Landslide hazard mapping in French Guiana: proposal for a quantitative methodology in a weathered basement context

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Résumé

In French Guiana, the Cayenne peninsula is experiencing strong demographic growth (+3.1% between 2014 and 2020) and increasing urbanization. This growth is leading to development problems, particularly in areas of high relief (known as "monts", with elevation around 240 m asl) particularly susceptible to landslides, whether shallow or deeper. Areas with a high probability of shallow landslides (< 500m3) are currently relatively well known in this territory (Aertgeerts and Joseph 2017; Aertgeerts, 2020) and well integrated into regulatory hazard maps. However, the triggering mechanisms, mobilizable volumes and the runout of larger landslides (up to several hundred thousand cubic meters) are still not well constrained. Methodological developments and new data acquisition are thus needed to improve the cartography of landslide hazards in French Guiana, both in an operational and informative framework for regulatory purposes. The main objective is to propose a quantitative methodology based on spatial approaches for calculating the volume and propagation of superficial and depp-seated landslides. The methodology is based on (i) a geomorphological and morphometric analysis of the phenomena; (ii) an identification of sensitive materials (weathered materials); (iii) a hydrogeological conceptualization, (iv) an identification of mobilizable volumes; (v) computations of runout envelopes according to the types of phenomena and mobilized volumes. Several scenarios based on known events (back-calculation) are tested in order to calibrate the parameters of the calculation tools. The results allow to propose two scales of restitution (site scale - 1:5,000 - or local scale -1:10,000) depending on the purpose of the study, and to propose an alternative to the classic PPRn-type hazard mapping methodology.

Mots-Clés: landslide, hazard, mapping, quantitative method, weathered context

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