Nepal Geographical Society (NGS) Webinar Series - I

Nepal Geographical Society Successfully Organized First Webinar

Nepal Geographical Society (NGS) has successfully organized first webinar on 8 August 2022 based on its plan of organizing webinars series in different crosscutting contemporary issues from geographic perspective. Dr. Bhagawat Rimal was the speaker of the event and had presented his research work "**Evidencing Climate Vulnerability of Land-Water Partitioning using Remote Sensing Technology**". Over three dozen participants from Nepal, China, Switzerland and USA including professional geographers/geoscientists, universities professors/faculties, researchers working in different sectors, and students actively participated on the event. Following the presentation, interesting discussion was held. Dr. Rimal responded queries and comments raised by the participants.

Mr. Tibendra Raj Banskota, Joint Secretary of NGS hosted the event and welcoming to the speaker and all the participants. The next, Dr. Basanta Paudel, the General Secretary of NGS has delivered vote of thanks and appreciations to the speaker and all the participants of the event. Finally, Dr. Bipin Kumar Acharya, President of the NGS had stated concluding remarks of the event with appreciations to the speaker as well as all the participants. Next episode of webinar series will be held on first week of September, 2022 on another geographic theme.

Once again Nepal Geographical Society express sincere gratitude to the event presenter Dr. Rimal and the all the participants of the event.

About Speaker and Abstract

Title: Evidencing Climate Vulnerability of Land-Water Partitioning using Remote Sensing Technology

Abstract: Nepal Has been vulnerable to the adverse effect of climate change, leading to shrinking and expansion of landmasses respectively due to melting of glaciers and evaporative losses in the upper Himalayan regions, mainly due to the rising temperature. This work presented effective implementation of remote sensing technology for monitoring evolutionary patterns of mountain lakes under climate stress in hard to reach glacial terrains.

Surface water content for three mountain glacial lakes (Kapuche, Dona, Tilicho), ranging between 2500-5000 meters above the mean sea level in the Gandaki region of Nepal, were evaluated on the basis of Modified Normalized Different Water Index (MNDWI) technique. Our longitudinal analysis (1988 – 2020), utilizing satellite data from Landsat Thematic Mapper (TM), Enhanced Thematic Mapper (ETM+) and Operational Land Imager (OLI), shows an increment in surface water pixel for Dona and Kapuche lakes (mean pixel value of 30 meter resolution), implying expansion of these glacial lakes over this period. The expansion of the studied lakes show positive correlation with the annual temperature rise in the region; the highest annual temperature rise of 0.158C is estimated over the study period. The study demonstrates potential for remote sensing technology for in situ pervasive monitoring of the spatiotemporal climate change impacts on topographically complex landscape.

Key words: glacier; MNDWI; remote sensing; mountain lake; surface water

Speaker:
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Bhagawat Rimal has acquired his Master's degree in Geography from Tribhuvan University, Kathmandu Nepal in 2002 and Obtained the PhD degree from Wroclaw University in 2011 in Geography. He has completed his Postdoctoral Research from the institute of Remote Sensing and Digital Earth (RADI), Chinese Academy of Science (CAS) in 2018. More than 40 research articles on different national and international scientific journals are under his credit as lead and co-author.. He has been contributing in several research and development projects with a national and international team of expert. He has been enrolled as teaching staff in College of Applied Science (CAS) Nepal since 2013 to date. Dr. Rimal has actively participated in various national and international seminars, workshops, conferences and training programs in the related fields.

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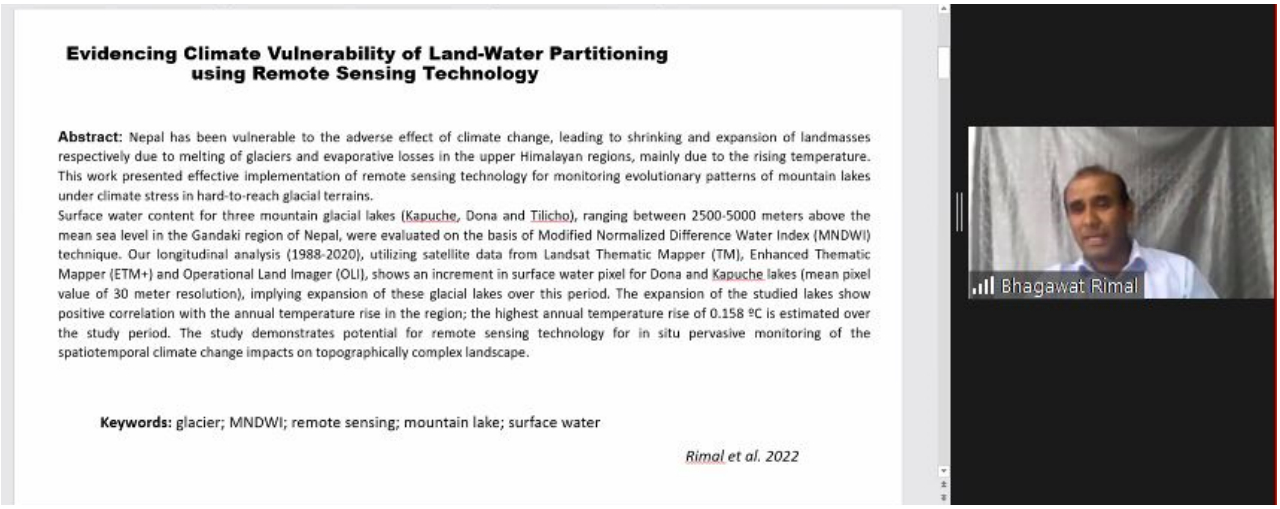
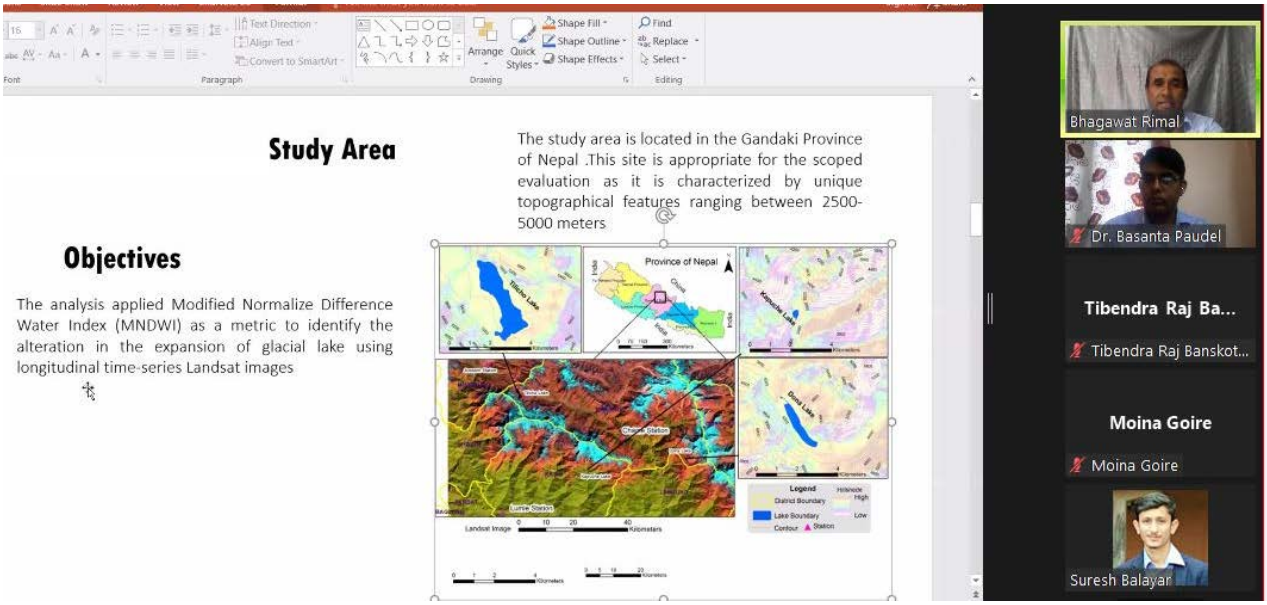
Email: ngs@ngs2018.org.np
Website: https://ngs2018.org.np/
Nepal 8 August 2022, Monday

Some Glimpse of the First Episode of NGS Webinar Series





Methodology

- The maximum cloud free Landsat time series level 1 data, including: Landsat 5 Thematic Mapper (TM); Landsat 7 Enhanced Thematic Mapper Plus (ETM+), and Landsat 8 Operational Land Imager (OLI) for the years between 1988 and 2020 were acquired from the US Geological Survey (USGS) website (https://earthexplorer.usgs.gov)

Time series Landsat 5, 7 and 8 imagery applied (Path/Row 142/040).

Year	1988	1991	1995	1999	2002	2005	2009	2013	2016	2018	2020
Months	19-Oct	12-Oct	8-Nov	13-Dec	3-Nov	18-Oct	29-Oct	24-Oct	1-Nov	7-Nov	Oct-11
Sensor	TM	TM	TM	TM	ETM	TM	TM	OLI	OLI	OLI	OLI

- All the images were registered and their accuracy were verified considering <0.5 pixel RMS errors. The digital number (DN) of Landsat Level 1 data values of all images were converted into radiance and further atmospheric corrections of all the images were conducted using ENVI software v5.3 and map was prepared in ArcGIS v10.4.

Rimal et al 2022

Method con...

- As a first step, cloud free Google Earth images for 2020 were used for evaluation of lake extent, mainly boundary delineation of the water area of all the Three lakes.

Tilicho lake Lake,10-5-2020

Kapuche lake, 10-30-2020

Dona lake, 10-12-2020

Method...

- The analysis with the MNDWI threshold values is based on the changes in those water features extracted using band ratio threshold values.

$$MNDWI^{TM} = \frac{Green(Band\ 2) - SWIR\ (Band\ 5)}{Green(Band\ 2) + SWIR\ (Band\ 5)} \quad \text{Equation 1}$$

$$MNDWI^{OLI} = \frac{Green(Band\ 3) - SWIR1(Band\ 6)}{Green(Band\ 3) + SWIR1(Band\ 6)} \quad \text{Equation 2}$$

MNDWI (Zhai et al. 2015)

NDSI (Zhang et al. 2019, Yan et al. 2020).

- The extracted pixels were classified into two different parts - water and non-water, according to their respective thresholds. For the water body extraction process, initially the positive threshold values were set for all years' images.
- Thereafter, positive water pixel value (0 to 1) was evaluated using MNDWI, the topographical variance of the entire region map was prepared and presented.

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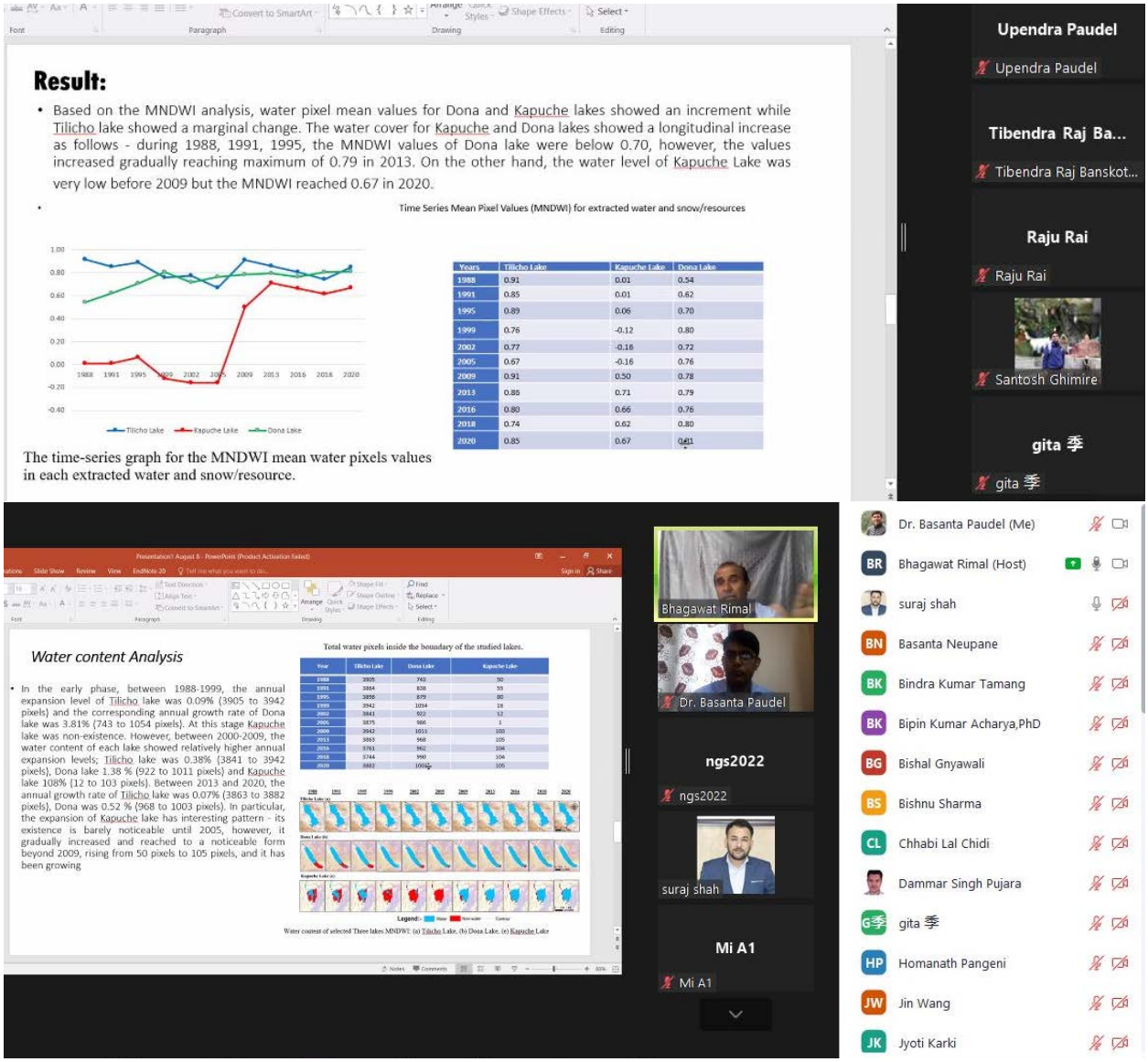

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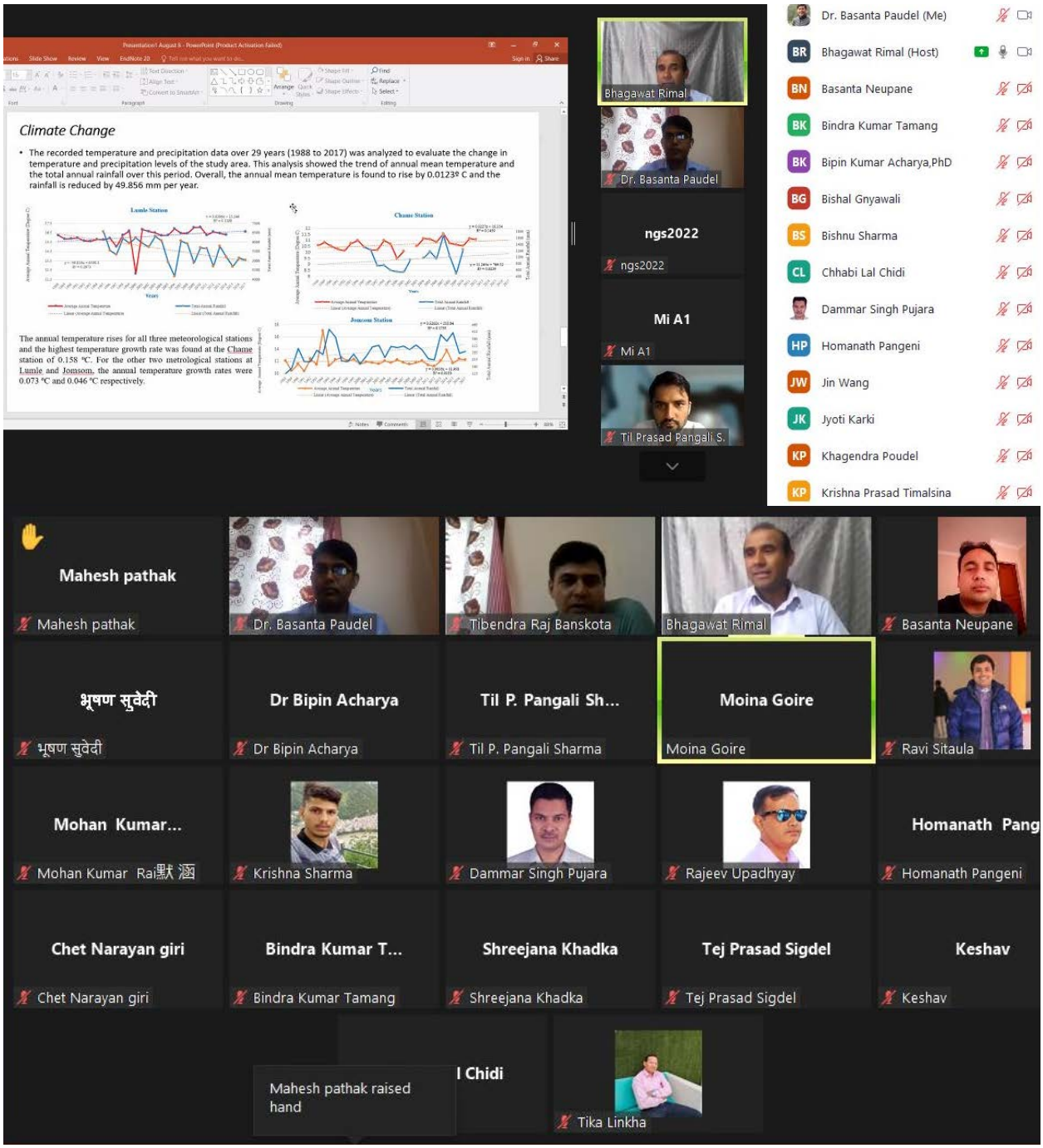

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