

## ABSTRACT

The Chucumayo ravine is affected by floods that occur mainly during the El Niño or La Niña phenomena, causing loss of life, losses or damage to infrastructure, and damage to health and the environment; the floods are caused by heavy rainfall and the topographic, geological, geomorphological, and morphological conditions of the basin, especially the steep slope. The hydrological, topographical and geomorphological information allows obtaining the alluvial flow in the basin. Then, with the topographic information, roughness, design flow and using the hydraulic computer program FLO-2D, the flooded area of the dejection zone is simulated, obtaining the hazard map. With the environmental, social and economic characterization, the vulnerability map is found, and with the hazard and vulnerability map, the risk map is found. A structural prevention measure is proposed and the new hazard map is determined, with the same vulnerability map the new risk map is determined. The hydrological, geomorphological, topographical and morphological data allowed obtaining the total flow of 59.80 m<sup>3</sup>/s through simulation with the HEC HMS software, thus estimating the volume of debris flow for a time of 2 hours and 20 minutes, resulting in 284,220 m<sup>3</sup>. The topography, design flow, roughness and the FLO-2D numerical hydraulic model are used to simulate and obtain the water flow and flooding in the debris flow zone, which is then represented on the hazard map. Vulnerability is determined by social, economic and environmental characteristics. Finally, the degree of risk is obtained according to the degree of vulnerability and hazard. With the hazard map, a longitudinal dike was proposed on both banks as a structural prevention measure. With the presence of the dike, the simulation was carried out to determine the new flood zone, whose levels of very high, high and medium are located in the bed and banks of the Chucumayo river. The high and medium levels occur in the Chucumayo riverbed and riverbank. XVIII The maximum liquid flow obtained is 33.2 m<sup>3</sup>/s, maximum solid flow is 28.80 m<sup>3</sup>/s and total flow is 59.80 m<sup>3</sup>/s; with a simulation time of 2 hours and 20 minutes, the estimated volume is 284,220.00 m<sup>3</sup> produced in the Chucumayo basin. The risk levels obtained consist of three levels: medium, high and very high; with the presence of the longitudinal dam as a structural measure, two high and medium levels were reduced, which occur in the riverbed and riverbank. The liquid and solid flow values obtained in the present investigation for the Chucumayo watershed are new and this may lead to consider other structural risk prevention measures or a different research topic. Maps of hazards, vulnerabilities and risks inside or outside the project are used to plan preventive measures to reduce the risk of alluvial landslides during periods of intense rainfall.