

Flood Risk Management in the Semi-Arid Regions of Lebanon - Case Study “Semi Arid Catchments, Ras Baalbeck and Fekha”

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Abstract : Floods are common natural disaster occurring in semi-arid regions in Lebanon. This results in damage to human life and deterioration of environment. Despite their destructive nature and their immense impact on the socio-economy of the region, flash floods have not received adequate attention from policy and decision makers. This is mainly because of poor understanding of the processes involved and measures needed to manage the problem. The current understanding of flash floods remains at the level of general concepts; most policy makers have yet to recognize that flash floods are distinctly different from normal riverine floods in term of causes, propagation, intensity, impacts, predictability, and management. Flash floods are generally not investigated as a separate class of event but are rather reported as part of the overall seasonal flood situation. As a result, Lebanon generally lacks policies, strategies, and plans relating specifically to flash floods. Main objective of this research is to improve flash flood prediction by providing new knowledge and better understanding of the hydrological processes governing flash floods in the East Catchments of El Assi River. This includes developing rainstorm time distribution curves that are unique for this type of study region; analyzing, investigating, and developing a relationship between arid watershed characteristics (including urbanization) and nearby villages flow flood frequency in Ras Baalbeck and Fekha. This paper discusses different levels of integration approach—es between GIS and hydrological models (HEC-HMS & HEC-RAS) and presents a case study, in which all the tasks of creating model input, editing data, running the model, and displaying output results. The study area corresponds to the East Basin (Ras Baalbeck & Fakeha), comprising nearly 350 km² and situated in the Bekaa Valley of Lebanon. The case study presented in this paper has a database which is derived from Lebanese Army topographic maps for this region. Using ArcMap to digitizing the contour lines, streams & other features from the topographic maps. The digital elevation model grid (DEM) is derived for the study area. The next steps in this research are to incorporate rainfall time series data from Arseal, Fekha and Deir El Ahmar stations to build a hydrologic data model within a GIS environment and to combine ArcGIS/ArcMap, HEC-HMS & HEC-RAS models, in order to produce a spatial-temporal model for floodplain analysis at a regional scale. In this study, HEC-HMS and SCS methods were chosen to build the hydrologic model of the watershed. The model then calibrated using flood event that occurred between 7th & 9th of May 2014 which considered exceptionally extreme because of the length of time the flows lasted (15 hours) and the fact that it covered both the watershed of Aarsal and Ras Baalbeck. The strongest reported flood in recent times lasted for only 7 hours covering only one watershed. The calibrated hydrologic model is then used to build the hydraulic model & assessing of flood hazards maps for the region. HEC-RAS Model is used in this issue & field trips were done for the catchments in order to calibrated both Hydrologic and Hydraulic models. The presented models are a kind of flexible procedures for an ungaged watershed. For some storm events it delivers good results, while for others, no parameter vectors can be found. In order to have a general methodology based on these ideas, further calibration and compromising of results on the dependence of many flood events parameters and catchment properties is required.

Keywords : flood risk management, flash flood, semi arid region, El Assi River, hazard maps

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