ポカラ大学のミシュラ教授による特別講義が行われました。講義の詳細とミシュラ教授の研究の進捗に関する簡単な要約を以下に添付します。

Special Lecture on Recent Advances in Hydrology

Organized by Department of Resilient Society, Research Center for Social Transformation, Saitama University, Japan

Date: March 4, 14:00-15:00, 2025
Room. Building 1, 2nd floor 211 meeting room
Special Lecture: Professor Binaya Kumar Mishra Pokhara University, Nepal

TITLE: Extreme Precipitation and Flooding under Climate Change in the Bagmati River, Kathmandu, Nepal

Urban flooding is increasingly reported and attributed to climate change in rapidly growing and unplanned cities in developing countries, including Nepal. This has led to loss of human lives, property damage, and economic losses. In recent years, Kathmandu Valley experiences severe flooding almost every year. These floods cause hours of traffic disruption, force evacuations, and require people to move their belongings to safer places. To reduce these losses caused by extreme rainfall and flooding due to climate change, this research investigates the impact of climate change on heavy rainfall and urban flooding. It uses very high-resolution precipitation projections under the SENTAN project. The study assesses future changes in extreme rainfall, flood discharge, and inundation in the Bagmati River system, focusing on the Manohara River, a key tributary of the Bagmati. The widely used HEC-HMS and HEC-RAS models were applied to simulate flood discharge and flood extent. The findings show a significant increase in extreme rainfall and flooding due to climate change. This highlights the urgent need for better flood management and stronger involvement of stakeholders to ensure the sustainable development of Kathmandu Valley.

Registraion is not necessary. Everyone can join this special lecture.
Don't miss out on this great opportunity!

Research Report (March 4, 2025):

Extreme Precipitation and Flooding under Climate Change in the Bagmati River, Kathmandu, Nepal

Binaya Kumar Mishra, PhD
Professor, Pokhara University, Nepal

Background

Climate change is a critical global environmental issue, particularly for developing countries like Nepal. The combination of rugged terrain and poor infrastructure makes Nepal highly vulnerable to extreme weather events. Unprecedented extreme precipitation and flooding have caused significant loss of life and property, especially during the monsoon season. In the Kathmandu Valley, located within the Bagmati River basin, extreme rainfall and unexpected flooding have become more frequent. Understanding future changes in precipitation and flooding is crucial for mitigating the impacts of climate change and reducing hydro-meteorological risks.

This research investigates the impact of climate change on heavy rainfall and urban flooding in the Bagmati River system, with a focus on the Manohara River, a key tributary. The study utilizes the Non-Hydrostatic Regional Climate Model (NHRCM) to assess climate change scenarios, comparing present climate data (1981–2000) with future projections (2080–2099) under the SSP5-8.5 scenario. With a high spatial resolution of 2 km and a temporal resolution of 1 hour, the study evaluates future changes in extreme precipitation, flood discharge, and inundation. The widely used HEC-HMS and HEC-RAS models were applied for rainfall-runoff and inundation modeling respectively. The research covers the Bagmati River basin upstream of Khokana (593 km^2) and the Manohara River basin (72.4 km^2), providing valuable insights for flood risk reduction and climate adaptation strategies.

Preliminary results

Future precipitation is projected to have higher peaks compared to present values, indicating an increase in extreme rainfall events. Rainfall intensity-duration-frequency (IDF) curves, commonly used to estimate rainfall intensities for different durations and return periods, suggest that extreme precipitation will become more frequent and intense across all return periods and durations. As a result, flood peaks are expected to be significantly higher in future

climate conditions. The highest discharge recorded for present and future climate conditions is 1,362 m^3/s and 1,818 m^3/s, respectively, highlighting the increasing flood risk due to climate change.

Under future climate conditions, flood-prone areas are expected to expand significantly, increasing the risk of inundation. As the recurrence interval rises, both flood depth and the extent of inundation will grow, leading to more widespread flooding. Consequently, low-risk zones will transition into medium- and high-risk areas, posing greater threats to communities and infrastructure.

Preliminary conclusions

The integration of HEC-HMS and HEC-RAS models provides a strong framework for analyzing urban flood dynamics in regions with topography similar to the Kathmandu Valley. Simulating extreme precipitation and flooding serves as an effective tool for tackling the increasing flood challenges. The significant rise in extreme rainfall, flood discharge, and inundation underscores the urgent need for flood managers and policymakers to take action in addressing the growing flood risks posed by climate change.