Risk management of an Italian road network due to earthquake and earthquake-triggered landslide hazards

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ABSTRACT: Natural hazards, such as earthquakes, have the potential to cause structural damage to transport infrastructure networks, which can result in significant network disruption and may lead to substantial economic losses. The INFRARISK project (*Novel Indicators for Identifying Critical INFRAstructure at RISK from Natural Hazards*) is developing a methodology to manage the risk to transport networks due to extreme hazard events. This paper presents an application of the methodology developed in the INFRARISK project to a road network in Northern Italy, located along the TEN-T network, which is considered a vital axis for the European economy. The road network is distributed over an area of approximately 990km^2 and consists of 340 bridges, 30 tunnels and 5300km of road pavement. The risk to the network is assessed according to the direct and indirect consequences associated with extreme, low-probability seismic events and the associated cascading effects in terms of earthquake-triggered landslides. The direct consequences are quantified in terms of the physical damage caused to the road network. The vulnerability of the various infrastructure components on the network is assessed using fragility functions, which are assigned based on the structural attributes of the bridges, tunnels and road pavements. The indirect consequences are assessed in terms of the additional travel times experienced by network users as a result of the functionality loss of the network. The direct and indirect consequences are quantified in monetary terms and the associated risk level is evaluated according to a stress testing methodology, whereby an intervention strategy for the network may be implemented where the level of risk is considered unacceptable.

KEY WORDS: Transport networks; Risk management; Seismic hazard.