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Validating national landslide susceptibility and hazard maps for Caribbean island countries: the case of Dominica and tropical storm Erika.

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The aim of this study was to generate national-scale landslide susceptibility and hazard maps for four Caribbean islands, as part of the World Bank project CHARIM (Caribbean Handbook on Disaster Geoinformation Management, www.charim.net). This paper focuses on the results for the island country of Dominica, located in the Eastern part of the Caribbean, in-between Guadalupe and Martinique. The available data turned out to be insufficient to generate reliable results. We therefore generated a new database of disaster events for Dominica using all available data, making use of many different sources. We compiled landslide inventories for five recent rainfall events from the maintenance records of the Ministry of Public Works, and generated a completely new landslide inventory using multi-temporal visual image interpretation, and generated an extensive landslide database for Dominica. We analyzed the triggering conditions for landslides as far as was possible given the available data, and generated rainfall magnitude-frequency relations. We applied a method for landslide susceptibility assessment which combined bi-variate statistical analysis, that provided indications on the importance of the possible contributing factors, with an expert-based iterative weighing approach using Spatial Multi-Criteria Evaluation. The method is transparent, as the stakeholders (e.g. the engineers and planners from the four countries) and other consultants can consult the criteria trees and evaluate the standardization and weights, and make adjustments. The landslide susceptibility map was converted into a landslide hazard map using landslide density and frequencies for so called major, moderate and minor triggering events. The landslide hazard map was produced in May 2015. A major rainfall event occurred on Dominica following the passage of tropical storm Erika on 26 to 28 August 2015. An event-based landslide inventory for this event was produced by UNOSAT using very high resolution optical images, and an additional field-based inventory was obtained from BRGM. These were used to analyze the predictive capabilities of the national-scale landslide susceptibility and hazard maps. Although the spatial patterns of the landslide susceptibility map was fairly accurate in predicting the locations of the landslides triggered by the recent tropical storm, the landslide densities and related frequencies used for the hazard assessment turned out to deviate considerably taking into account the spatial landslide pattern and estimated frequency of rainfall for tropical storm Erika. This study demonstrates the importance of reconstructing landslide inventories for a variety of triggering events, and the requirement of including landslide inventory data of a major event in the hazard assessment.