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A closer look at factors governing landslide recovery time in post-seismic periods

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Various mechanisms are proposed to explain landslide recovery time in the time following major earthquakes. However, research on prescribing possible recovery times following an earthquake is still relatively new. This paper provides an insight into factors governing landslide recovery time, which could be considered as a step forward in predictive modeling for landslide recovery time. To accomplish this, we examined 11 earthquake-affected areas based on the characteristics of both landslide events and landslide sites associated with diverse morphologic and climatic conditions. Our analyses indicate that the dominant characteristics of post-seismic landslide mechanisms determine the recovery time. The characteristics can be identified based on: (i) the fraction of area affected by landslides (%), (ii) mean relief and its standard deviation (m), (iii) average daily accumulated precipitation (mm) and (iv) rainfall seasonality index. If there are not enough co-seismic landslide deposits or not enough relief to trigger large deposits on hillslopes, then the recovery processes are mostly controlled by new landslides caused by a strength reduction of hillslope materials. In most of the cases, this brings a relatively quick recovery process in which the majority of post-seismic landslides may happen within a year or even in a month if sufficient intense rainfalls occur soon after the earthquake. If the predisposing factors create large co-seismic landslide deposits, then remobilization of material takes the role of the dominant mechanism and recovery may take years. Overall, our analyses show that the recovery takes relatively longer if a large amount of co-seismic landslide material is deposited within a high-relief mountainous environment where precipitation rate is low and not persistent.