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Indirect economic impact of landslide hazards by disruption to national road transportation networks; Scotland, United Kingdom.

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The failure of engineered or natural slopes which support or are adjacent to transportation systems often inflicts costly direct physical damage and indirect system disruption. The consequences and severity of indirect impacts vary according to which links, nodes or network facilities are physically disrupted. Moreover, it is often the case that multiple slope failure disruptions are triggered simultaneously following prolonged or intense precipitation events due to a degree of local homogeneity of slope characteristics and materials. This study investigates the application of national commuter statistics and network agent simulation to evaluate indirect impacts of landslide events disrupting the Scottish trunk road transportation network (UK). Previous studies often employ shortest pathway analysis whereas agent simulation has received relatively little attention. British Geological Survey GeoSure landslide susceptibility data is used to select 35 susceptible trunk road segments by means of neighbouring total area at risk. For each of the candidate 35 segments the network and zonal variation in travel time is calculated for a single day of disruption, economic impact is approximated using established governmental and industry transport planning and appraisal values. The results highlight that a number of trunk road segments incur indirect economic losses in the order of tens of thousands of pounds for each day of closure. Calculated losses at the A83 Rest and Be Thankful are 50% greater than previous estimates at £5 thousand per day of closure. Also highlighted are events in which economic impact is relatively minor, yet concentrating on particular communities that can become substantially isolated as a consequence of a single event. The findings of this study are of interest and support wider investigations exploring cost considerations for decision makers and mitigation strategies, in addition to identifying network topological and demand indicators conducive to high indirect economic cost events.