

Glacial Lake Outburst Flood (GLOF)

- role of satellite based observation

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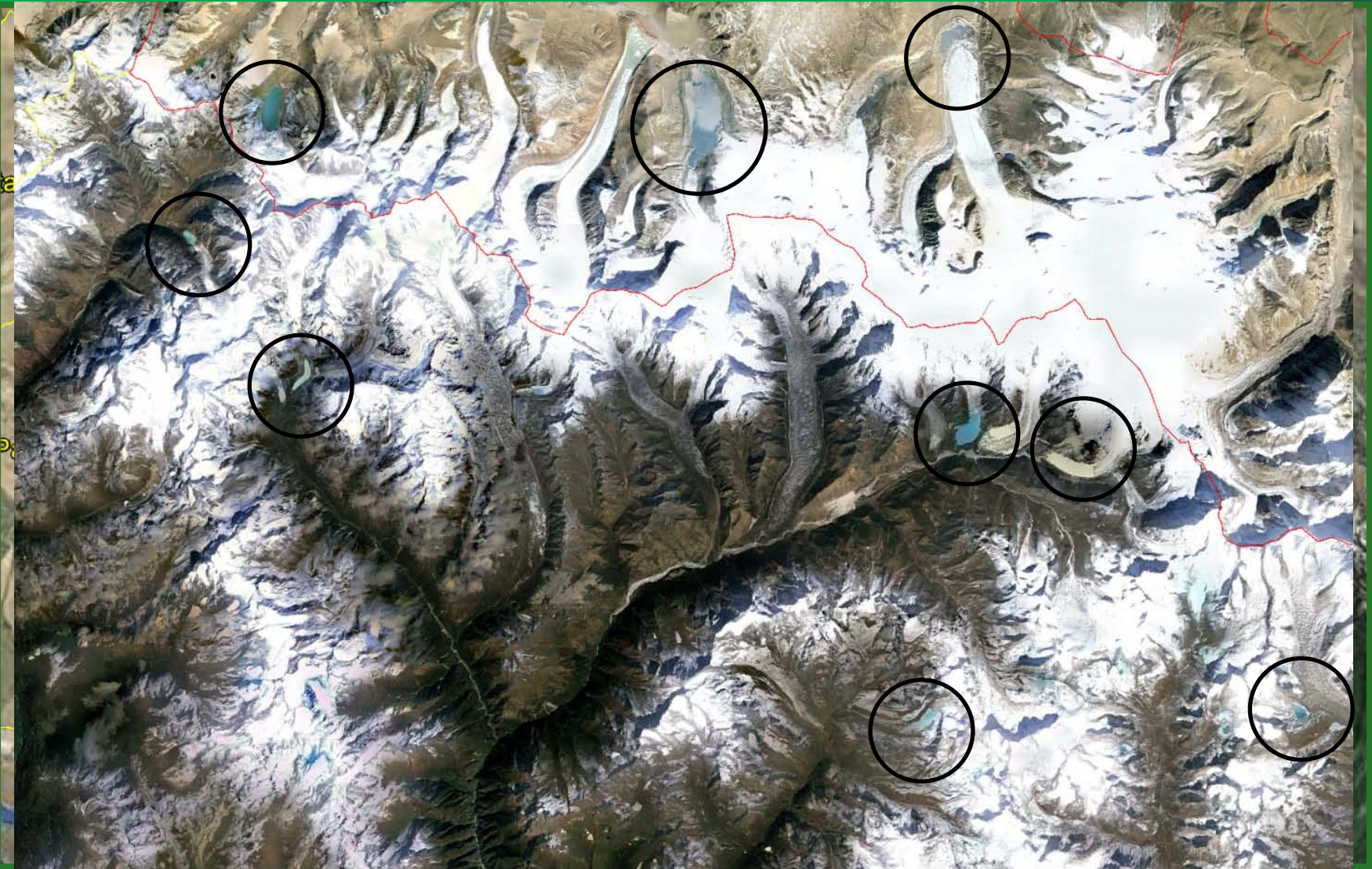
Presentation structure

- Intro to GLOF;
- Issues in the Himalaya region;
- Disaster management options/alternatives;
- Role of earth observation in DM framework;
- Proposal for SA.

Himalayan terrain – opportunities and challenges

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Glacial lakes

Glacial lakes poses threats of GLOFs.



Raphstreng Tsho, Bhutan

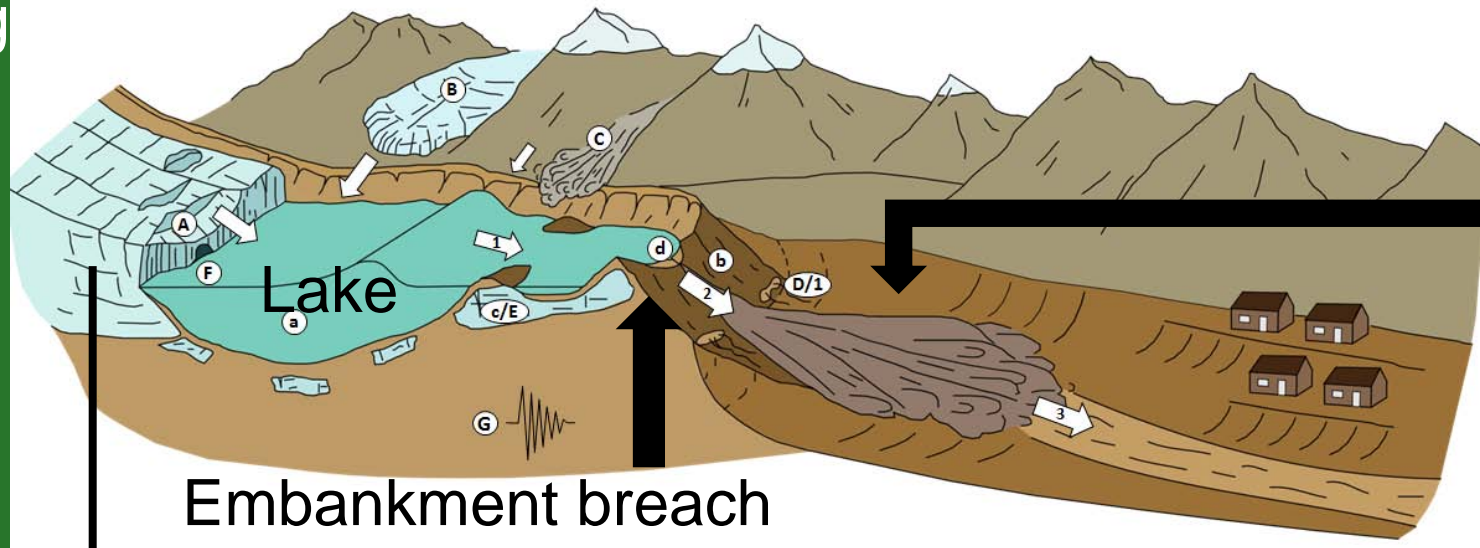


Tsho Rolpa, Nepal

Formation of glacial lake and GLOFs

Melting

Source: <http://www.lakescientist.com/>



GLOF

Embankment breach

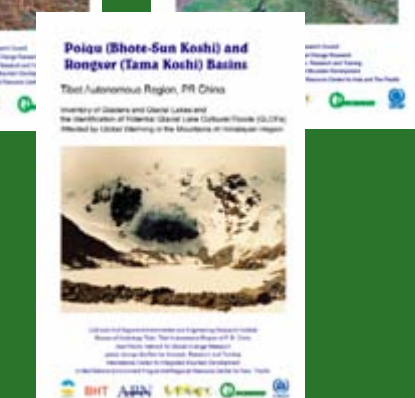
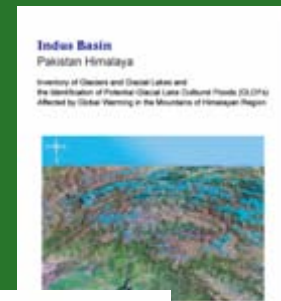
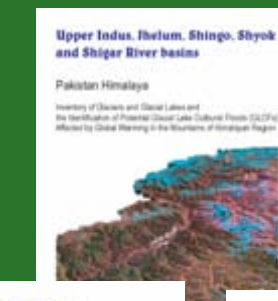
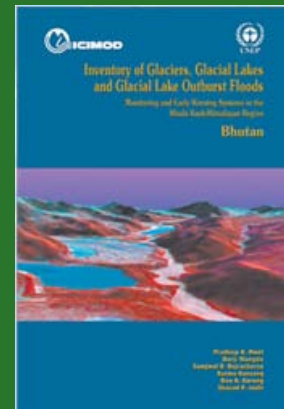


Glacial lake inventory

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- 1st generation inventory released in 2001;
- Over 9000 glacial lakes;
- Over 200 are classified as potentially dangerous glacial lakes;
- HKH region has experienced 35 recorded GLOFs events;



Devastation from GLOFs

Dig Tsho GLOF of Nepal, 4th August 1985

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Namchi hydro-power, over 1.5 million USD completely damaged.



Power House



Devastation from GLOFs

Lugge Tsho GLOF of Bhutan, 7 October 1994

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Punakha Dzong was not built on island



This sacred temple was not built on island



People do not transport logs this way in Pho Chu



Forest does not grow well in such river bed

Disaster management options

Mitigation: Artificial lowering of lake level

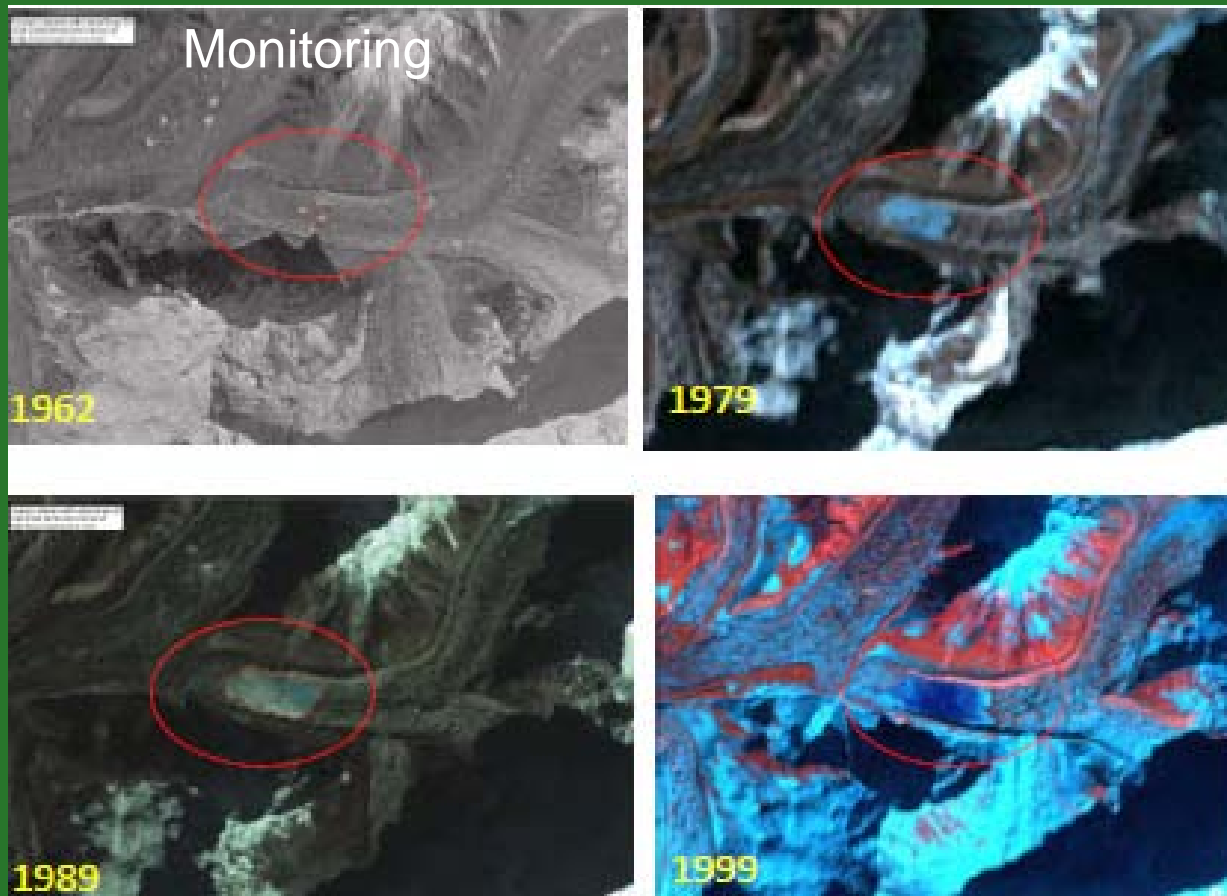


Lowered 4 m in 4 years in
Thorthormi lake, Bhutan

Cost over several millions of
USD dollar

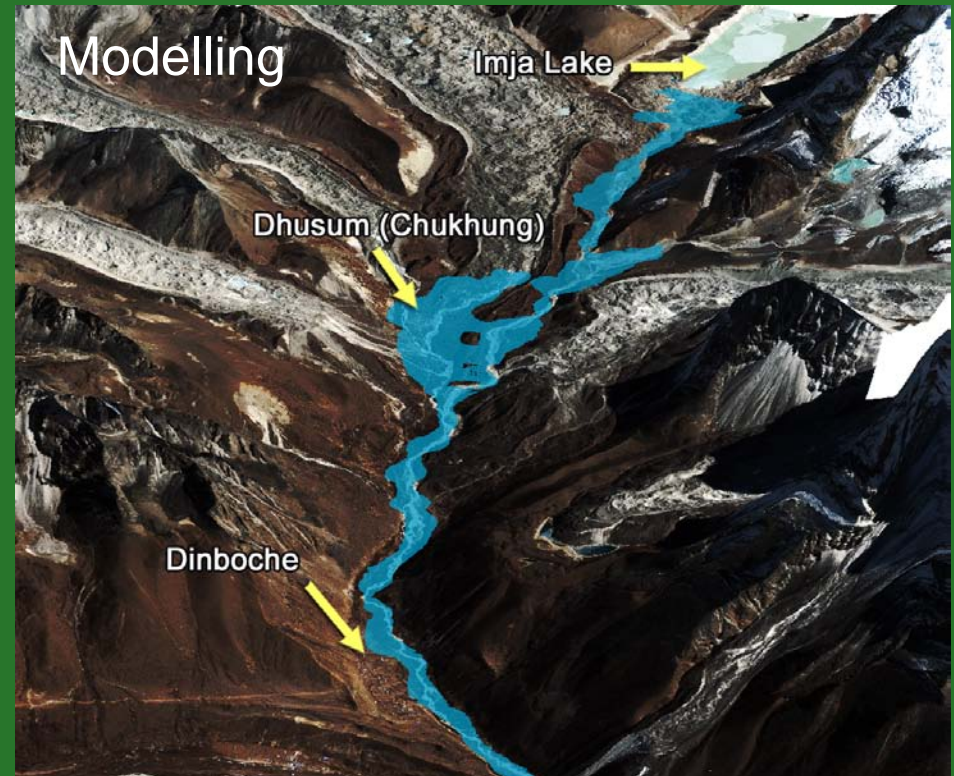
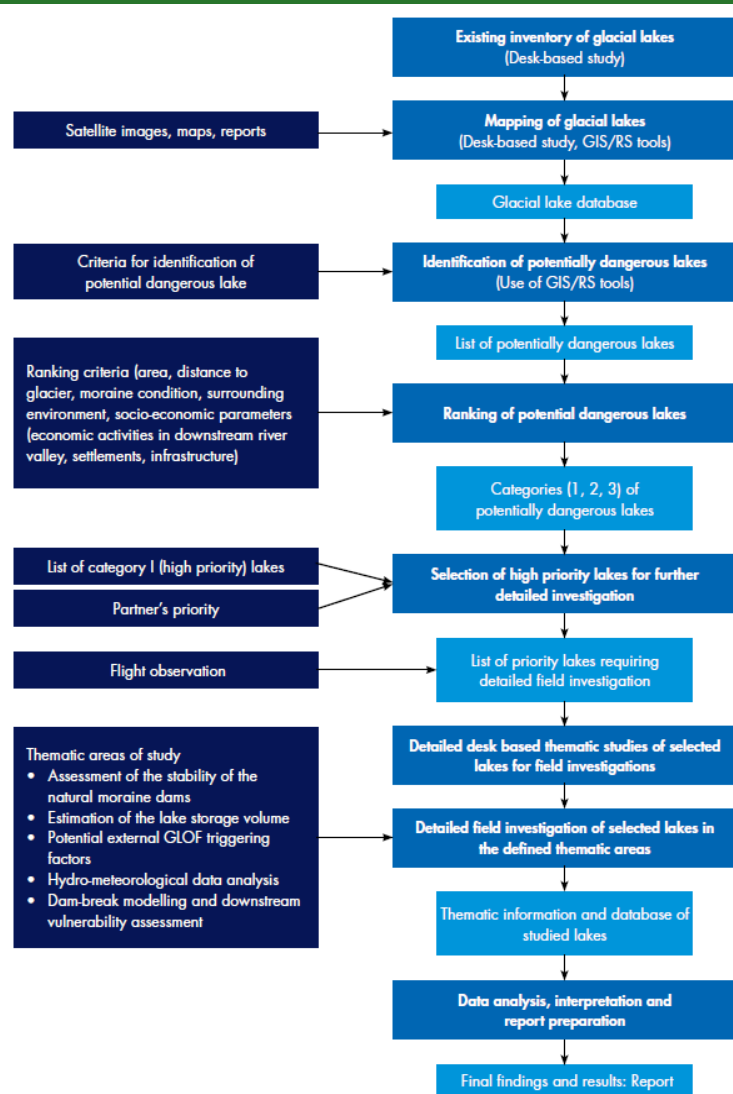


Regular monitoring of glacial lakes



1st level of early warning through regular monitoring of glacial lakes

GLOF risk mapping



(Source: ICIMOD 2011)

Technical EWS

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(Water level sensor)



(Siren warning system)



Field based monitoring as early warning system (EWS)

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■ Wi-Fi Mesh-network

■ Web Server

- ✓ Measurement
- ✓ Device Control

■ Sensors (up to 24ch)

- ✓ Air temp.
- ✓ Humidity
- ✓ Solar Radiation, UV
- ✓ CO₂ concentration
- ✓

tolerate the cold weather

■ Camera (0.3-8M Pixels)

■ Solar-cell

■ LED Lighting



Proposal to SA

- Develop inventory of glacial lakes every 5 years using ALOS data set;
- Regular monitoring – 2 or 3 glacial lakes using monthly satellite images – ICIMOD will lead;
- Develop field based monitoring system;

Thank you very much!