet connection. The British Council will provide training of teachers. Once the success of the pilot has been assured, SchoolNet Malawi plans to scale up activities and carry out more fund raising to help the remaining secondary schools obtain equipment and connectivity.

Parental contributions and Ministry of Education budget are ultimately expected to help meet on-going costs, but other options to ensure the sustainability of these school-based facilities are also being explored. SchoolNet Africa would be willing to participate in the pilot project to test possibilities for providing community access as a means of offsetting the setup and operating costs. Two possible sites were identified for this – Robert Brake Secondary School in Dowa district, and Dedza Secondary School, Dedza District.

## **IV The proposed Malawi Rural Telecentre Project**

### **Project Strategy**

The key issues for the project are ensuring scalability and sustainability once the international funding is at an end, and that the existing initiatives to establish cybercafes, community based schoolnets and public call centres are not destabilised, but rather enhanced by the project. With the limited government resources available, an innovative approach will be needed to encourage private sector participation to reduce operational and startup costs as much as possible, while maximising the use of the ICT resources that will be provided. At the same time, it will be

necessary to take into account the limited skills to establish and maintain ICT facilities in the rural areas, and to ensure that there is local ownership of the project, so that the Telecentres are not seen as a national 'hand-out' to the local community.

To this end, the project proposes that a new model of public access provision is piloted, involving the three separate activities – 1) the provision of privately operated Internet infrastructure in the chosen locations combined with centralised telecentre support, 2) the establishment of a 'Multipurpose Community Telecentre operators license', as envisioned in the RTP, along with 7 local Telecentre pilots, and 3) the creation of a system of ICT access 'credits' which can be purchased by entities wishing to sponsor the provision of services to qualifying members who would not otherwise be able to afford access – students, state employees etc. This will require:

- Establishing a large pilot involving 7 different locations in order to achieve a minimal critical mass to test the model and make the initial service requirement sufficiently interesting to hold the attention of the service providers.
- Identifying potential local prospects for the 'Multipurpose Community Telecentre (MTC) operators license' in the chosen locations and then helping these prepare their plans.
- Holding a competitive public tender for the provision of the ICT infrastructure required, technical support, credit application and telecentre management system for the 7 chosen locations.

This strategy builds on the Brazilian Universal Service Fund model which uses a competitive bid process to identify the projects most worthy of funding, and the Chilean model in which local operator licenses were given to bidders requiring the lowest subsidy. It also takes into account the telecentre experience to-date, which indicates competitive private sector operation of services is, tends to be more efficient, and that there are many agencies and individuals located outside the community (including the diaspora internationally) which may wish to sponsor access to members of the community. Finally, MTC operators may be the 'seeds' for the future local network operators envisioned in the RTP, so provision for their evolution to becoming local operators needs to be accommodated in the strategy. This should allow the MTCs to provide VOIP services with an appropriate interconnect to the PSTN.

In order to qualify for a MTC license, MACRA would in theory evaluate the bids in a 'beauty contest', but as this is a pilot, in which the project would assist pre-identified applicants, the 'winners' would be known ahead of time. For the purposes of the pilot, only one MTC per location would be supported, but in the future, depending on the local conditions there could be more than one successful candidate in some of the locations (new applicants would need to show that an

additional facility in the locality is necessary).

The pilots, and in future, those qualifying for a MTC license, will be able to avail themselves of centralised installation and maintenance/management support as described above and in more detail below, and a soft loan to cover the initial cost of the equipment (to simplify and reduce costs for the pilot, the equipment will be purchased by the project and provided directly to the MTCs). Ultimately, MTC license fees would be based on license application processing costs to minimise startup costs for the MTCs. In return, MTC operators would holders be required to undertake the following commitments:

- Provide clean, comfortable and secure premises.
- Be open for at least 10 hours per day and provide an external 24hr access payphone if not already available in the locality.
- Provide a minimum set of defined ICT services (see below).
- Adopt the use of 'MTO credits' for payment for services used.

The system of credits would be able to use of the Malswitch smart card or a simple web-based application, and would work in the following way: An organisation wishing to sponsor access for an individual or organisation in the community, such as an NGO, a development agency, a school or other state agency, or even a family member, friend or business associate, would be able to purchase MTC credits and pass them on to the recipient who would then be able to use them at the designated MTC. Credits could also be restricted for use to a specified list of applications or even to purchase non-MTC related products or services. For large purchases of credits, MTC operators and credit purchasers could be matched using an auction-type web application.

The details of the credits application system would be built by the winner of the ICT infrastructure bid, as part of the broader provision of ICT infrastructure to the project/MTCs. Bids will be evaluated by the project executors on the basis of the proposed cost of the services and the strength of the technical design. Aside from proposing the overall infrastructure design and cost of building the credits application, the competitive bid will entail proposing and pricing:

- Establishment of an Internet POP close enough to each of the designated locations to allow for local call dialup and low-cost wireless access at proposed tariffs for specified amounts of national and international bandwidth, for at least 2 years. In addition, proposals for email box services, web site hosting and VOIP interconnection with the PSTN would be required.
- Provision/installation of the Telecentre equipment and training for the 7 MTCs at a specified price per location.

- Provision of an MTC support desk for 2 years to provide technical support as well as a centralised accounting facility and roaming user management system for the MTCs (this would be likely be part of the credits management system and would also probably include a local MTC cybercafe management application to interface with the central server).

The winning bid would be the one, which offers the lowest overall price for the most effective design for the above services. The highest cost and most indeterminate income for the bidder would be the provision of the local Internet POP, which may discourage bidders. To address this, the bids would be required specify the minimum income necessary for each POP to justify its installation (in terms of numbers of dialup and/or leased line accounts at the specified tariff). As part of the contract with the winning bidder, the project would agree to pay any shortfalls on this amount for the first year. This would also encourage project partners to assist local groups to obtain connections to the POP in order to reduce the direct contributions to this amount.

Due to the range of services required, the winner of the competitive bid will likely be a national consortium comprising an ISP, an equipment provider and an applications developer, perhaps even including international partners such as DireqLearn, which specialises in low-cost ICT systems for schools and cybercafes, or SimbaNet which specialises in rural and public access Internet infrastructure provision equipment and applications.

Because some of the locations are unlikely to have fixed line telecom links that are able to support data (see below), the new generation of low-cost VSAT services (costing only \$3K in equipment and \$200-\$400/month for bandwidth) is likely to be a preferred option at these sites. However to make this a cost effective option for rural MCTs, the current VSAT licensing fee of \$5000 per terminal will likely need downward adjustment by MACRA.

Attention within the project strategy will also be given to gender issues and special efforts will be made to include women in the project and to train women staff for the telecentres. Telecentre projects have generally made explicit efforts to encourage equal representation of women and minority groups in the Telecentre management and staffing as surveys of some of these projects have shown that female Telecentre staff increase the attendance by female customers.

#### 1) Identification of local MTCs and criteria for selection

The prospective local MCT operators in the pilot will be the key component of the project. These will include a wide range of organisations and locations to maximise learning and to ensure a wide spread of options for scaling up successful pilots.

The initial assessment indicates that pilots will be situated at the following locations and partners, however finalisation will depend on more detailed groundwork at each of the potential locations:

- The Phalula Regional Growth Centre with a community co-operative MTC initiated by the Balaka District Assembly. Phalula is located on the main tar road between Lilongwe and Blantyre, about 1 hour from Lilongwe.
- The Jali Regional Growth Centre, Zomba District, with MTC hosted by a private PCO/telephone bureau. Jali is a small rural town, located about 2hours drive from Blantyre, 30 minutes from Zomba with the last 10kms being gravel road.
- The Post Office in Salima Town. (Nkhata Bay or Karonga district trading centres are backup locations if Salima proves unsuitable, see Post Office project above).
- The Mchinji Private Sector Forum chapter. Mchinji is a district centre and border town with Zambia (see UNDP project above).
- The prospective community radio station in Nkhotakota, (Mangoche is a backup location, see Ministry of Information UNESCO project).
- The secondary school in Dowa - Robert Brake SS, (Dedza Boys SS in Dedza is a backup location see SchoolNet Malawi project above).
- The office of the National Association of Small Holder Farmers of Malawi (NASFAM) in Nsanje district trading centres (Ndawambe or Thyolo are backup locations).

The proposal to house a Telecentre at a community radio project perhaps needs further elaboration. There is increasing awareness of the strong synergies between community radio stations and telecentres, which is resulting these activities being combined in the community. Portable, low cost FM transmitting stations and digital radio systems that transmit via satellite and/or terrestrial cellular networks are being implemented in many parts of the globe. Internet streaming audio software technology allows a global audience to listen to news from various countries and wind-up and solar portable radios have been developed that free radio from the need for expensive power sources in remote and rural situations (see Freeplay Energy, formerly Baygen Power, at [www.freeplay.net](http://www.freeplay.net)).

In designing a sustainable Telecentre model, it may be useful to look to such technologies. For example, in establishing a Commonwealth of Learning-supported Telecentre in northern Uganda, the first step was to set up an FM radio station. This was seen as an invaluable means of giving a sense of identity and focus to the community, preserving the local culture and language, providing emergency medical services, and delivering formal and non-formal education and agricultural extension programmes for farmers and agro-food processors. It was also seen as a way of generating revenue, for example, by broadcasting community-based announcements and market

and commodity prices. It is hoped that the income stream from, and interest generated by, these services will lead on to computing and other services.

## 2) National Partners & Management Structure

MACRA is the national executing agency for the project with overall responsibility for its implementation as described here, on behalf of the Ministry of Information, and for reporting progress to the international partners.

To aid in this process a National Project Committee would be constituted, chaired by MACRA and comprising the other national and international partners.

MTL, where feasible, will prioritise network upgrades at the locations of the pilot projects to ensure support for data access. Some of the prospective locations are on low-bandwidth radio links, which currently do not support data access or only provide for very slow connections (Balaka, Jali, Nkhata Bay, Karonga and Mchinji).

The winner of the competitive tender for the ICT infrastructure will also in effect be one of the local partners.

Once the project has started, the Ministry of Education and Health will be approached to assist in awareness raising and in the development of applications in distance education and telemedicine for students and staff. The Ministry of Agriculture and Ministry of Local Government are also expected to have an interest.

## 3) International Partners

As indicated above, the primary international partners are ITU, UNDP and UNIDO-ICS. Aside from providing financial support they will also provide ongoing technical expertise and advice in the implementation stage of the project, mobilise other international partners, support networking with other pilot projects to improve the knowledge base, and assist with evaluations. UNDP will also assist with the importation of equipment duty free.

Once the project is finalised, other UN agencies, bilateral agencies and NGOs that have expressed an interest in this area, in particular, UNESCO, FAO, the World Bank, African Development Bank, DANIDA, British Council, Commonwealth of Learning (COL), GTZ and World Vision will be informed of the project and encouraged to develop strategies to make use of the centres, support the development of appropriate content for rural applications and develop strategies for scaling up

the successful pilots on a nationwide basis.

#### 4) Project Implementation

##### 4.1) MTC Site and Operator Selection

Consultation with the project partners will first take place to finalise funding. Following this each of the proposed MTC sites will be visited by the project staff to produce a filled in template that would be used to finalise agreements with the MTC hosts, gather information for the ICT infrastructure bidders and select the actual location / premises of the MTC. Below is a rough example for one of the sites visited.

*Jali Rural Growth Point, Zomba district*

*Jali is a small rural town, located about 2hours drive from Blantyre, 30 minutes from Zomba with the last 10kms being gravel road. Its features are as follows:*

*Population: About 30,000*

*Telecoms: MTL: 33 subscribers on a NEC DRMS radio network capacity 60 lines, backhaul to Zomba (xKbps) plus separate MTL Office with 1 linesman.*

*Data capacity: unreliable connections to Blantyre at 4.8Kbps*

*Mobile: Celtel*

*Electricity grid: Yes*

*Post Office: Full Office with two payphones outside.*

*Private Telephone Bureau*

*Market: Yes;*

*Community Hall: Yes*

*Clinics: 3*

*High schools: 2*

*NGOs: World Vision project office*

*District assembly: In Zomba*

*Other businesses and organisations:*

Following this, project staff will work with the MTC hosts to develop the full 'license application'.

After the final approval of the MTC operators, any necessary premises upgrading would commence, using the resources of the project and the MTC operators.

#### 4.2) ICT Infrastructure Provision

Following study of the sites and MTC operators above, project staff will draft a competitive tender document for the ICT infrastructure, which will also be based on the further details on MTC equipment, premises and service requirements provided in the Annex. This will then be circulated widely and the bids evaluated by MACRA in consultation with the project partners.

This part of the project is where most of the funds will be spent (on equipment, applications development, training and connectivity subsidy to the bidder as described above). Assuming basic premises are provided, the costs to equip an MCT are estimated at about \$20 000 - \$30 000 per site, depending on the upgrading of premises and transport required. Applications development, installation and training is not expected to exceed \$150 000 for up to 7 sites. The communications subsidy to top up the POP service provider's income for the first year is unlikely to exceed \$20 000 per site.

#### 4.3) Project Staffing and Consultancy Requirements

In view of the substantial size of the project and the extent of the preparatory work that will be also be used for the future scaling up the MCT programme, a full-time project staff person will be required for the first year to manage the project, carry out site visits, work with prospective MCT operators in developing their applications, manage the tender process and liaise with the project partners. This will also need to be augmented by some consultancies to assist in the drafting of the public tender and in evaluating the success of the pilots. (10-20 days estimate). During year two staffing will be curtailed to a one third time position.

Consultancies will also assist with identifying the central activities that the project management could consider in order to improve the general viability of the Telecentre project. In particular to:

Develop generic brochure, marketing materials and branding to be made available to each Telecentre for localisation and dissemination.

Develop channels to regularly inform the government structures and

development agencies where new Telecentres have become available.

Develop proposals for joint content development projects with national and provincial organisations and the international community to pilot new information dissemination programmes and digitisation of national resources. This would include developing contacts with National Archives, Agricultural Extension agencies, University Libraries, Trade Points and Chambers of Commerce etc.

Identify appropriate systems for establishing local online exchanges between farmers and other local businesses wishing to buy and sell products and inputs.

Define and develop the operating documentation and the training and course materials Telecentre operators.

Develop the evaluation criteria and on-going monitoring procedures for measuring the success of the Telecentres. This would not only be to measure the financial success, but also of the poverty alleviation effects of the scheme and its effectiveness in reaching priority groups, such as women, youth and the disabled.

#### 4.4) Implementation Timeline

The project is expected to take 18-months to 2 years to complete, with the following major milestones:

Contract signing with the project partners – Week 1

Site location and prospective Telecentre operator assessment - Weeks 1-2

Meetings held with local community and prospective Telecentre managers to assist in development of MTC proposals - Weeks 2- 4

Negotiation with MTL for areas where data connections are not supported by the infrastructure - Week 4

Revise overall project document and work plans to take into account the results of the above activities – Week 5

Finalisation and publication of competitive tender for ICT infrastructure - Week 6

Bids for ICT infrastructure evaluated and winner announced – Week 10

Premises upgrading where necessary - Week 6-10

ICT infrastructure deployment and installation - Week 11-16

Central training workshop for Telecent staff - Week 17

Followup on site assessment and training of Telecentre staff - Week 19

Opening of Telecentre for business - Week 20

First round evaluation of progress and identification of problems - Week 25

2<sup>nd</sup> Round evaluation combined with promotion of new content / applications -  
Week 36

3<sup>rd</sup> Round final evaluation and monitoring – Week 70

Preparation of Final report – Weeks 71-75

#### 4.5) Project Budget

The indicative budget for the project is as follows:

Project management staff - \$2000 / month for 16 months -	\$ 32 000
Premises upgrading for 7 sites – average \$3000/site -	\$ 21 000
ICT Infrastructure for 7 MTCs - \$25 000/site -	\$175 000
Consultancies – 20 days @ \$400/day -	\$ 8 000
Applications development, installation, marketing and training	\$150 000
POP income subsidy for first year – 7 sites @\$20 000/yr -	\$140 000
Contingency @ 5% of budget -	\$ 26 000
<b>TOTAL BUDGET:</b>	<b>\$552 000</b>

## V PROJECT CONTACTS

The Director General  
MACRA  
CSC Building  
Angoni/Zalewa Road  
P/Bag 261  
Blantyre  
Malawi

Tel: +265 1 623 611  
Fax: +265 1 623 890  
E-mail: [dg-macra@malawi.net](mailto:dg-macra@malawi.net)