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Flood Hazard Mapping Assessment for Lebanon

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Of all natural disasters, floods affect the greatest number of people worldwide and have the greatest potential to cause damage. In fact, floods are responsible for over one third of people affected by natural disasters; almost 190 million people in more than 90 countries are exposed to catastrophic floods every year. Nowadays, with the emerging global warming phenomenon, this number is expected to increase, therefore, flood prediction and prevention has become a necessity in many places around the globe to decrease damages caused by flooding. Available evidence hints at an increasing frequency of flooding disasters being witnessed in the last 25 years in Lebanon. The consequences of such events are tragic including annual financial losses of around 15 million dollars. In this work, a hydrologic-hydraulic modeling framework for flood hazard mapping over Lebanon covering 19 watershed was introduced. Several empirical, statistical and stochastic methods to calculate the flood magnitude and its related return periods, where rainfall and river gauge data are neither continuous nor available on a long term basis with an absence of proper river sections that under estimate flows during flood events. TRMM weather satellite information, automated drainage networks, curve numbers and other geometrical characteristics for each basin was prepared using WMS-software and then exported into HMS files to implement the hydrologic modeling (rainfall-runoff) for single designed storm of uniformly distributed depth along each basin. The obtained flow hydrographs were implemented in the hydraulic model (HEC-RAS) where relative water surface profiles are calculated and flood plains are delineated. The model was calibrated using the last flood event of January 2013, field investigation, and high resolution satellite images. Flow results proved to have an accuracy ranging between 83-87% when compared to the computed statistical and stochastic methods. Results included the generation of recurrence flood plain maps of 10, 50 & 100 years intensity maps along with flood hazard maps for each watershed. It is of utmost significance for this study to be effective that the produced flood intensity and hazard maps will be made available to decision-makers, planners and relevant community stakeholders.