



The Imja Tsho glacial lake was born in the 1960s. Today, it stretches for over 1,600 km.

Glacial lake outburst **FLOODS** in the Himalayas

THE HIMALAYAS HAVE A LARGE CONCENTRATION OF GLACIERS. IN RECENT DECADES, RISING TEMPERATURES HAVE BEEN CAUSING THESE GLACIERS TO MELT AT AN UNPRECEDENTED RATE, WITH A SIGNIFICANT EFFECT ON THE AVAILABILITY OF WATER SUPPLIES FOR DRINKING, AGRICULTURE, BIODIVERSITY AND HYDROPOWER. FURTHERMORE, NEW AND EXISTING LAKES CREATED BY MELTING GLACIERS ARE IN DANGER OF TRIGGERING EVENTS KNOWN AS GLACIAL LAKE OUTBURST FLOODS.

These flooding events release several thousand cubic metres of water per second along stream channels and can cause morphological changes along a river channel as they flow with the debris, resulting in loss of life and property. The impacts can be felt a long way from the source of the flood, depending on the magnitude of the outburst.

Geoinformation to identify glacial lakes

The International Centre for Integrated Mountain Development (ICIMOD) and regional governments have developed a glacial lake outburst flood (GLOF) risk assessment study in the Poiqu/ Bhote Kosi river basin, a region between China and Nepal highly prone to flash floods. The basin has already experienced at least three GLOF events in the past (in 1935, 1964 and 1981), causing damage in both countries, and there are now around nine potentially dangerous glacial lakes threatening the region. Since the last GLOF event, new settlements have been established and infrastructure has been built in the river valley, so a risk assessment study is necessary to estimate the potential impacts if a GLOF event occurred today.

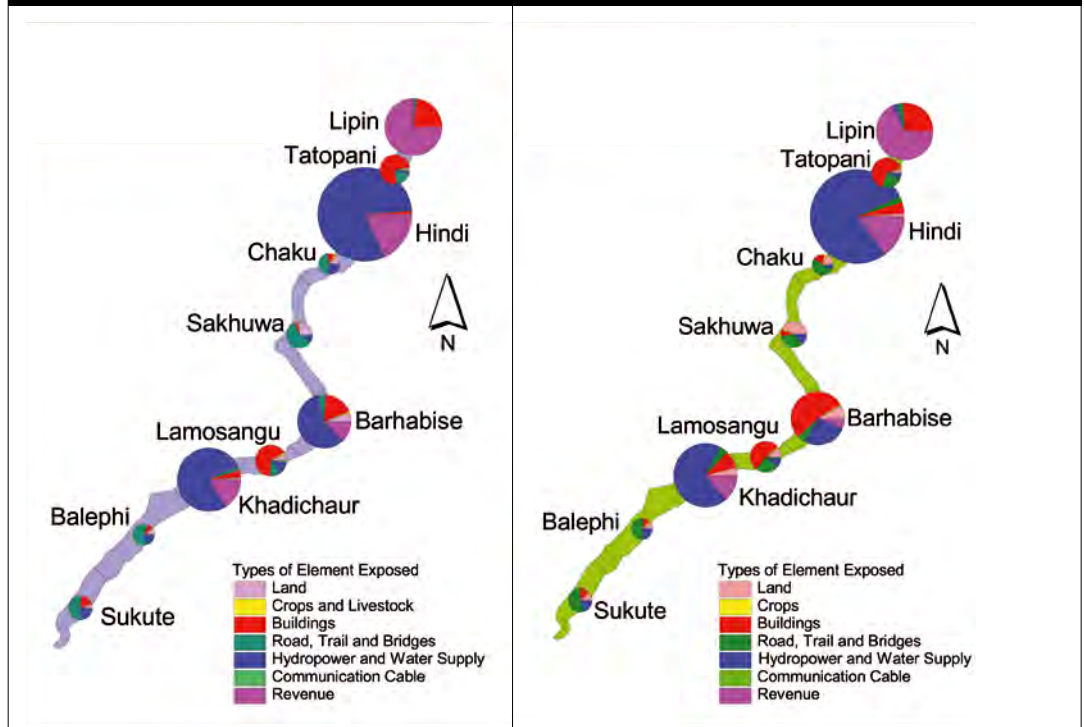
Remote-sensing technology is essential to identify and monitor glacial lakes, as well as to map settlements, land-use patterns and infrastructure along the river's path. With the support of Planet Action, ICIMOD received in 2008 SPOT scenes and a licence for Definiens eCognition image-processing software. Different types of high-resolution images—Landsat, MOS, IRS, CBERS and SPOT—from 1970 to 2008 were used to identify glacier lakes. The spatial distribution and shape of glaciers and lakes were identified and extracted using segmentation and rule-based techniques with Definiens software and screen digitization. Topographic maps published by China, Nepal and India were used as a baseline to obtain and verify attributes of the glacier lakes extracted by the eCognition software.

THIS PROJECT IS BACKED BY
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ESTIMATED AMOUNT AT RISK WITH FLOOD LEVEL SAME AS IN 1981 GLOF

ESTIMATED AMOUNT AT RISK WITH FLOOD LEVEL 10 M HIGHER THAN THAT OF 1981 GLOF



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► Risk assessment study

Floods notoriously disrupt lives, often for long after the event. To determine the magnitude of losses and damage, a field household survey was conducted and information about the 1981 GLOF event was collected. Several elements were taken into account for the risk assessment study, such as population density, destruction of houses, buildings, roads and hydropower plants, as well as the consequences for the local economy on tourism and trading. The picture above describes the magnitude of flood damage along the river for a GLOF event similar to 1981, and for a more devastating one with flood waters reaching ten metres higher.

Damage to business and personal property from any flood event in the present scenario will be economically significant. Higher water levels will increase the damage to personal property and land located further away from the river, while destruction of infrastructure mainly situated along the river (hydropower plants, roads, bridges, etc.) and economic impacts (tourism, revenue, trade, etc.) will remain approximately the same in both scenarios. ■

ICIMOD



The International Centre for Integrated Mountain Development (ICIMOD) is a regional knowledge-development and learning centre serving the eight member countries of the Hindu Kush-Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal and Pakistan. Its dual objective is to propose and implement, through cooperation between regional, national and international partners, innovative solutions to reduce ecological and socio-economic vulnerabilities in this region of the globe. To this end, ICIMOD intends to be an information platform for exchanging experience and knowledge of sustainable risk management.