Flood risk in Argentina. A local case using GIS.

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(1) Introduction/Motivation: In Argentina, almost half of disasters are related to floods (Celis and Herzer, 2003). During the period 1944 to 2005, 41 major floods occurred in urban areas in the country (Argentina Red Cross, 2010) with more than 13 million people affected. Luján (34°33′S, 59°07′W) suffered 21 floods between 1967 and 2018 with a result of about 14,600 evacuees and 3 dead people. The main cause of the floods is the overflow of the Luján River.

(2) Methodology: Geographical Information Systems (GIS) enable us to perform a spatial analysis of the elements of risk. Risk could be defined as a combination of hazard, exposure and vulnerability (Behanzin, 2015; Armeneakis et al., 2017; UNISDR, 2017). If one of those is missing, risk is not defined. Hazard analysis was made by converting 5-m Digital Surface Model (DSM) into a Digital Terrain Model (DTM). Then, rainfall data, land use information, drainage system (sewers and streams) and historical flood maps will be used to create flood hazard maps. An Index of Social Vulnerability to Disasters (ISVD) was created using ten indicators (illiteracy, population 0-14 and +65, house overcrowding no sewer access, no tap water, population unemployment, single-parent household, education of household head, distance from health centers). Finally, three exposure indicators were selected (total population, population density and building distance from nearest streams) to build an Exposure Index. A final flood risk index will be created with five categories based on risk values from 0 (lowest) to 1 (highest).

(3) Results: Preliminary findings from this study illustrate that in the central east part of the city highly exposed and vulnerable population live within topographic low areas (less than 10 meters above medium sea level).

(4) Conclusions and future work: This methodology helps to develop disaster risk management strategies for settlements frequently flooded. Although it is impossible to totally eliminate flood risk, it is possible to mitigate some consequences. Once the flood hazard map (flood duration and height) is complete, a final risk map will be created using exposure and vulnerability results.

(5) References:

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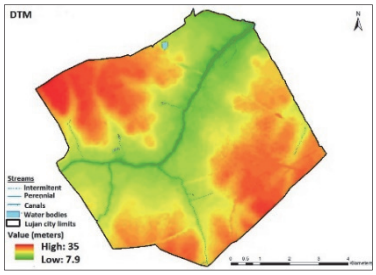

Figure 1: DTM of Luján.

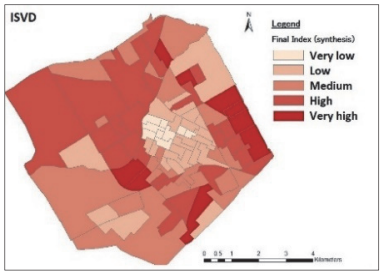

Figure 2: ISVD of Luján.

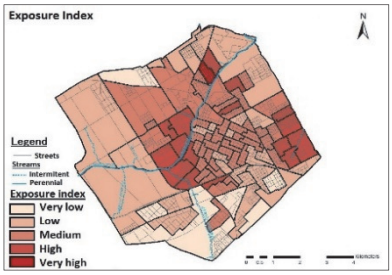

Figure 3: Exposure Index of Luján.