

DISASTER HAZARDS IN BHUTAN

By Tshewang Rinzin

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Disaster Hazards in Bhutan

- **Earthquakes**
- **Glacial Lake Outburst Flood (GLOF)**
- **Floods in monsoon**
- **Natural Dam formation and dam bursts**
- **Landslides**
- **Fires**
- **Droughts**
- **Epidemics, Pests, Diseases**

Earthquakes



- ❖ **Bhutan is located in one of the most active seismic zones (Zones IV &V)**
- ❖ **8+ RS: 1897, 1906, 1934**
- ❖ **7+RS: 1713, 1806, 1947**
- ❖ **6+RS: 1910, 1941, 1950, 1954, 1960, 1980, 1988**
- ❖ **5+RS: 2003, 2006**

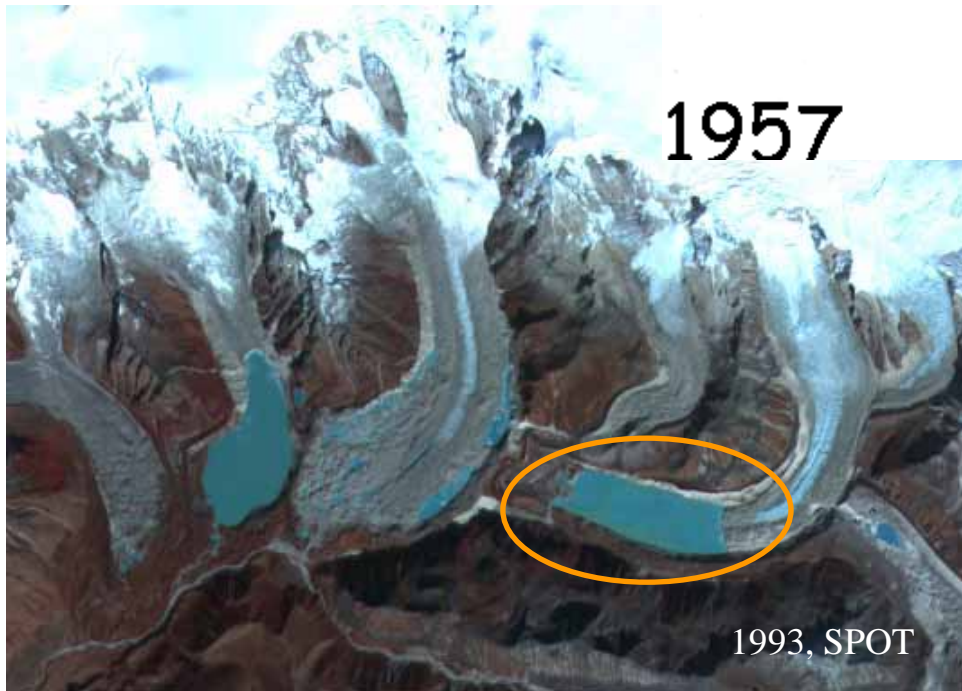
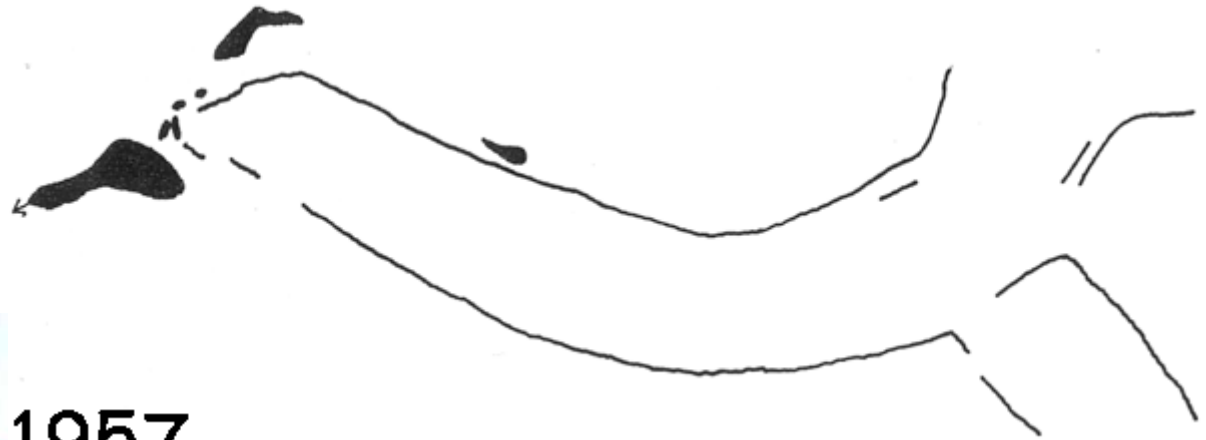
Glacial Lake Outburst Flood (GLOF)



- ❖ **GLOFs: the most serious natural hazard potentials with 25 lakes potentially dangerous out of about 3000 glacier lakes..**
- ❖ **Hazards due to GLOF flash floods are likely to increase in intensity with the impacts of climate change.**

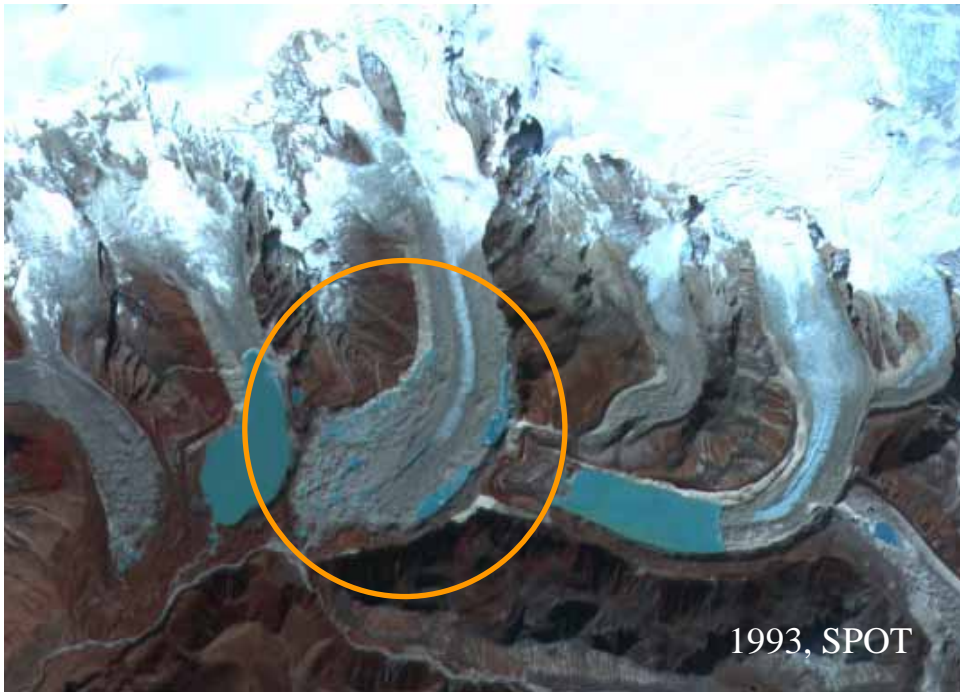
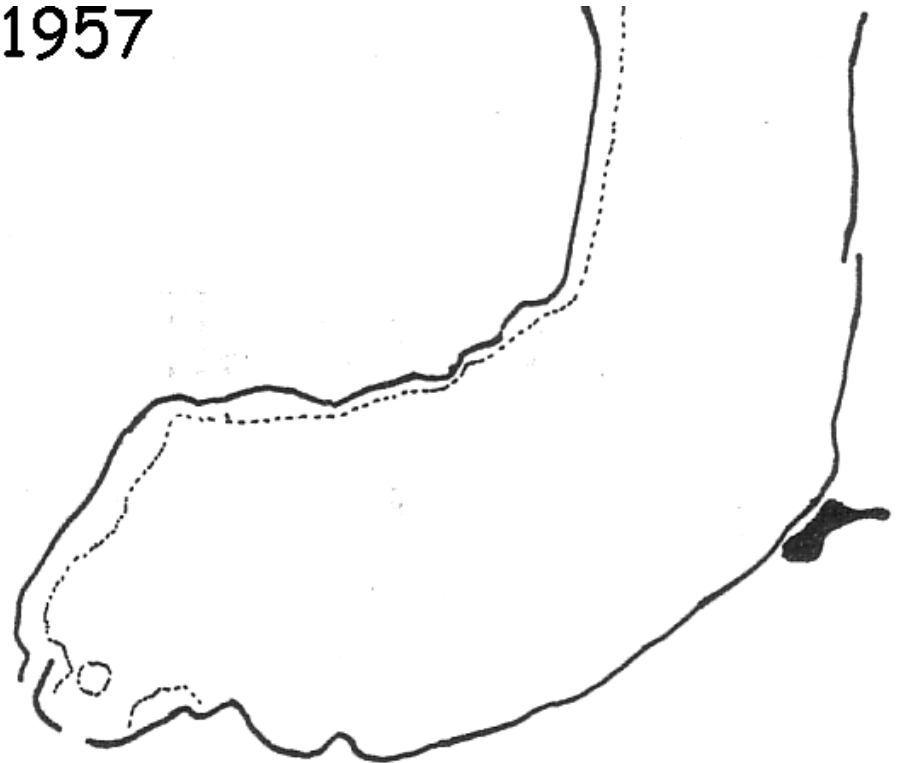
- Glacial Lakes form due to glacial melt/retreat
- Global warming has accelerated glacial retreat, and therefore the formation/expansion of glacial lakes.
- Using current technology, GLOFs can neither be *totally prevented* nor *predicted*.
- Home Minister in his speech on 20/1/2009 called it “SILENT TSUNAMIS”

Lugge Tsho



Thorthormi Tsho

1957



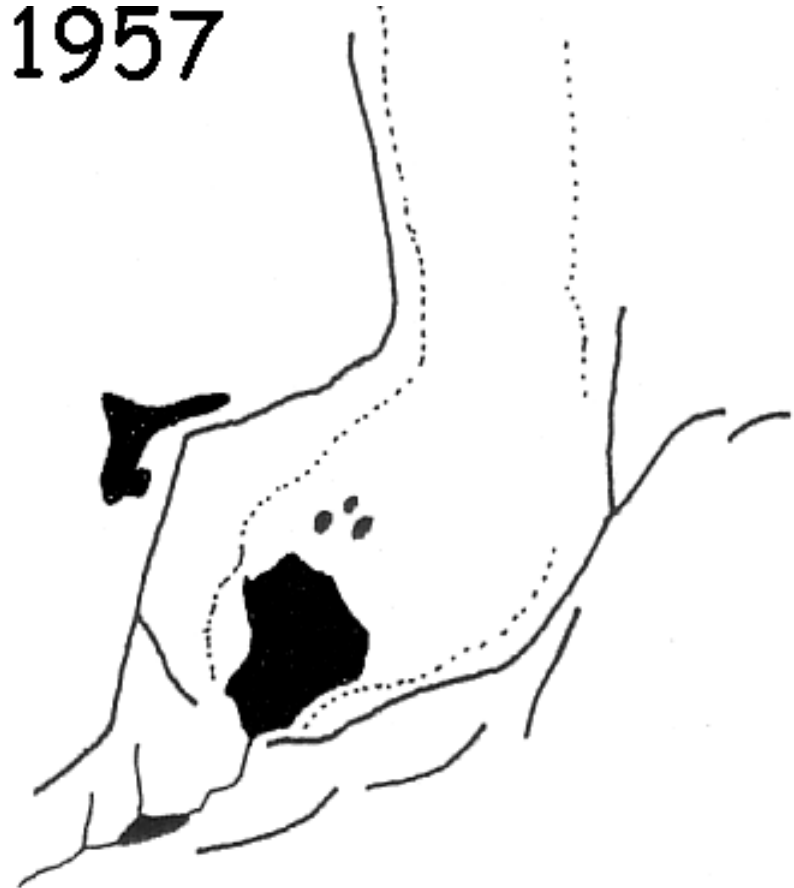
1993, SPOT

Cases of major Glacial Lakes from Lunana (Bhutan Himalaya)

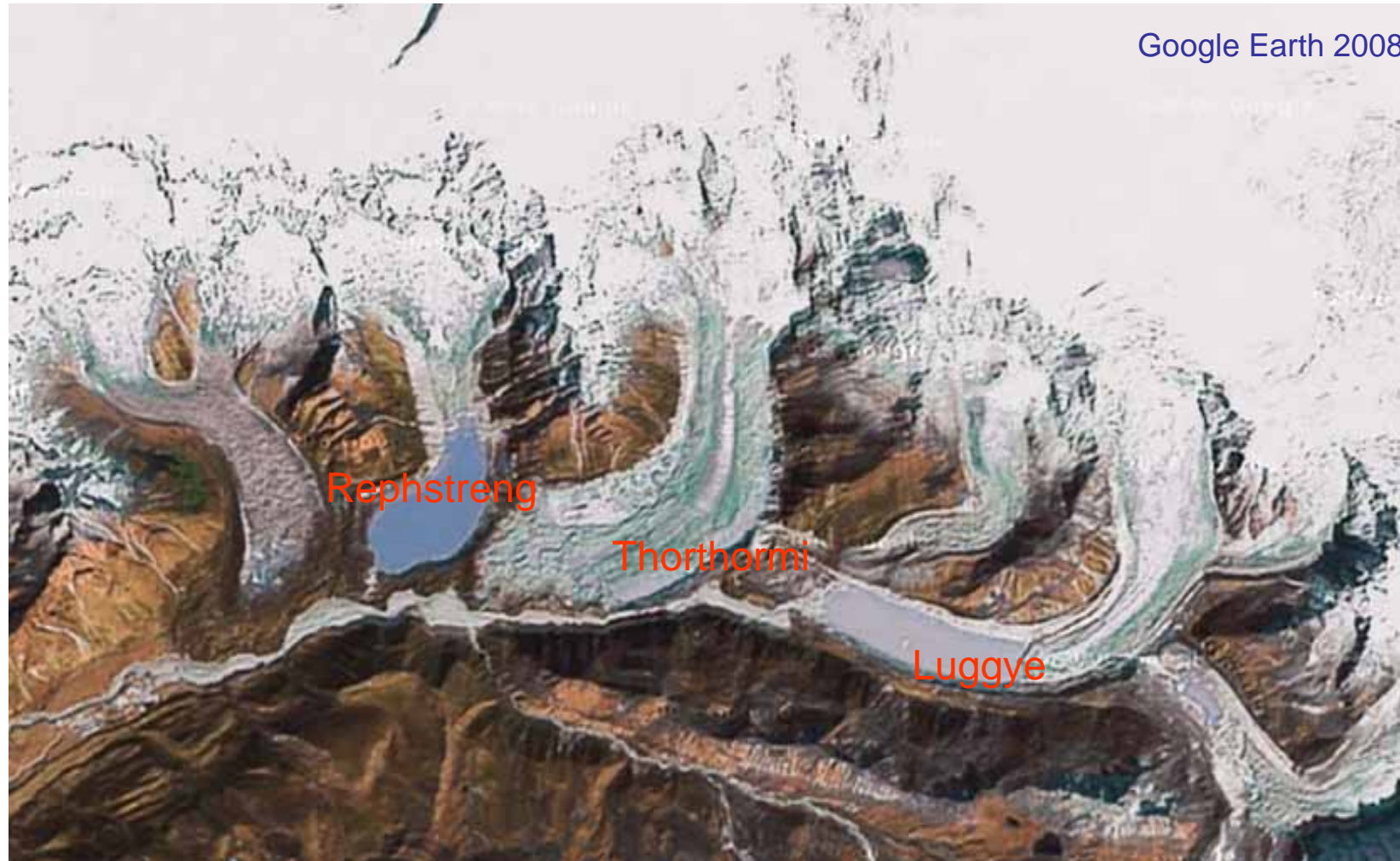
Raphsthreng Tsho



1957

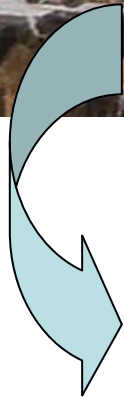
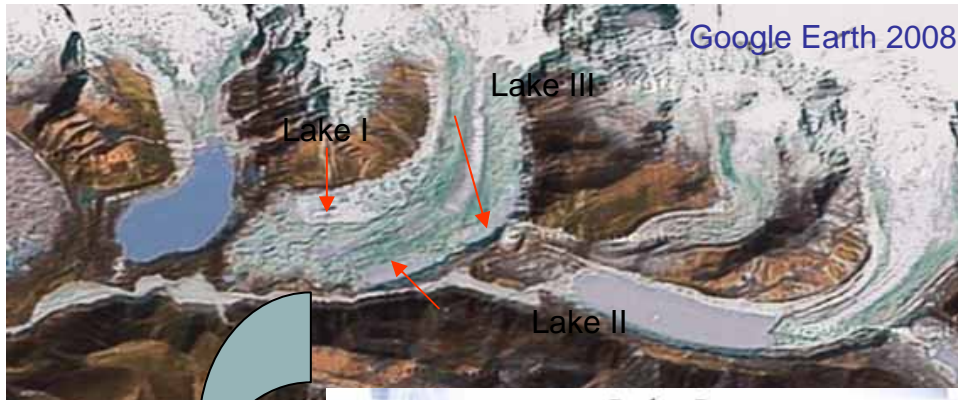


Interconnected glacier and glacial lake systems.



Thorthormi – Potentially dangerous?

Size of glacier (3.422 sq. Km)

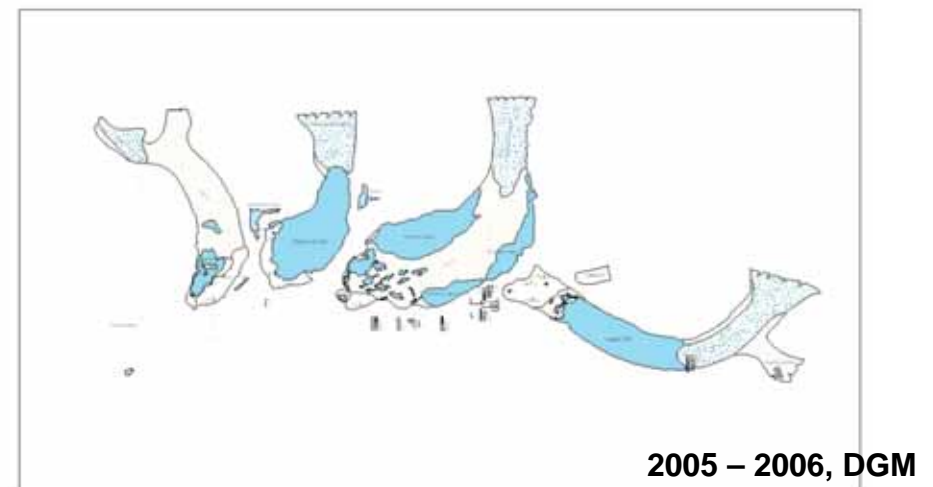
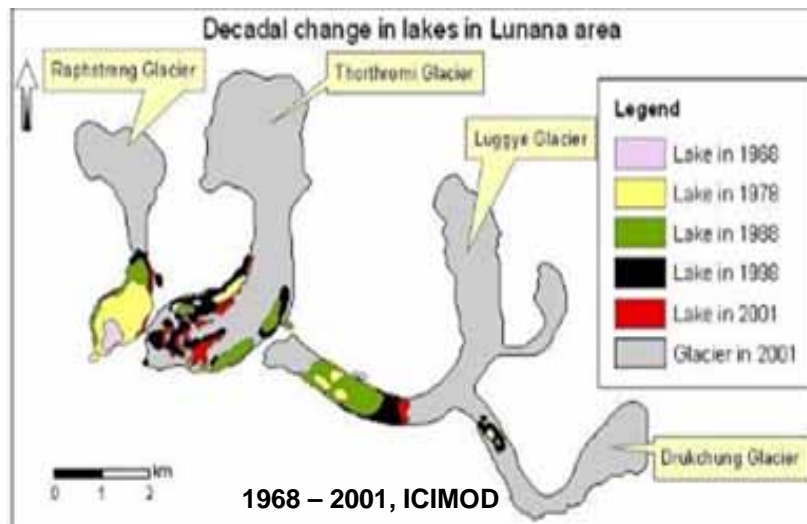


Thorthormi – Potentially dangerous?

Formation of large supra-glacial lakes

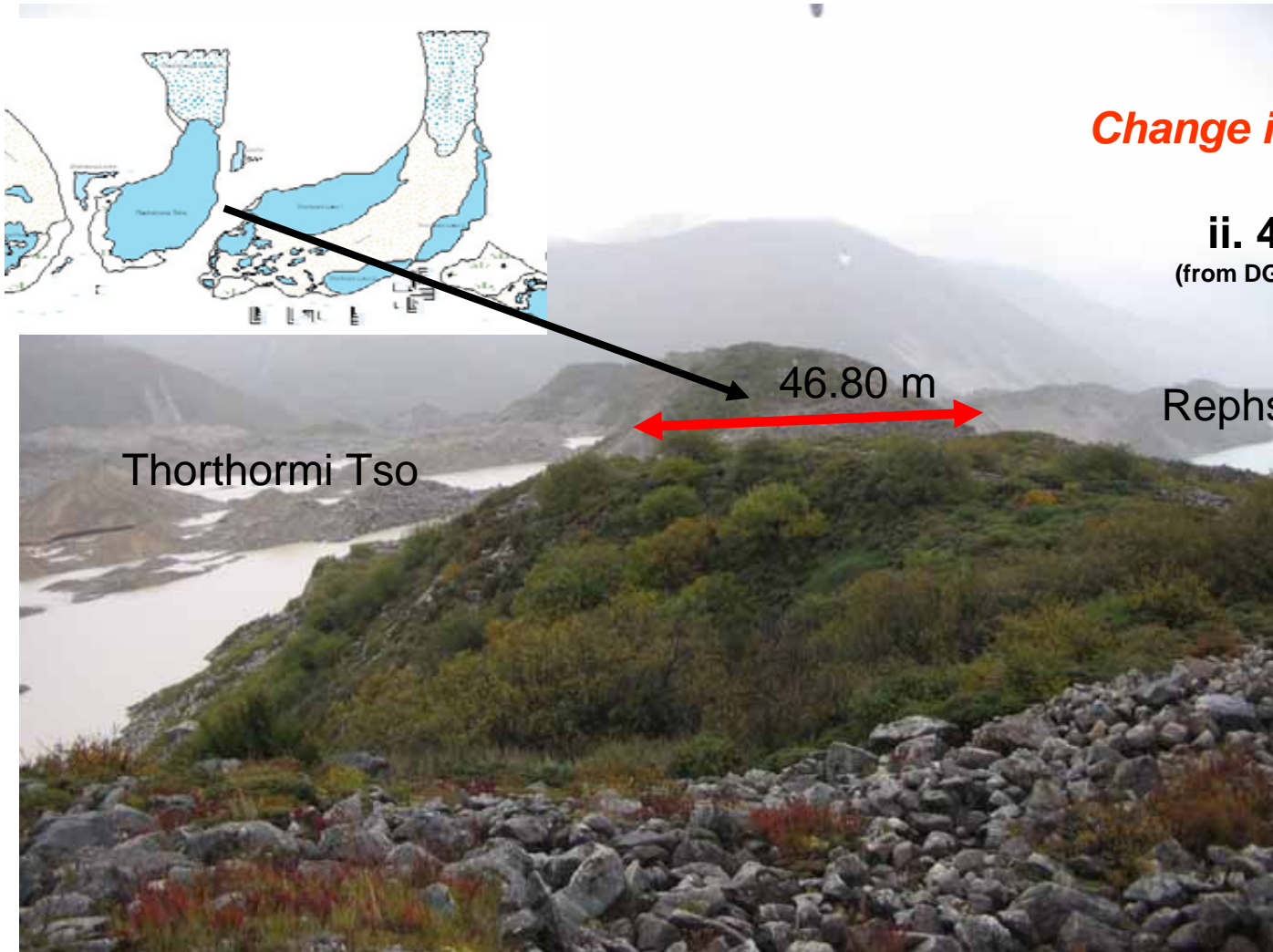


Rapid extension of the supra-glacial lakes due to fast glacial melting.



Thorthormi – Potentially dangerous?

Thinning barrier between Thorthormi and Raphstreng



Change in barrier width

i. 75 m in 2006

ii. 46.80 m in 2007

(from DGM annual Lunana reports)

46.80 m

Raphstreng Tso

Thorthormi Tso

Change in Glacier



Change in Glacier

Oct. 1984

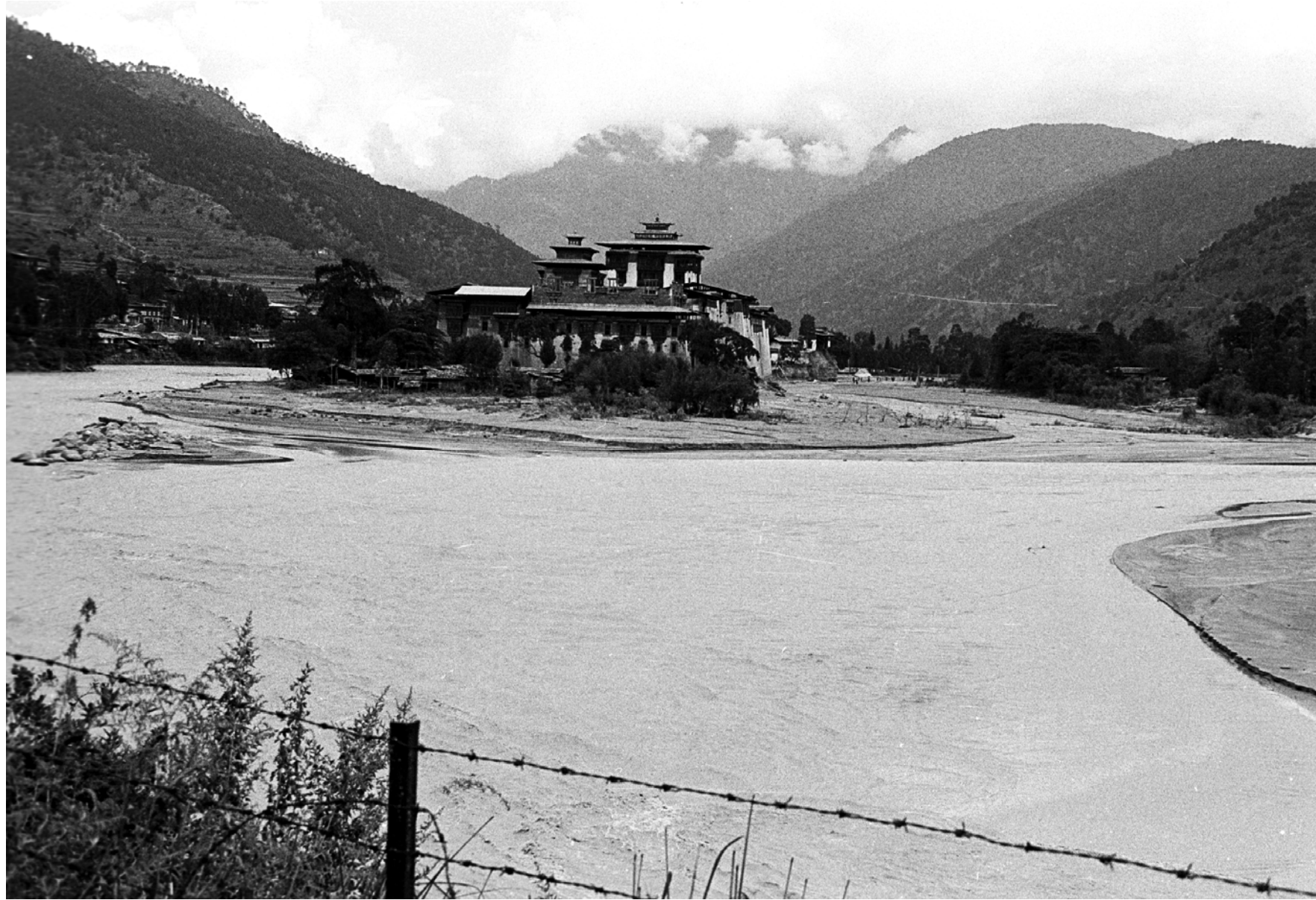


Oct. 1999





- ❖ **Major GLOF incidences 1957, 1960 and most recently 1994**
- ❖ **The 1994 GLOF caused 21 lives and damaged more than 1700 acres of land.**

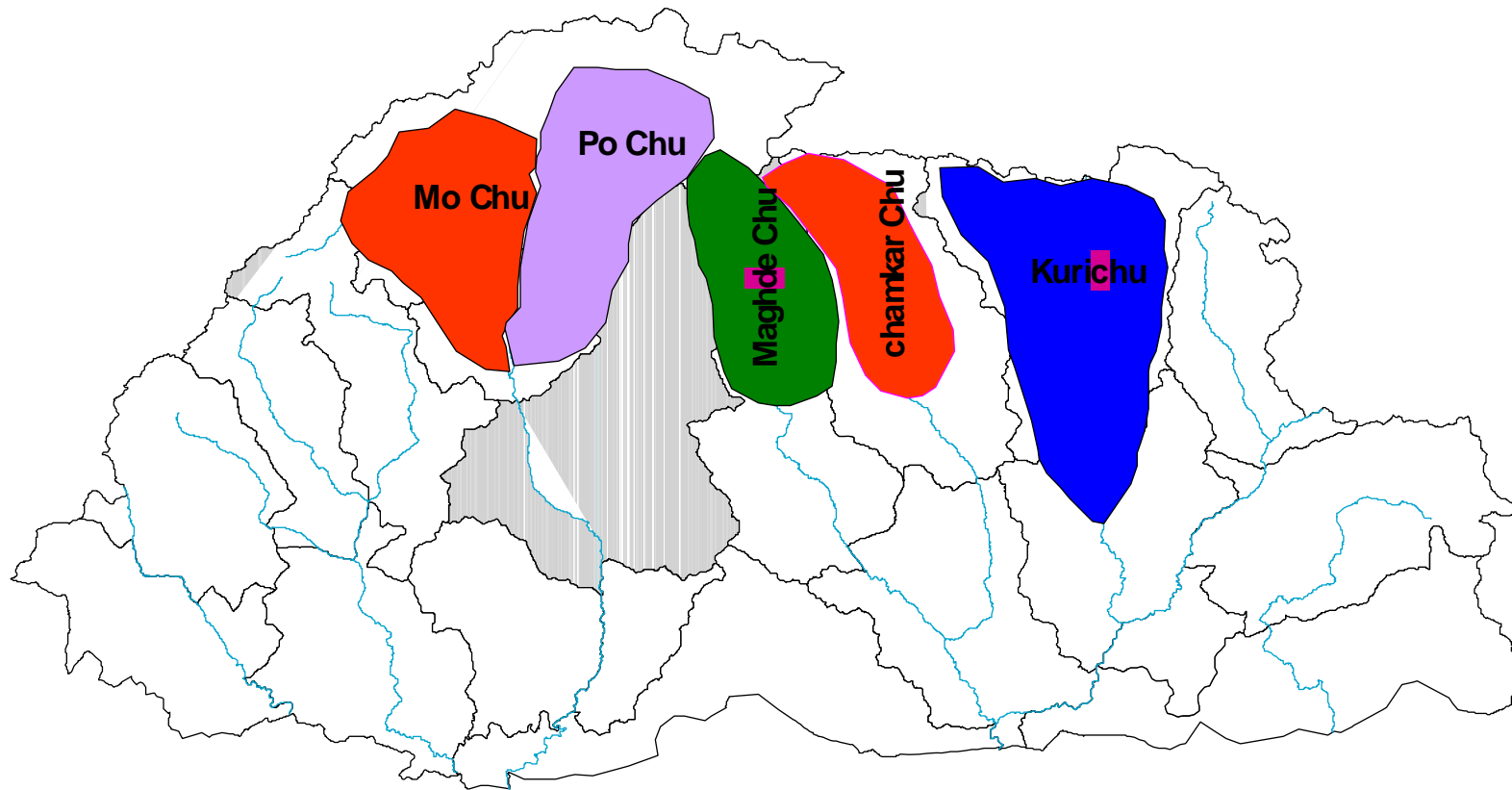




❖ **GLOFs threaten lives and livelihood of people living in the valleys and low lying river plains.**

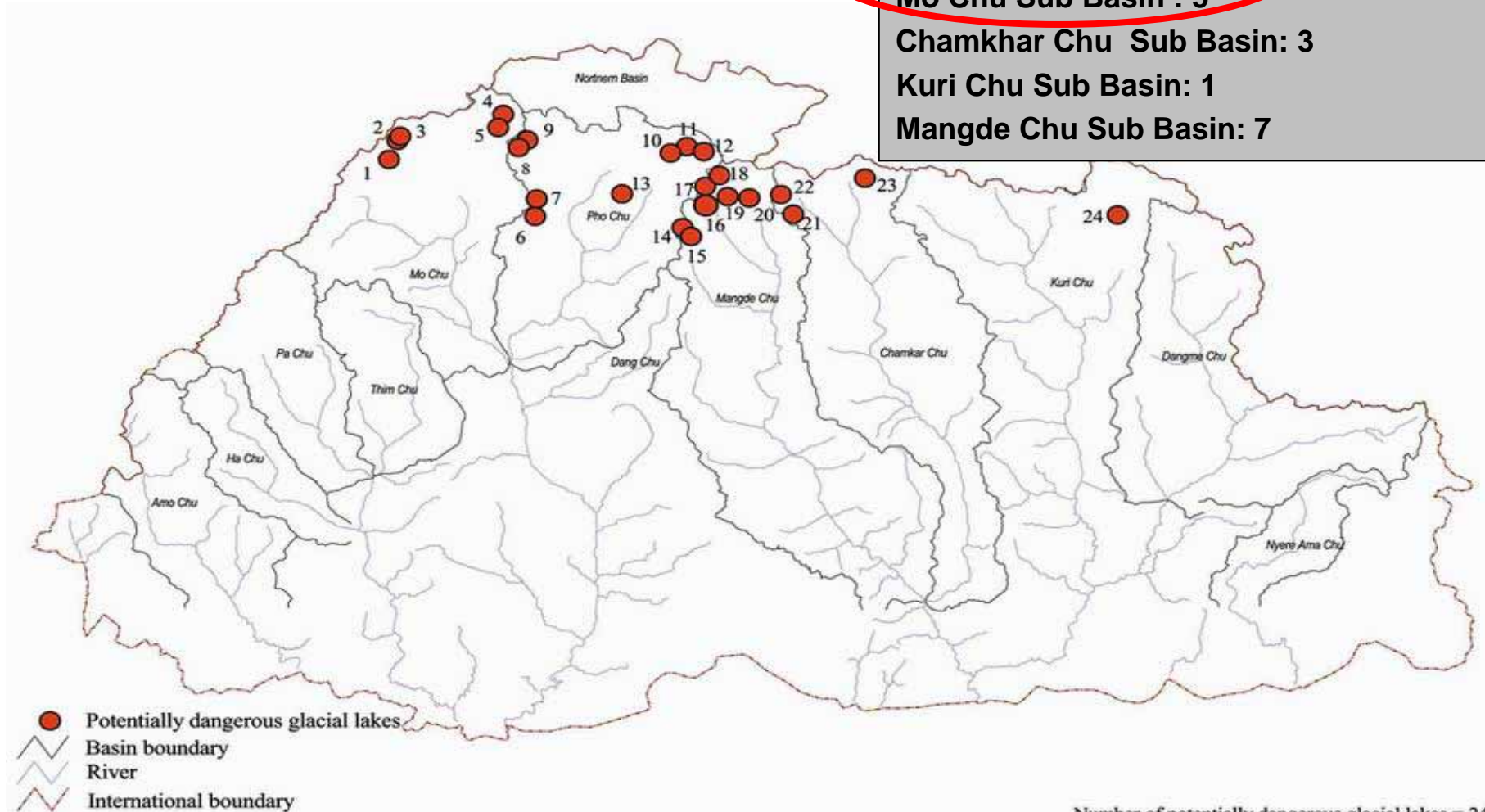


- ❖ **The basins of Mochu, Po chu, Mangde chu, Chamkhar chu and Kuri chu pose threats to the lives, livelihoods of people living in the valleys and low lying river plains**



Potentially dangerous glacial lakes of Bhutan

Pho Chu Sub Basin : 9
Mo Chu Sub Basin : 5 **14**
Chamkhar Chu Sub Basin: 3
Kuri Chu Sub Basin: 1
Mangde Chu Sub Basin: 7

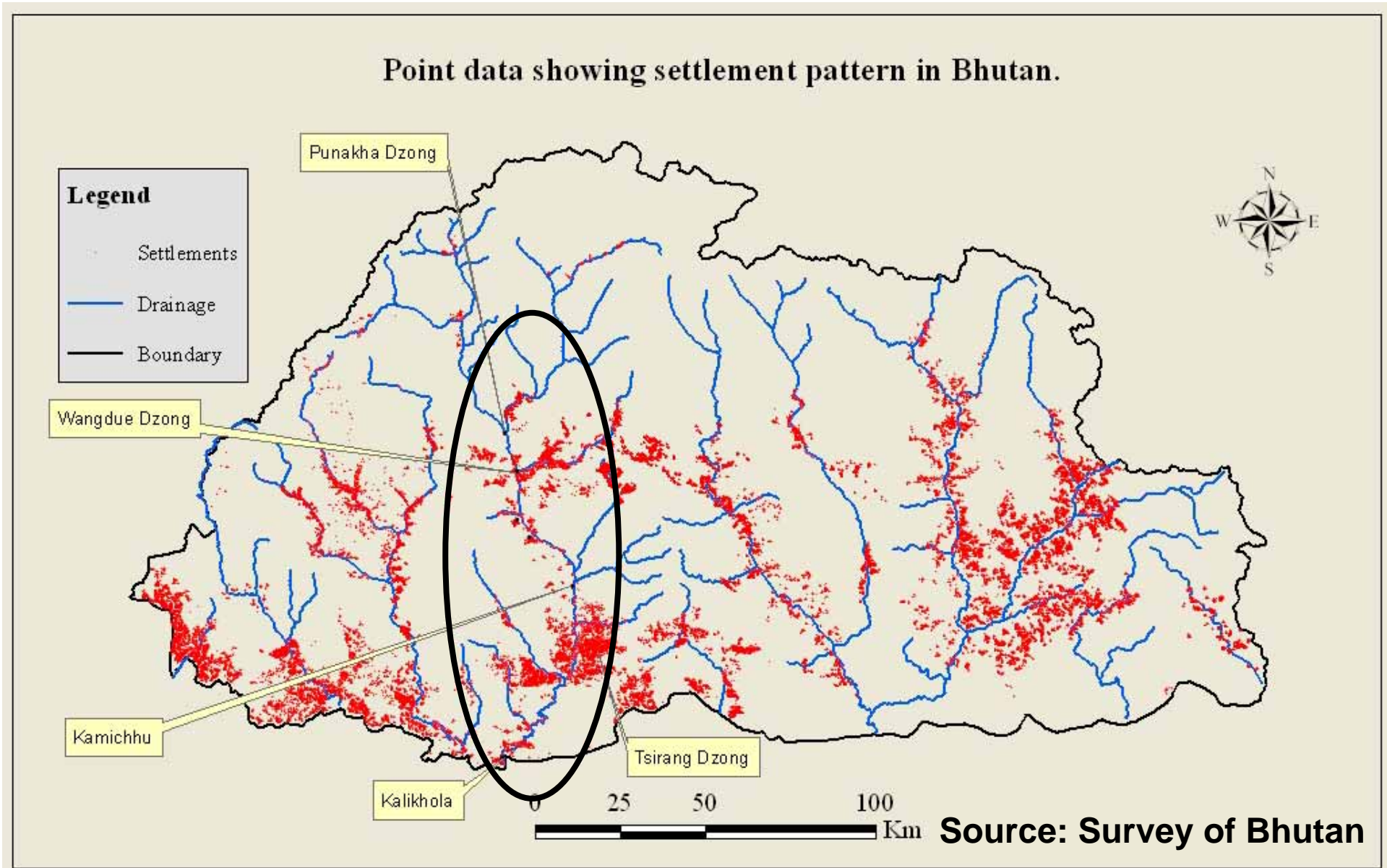


Number of potentially dangerous glacial lakes = 24

Out of **2794** glacial lakes, **25** has been identified as potentially dangerous lakes.

Source: DGM & ICIMOD publication

Point data showing settlement pattern in Bhutan.

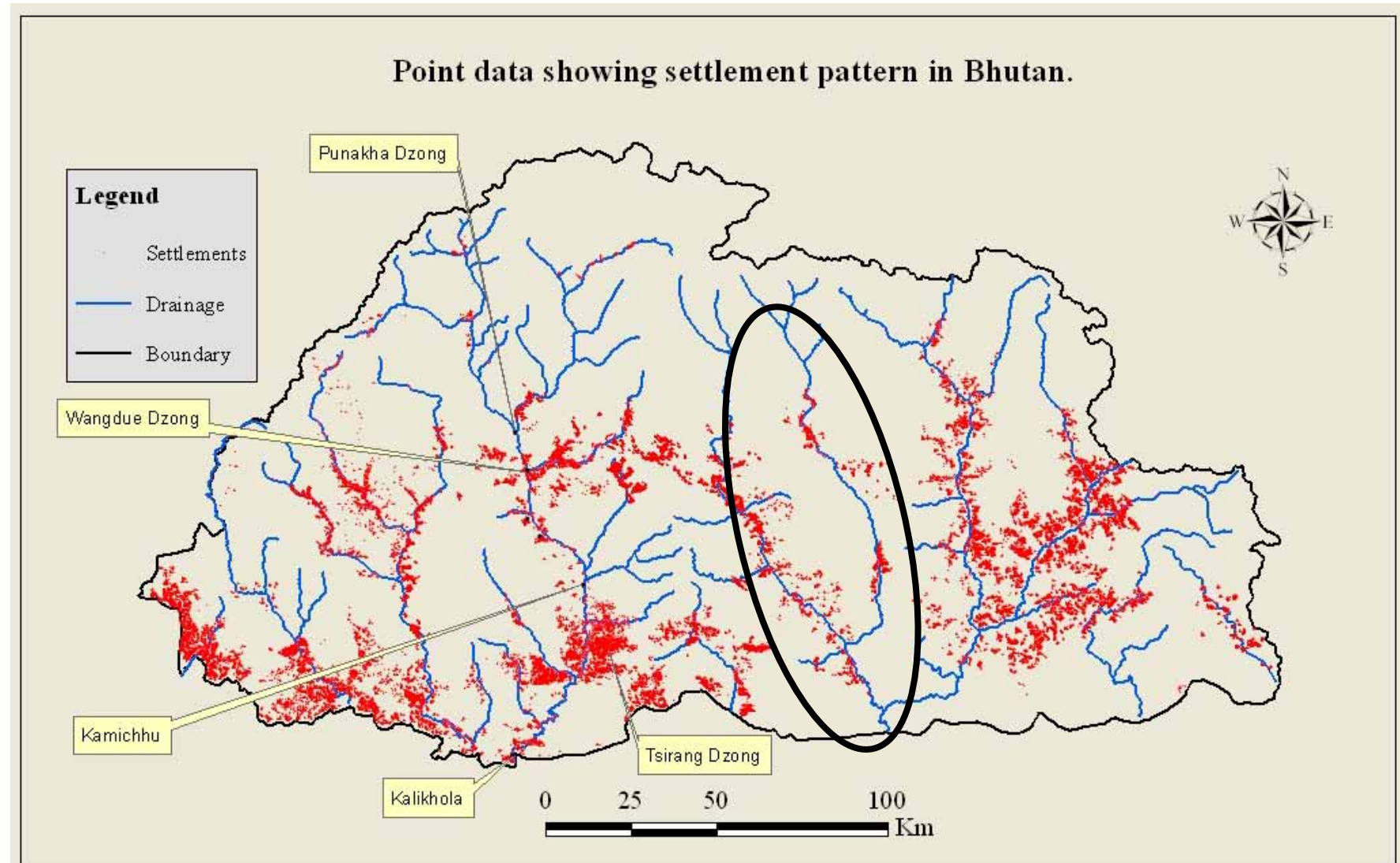


Over 70% of the settlements are located along the drainage basins.

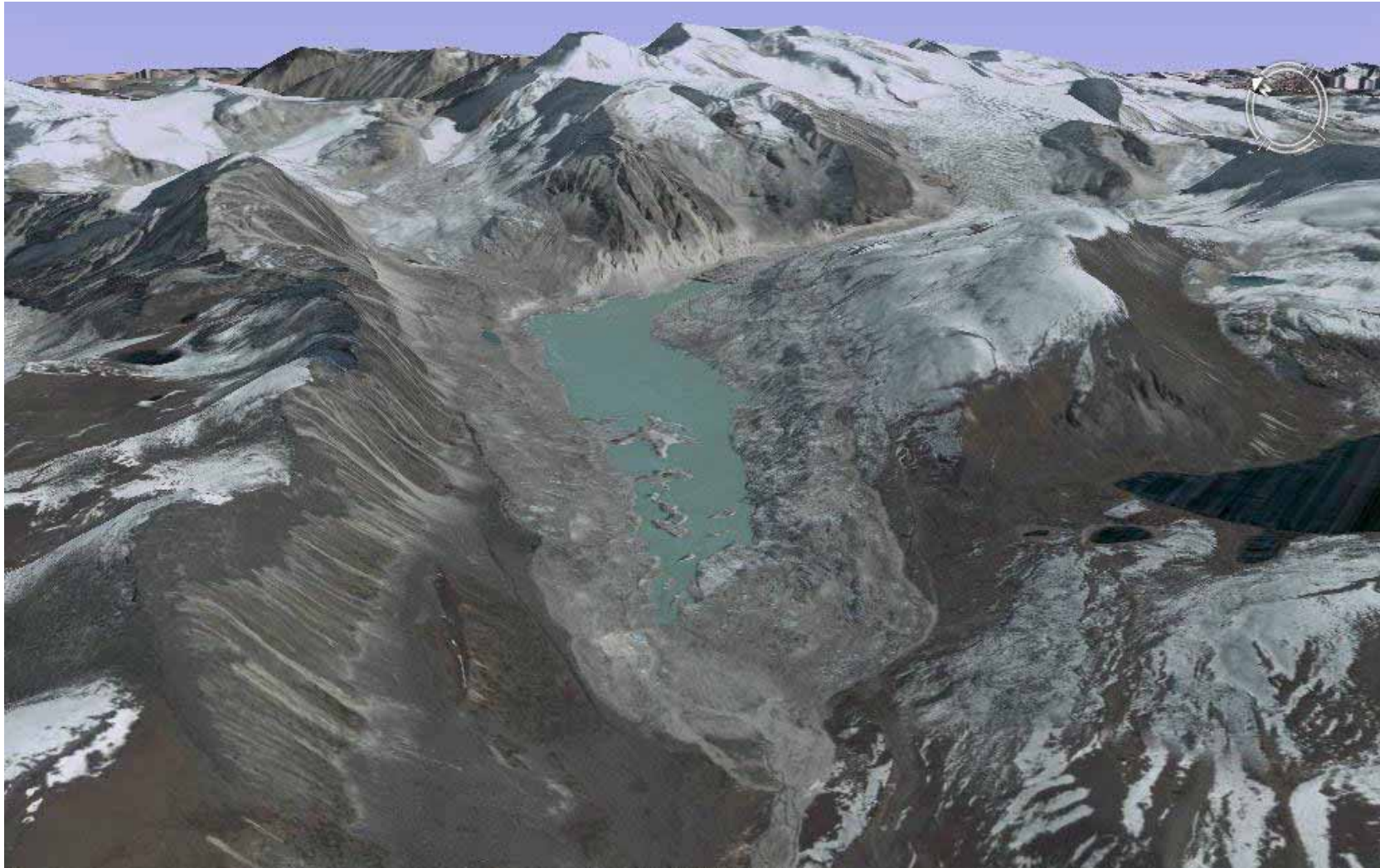


Raphstreng and glacier tongue of Thorthormi Glacier
Sat imagery: 1994 and 1999

The Chamkhar chu Basin



Chubda Tso (Chamkhar Chu Sub Basin)



Floods



- ❖ **Recurrent phenomena in Bhutan**
- ❖ **Killed 49 people and destroyed 17 houses in Pasakha.**
- ❖ **2004 monsoon in eastern Districts have caused loss: 9 lives, 29 houses, and 664 acres of land.**
- ❖ **The most recent flash floods of Phuentsholing and Pasakha have caused 49 lives and destruction to 17 houses.**



Natural Dam formation and dam bursts



- ❖ In September 2003, there was a dam formation at Tsatichhu which burst its banks in July 2004 releasing 6000 cubic meters per second
- ❖ There are also trans-boundary threats due to such dam formations

Natural Dam formation and dam bursts

- Such hazards will continue to prevail in Bhutan's rivers placing many of the hydropower plants, farmland and human settlements at risk.



Landslides



- ❖ Slopes in the country highly susceptible to landslides during rainy season.

Landslides



- ❖ **Most occur in the eastern and southern foothills belt where the terrain is steep and rocks underlying the soil cover are highly fractured, allowing easy seepage of water.**

Fires on forest and human settlements:



- ❖ **A total of 803 forest fires damaging 309,181.9 acres of forest were recorded from 1994-2004.**
- ❖ **In 2002, 25 houses in Yangthang village in Haa were burnt.**
- ❖ **In 2005, 5 houses in Bumthang were burnt**
- ❖ **March 2006, forest fire in Bartsham destroyed five houses and killed 3 people.**



Epidemics, Pests and Diseases:



- ❖ Avian flu and other diseases
- ❖ An influenza pandemic is a unique event
- ❖ Once a fully transmissible pandemic virus emerges, its international spread is considered unstoppable
- ❖ Through trade in poultry and poultry products
- ❖ The migratory water birds
- ❖ Damages to crops by wild animals etc

Ongoing Efforts

- Disaster Management Committee as in place right to the village level
- Improvement of early warning system in case of GLOF
- Mitigation work amounting to US\$ 7.8 million to start soon (draining out water through channels with regulated discharge)

Thank you for your Attention

TASHIDELEK