

History and current state of glacial study and GLOF mitigation works in Bhutan

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The most recent GLOF event in Bhutan occurred in 1994 flooding the Punakha-Wangdue valley and downstream. This flood generated from Luggye glacial lake ran down Pho Chhu valley and hit in and around Punakha Dzong and Wangdue valley. 21 people fell victim to the flood and Punakha Dzong was left with partial effect. Serious survey and mitigation works for glacial lakes were started from this disaster. Until then, the attention paid against those hazard possessing glaciers and glacial lakes were less. Many kinds of experience and knowledge have been gained from these works. On the other hand, our survey and mitigation works need renewed scientific knowledge and technology from other countries. We will share such information in this presentation.

As of now, few researches have been carried out by the Department of Geology and Mines (DGM) in collaboration with other international organizations, a detailed research and mitigation works have not been carried out for the northern glaciated frontier. But historic account and ruptured terminal moraine dam indicate that Bhutan has experienced episodes of GLOF events.

Among the few researches that has been carried out in the northern frontiers of Bhutan, a first of this kind was done by Augusto Ganser, Geologist in 1960s & 70s during his expedition to Bhutan Himalayas. During his 1967 expedition, he identified number of lakes which could flood downstream. To his opinion, 1957 GLOF could have burst from Tarina (Western Lunana).

A preliminary aerial reconnaissance survey was carried out in and around Lunana by Geological Survey of India (GSI) in 1974 and 1981 to rule out the possibility of flash flood by the bursting of glacial lakes. They recommended that the lakes does not possess the immediate danger but detailed ground survey be carried out.

In 1984 a joint expedition of the Geological Survey of Bhutan and GSI was carried out to study Raphstreng Tsho. A detailed map of 1:20000 scale was produced and recommended for further detailed work on continuing basis.

From July-September 1986 a joint expedition team (GSB & GSI) carried out detailed studies of Lunana Lake based on 1984 expedition to study in detail, all aspects that had a direct bearing on a possible Lunana lake outburst. They recommended that no danger of outburst from Raphstreng Tsho but periodic checks every two to three years due to presence of ice core in moraine dams.

After the flood on 7th October, 1994 due to the breach of Luggye Tsho, resulting in loss of life and property, a joint team from RGoB and GSI were sent to Lunana to carry out preliminary studies to rule out cause and effect of GLOF in Pho chhu. They recommended carrying out short and long term mitigation measures and to set up seismic and meteorological stations at the site.

In 1996, funded by National Environment Commission and Coordinated by Ministry of Home Affairs, an expedition was undertaken in and around Roduphu based on report that there is a lake that could burst causing floods downstream. Due to retreating of Roduphu glacier, number of lakes have been formed but possessed no immediate danger. Still, the team recommended conducting periodic physical monitoring.

In 1998, GSB in collaboration with Nagoya University and Tokyo Metropolitan University undertook a joint research programme to prepare an updated inventory of major glacial lakes located at the headwaters of Bhutan and to produce an assessment of the dangers of GLOF.

At present, the DGM is implementing two projects viz. DGM-UNDPGEF project for artificial lowering of Thorthormi Lake and DGM-JICA/JST project for studying GLOFs in Bhutan Himalayas. When DGM-UNDPGEF project is aimed at artificial lowering of Thorthormi Lake by 5 m, the later is aimed at studying glacier and glaciers lakes in the headwater of Mangde Chhu and to produce hazard zonation maps downstream.

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