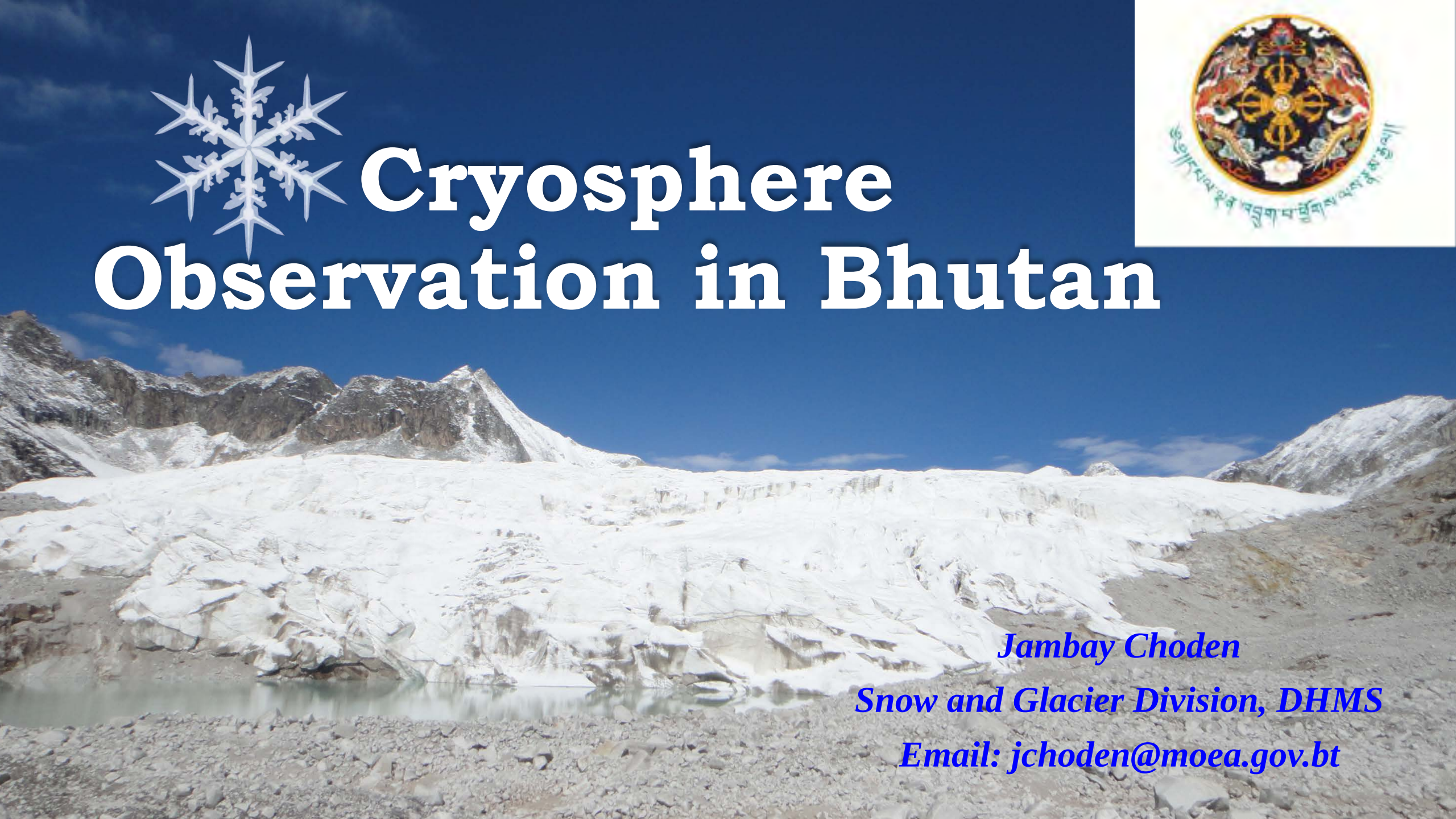
Cryosphere Observation in Bhutan



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Outline of Presentation

- Background
- Glacial lakes in Bhutan
- Glacier Activities
- Snow Monitoring
- Challenges
- Future plan

Background

Snow and Glacier Division:

- Smallest and the newest division formed in 2013
- Staff strength - 4

Is responsible for studying the snow and glaciers of the country through setting up of field measurement systems and remote sensing techniques. The cryosphere data and related services shall be provided to end users for understanding the complete hydrological system of Bhutan and to ascertain climate change impacts on the Himalayas of Bhutan.

Glacier

Number of Glaciers in Bhutan (2010, ICIMOD) CI=885, DC=50

Glacier Area in Sqkm in Bhutan:CI = 550+/-13.8, DC= 91+/-0.7.

Highest Elev= 7231 masl CI, 5373DC,

Lowest Elec= 4469 masl CI, 4053 DC,

Snow

Average snow cover area (SCA) of Bhutan estimated for the period 2002 to 2010 was 9030 sq. km, about 25.5% of the total land area.

Glacial Lakes in Bhutan

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

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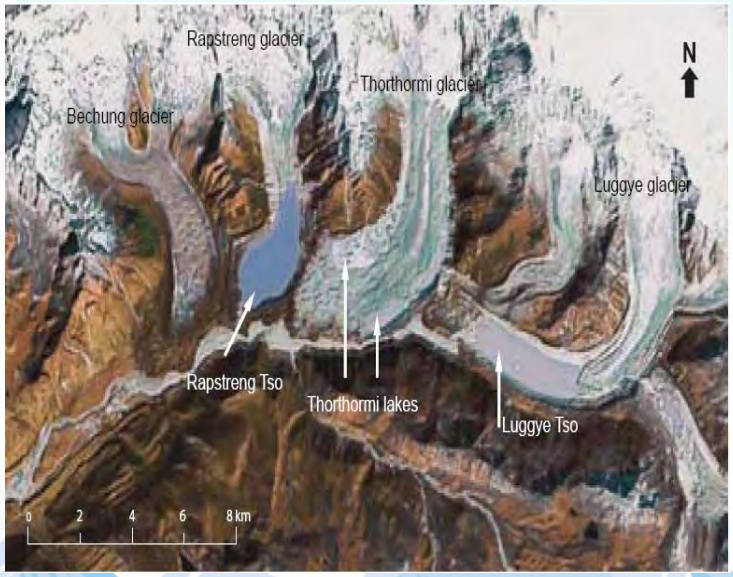


Out of 2068 glacial lakes, 25 has been identified as potentially dangerous lakes.

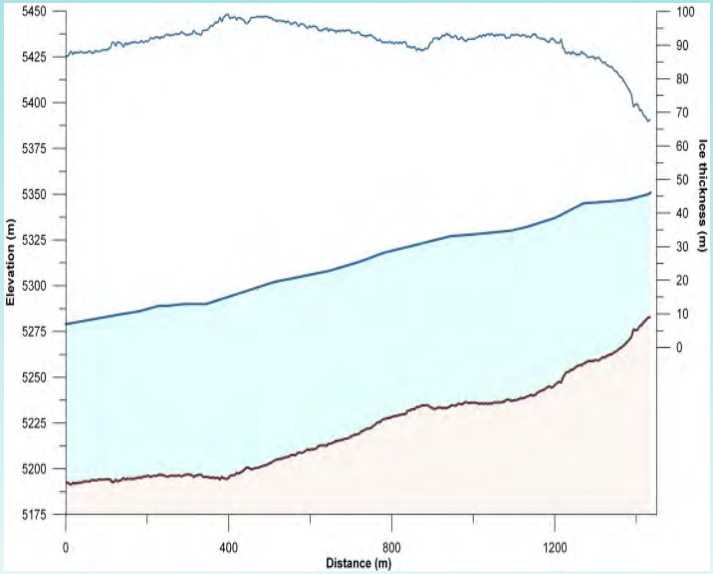
Glacier Activities

Field Measurement conducted till date.

- Annual mass balance/net balance at Metatsota and Thana.
- Ice thickness measurement using Ice Penetrating Radar (April2014).
- Recording ambient Air Temperature(AT) and Relative Humidity around Glacier tongue using data logger(frog).
- Conducted Net balance from 2013.

AT & RH recorded since Oct. 2013.

Thana Glacier Sept. 2014

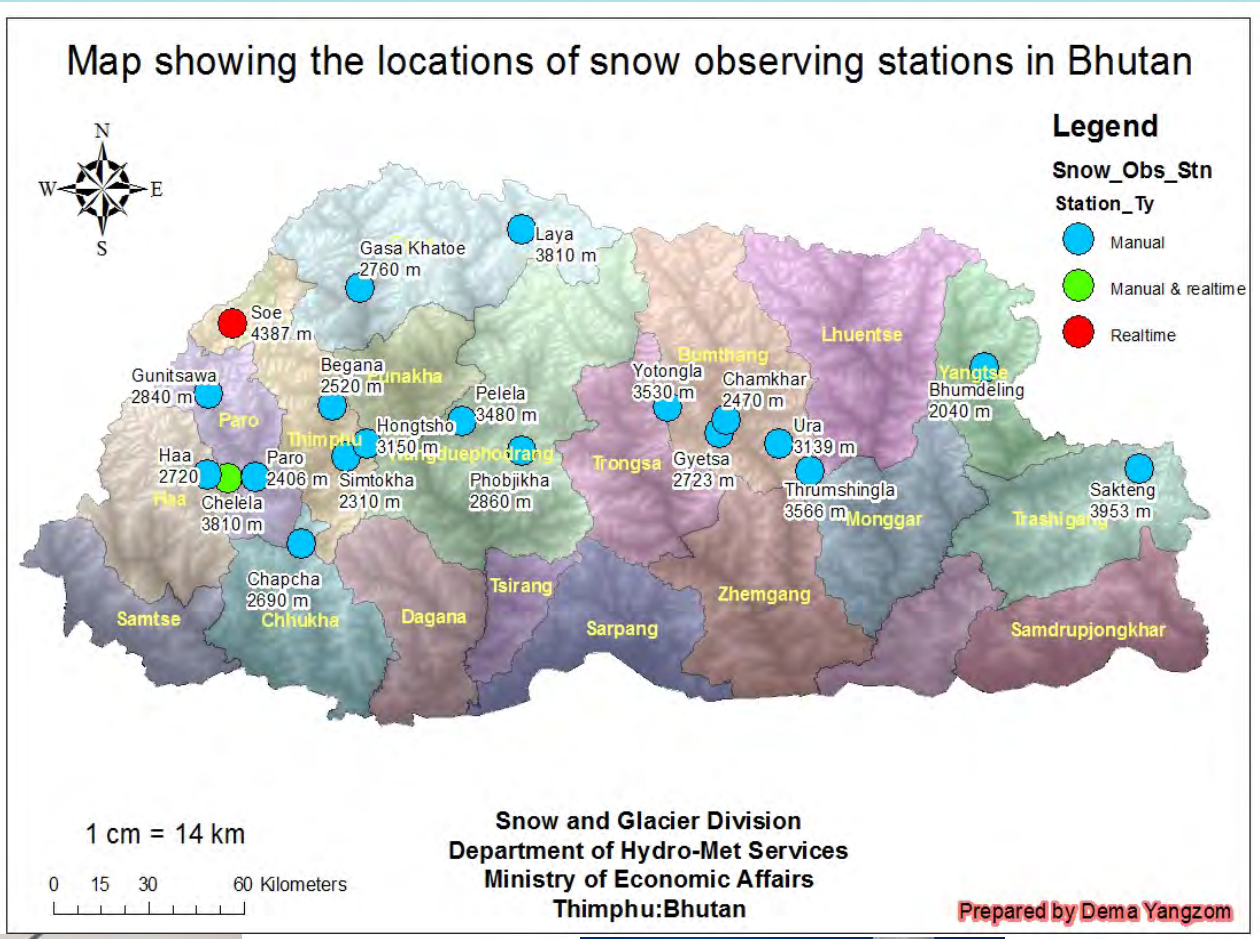


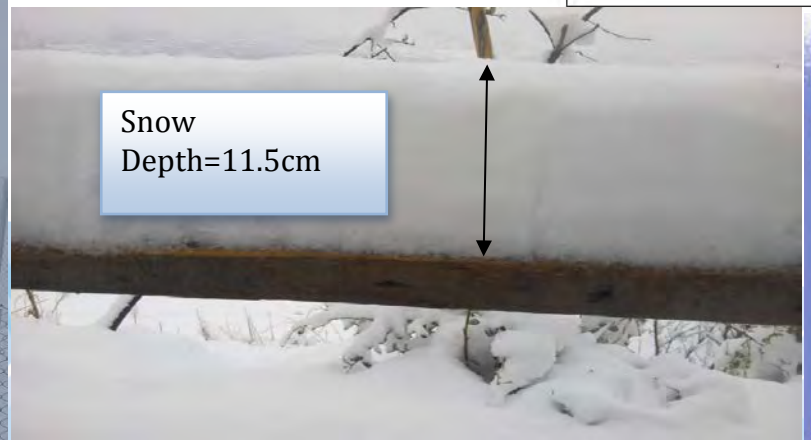
Metatsota Glacier Sept. 2014

Snow monitoring

Automatic Station=2 (Snow Depth, TPG and other weather parameter).
Manual Stations=19 (above 2000masl and passes)
Manual station records

1) Snow depth.
2) Snow Water Equivalent (SWE).
3) Snow Incidences.





CHALLENGES

- Accessibility
- Health and safety of team members (lack of emergency rescue operation /insurance policies)
- Transportation of Equipments
- Limited technical capacity
- Financial resource

Future plan

- To expand snow and glacier monitoring network across the nation.
- To build in-house research capacity in order to provide analyzed climate data and information.
- To conduct aerial survey on snow and ice using latest technologies (LiDAR).
- To focus more on geodetic mass balance measurement and remote sensing techniques on understanding cryosphere.
- To study the contribution of melt water to runoff of major river systems.

Thank you

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Tashi Delek!