

Cryosphere Monitoring in the Langtang Valley of Nepal



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Automatic weather station on Yala Glacier

Since 2011, various organizations including ICIMOD have been carrying out intensive glaciological, meteorological, and hydrological activities in the Langtang Valley under the Norwegian-supported Cryosphere Monitoring Programme (CMP). ICIMOD's cryosphere-related work in the valley is focused on the following activities:

- Field-based glacier monitoring
- Field-based hydrometeorological observations and monitoring
- Snow Accumulation and Melt Processes in Himalayan Catchment (Snow-AMP) Project
- Permafrost study and ground surface temperature monitoring
- UAV surveys of debris-covered glaciers

The cryosphere monitoring activities in Langtang are jointly carried out by ICIMOD; the Norwegian Water Resources and Energy Directorate (NVE), Norway; the Department of Hydrology and Meteorology (DHM), Government of Nepal; Kathmandu University (KU); and Tribhuvan University (TU), Nepal.

Glacier and hydrometeorological measurement stations in the Langtang Valley



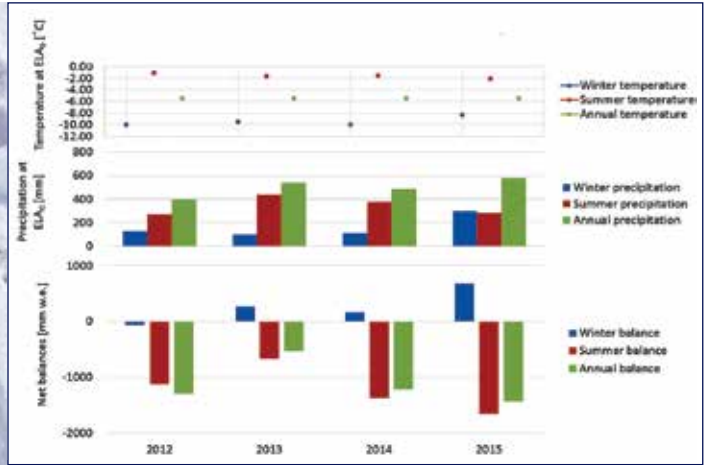
Field-based glacier monitoring

Yala Glacier's mass balance and length have been monitored seasonally since 2011. The mass balance is monitored using the glaciological method (stakes and snowpits) and complemented with differential GPS surveys to measure glacier surface changes. Additionally, seven trainings have been conducted for regional participants

as a part of the Master's Programme in Glaciology at Kathmandu University. Changes in glacier mass balance and length are important climate indicators. These indicators are reported on a regular basis to the World Glacier Monitoring Service (WGMS) and are used to support decisions related to water resource management.



Checking the size of snow grains on Yala Glacier



Temperature, precipitation, and mass balance on Yala Glacier for 2012 and 2013

Hydrometeorological observations and monitoring

Since 2012, ICIMOD and its partners have monitored the operation of meteorological and hydrological stations. Twelve meteorological and hydrological stations installed across the Langtang Valley have been pivotal in training regional and international postgraduate students through

research conducted in ICIMOD's Cryosphere Initiative. These stations collect important meteorological (air temperature, wind speed and direction, solar radiation, precipitation) and hydrological (water level) data that have been used in a number of influential publications.



Measuring stream discharge of Langtang Khola



The main Snow-AMP station (4,962 m) on the south slopes of Ganja La

Snow Accumulation and Melt Processes in Himalayan Catchment (Snow-AMP) project

The 'Snow Accumulation and Melt Processes in Himalayan Catchment' (Snow-AMP) project was implemented in 2015. Four automatic weather stations for snow monitoring were installed in the Langtang National Park. The stations provide measurements of snow height and snow water equivalent. The data collected are being used to validate a snow cover evolution model, and to study the contributions of snow melt to water runoff in the selected catchment.

Langtang valley and location of the Snow-AMP stations





Lirung Glacier (lower centre), Kimoshung Glacier (right), and Langtang-Lirung peak (left)

Permafrost study and ground surface temperature monitoring

Ground surface temperatures (GST) have been monitored on a hill slope (4,650–5,000 m) and a rock ridge (5,500 m) since 2013. The first analysis of GST provided surprising insights about the likely presence of permafrost in this climatic setting. This highlights the need for a better understanding of permafrost in the HKH region. The permafrost study is part of ICIMOD's Special Project on Permafrost. The goal of the project is to increase knowledge on permafrost and the impacts of permafrost thaw on natural systems and livelihoods, as well as and to build capacity in the region.

UAV surveys of debris-covered glaciers

Repeat monitoring of two debris-covered glaciers, Lirung and Langtang, with unmanned aerial vehicles (UAV) has provided unique data for examining the evolution of debris-covered glaciers and the role of ice cliffs and supra glacial ponds in overall glacier melt.



Deploying temperature logger for permafrost studies in Tserko-Ri, Langtang Valley

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