



## **A methodology to develop a vulnerability index of an urban area through rapid visual screening and network analysis**

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The occurrence of an earthquake in an urban area not only affects the buildings but also impacts their immediate environment at the street level in ways that significantly lowers the speed of emergency response. More often, the streets get blocked with the debris of the collapsed building, resulting in the isolation of certain parts of an urban area. This paper specifically focuses on building vulnerability and its impact on road network connectivity i.e. whether a street is still accessible aftermath of an earth. The building vulnerability and its probability of collapse is assessed using rapid visual screening (RVS) procedure developed by FEMA and the resulting scores are overlaid on GIS database to identify the probable road closures. Network analysis and graph traversal algorithms are used in combination to measure the performance of a road network under probable road closure conditions, thereby identifying the isolated components of the road network and areas. The integration of the vulnerability scores of building and the road network would give a vulnerability index of an urban area. A pilot implementation of this methodology was carried out in one ward in Siliguri Municipal Corporation, which falls under seismic zone IV of India. The ward selection was done based on the population density and socioeconomic characteristics. The critical links and probable isolated areas visualized in GIS maps. This methodology make it possible for the emergency managers and decision makers to identify the critical parts of the network to take necessary precautions beforehand to avoid the delay of emergency services.

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