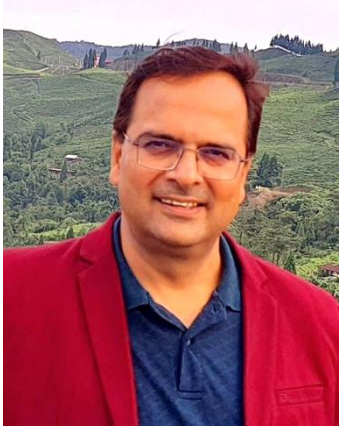

Title of talk:

Recent effects of high-altitude geomorphological systems for triggering geodisaster in the Himalayas

Brief Biodata:

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Dr. Ranjan Kumar Dahal, a professional geology engineer and geohazard expert of Nepal has been working in the research field of geohazards such as earthquake, landslide and debris flow for the last 27 years. He has completed PhD and PostDoc in geohazards and specialized in landslide, debris flow and earthquake risk research and management. At present, he is serving Tribhuvan University as Associate Professor. From the research and academic perspective, he has published more than 120 technical/scientific papers in peer reviewed international and national journals. He is also author of four books and co-authored three books. Based on his excellent credential and academic contribution, he has been awarded as Young Scientist of Nepal in 2009 by Nepal Academy for Science and Technology (NAST) and in 2010, he has been nominated as Fellow Academician in NAST. He is serving Kagawa University, Japan and Shimane university-UNESCO Chair Program, Japan as visiting professor, and Ehime University, Japan as visiting associate professor. Dr. Dahal has worked on various research projects, training courses and consulting projects related to geohazard risk assessment in different countries, such as Japan, Taiwan, Uganda and India.

He is the Management Director of International Consortium of Geodisaster Reduction (ICGdR) and works in close coordination with geohazard experts of Japan, Taiwan, China, Indonesia, USA and European countries for geodisaster reduction for the benefit of human society and the natural environment, and capacity development, including education. He is the Associate-Editor-in-Chief of Springer Journal Geoenvironmental Disasters. He is Editorial Board Member of Bulletin of Engineering Geology and Environment of IAEG. Dr. Dahal is Founder President of the Nepalese Society of Engineering Geologists (NSEG) and recently he is elected as Vice-President for executive committee of IAEG for 2023-2026 tenure.

With such a long expertise and exposure of national as well as international geohazard research, he is serving Nepal for suitable mitigation practices for geodisaster resist infrastructures. He is also supporting Asian Development Bank (ADB) and World Bank (WB) as senior geohazard expert.

Recent effects of high-altitude geomorphological systems for triggering geodisaster in the Himalayas

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The Himalayas are exposed to almost all types of major geodisasters including earthquakes, floods, landslides, debris flows, glacial lake outburst floods and avalanches. A wide range of physiological, geological, ecological, meteorological, and demographic factors contribute to the occurrence of these disasters, but more prominent in the Himalayas are rapid population growth, slow economic development, high degree of temperature and rainfall variations in the elevated area, and fragility of the land mass. At the same time, climate change have not only adversely affected the environment and people's livelihood but have also led to increased severity, frequency and scale of geodisasters in the Himalaya.

In recent years, landslides, land subsidence, debris flows and floods are also frequent as a result of extreme weather events in the Himalayas. Glacial lake outburst floods triggered by a wide range of hydrological and meteorological factors are also common in the Himalayas. All this indicates that geodisasters are changing its nature and such changes are purely unprecedented. So, enhancing geodisaster adaptation capacity in communities and infrastructures are major challenge to all stakeholders of the Himalaya. On 15th June 2021, extensive rainfall and major landslides in the upper reaches of the Melamchi River catchment (upper western part of Koshi River basin) of central Nepal area resulted in a catastrophic flash flood mixed with debris in the Melamchi River. This event caused 17 causalities and at least 23 have been reported missing. The flood damaged Melamchi Water Supply Project's headwork area and buried many settlements downstream. It took 25 years to complete the water supply project and when it was ready, the floods damaged all its headwork structures. This 2021 Melamchi flood is a highly alarming type for the infrastructure projects in the river valley specially installed in snow-fed rivers. The Melamchi River flood disaster was a result of cascading hazards. Similar issues can be appeared in the higher elevation of other parts of the Himalayas as the rainfall is shifting to the northern higher elevation from the river valleys of lower elevation. It was well observed in Melamchi, Budhi Gandaki and Marshyagdi river basins of the Himalayas already. The Dudh Koshi river and Arun river basins could be another victim of such geodisasters.

Considering the context of the 2021 Melamchi Disaster present vulnerable situation in Dudh Koshi river basin, this paper describes the changing pattern of geodisaster scenarios in the Himalayas due to change in high-altitude geomorphological systems and associated future challenges to the river basin-based infrastructure projects, mainly hydropower, irrigation and drinking water projects.