Performance of Hydropower Infrastructure after April 25, 2015 Gorkha Earthquake

By Menzer Pehlivan
CH2M, 1100 112th Ave NE, Suite 500, Bellevue, WA, 98004, USA

Following the April 25, 2015 Mw 7.8 Gorkha Earthquake, Geotechnical Extreme Events Reconnaissance (GEER) team travelled to Nepal to perform post-earthquake reconnaissance. The GEER team collected in valuable information on site response and topographic effects, liquefaction and other ground failure mechanisms, and damage to structures and infrastructure, including damage to the hydropower infrastructure. The hydropower infrastructure was one of the unique fociusses of this reconnaissance study due to their importance for Nepal. Although a small country, Nepal has one of the world’s largest hydroelectric potential (around 42,000 MW) with its steep mountainous topography and around 6000 perennial rivers, rivulets, and tributaries. On contrary to its large hydroelectric potential, Nepal is not producing enough hydropower to meet the country’s electricity demand. Nepal Electricity Authority’s 2010/2011 report showed that the country was producing only 965 MW through 17 government owned hydropower stations, which does not meet the electricity demand of approximately 2,500 MW with approximately 9% annual growth. Recently, Nepalese government signed an initiative to increase the Nepal’s hydroelectric capacity by 10,000 MW by 2018. The three big ongoing projects that are a part of this initiative, included the Upper Tamakoshi Hydropower Project, which was considered as one of the national priorities. April 25 Gorkha earthquake damaged 6 government owned and 10 privately owned hydropower plants with a total of 270 MW capacity, in addition to the some ongoing hydropower projects including Upper Tamakoshi Hydropower Project.

The GEER team conducted three campaigns, during which the team visited the damaged hydropower projects along Trishuli and Sunkoshi rivers by road and Upper Tamakoshi Power Plant by helicopter. Along the Trishuli River, GEER team visited Rasawagahi, Chilime, Upper Trishuli 3A, and Trishuli hydropower projects between May 26 and 28, 2015. Along the Sunkoshi River, GER team visited Upper Bhotekoshi, Sunkoshi, and Sanima hydropower projects between May 29 and 30, 2015. On May 27, 2015 GEER team visited Upper Tamakoshi hydropower project via helicopter as the access roads to this project was closed due to an earthquake-induced landslide. Hydropower projects along both the Trishuli and Sunkoshi Rivers showed similar pattern of earthquake induced damage. In the steep, narrow reaches of each drainage, closer to the Chinese Border, observed damage was mostly due to the rockfalls. Infrastructure including roads, penstocks, and secondary structures were damaged from these slope failures. In the lower reaches of each drainage, closer to the Kathmandu valley where river channels open up and water is transmitted via open channels, observed damage was mostly due to earthquake-induced settlement and structural damage. Projects along the Sunkoshi River observed to be more heavily damaged possibly due to the closer proximity to May 12 Mw 7.2 aftershock epicenter, which created “one-two punch”. This poster summarizes the GEER team reconnaissance study on the performance of hydropower infrastructure and addresses the observed damage pattern for each of the visited hydropower plants.