

Hydraulic Modeling of Flash Floods in Sana'a

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Abstract: Flash floods, the most common type of flooding in Yemen, have killed many people in Sana'a (the capital of Yemen) in the past decade. A natural disaster risk evaluation, funded by the World Bank, Global Facility for Disaster Reduction and Reconstruction was conducted in Sana'a to identify the main sources of losses from natural disasters such as floods and landslides and to develop an analysis of flood risk exposure and financial response capacity for the city. Climate change and the rapid urban development of Sana'a has led to an increase in flood hazards for two main reasons, changes in land use, and the increased presence of people and buildings in flood prone areas. The major stormwater channel in Sana'a, which runs through the middle of the city and next to the old historic city, also serves as a major transportation route. When a flash flood occurs, the stormwater channel is suddenly flooded causing vehicles to be trapped and sometimes swept away, putting lives at risk. No mechanism is currently in place to prevent vehicles or people from using the channel during extreme flood events. Comprehensive hydrologic and hydraulic modeling of the Sana'a Basin was conducted to support a flood hazard analysis that quantifies the extent and depth of flooding throughout the flood prone areas for a range of flood frequency events. The hydraulic analysis was performed to create water surface profiles and develop floodplains for extreme events within the city of Sana'a. HEC-RAS was used to model the hydraulic response of the stream network to frequency flows. The HEC-GeoRAS tool was used to expedite parameter input and mapping processes. Significant challenges were addressed during the modeling process due to the lack of accurate digital elevation data, few historical flood data, and major changes in the land use from rapid urbanization. The floodplains were mapped along the major stormwater channel identifying the flood hazard areas in Sana'a during extreme events. This information will be used to calculate infrastructure and economic losses, identify mitigation projects and develop a flood warning system for flash floods in Sana'a.
