Among natural hazards, large seismic events are one of the major sources of human and economical losses. In the last decades, the discipline of Earthquake Engineering has focused its effort on examining the performance of buildings and infrastructures under seismic hazard. While in the past major efforts have been investing in analyzing and minimizing the losses, today we know that survival of the built inventory alone does not guarantee that the affected community will recover from an earthquake.

Community resilience, briefly, is the ability of a community to absorb the impacts of a hazard. In order to model community resilience, a holistic and multifaceted vision needs to be adopted, which includes not only the vulnerability of the built environment but also the post-disaster recovery process. The functionality of societies depends not only on the state of the built inventory but also on the services provided by various interdependent civil infrastructure systems, such as the electric power supply system (EPSS) or the water distribution system, and the interdependence of these systems. It is essential to include models of the loss and recovery of the services provided by the civil infrastructure systems in a holistic resilience assessment of a community.

Figure 1: Damaged/ Collapsed building near Siddhitol, Kathmandu, Nepal; Work on a partially damaged electric power pole next to a collapsed building.
The April 2015 Gorkha earthquake (Nepal) and its aftershocks caused more than 9,000 fatalities, injured more than 23,000 people and largely destroyed the local cultural heritage. This event also represents a unique opportunity to analyze the seismic resilience of the civil infrastructure systems of a lower income country, such as Nepal.

The main aim of this study is to investigate a set of the collected data on the EPSS, using a compositional demand/supply resilience framework [1,2]. The supply performance of the EPSS immediately after the earthquake and the post-disaster recovery of the supply are analyzed first, using a Dynamic Bayesian Network model. The supply performance of the EPSS is then compared to demand generated by built inventory in the damaged, post-disaster, condition modeled using a Static Bayesian Network model, and the evolution of the build inventory state during the recovery phase. The built inventory considered in this study includes residential buildings, office buildings, and critical facilities like schools or hospitals. The data was collected through on-site visits, expert and stakeholder interviews, report analyses, and damage assessment surveys.

The obtained vulnerability and recovery model of the supply and demand performance of the EPSS in Nepal after the April 2015 Gorkha earthquake can be used to validate the compositional supply/demand resilience model for low-income countries. Verification and validation of the compositional supply demand resilience model is a first step towards developing seismic risk and resilience governance strategies for low-income countries with the aim to facilitate investments to increase the seismic resilience of such countries in the future.

References
