How Internet can be used for climate change monitoring, early warning and mitigation in the Himalayas?

Guarab Raj Upadhaya

Nepal Wireless Project

Nepal Research & Education Network

December 4, 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
- Trustee – National Trust for Nature Conservation, Nepal

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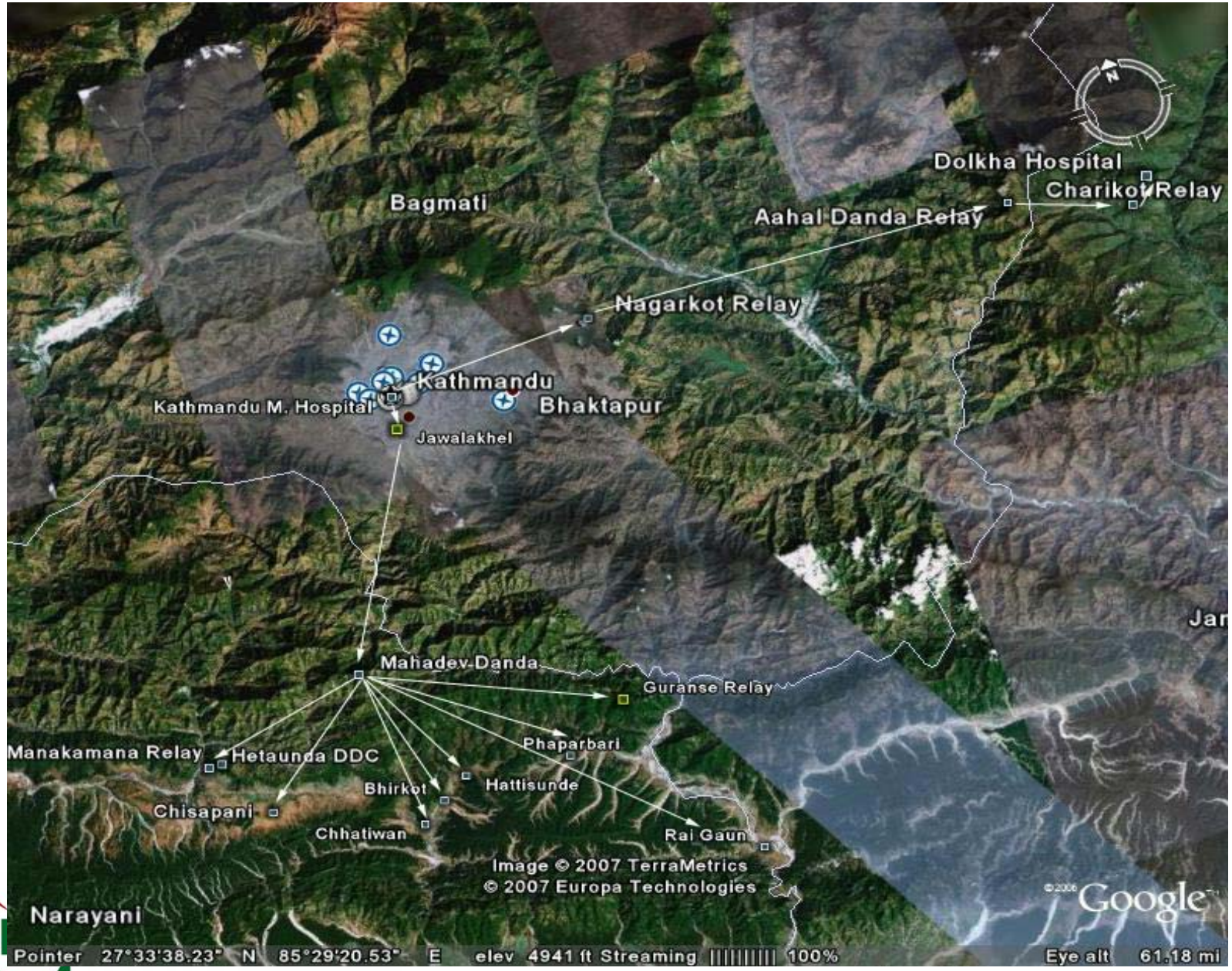

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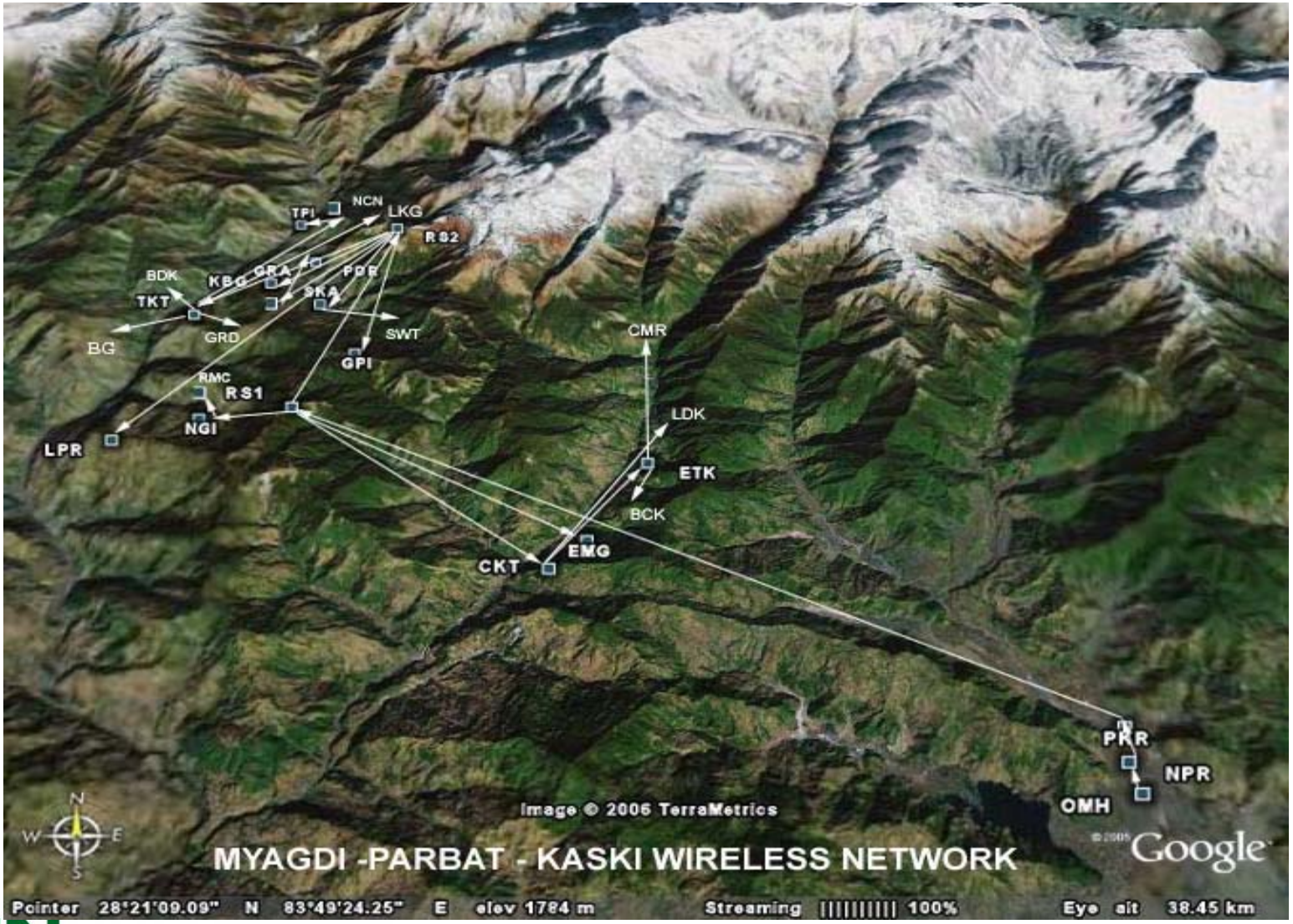

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TOTAL

Relay Station 1 Receiver at 3,220m

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Impact of Climate Change 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** in the high Himalayas
- **Glacial lakes outburst floods (GLOFs)**

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Nepal Context

- 8 out of 10 highest Mountains in the world
- Total Glaciers - 3252 covering 5223 sq. km in Nepal
- 2323 glacial lakes in Nepal

(Source: ICIMOD and UNEP)

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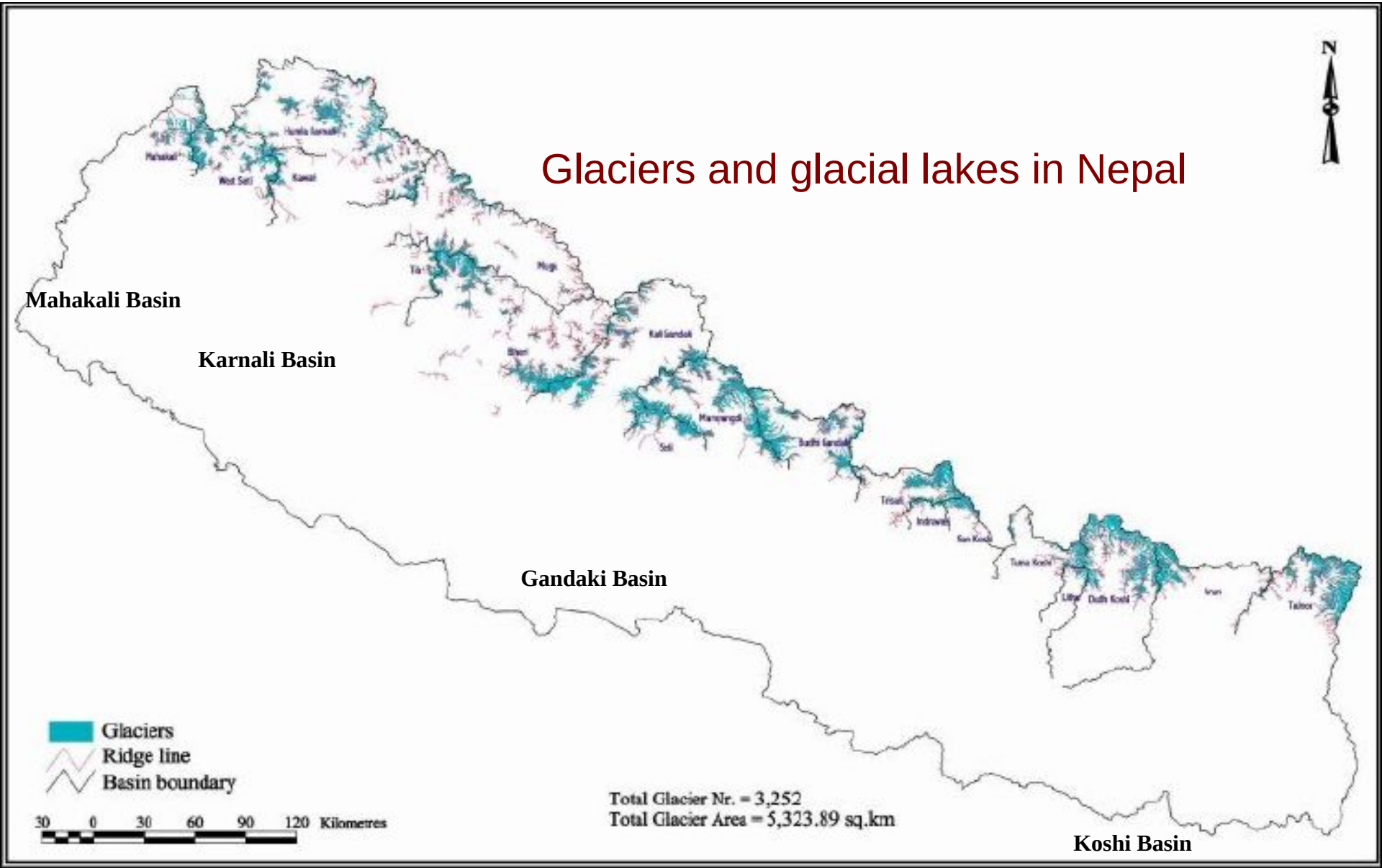
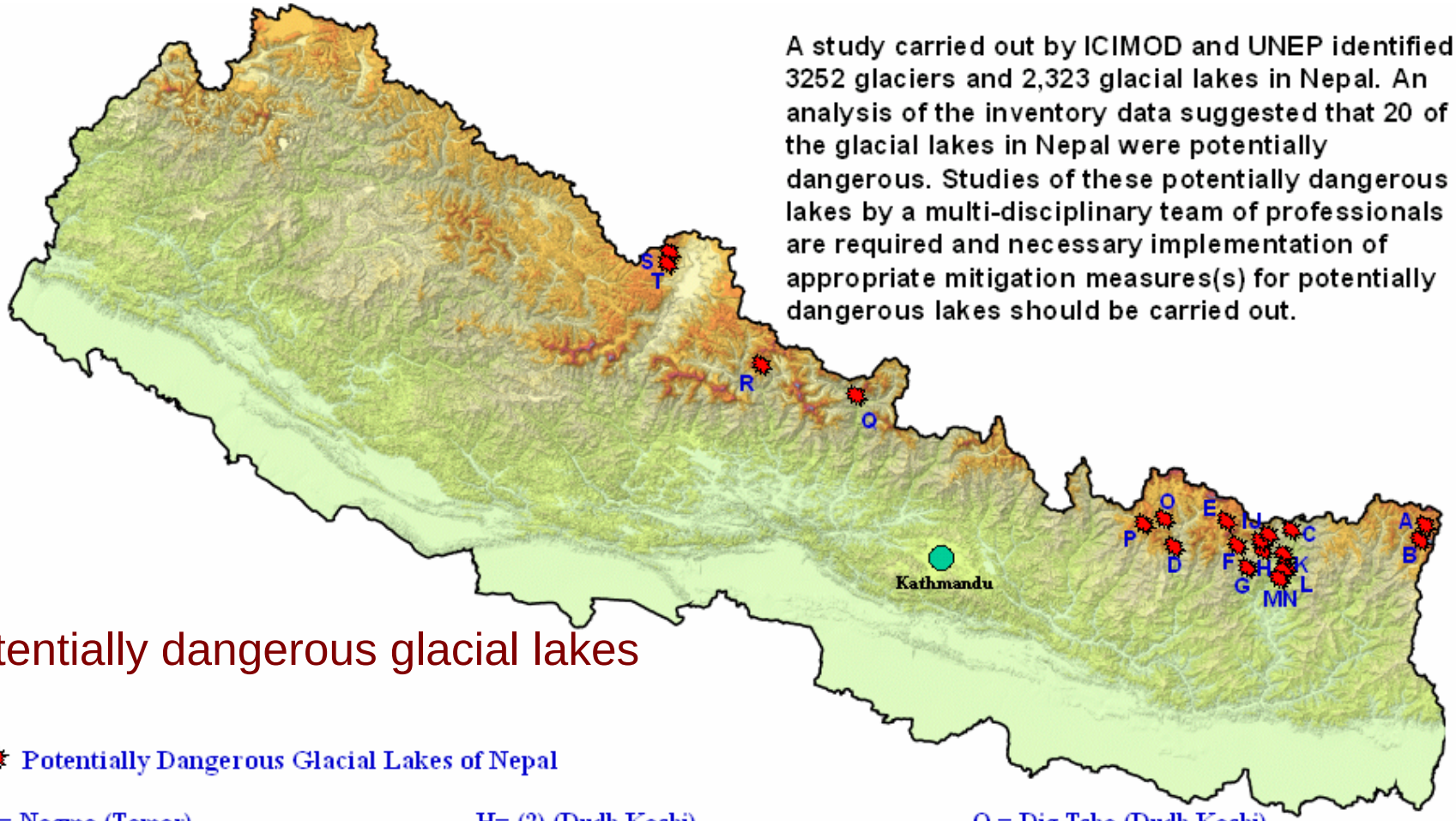
Glaciers and glacial lakes in Nepal



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= Nagma (Tamor)
B= (?) (Tamor)
C= Lower Barun (Arun)
D= Lumding (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

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

THE HIGHEST RISK
GLACIAL LAKE OUTBRUST 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

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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 done in only in **Tso Rolpa**
  - **Current Research Work** between NREN, ICIMOD, DNPW, Keio University, NARO and APAN-JP on Imja-Tso
  - This week there is expedition in Everest region already.

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Objectives of Imja Lake Project

- To demonstrate the real time monitoring of Imja glacial lake as a pilot study
- To provide early warning and **save** the lives of people living downstream and properties, 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

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Imja Glacier Retreat and Growing Lake

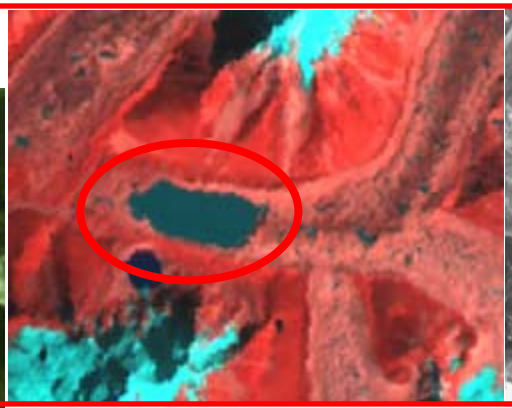
Source: Hiromichi FUKUI, Faculty of Policy Management,
Global Security Research Center, Keio University

•CORONA

15 DEC 1962

•SPACE SHUTTLE

DEC 1983



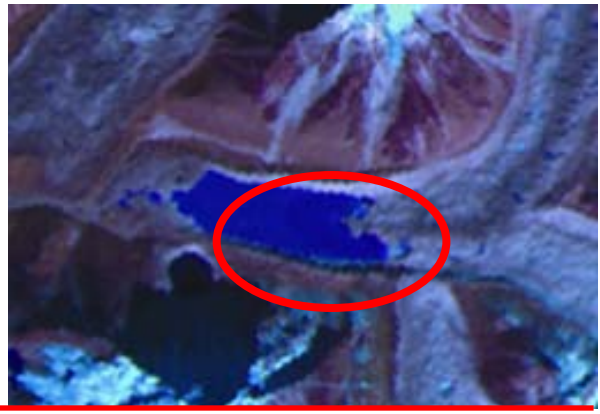
•LANDSAT
TM 1992

•IRS ID PAN 19

MAR 2001

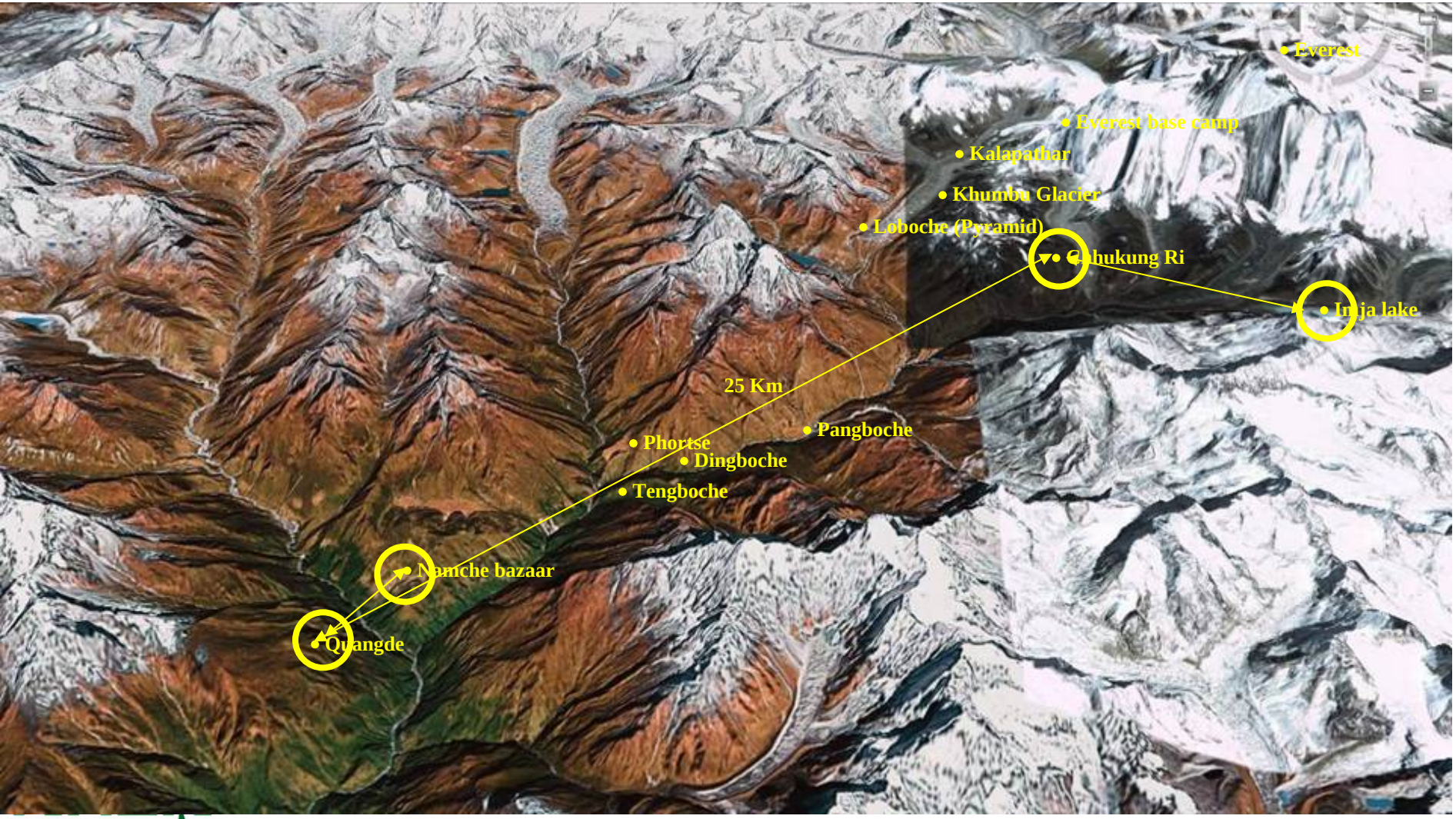
•ENVISAT, ASAR, 18 October 2007

•Quickbird Jan 2006



•IRS LISS3
2005

Wireless Network from Imja Lake to Namche Bazar – 4 days walk



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Imja Lake at 5,110 m


Wireless Relay at Chhukung
with Prof. Hiramichi Fukui

Pictures of field server deployment

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Real Time Image of Imja Lake

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

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Lessons Learned

- ICT can help in monitoring and documenting climate changes. Also helps in taking preventive measures.
- ICT can also increase the awareness in local communities about climate change and potential hazards
- A public private partnership between local communities, government, service providers and scientific researchers is required to get the work done.

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Technology 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.

Next Steps

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

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What We Need to Do?

- Build a network from Everest region to Dhaulagiri /Annapurna region to monitor changes happening between the six 8000m+ and several 7000m+ mountains in the region
- Deploy more wireless enabled field stations for monitoring climate change
  - Weather stations, sensors network, field servers

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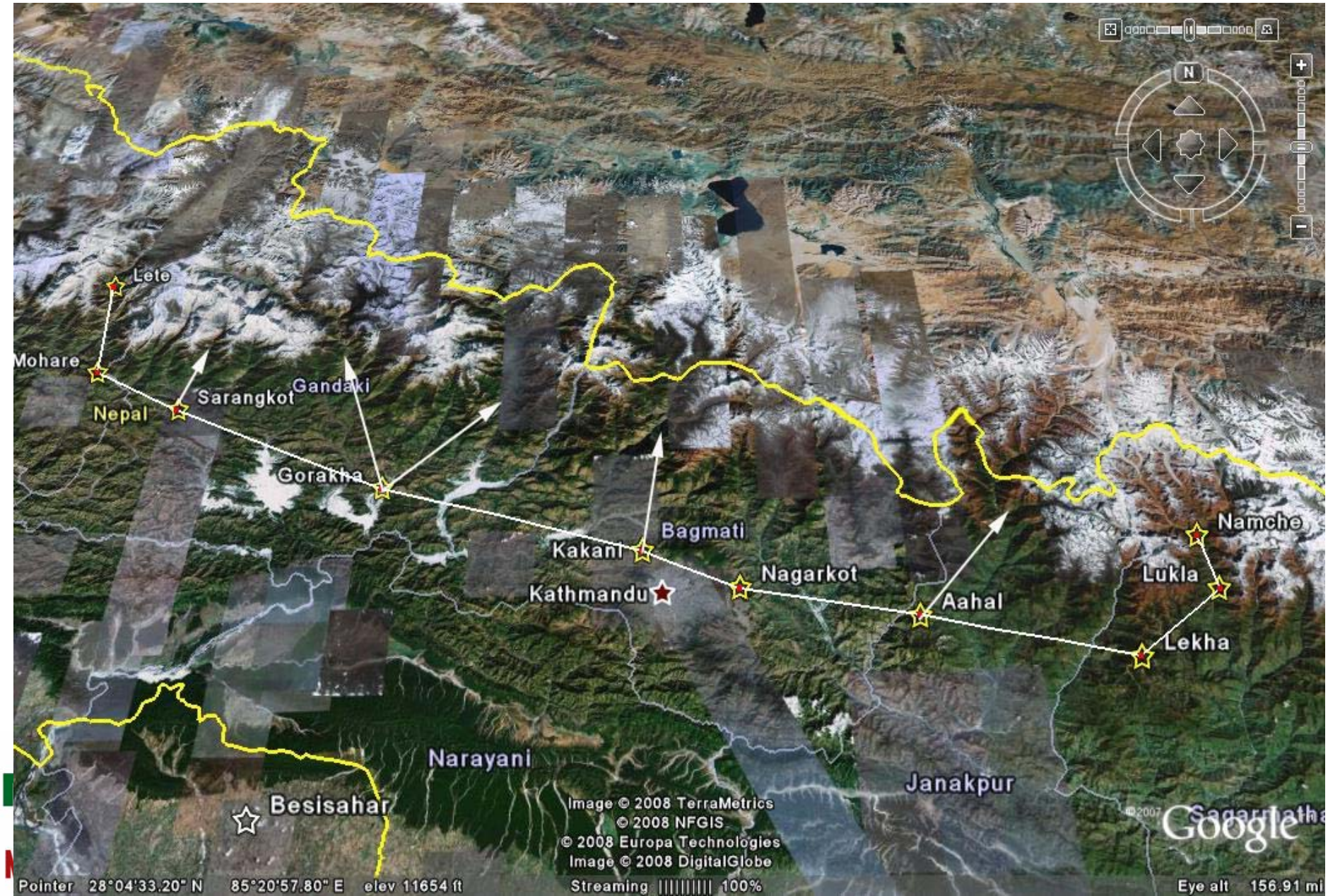
Mount Everest to Dhaulagiri ~ 370 KM



Invitation to interested parties

- NREN, NWP and partners in Nepal welcome other participants who have stake in these activities.
- Imja Field Server website: Please visit it to see the real time data sent y the field servers

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

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PHILOSOPHICAL SOLUTION TO REDUCE THE CARBON EMISSION

WE MUST REDUCE HUMAN GREED IN ORDER TO REDUCE THE EMISSION OF CARBON DIOXIDE.

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Thank you

- Mahabir@himanchal.org

www.nepalwireless.net

www.nren.net.np

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