



Changes in sedimentation patterns in proglacial lake Engabrevatn as a consequence of Svartisen hydropower operations, Nordland, Norway.

Patricia Kennie and Jim Bogen
Oslo, Norway (padk@nve.no)

1. The Norwegian Water Resources and Energy Directorate (NVE) has carried out investigations into the hydrological and sedimentological conditions in Engabrevatn proglacial lake, Northern Norway, in order to document environmental changes which result from the establishment of Svartisen hydropower station in 1995. These studies include water discharge data and sampling of suspended sediment, in addition to extraction of sediment cores from the bottom of the lake. Sediment cores taken up in 2008 were analyzed for annual sedimentation thickness and grain size distribution. The sedimentation occurs in a series of annual layers called varves, and two large magnitude rainfall-induced floods in 1995 and 1999 deposited thick layers of material on the lake bottom which assisted in the varve dating. The varves deposited in 1995 were especially thick due to the extra sediment source of particles created during construction of the hydropower tunnels. The results were compared to a long time series of water discharge and suspended sediment transport taken at the inflowing glacial melt-water river. It was found that after hydropower development the sediment transport and sedimentation in the lake decreased along with water discharge. Despite the general reduction in sediment supplied by the glacial river tributary, the relative percentage deposited in the lake increased due to the decrease in water velocities and flow through the lake. Sedimentation thickness near the inlet increased, with coarser material, due to the flushing of the sediment collection chamber which prevents sand from entering the turbines. Varve thickness in the middle and near the outlet of the lake was on the other hand reduced after 1995, because of reduced water discharge and stream flow through the lake. The natural annual sedimentation cycle in Engabrevatn was changed on a time-scale as well as spatially, resulting in unclear varve structures. This is because the operation of the hydropower plant disturbs the natural hydrological regime of the catchment, resulting in reduced water discharge during the summer months along with an increase in discharge in the winter instead of the catchment freezing over as it normally did before 1995, and annual flushing of the coarser material collected by the trap.