

Disaster Prevention Monitoring in a Vulnerable Environment

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Nepal Wireless Networking Project
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21 May 2008

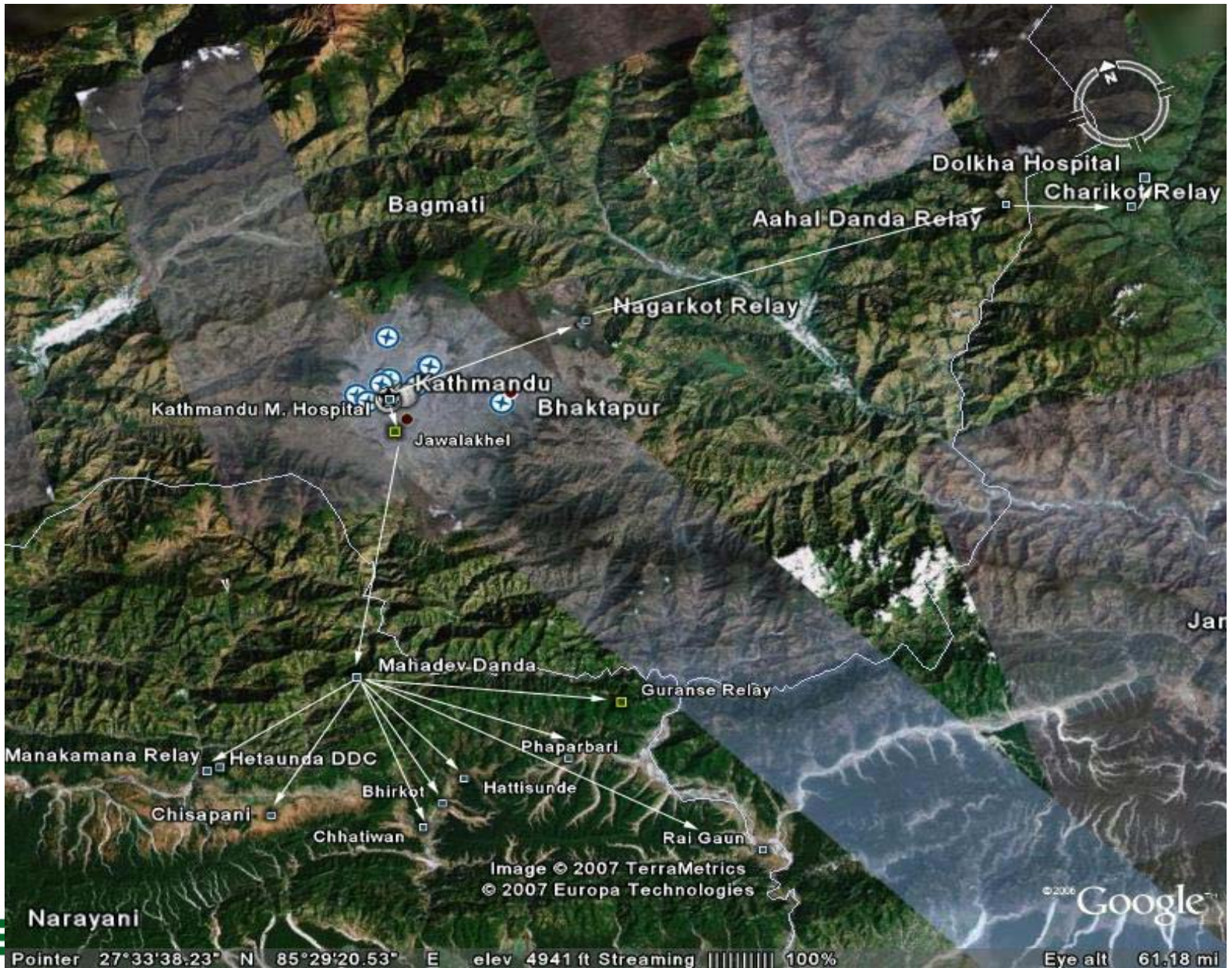


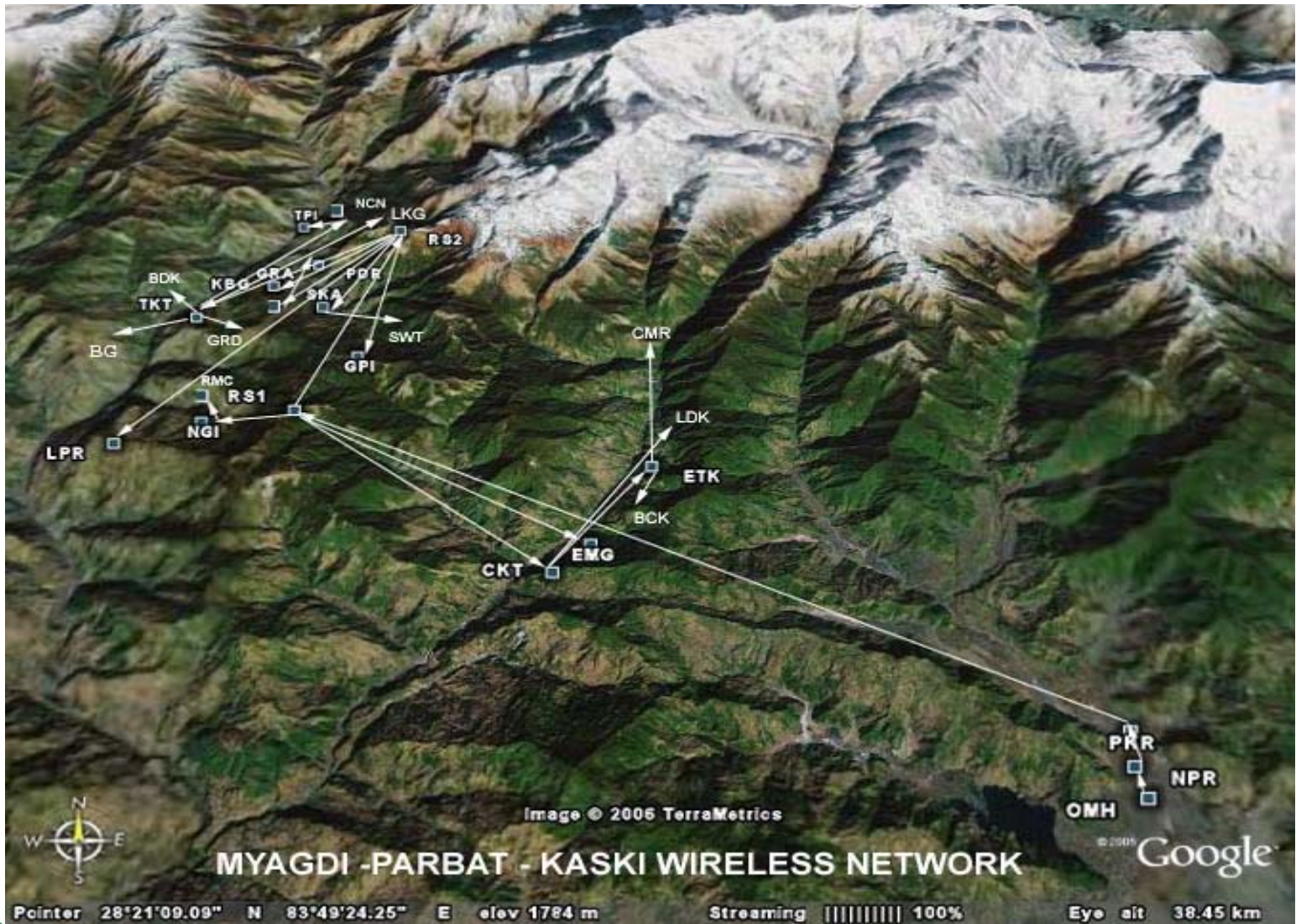
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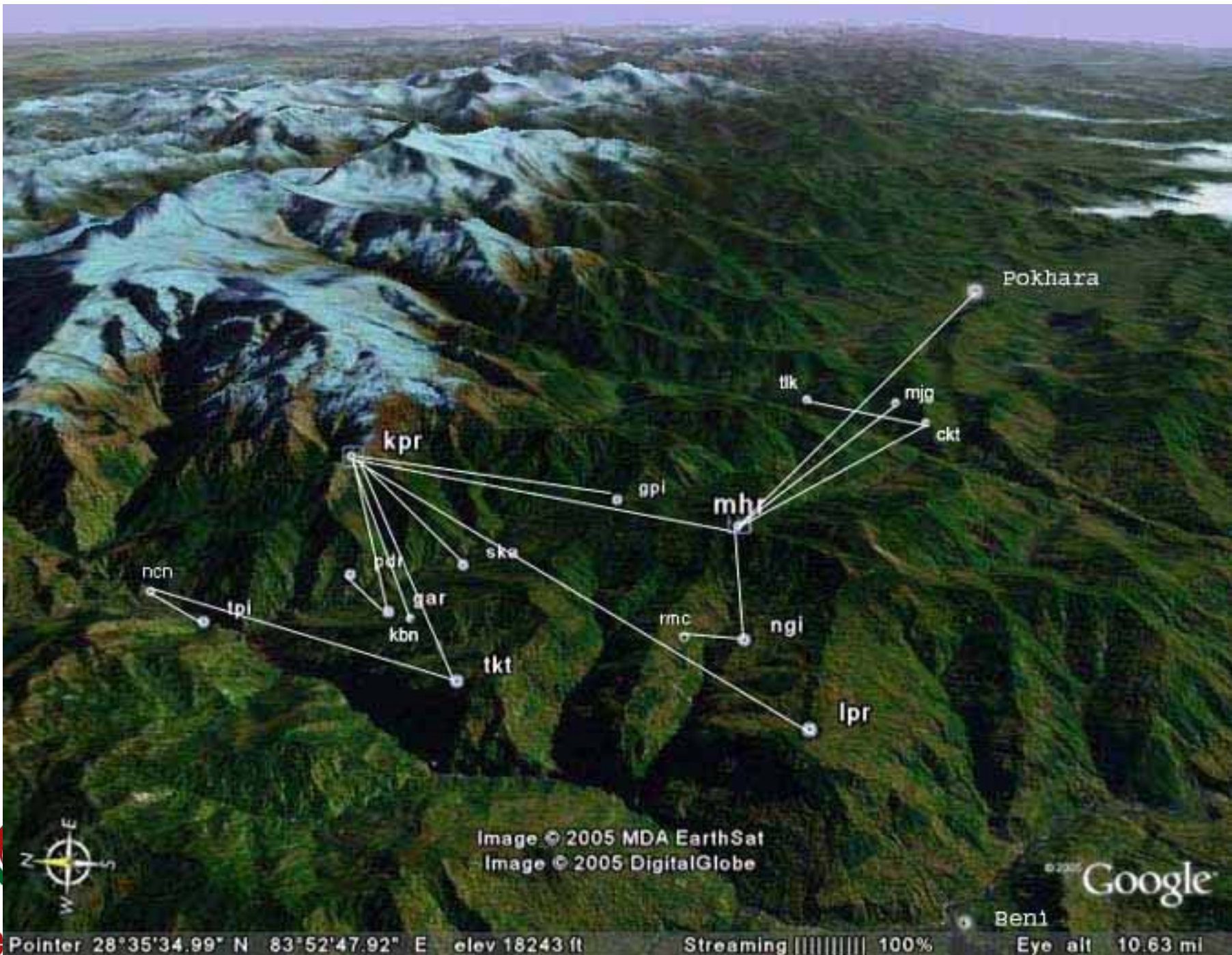
My Involvement

- Chairman, the Institute for Himalayan Conservation – Nepal since 2000
- Team Leader – Nepal Wireless Networking Project since 2002
- Vice Chairman – Nepal Research and Education Network since 2006









Pokhara

tki

mjb

ckt

kpr

gpi

mhr

ska

ncn

pdr

gar

kbn

rmc

ngi

tkt

lpr



Image © 2005 MDA EarthSat
Image © 2005 DigitalGlobe

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Beni



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Relay Station 1 Receiver at 3,220m





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My Role as an Activist in ICT Field

- Led the successful campaign to de-license 2.4 GHz and 5.8 Ghz Industrial, Scientific and Medical (ISM) bands in 2006 in Nepal.
- Lobbied successfully to reduce the license fee to approx. \$3 per year for those small businesses that are interested to set up ISPs using VSAT in rural Nepal
- Led the team successfully to make Government owned Nepal Telecom share its copper infrastructure with private Internet Service Providers for providing ADSL services to the customers in 2008.
- Working on to build Broadband Information Highway using Wireless technology across Nepal.



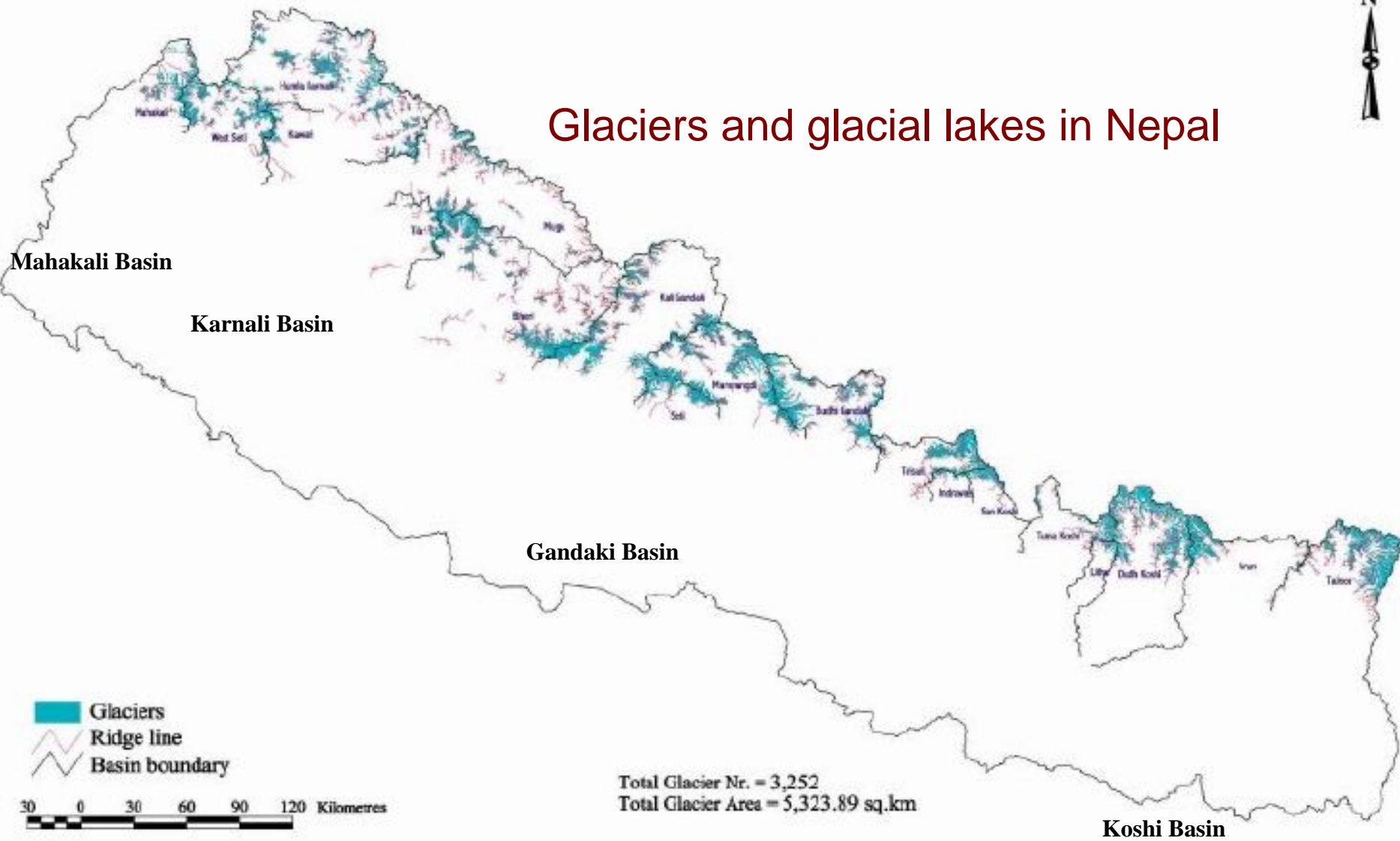
Nepal Context

- 8 out of 10 highest Mountains in the world and many peaks over 7,000 m.
- Total Glaciers - 3252 covering 5223 sq. km in Nepal
- 2323 glacial lakes in Nepal

(Source: ICIMOD and UNEP)



Glaciers and glacial lakes in Nepal

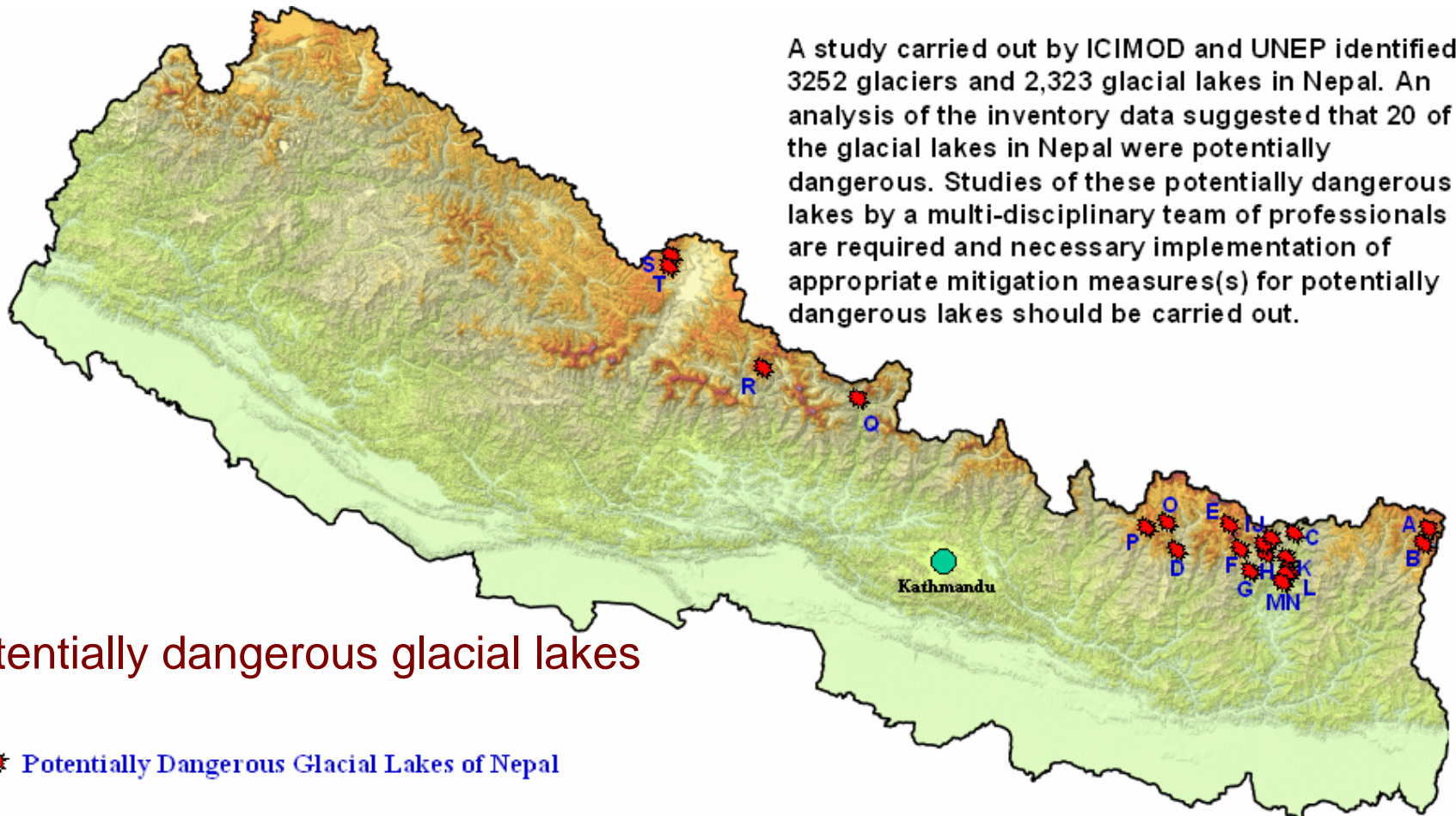


Total Glacier Nr. = 3,252
Total Glacier Area = 5,323.89 sq.km

Glacial lakes - 2323



A study carried out by ICIMOD and UNEP identified 3252 glaciers and 2,323 glacial lakes in Nepal. An analysis of the inventory data suggested that 20 of the glacial lakes in Nepal were potentially dangerous. Studies of these potentially dangerous lakes by a multi-disciplinary team of professionals are required and necessary implementation of appropriate mitigation measures(s) for potentially dangerous lakes should be carried out.



Potentially dangerous glacial lakes

☀ Potentially Dangerous Glacial Lakes of Nepal

A= Nagna (Tamor)
 B= (?) (Tamor)
 C= Lower Barun (Arun)
 D= Lunding (Dudh Koshi)
 E= Inja (Dudh Koshi)
 F= Tam Pokhari (Dudh Koshi)
 G= Dudh Pokhari (Dudh Koshi)

H= (?) (Dudh Koshi)
 I= (?) (Dudh Koshi)
 J= Hungu (Dudh Koshi)
 K= East Hungu 1 (Dudh Koshi)
 L= East Hungu 2 (Dudh Koshi)
 M= (?) (Dudh Koshi)
 N= West Chamjang (Dudh Koshi)

O = Dig Tsho (Dudh Koshi)
 P= Tsho Rolpa (Tama Koshi)
 Q= (?) (Budhi Gandaki)
 R= Thulagi (Marsyangdi)
 S= (?) (Kali Gandaki)
 T= (?) (Kali Gandaki)

? No name

Impact of Global Warming in the Himalayas

- Rate of increase of warming by 0.15°C to 0.6°C per decade
- Rate of glaciers shrinking is higher in recent decades
- The numbers of Glacial lakes are increasing
- Glacial lakes Outburst Floods (GLOFs) has been happening in the Himalayas

GLACIAL LAKE OUTBURST FLOOD

- The highest risk from climate change is the increasing risk of Glacial Lake Outburst Flood
 - Impacts upon mountain eco-system
 - Displaces downstream villages
 - Further south, huge damage to corps and other livelihoods
- There are many new glacial lakes being formed in the high Himalayas
 - *20 potential GLOF in Nepal*

GLOF Risks in the Himalayas

- Extensive Study only done in Dudhkoshi Basin by *Samjwal et al* (ICIMOD)
 - Big Damage due to Dig Tso burst in 1985
 - Preventive work has been done in Tso Rolpa glacial lake by building mitigation system.
 - Current Research work between NREN, ICIMOD, DNPW, Keio University, NARO and APAN-JP on Imja Lake in the Everest region.

Imja Lake Monitoring Project

Started by Keio University Japan, in collaboration with Sagarmatha National Park (SNM), Nepal and International Center for Integrated Mountain Development (ICIMOD) and Nepal Research and Education Network, Nepal (NREN)



Imja Glacier Retreat and Growing Lake

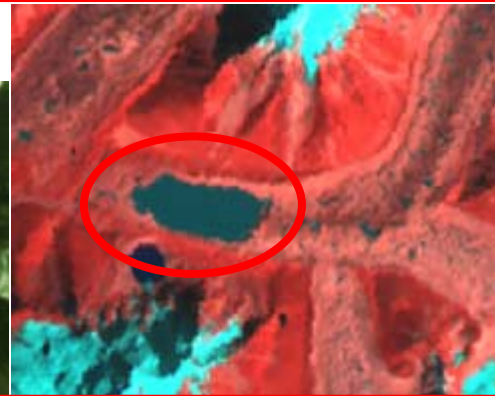
Source: Hiromichi FUKUI, Faculty of Policy Management,
Global Security Research Center, Keio University



•CORONA
15 DEC 1962



•SPACE SHUTTLE
DEC 1983



•LANDSAT
TM 1992



•IRS ID PAN 19
MAR 2001



•ENVISAT, ASAR, 18 October 2007



•Quickbird Jan 2006



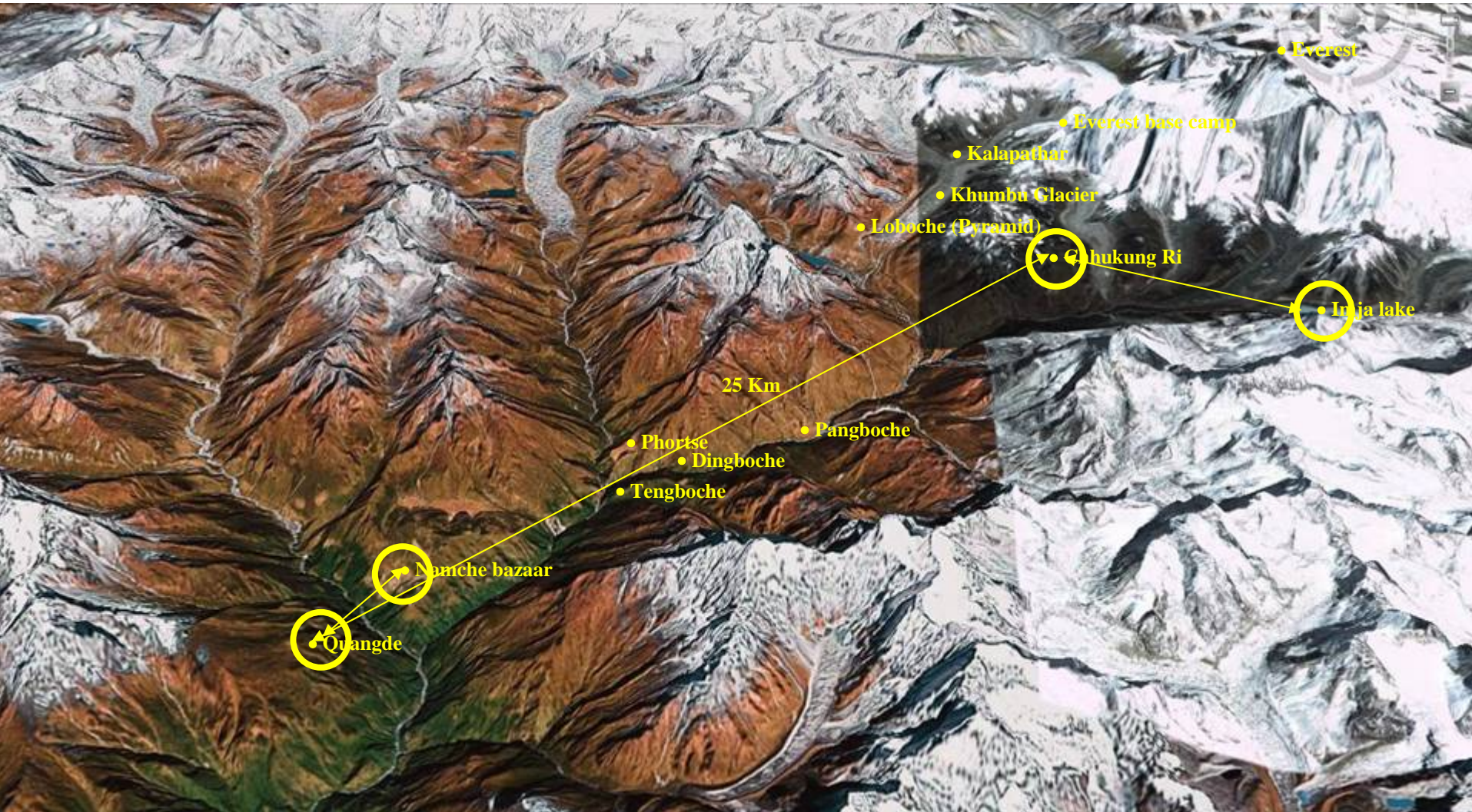
•IRS LISS3
2005

Objectives

- To demonstrate the real time monitoring of Imja glacial lake as a pilot study for potential Glacial Lake Outburst Flood hazard
- To provide early warning to save mountain communities, infrastructure and environment
- To build local area Wireless network (wifi) between the villages and connect with VSAT terminal to provide Internet connectivity and access for the local community



Networking of field sensor and transmission station in Mt. Everest region for the real time monitoring of Lake Imja Tsho



Imja Lake at 5,110 m



Wireless Relay at Chhukung with Prof. Hiramichi Fukui



Picture of field server deployment



Real Time Image of Imja Lake (2008/5/19, 09 AM)

The screenshot shows a Microsoft Internet Explorer browser window displaying the 'Field Server Monitoring Agent' web page. The address bar shows the URL: <http://fscs.dc-affrc.go.jp/data4/Himalayan/>. The page title is 'Field Server Monitoring Agent'.

The main content area is titled 'Field Servers Data Display' and includes the text 'Format ver. 2.2 [2008/05/15] T.FUKATSU (NARC,Japan)'. Below this, there are four columns, each representing a field server:

- Himalayan06_cam**: Shows a real-time image of a mountain landscape.
- Himalayan05_cam**: Shows a real-time image of a mountain landscape.
- Himalayan04_cam**: Shows a real-time image of a mountain landscape at night with lights.
- Himalayan02_cam**: Shows a real-time image of a mountain landscape.

Below the camera images are four data panels, each titled 'Field Server Real-time Data' and corresponding to the servers above:

- Himalayan06**: Interval 0 sec., TimeZone: GMT+09:00
- Himalayan05**: Interval 0 sec., TimeZone: GMT+09:00
- Himalayan04**: Interval 600 sec., TimeZone: GMT+09:00
- Himalayan02**: Interval 300 sec., TimeZone: GMT+09:00

On the left side of the page, there is a sidebar with the following content:

- select FieldServer
- [all data / round_cam](#)
- fs Cam
- Field Server**
- [Himalayan06 \(e-Lab FS4, Imja ridge\)](#)
- [Himalayan05 \(e-Lab FS4, Imja Lake\)](#)
- [Himalayan04 \(EOS version\)](#)
- [Himalayan02 \(2008 Standard version\)](#)
- [Himalayan01 \(demo version\)](#)
- [Himalayan03 \(Toshiba-cam version\)](#)

The browser's taskbar at the bottom shows several open applications: start, SquirrelMail 1.4.9a, Yahoo! Mail - punm@..., E-mail1.doc - Micro..., Field Server Monitork..., and Adobe Photoshop. The system clock shows 10:27 AM on 5/19/2008.

Real Time Image of Imja Lake (2008/5/19, 09 AM)

Field Server Monitoring Web Page - Microsoft Internet Explorer

Address: <http://fsds.dc.affrc.go.jp/data4/Himalayan/>

Field Server Monitoring Agent

Format ver.2.2 ([T.FUKATSU](#))

[DataViewer](#) [ImageViewer](#) [aboutFieldServer](#)

select FieldServer
[all data / round cam](#)

fs Cam

Field Server

- [Himalayan06 \(e-Lab FS4, Imja ridge\)](#)
- [Himalayan05 \(e-Lab FS4, Imja Lake\)](#)
- [Himalayan04 \(EOS version\)](#)
- [Himalayan02 \(2008 Standard version\)](#)
- [Himalayan01 \(demo version\)](#)
- [Himalayan03 \(Toshiba-cam version\)](#)

[Himalayan06 daily](#)

Field Server Real-time Data

Himalayan06

Interval	0 sec.
TimeZone:	GMT+09:00
Date	2008/05/15
Time	18:01:02
Air-Temp_mV	1073 mV
Humid_mV	561 mV
PPFD_mV	848 mV
AD0_mV	2500 mV
AD1_mV	2500 mV
AD2_mV	2500 mV
AD3_mV	2500 mV
AD7_mV	2500 mV

[Himalayan05 daily](#)

Field Server Real-time Data

Himalayan05

Interval	0 sec.
TimeZone:	GMT+09:00
Date	2008/05/15
Time	18:00:57
Air-Temp_mV	1086 mV
Humid_mV	545 mV
PPFD_mV	732 mV
AD0_mV	641 mV
AD1_mV	2500 mV
AD2_mV	2500 mV
AD3_mV	2500 mV
AD7_mV	2500 mV

[Himalayan04 daily](#)

Field Server Real-time Data

Himalayan04

Interval	600 sec.
TimeZone:	GMT+09:00
Date	2008/05/19
Time	07:53:11
CPU-Temp_mV	1722 mV
I-Humid_mV	427 mV
I-Temp_mV	1754 mV
Solar_mV	12 mV
CO2_mV	356 mV
Air-Temp_mV	1781 mV
Humid_mV	750 mV

[Himalayan02 daily](#)

Field Server Real-time Data

Himalayan02

Interval	300 sec.
TimeZone:	GMT+09:00
Date	2008/05/13
Time	11:12:09
CPU-Temp_mV	1490 mV
I-Humid_mV	178 mV
I-Temp_mV	1546 mV
CO2_mV	359 mV
Humid_mV	427 mV
Air-Temp_mV	1651 mV
Solar_mV	510 mV

(1 item remaining) Downloading picture http://fsds.dc.affrc.go.jp/data4/Himalayan/Himalayan04_cam/Himalayan04.jpg...

Internet

start SquirrelMail 1.4.9a - ... Yahoo! Mail - punm@... Microsoft PowerPoint... Field Server Monitori... Adobe Photoshop - [...]

Nepal Research and Education Network

Regular Monitoring, Early Warning and Mitigation Measures

- Simulation of GLOF
- Vulnerability and risk assessment
- (Near) Real time monitoring
- Networking of field sensor and transmission station
- Wireless Sensor Network

Lessons Learned

- ICT technologies can help in monitoring and documenting changes.
- Will also help in taking preventive measures.
- ICT can also increase the awareness in local communities about potential hazards
- A public private partnership between local communities, government, service providers and scientific researchers can only get the work done

Lessons Learned

- Wireless Network can be made to work in remotest areas
- Low power self sufficient devices embedded with appropriate sensors are needed to avoid big impact on fragile ecosystem
- Power storing technology still needs more work for remote and cold areas.

Current and Next Steps

- Enhanced observation, monitoring
- Promote exchange of data and information
- Enhance cooperative studies among other area
- Promote capacity building
- Considering systematic way for mitigation and adaptation

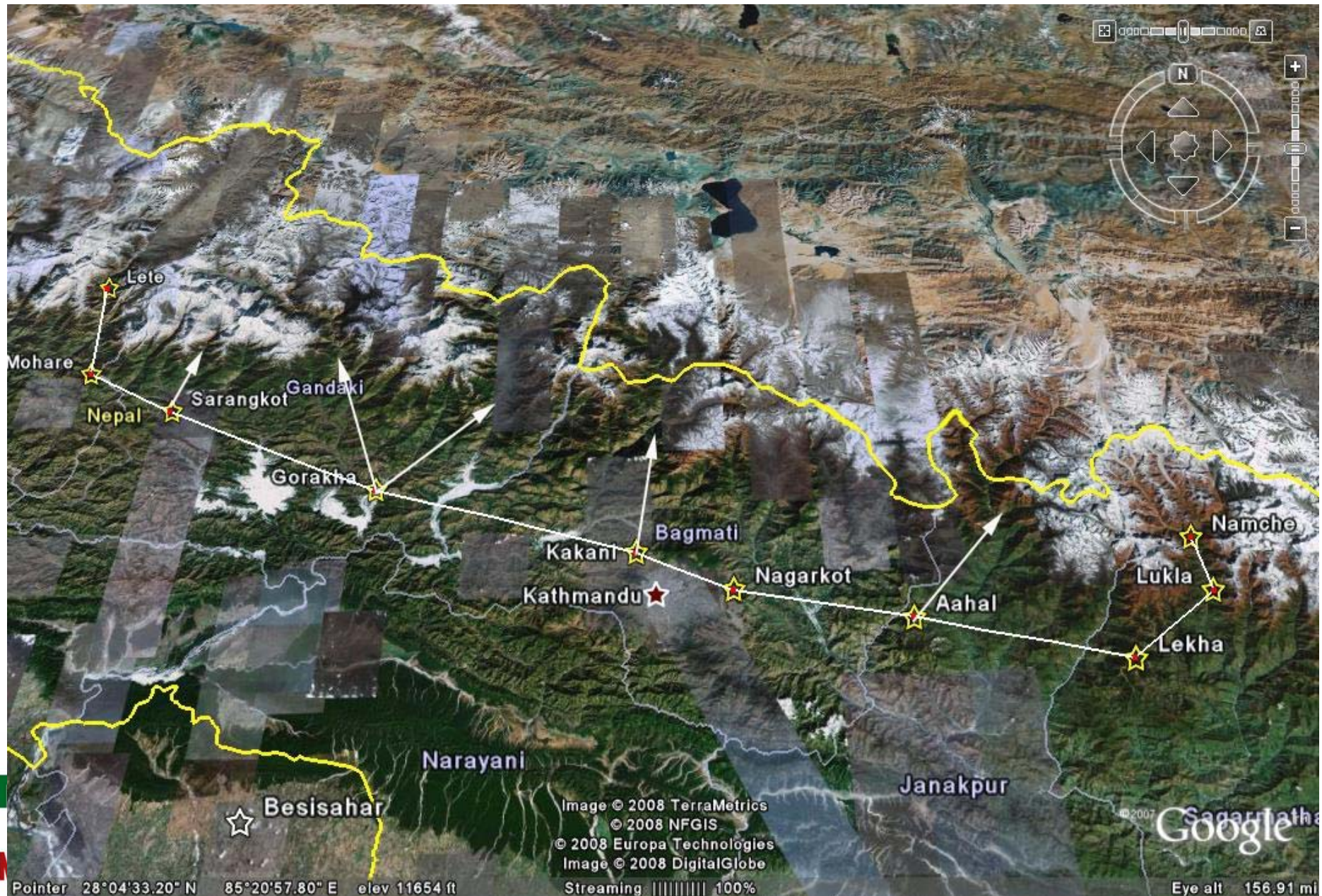


Our Bigger Plan

- Deploy more wireless enabled field stations
 - Weather stations, sensor network, field servers
- Build a wireless network from Mount Everest region to Dhaulagiri /Annapurna region to monitor climate changes by putting field servers between the six 8000m+ and several 7000m+ mountains in the Himalayan region.



Mount Everest to Dhaulagiri ~ 370 KM



Invitation to all Interested Parties

- Nepal Research and Education Network, Nepal Wireless Project and partners in Nepal welcome other participants from around the world who have stakes in these activities.
- Imja Field Server website to get real time data and video pictures:
 - <http://fsds.dc.affrc.go.jp/data4/Himalayan/>



Thank you

- Contact: mahabir@himanchal.org
- <http://www.nepalwireless.net>
- <http://www.nren.net.np>

Please look at the real time data from the field servers in Imja Lake near the Mount Everest and Namche Bazar, Nepal by clicking at the link below.

<http://fsds.dc.affrc.go.jp/data4/Himalayan/>

