



Seasonal rockfall risk assessment along transportation network: a sample from Mallorca (Spain)

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In the literature there are numerous works focusing on rockfall risk assessment along transportation corridors which take into account several factors, including the annual average traffic volume. Few papers examine in detail examples with a strong seasonal distribution of people travelling along roads, in particular in regions with a great importance for tourism. In these areas, potential blockages along the road network can cause significant economic losses, considering not only direct costs, but also indirect ones related to a reduction in tourism arrivals, with the consequent loss of jobs and profits.

In this work we present a methodology for rockfall risk assessment focusing on the reliability and applicability of the evaluation in a test site located in the island of Mallorca, a region which welcomes over 11.3 million visitors per year and where tourism represents the main source of income (83% of its GDP). The Ma-10 road (111 km), located in the north-western sector of the island along the coastal face of the Tramuntana range, has been affected by 85 rockfall events during the past 18 years, which caused repairing costs valued at approximately 2M Euro (Mateos et al., 2013). Rockfalls are triggered by heavy rainfall and freeze-thaw cycles and, for these reasons, autumn and winter can be considered as the most hazardous seasons (Mateos et al., 2012). The road has heavy traffic estimated at 7.200 vehicles per day on average, with a seasonal variation of people travelling in vehicles, the summer being most prominent– up to 6 times the average– due to the pattern of tourism arrivals. To analyse the seasonal rockfall hazard and risk along the Ma-10 road, we obtained the extent of the areas potentially subject to rockfall hazards using STONE, a physically-based rockfall simulation computer program (Guzzetti et al, 2002). The availability of historical rockfalls mapped in detail allowed checking the STONE results, and identifying a hazardous area on the southern section of the road. For the risk analysis, four scenarios depending on the seasonal people exposition have been taken into account, considering the autumn as the season with the highest risk. This methodology can be applied to highly touristy areas such Mallorca, where the safety of the population and its visitors must be the priority of all concerned.

References :

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