INTRODUCTION

Jamaica, the third largest island of the Caribbean is vulnerable to severe flooding from short duration, high intensity rainfall associated with hurricanes, tropical storms, fronts and troughs. Flood hazards in Jamaica have shown a significant increase in the decade 2000-2010 with major flooding in the years of 2004, 2007, 2008, 2009, 2010 and 2012. Flooding in the eastern and north-eastern sections of the island are primarily dominated by terrestrial flooding owing to the presence of steep topography (>30 degree slope), high intensity of rainfall and river system as well as less sub-surface infiltration due to presence of impermeable bedrocks (Figures 1 and 2). Among the watersheds in eastern Jamaica the Yallahs river watershed (Figure 3) is one of the major affected one with significant damages from flooding leading to collapse of the major bridge in 2004 following hurricane Ivan. The Intergovernmental Panel on Climate Change (IPCC) outlook for climate change in Jamaica shows an increasing likelihood of more intense hurricanes, which would result in increased frequency of flooding due to intensive rainfall. Hence, this necessitates research on watersheds most affected with creation of new and improved flood inundation maps for present and future scenarios. The present project thus aims to fulfill this for the Yallahs watershed which lacks a flood inundation map since 1986.

Floods and extreme events affecting Jamaica (1850-2010)

Figure 1. Map of Jamaica showing the flood prone areas superimposed on the topography of the island. Rivers are marked by blue lines.

Figure 2. Map of Jamaica showing the 30Yr mean annual rainfall and reported flood events.

Figure 3. Map of Jamaica showing the 30Yr mean annual rainfall, reported flood events and watersheds. (Data from WRA, ODPEM, CEAC)

AIM:

• Analysis of floods and extreme events in Jamaica.
• Create present and future flood inundation map for the Yallahs river watershed. Future maps driven by climate models.
• Community awareness and knowledge assessment to flooding in the Yallahs watershed.

METHODOLO:

Historical analysis of floods and associated weather systems. Monthly and yearly pattern of rainfall and rainfall Statistical relationship of floods with rainfall, storms, hurricanes, fronts and troughs.

Statistical downsampling of 24 hour rainfall return period depths to hourly data using the NRCS Type II method. Similar process of downsampling is done for the 24 hour rainfall for tropical storm Gustav.

Floors generated from rainfall data using USDA – Soil Conservation System Curve Number method for Loss estimation in HEC HMS for extreme event (tropical storm Gustav) and for different return periods.

Floors from HEC-HMS routed through the LISFLOOD-FP model to predict inundation extents and depths.

Climate model conditioned on rainfall. Models of catchment hydrology and flood hydrodynamics. Percentage difference between baseline climate (PRECIS) and future climates (ECHAM, 2040-2070 and 2070-2099) calculated for rainfall events down to 24-hour. HEC-HMS run for future return periods and floors routed through the LISFLOOD-FP model to predict inundation extents and depths.

Community meetings conducted to create awareness for flooding and climate change. Dissemination of knowledge to communities affected.