Nepal Wireless Networking Project

Final Report of

APT ICT J3 Project in Nepal

Submitted by:

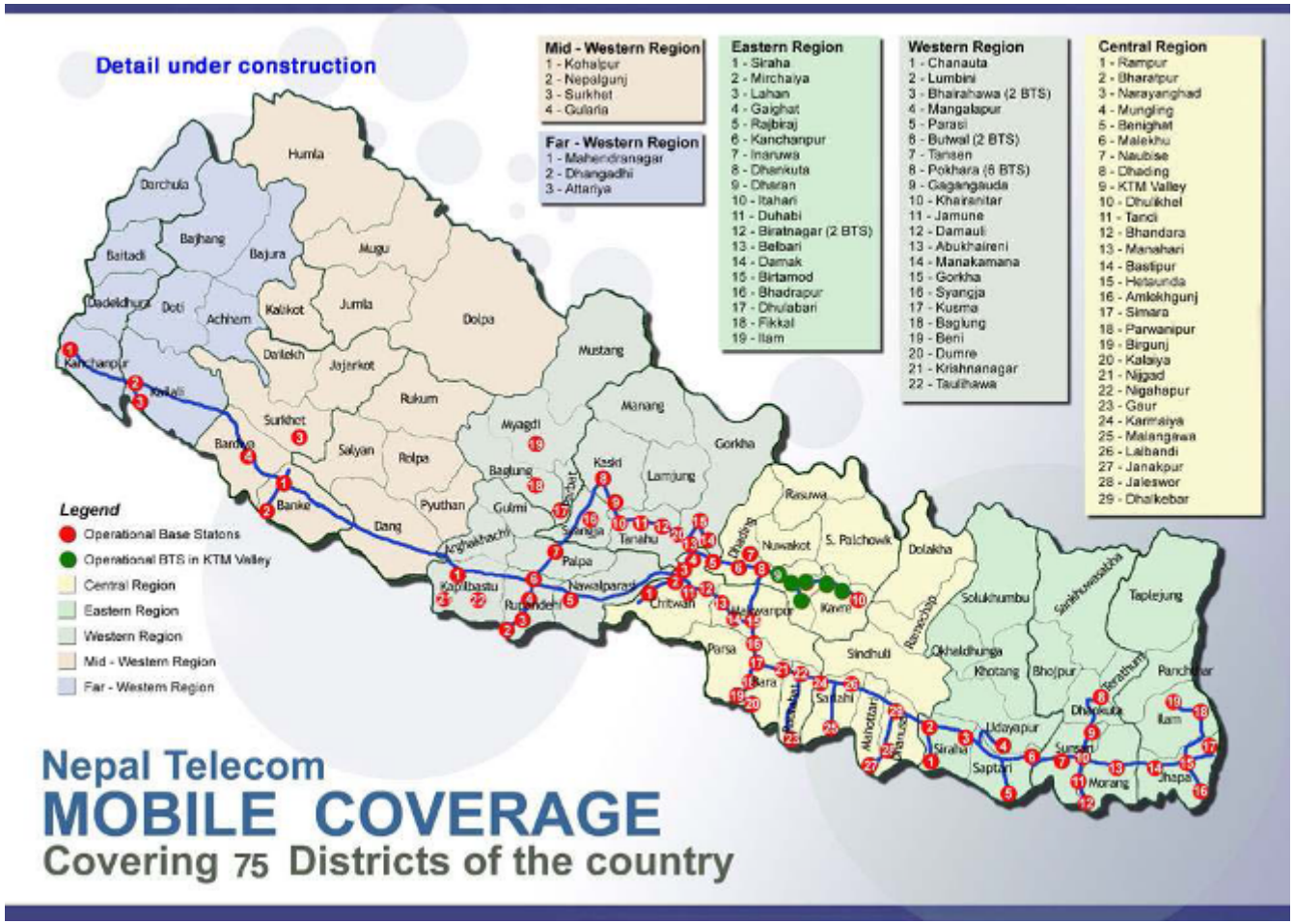
E- Networking Research and Development, Nepal

http://www.enrd.org

Project Supported By:

Asia Pacific Telecommunity

2009

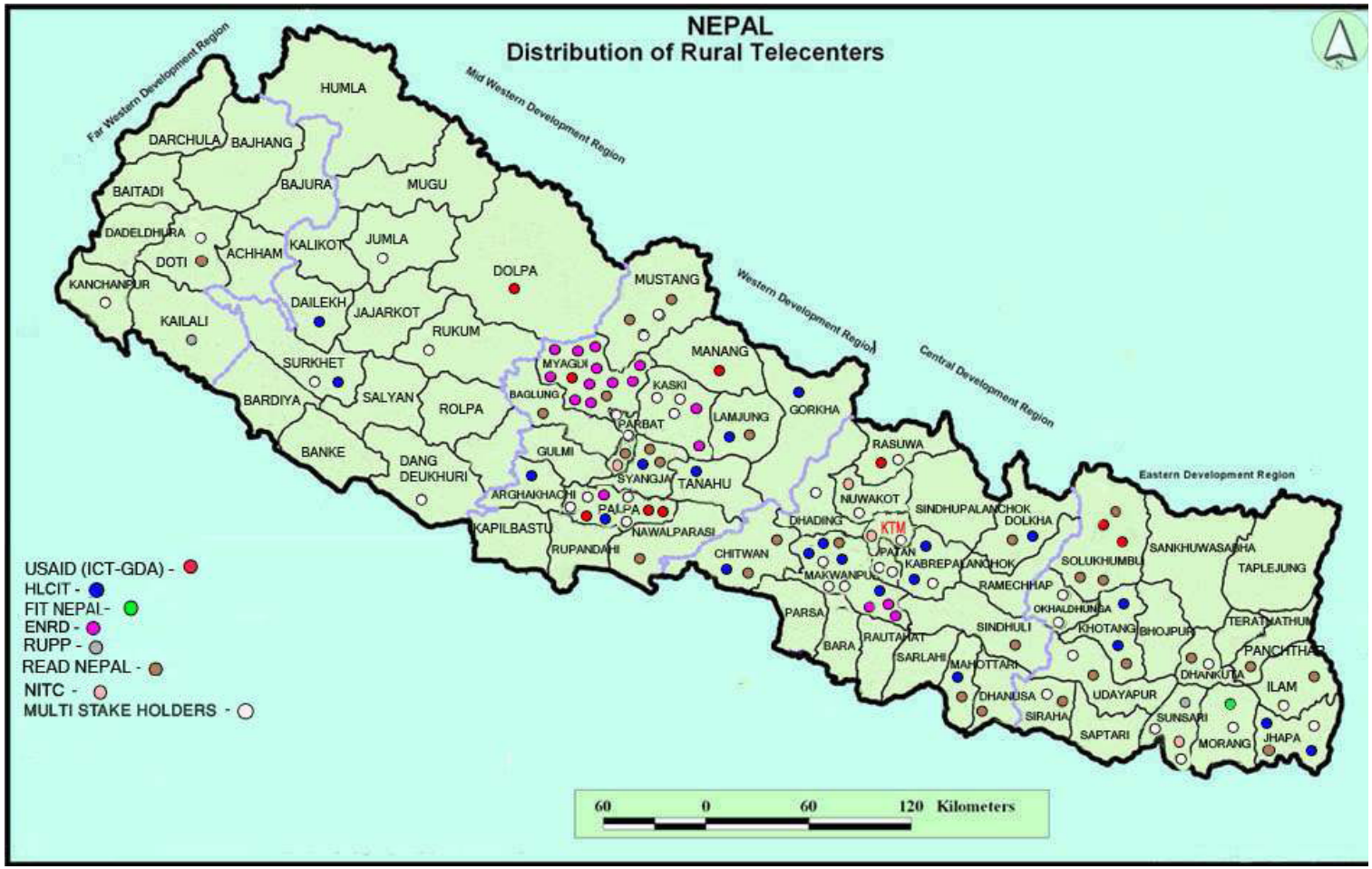


Nepal Telecom

MOBILE COVERAGE

Covering 75 Districts of the country


Coverage
Plan Coverage
N
MAHAKALI
SETI
KARNALI
BHERI
RAPTI
DHAULAGIRI
GANDAKI
LUMBINI
BAGMATI
NARAYANI
JANAKPUR
SAGARMATHA
KOSHI
MECHI


NEPAL
Distribution of Rural Telecenters
Far Western Development Region
Mid Western Development Region
Western Development Region
Central Development Region
Eastern Development Region
HUMLA
DARCHULA
BAJHANG
BAITADI
BAJURA
MUGU
DADELDHURA
DOTI
ACHHAM
KALIKOT
JUMLA
KANCHANPUR
DOLPA
MUSTANG
DAILEKH
JAJARKOT
KAILALI
RUKUM
MANANG
SURKHET
MYAGDI
KASKI
BAGLUNG
BARDIYA
SALYAN
ROLPA
PARBAT
LAMJUNG
GORKHA
RASUWA
BANKE
GULMI
DANG DEUKHURI
SYANGJA
TANAHU
NUWAKOT
ARGHAKHACHI
PALPA
SINDHUPALANCHOK
DOLKHA
KAPILBASTU
NAWALPARASI
DHADING
KTM
RUPANDAHI
CHITWAN
LALITPUR
KABREPALANCHOK
SANKHUWASABHA
TAPLEJUNG
MAKWANPUR
SOLUKHUMBU
RAMECHHAP
PARSA
OKHALDHUNGA
SINDHULI
KHOTANG
BHOJPUR
TERATHUM
BARA
RAUTAHAT
SARLAHI
PANCHTHAR
MAHOTTARI
DHANKUTA
ILAM
DHANUSA
UDAYAPUR
SIRAHA
SUNSARI
SAPTARI
MORANG
JHAPA
USAID (ICT-GDA) -
HLCIT -
FIT NEPAL -
ENRD -
RUPP -
READ NEPAL -
NITC -
MULTI STAKE HOLDERS -
60 0 60 120 Kilometers

- The first long range link testing (34 KM) was done in 2002
- from Mohare to Pokhara putting a dish on the ground

Beginning of Nepal Wireless in 2002 with dish antenna and Wi-fi radio on the tree.

Team members welcomed by the villagers with garlands and cup of local wine

Office of Mustang District Development Committee

Mr. Yasuhiko Kawasumi
Mr. Naomi Fuke
Mr. Izumi Aizu
Photos of the Japanese Experts, who visited the project sites and gave their inputs

Assembling Grid Antenna at Mohare Relay

Mr. Kawasumi and Mr. Fuke at the office of Kaski Association of the Blinds

Primary Health Center Lete, Mustang

Dr. Saroj Dhital looking at the ultrasound image transmitted live from Mustang

Haatbazar | ○○○○○○○ - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://192.168.254.2/~haatbazaar/

Most Visited Getting Started Latest Headlines Index of /downloads

Welcome To Nepal Wireless Project | Loading...

Haat bazar
हाटबजार
Nepalwireless.net

Intranet Home

खोज्नहोस

Control Center
(स्थानिय प्रयोगकर्ता)

Admin Login
(मूल प्रयोगकर्ता)

Gandaki College of Engineering and Science

Search | All Categories | from | All Places | Search

Search for
Data 1 - 9 of 14 [Total 2 Pages]

Kukhura

ID:516
Rs.500
Status:Available
Location:Bega

खरायो

ID:515
Rs.350
Status:Available
Location:Tikot
Seller:टेक बहादुर पुन,हिस्तान

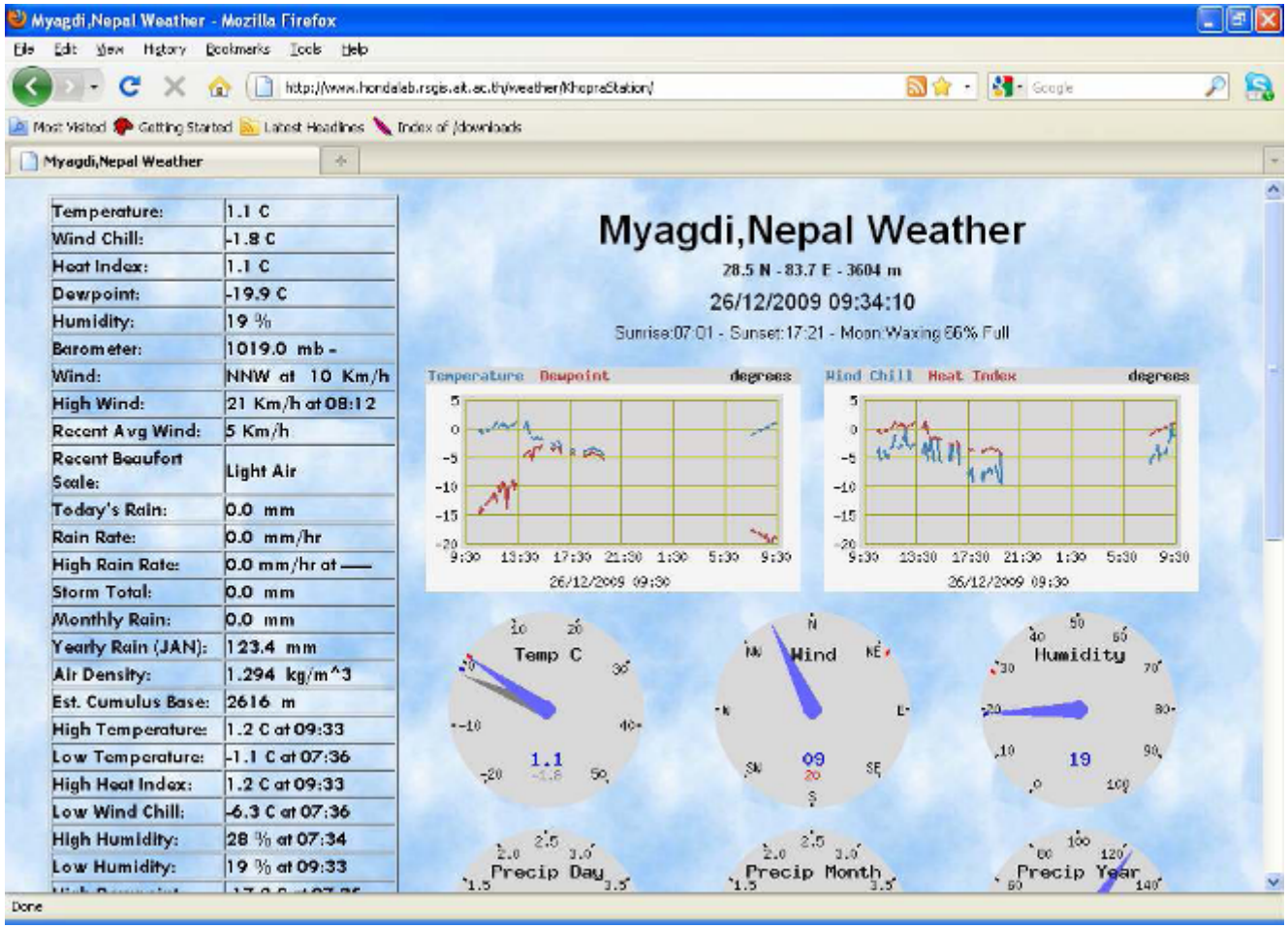
गोरु

ID:514
Rs.7600
Status:Requested
Location:Tikot
Seller:ठकराज पुन, हिस्तान
मथेनीटोल-३ सम्पर्क

Transferring data from 192.168.254.2...


Coverage
Plan Coverage
N
MAHAKALI
SETI
KARNALI
BHERI
RAPTI
DHAULAGIRI
GANDAKI
LUMBINI
BAGMATI
NARAYANI
JANAKPUR
SAGARMATHA
KOSHI
MECHI

Dr. Kiyoshi Honda and his team with the Weather Station at Khopra



Temperature:	1.1 C
Wind Chill:	-1.8 C
Heat Index:	1.1 C
Dewpoint:	-19.9 C
Humidity:	19 %
Barometer:	1019.0 mb -
Wind:	NNW at 10 Km/h
High Wind:	21 Km/h at 08:12
Recent Avg Wind:	5 Km/h
Recent Beaufort Scale:	Light Air
Today's Rain:	0.0 mm
Rain Rate:	0.0 mm/hr
High Rain Rate:	0.0 mm/hr at —
Storm Total:	0.0 mm
Monthly Rain:	0.0 mm
Yearly Rain (JAN):	123.4 mm
Air Density:	1.294 kg/m^3
Est. Cumulus Base:	2616 m
High Temperature:	1.2 C at 09:33
Low Temperature:	-1.1 C at 07:36
High Heat Index:	1.2 C at 09:33
Low Wind Chill:	-6.3 C at 07:36
High Humidity:	28 % at 07:34
Low Humidity:	19 % at 09:33

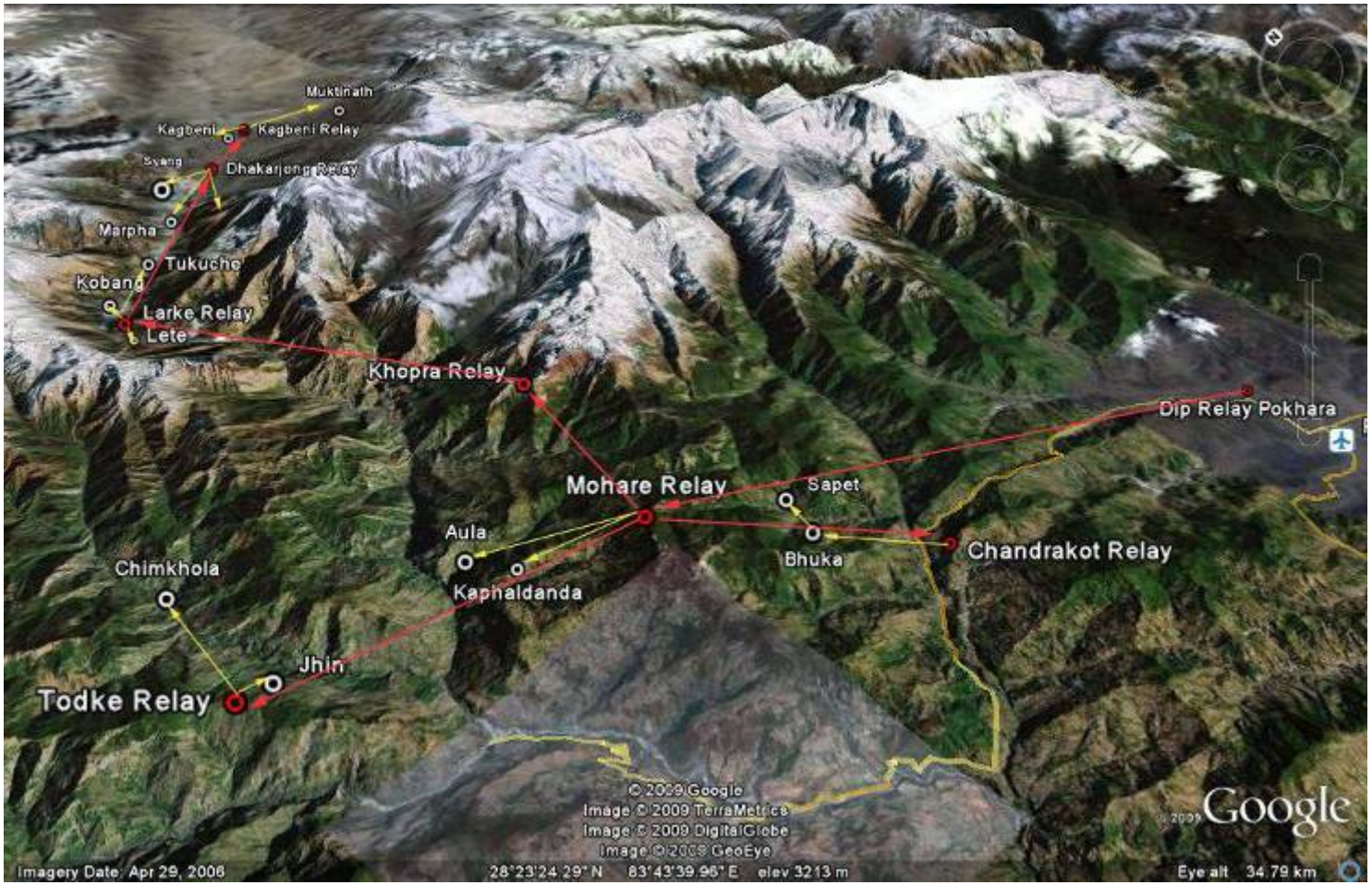
Trainees from different villages

Sebastian Buttrich, the trainer from Denmark

Jomsom and Kali Valley as seen from Dhakarjung Relay station

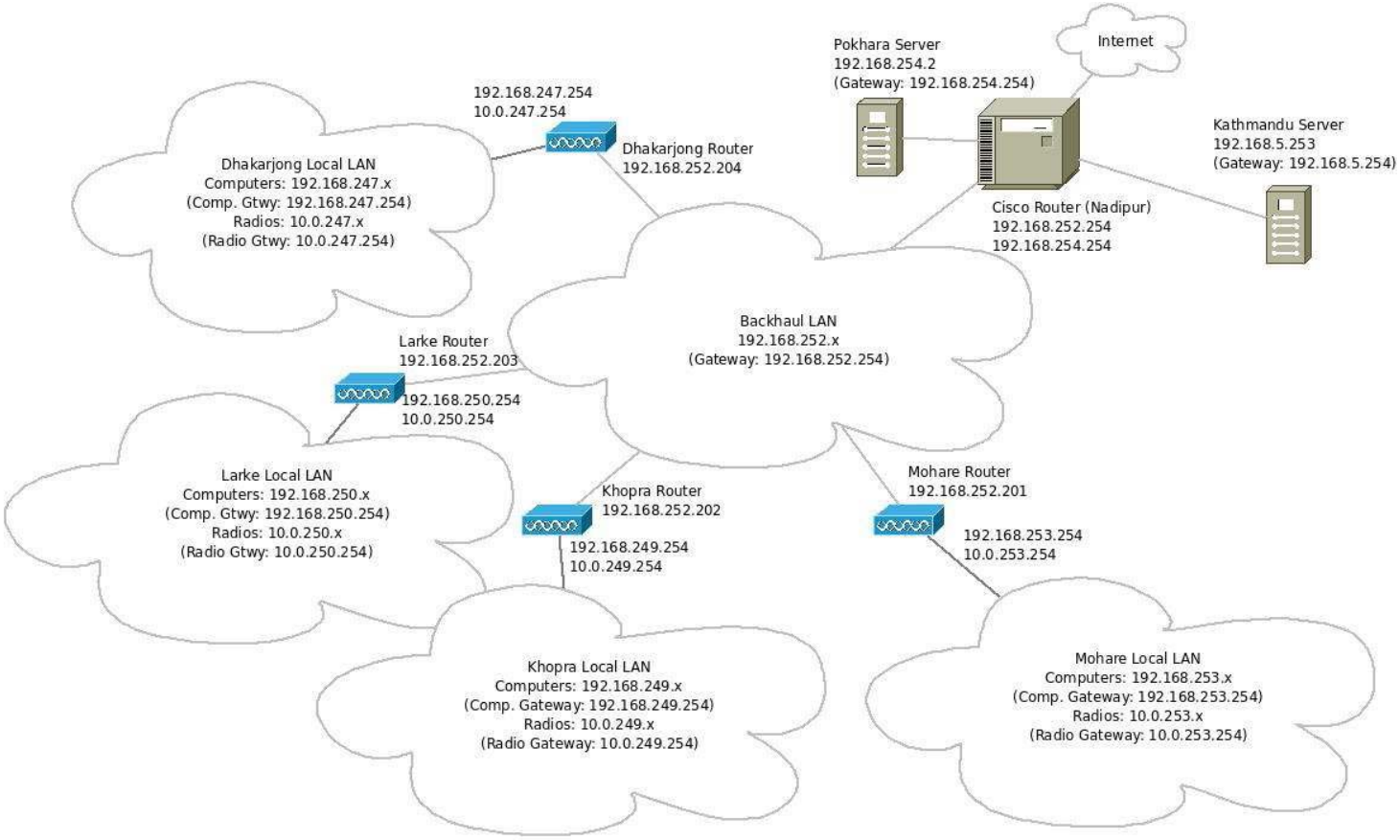
Tukuche Village

Google Earth map of the network looking towards Jomsom from Pokhara area



- Table 1: Complete list of Network Nodes
- From To Distance Means of travel
- Pokhara Station Beni 3 hours By bus
- Pokhara Jomson 22 minute By flight
- Pokhara Chandrakot 2 hours By taxi (1 hour and walk)
- Pokhara Bhuka 6 hours By taxi and walk (5 hours uphill)
- Pokhara Sapet 5 hours By taxi and walk (4 hours uphill)
- Pokhara Mohare Relay 2 days By Jeep and walk (7 hours uphill)
- Pokhara Khopra 2 days By Jeep and walk (9 hours uphill)
- Beni Jomsom 8 hours By Jeep or bus
- Beni Kaphaldanda 4 hours By jeep (3 hours) and walk
- Beni Todke Relay 5 hours By walk (Up hill)
- Beni Jhin 4 hours By walk (Up hill and straight)
- Beni Chimkhola 8 hours By walk (Up hill and straight)
- Beni Aula 4 hours By Jeep and walk (3 hours up hill)
- Jomsom Larke 5 hours By Jeep and walk (3 hours)
- Jomsom Kobang 1 hours By Jeep
- Jomsom Dhakarjung Relay 3 hous By walk (up hill)
- Jomsom Muktinath 2 hours By Jeep
- Table 2: Walking distance in hours and days from the nearest highway
- 1 l

Putting Alvarion radio at Kobang School

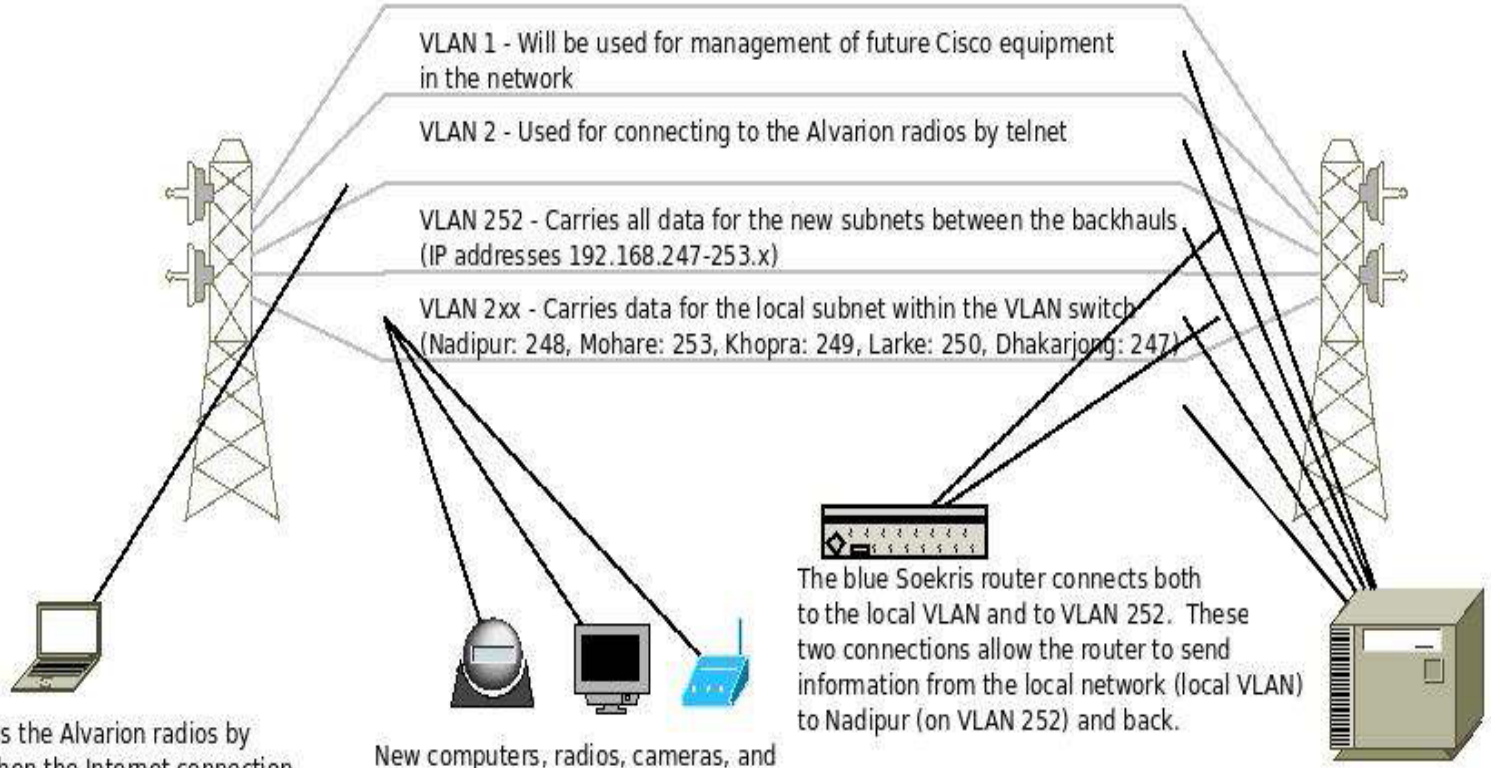


Conceptual Diagram of the Nepal Wireless Network

Connecting the districts of Kaski, Parbat, Myagdi, and Mustang

Description of VLANs Used in the Nepal Wireless Network

from Pokhara to Dhakarjong



To access the Alvarion radios by telnet when the Internet connection is down, your laptop must be connected to the VLAN 2 port on the VLAN switch.

New computers, radios, cameras, and other equipment should connect to the local VLAN. These devices will get an IP address automatically from the Soekris DHCP server.

The blue Soekris router connects both to the local VLAN and to VLAN 252. These two connections allow the router to send information from the local network (local VLAN) to Nadipur (on VLAN 252) and back.

The Cisco router in Nadipur is connected to every VLAN and can move information between them.

- S.N. Equiment Number
- 1 Alvarion radios of different capacity 28
- 2 5.7 GHz Motorola radio with reflectors 6
- 3 5 GHZ MikroTik APs and Client radios 18
- 4 2.4 GHZ EnGenius , and Deliberant 10
- 5 24dB Directional Antennas 4
- 6 15 dB Panel Antennas 13
- 7 14 dB Omni Directional Antennas 3
- 8 Cisco routers and switches 4
- 9 Soekris Routers 4
- 10 Linksys wireless routers 12
- 11 Linksys Wi-fi to PSTN Phone adaptors 5
- 12 Polycom IP phones 5

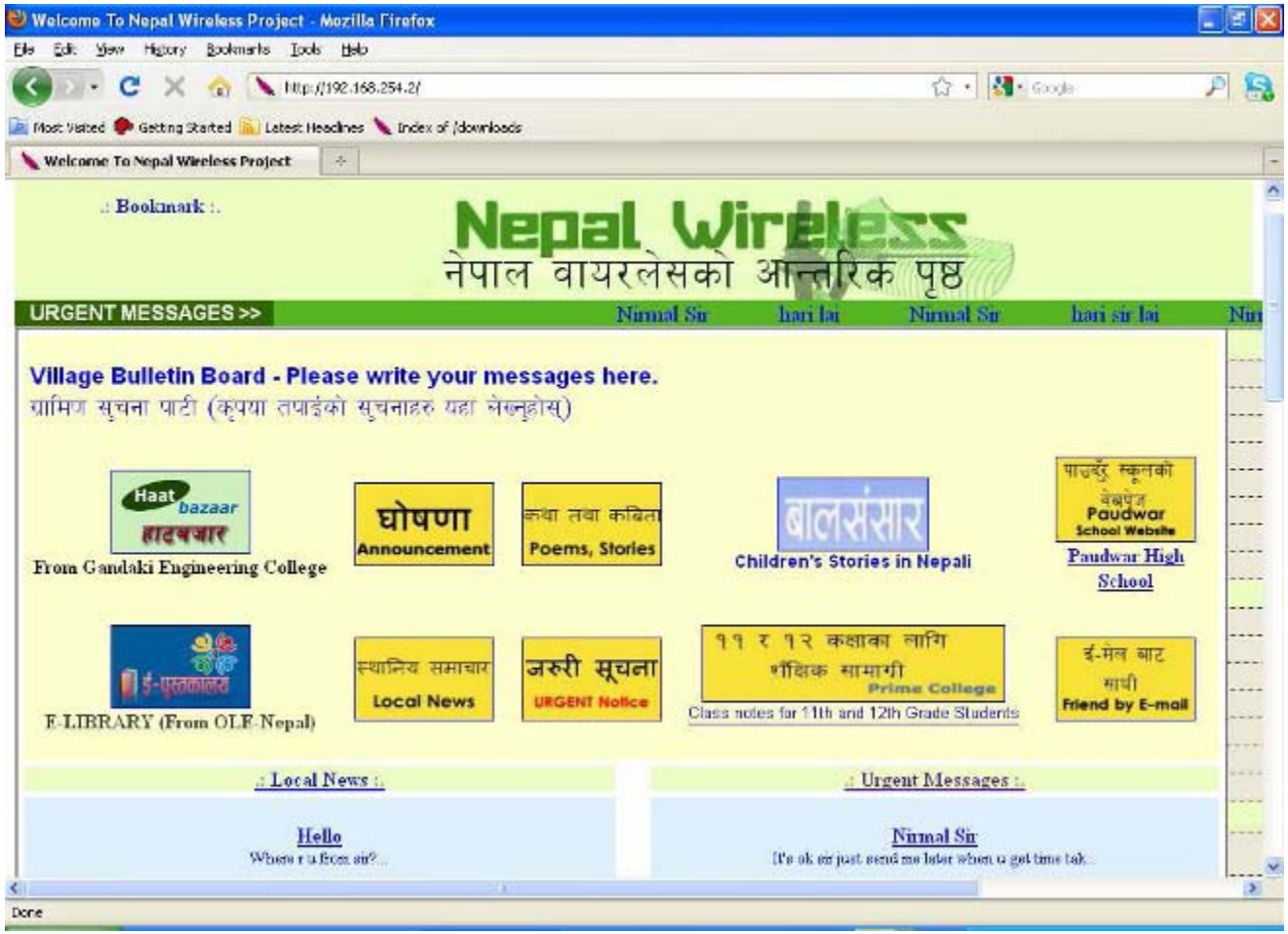
- Table 3: List of the main transport equipment used

Routers at Mohare Relay Station

Installing Antennas

Tower at Mohare

Web Site Nepal Wireless



Solar Paners at Mohare Relay Station

Power Generation and Backup Systems Used in the Relay Stations

- S.N. Item Quantity
- 1 50 W Solar Panels 6
- 2 80 W Solar Panels 24
- 3 120W Solar Panels 8
- 4 30 Amp rated Solar Charge Controllers 7
- 5 40 Amp rated Solar Charge Controllers 4
- 6 400W Air-403 Wind Generators 1
- 7 100 amp-hour rated Deep Cycle Batteries 30
- 8 12 VDC to 110VAC Inverter (250W) 14
- 9 600 VA Kerosene Generator 1

Wind Generator

Server room at Pokhara

Backup Batteries

Porters Carrying Equipment to Relay Stations

- S.N. Budget Headings Amount USD

- 1 Planning and Investigation 2,000
- 2 Equipment Procurement 122,400
- 3 Correspondence and Shipping fee 2,000
- 4 Business Trips 15,200
- 5 Miscellaneous 4,700
- Total Amount 146,300

- Table 5: Budget approved by APT for Nepal Wireless Networking Project

- S.N. Budget Headings Amount USD

- 1 Planning and Investigation 2,000
- 2 Equipment Procurement 122,400
- 3 Correspondence and Shipping fee 2,000
- 4 Business Trips 15,200
- 5 Miscellaneous 4,700
- Total Amount 146,300

- Table 5: Budget approved by APT for Nepal Wireless Networking Project

- S.N Budget head
- Amount Spent USD % of the totalBudget

- 1 Planning and Investigation 2,444.75 1.7%
- 2 Equipment Procurement 125,057. 99 85.5%
- Wireless equipment and Accessories 63,930.06
- Solar and backup power 18,747.78
- Computer and telemedicine 35,741.53
- Tower and miscellaneous expense 6,638.62

- 3 Shipping and Correspondence 2,193.90 1.5%

- 4 Business Trip 13,967.41 9.5%

- 5 Miscellaneous (Handbook and workshop) 2,605.71 1.8%

- Total 146,269.76 100.0

- Table 7: Percentage of the total APT budget spent on each budget head

Network Managers

- Connection Fee
- Per month USD Income in USD
- 1 From Mustang sector
- Government offices 7 25 175
- Schools 8 25 200
- Hotels 6 50 300
- Hospital and health clinics 2 15 30
- 2 From Myagdi sector
- Schools 6 25 150
- Total Revenue in USD 855
- Table 10: Approximate monthly income for the network

Team Members—Mostly Volunteers

Students at Kalopani Secondary School

Operator Handbook

Mahabir Pun Presenting the Final Report