BENCHMARKING OF A BIDIMENSIONAL FLOOD ANALYSIS WITH A STRUCTURAL MEASURE IN THE CATCHMENT ROSARITO HUAHUATAY BAJA CALIFORNIA SUR, MEXICO.
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**Objective**

The main objective of the research is due to the great need to generate hazard maps and calculate the risk in the basin Huahuatay Rosarito in Baja California Sur, Mexico.

**Study area**

Region (BASIN Organization of the Baja California Peninsula Habitacionales de Mexico, September 2011). This region in turn sub-regions is divided into two: Baja California and Baja California Sur. Surface water for the whole area is scarce due to low rainfall and high temperatures are present. Most are intermittent and torrential runoffs.

**Materials and methods**

Among the materials used for the development of this research was the use of a digital elevation model used for numerical simulation was a combination of information from "United States Elevation Data (NED) (10m Resolution)" (Use http://seamless.usgs.gov/) LiDAR and INEGI with resolution of 5 m by 5 m, but that does not cover the entire area under study.

To perform mathematical modeling of a digital elevation model with a resolution of 50 m by 50 m was used as it was considered that the resolution results were obtained with sufficient resolution in a timely and mathematical calculation.

The mesh considered in the mathematical model 881 columns by 1,021 rows corresponding to 685 km².

To achieve numerical stability in mathematical modeling considering the cell size of 50 m by 50 m and taking into account that the slope is strong mostly considered the passage of time is 0.6 seconds.

**Mathematical model results**

A product resulting from the mathematical modeling corresponds to depths and maximum speeds. In other words, a map with maximum values, which are not necessarily the same simulation time as the process, the maximum values may occur at different times but the worst value considered, is the maximum.

**Vulnerability and Severity**

Increasing depth and water speed, the damage increases. At higher speeds, the water has greater capacity to transport objects. The damage will be considerable if it erodes the riverbed and will depend on the magnitude of the force of impact. It has called vulnerability to the susceptibility of the houses were damaged when a threat of certain intensity occurs. (For this case, the study, the houses and their contents or furniture).

Vulnerability index is the proportion of the total cost of the damage to houses where some flooding occurs is calculated as follows:

$$D = l \cdot C$$

Where:  
- C Total cost of damage 
- l Vulnerability index (between 0 and 1)

The risk: the expected value of losses, produced by the occurrence of a phenomenon of natural or anthropogenic origin, a particular physical or social entity.

$$R = \frac{C \cdot l}{D}$$

When vulnerability analysis is carried out in a community exposed to flood danger, the best way to reduce vulnerability, identifies the most vulnerable households and consequently take corrective measures.

**Hydraulic evaluation of a structural measure**

Risk management promotes identifying threats, assessing and minimizing risk, using appropriate policies and practices.

Management of flood risks also covers the work to reduce hazards through measures such as land use and spatial planning that take into account the danger of floods, the systems of early warning, evacuation plans, preparing aid disaster and protection of elements located in flood-prone areas and, as a last resort, insurance and other risk-sharing mechanisms.

In the case of Rosarito Huahuatay, it is proposed as a structural measure placing levees or dams, with the aim of reducing flood areas and thus bring down the risk.

**Conclusions**

With the growing concern over the increase in the frequency and severity of disasters and natural hazards, and the substantial reduction of losses in environmental, economic and social assets the risk analysis become very important.

The analysis presented in this paper is: in the range of 0 to $600 / year, affecting about 92 % of households, corresponding to 7,963 of them. It is the largest percentage falls on the poorest households.

However, the higher cost range belongs to the range between 36,000 to $58,000 / year where only 44 homes are affected with a rate of 0.7%. This means that the most expensive houses where the depth and / or speed are considerably large not represent even 1% of total damages.

Not necessarily the works proposed reduce flood damages. Sometimes the water that temporarily occupied an area of land can be moved to other regions where it could cause further injury, therefore, it is convenient to carry out comprehensive studies of a whole watershed to evaluate the goodness of the proposed works, usually with simulation surface flow models covering the basin where flood areas are located. An important point of analysis leads us to consider that a large number of houses affected with a small economic value results in a large economic damage, affecting the most vulnerable population; the resilience of this segment of the population in the town need more recovery time. Therefore a fundamental tool for decision making after a flood is risk analysis.

**References**


Bard, Suarez Jose Emilio. “Costo más probable de daños por inundación en zonas habitacionales de México", septiembre 2011.


Colombia.


