

Glacier Floods and Hydropower - curse or blessing?

Miriam Jackson

Norwegian Water Res. & Energy Directorate, Hydrology-HB, Oslo, Norway (mja@nve.no)

The problem of jökulhlaups (also known as Glacier Lake Outburst Floods or GLOFs) from glacier-dammed or pro-glacial moraine-dammed lakes is probably one that will occur with increasing frequency due to glacier retreat in most parts of the world. As well as threatening people and infrastructure generally, these floods are particularly problematic for hydropower facilities downstream. In the Himalayas and the Andes, there is increased construction of hydropower schemes and these have to take into account the existence or possible future existence of glacier lakes. Proposed hydropower schemes have to choose amongst being built to withstand a glacier flood, find some way of diverting excess water in case of a flood or simply choose not to build in that location. In one case from Nepal, such a flood destroyed a hydropower scheme two weeks before its inauguration.

However, experience from Norway shows that reservoirs built for hydropower schemes mitigate the consequences of these floods. In some cases, the water from a jökulhlaup may even be unanticipated extra input to the reservoir if it previously drained in a different direction. At Blåmannsisen in northern Norway, there have now been eight jökulhlaups of up to 35 million cubic metres of water since 2001. The reservoir and dam were able to withstand the exceptional loads caused by these events, despite the fact that it was an unforeseen event for the safety personnel, although hydrologists had warned of the possibility several years previously. Several events have occurred at Harbardsbreen in southern Norway. In the most recent case, the volume of the flood was bigger than the hydropower reservoir. However, as hydropower personnel were advised to drain the reservoir when the high lake level was observed, the event proceeded in a controlled manner, even though for many hours the input to the reservoir from the glacier lake was higher than the rate of flow out of the reservoir.

These and similar cases suggest that rather than hydropower schemes and jökulhlaup/GLOF mitigation strategies being evaluated independently, the two could benefit from being considered together. The extra costs associated with making hydropower schemes recent to sudden loads, as from jökulhlaups or other cases of extreme flooding, can be offset by the increased security to downstream communities.