

Terrestrial Flood Risk and Climate Change in the Yallahs River, Jamaica

An assessment of future flood risk using hydrodynamic models driven by projections of future climate

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Introduction



- Flooding is one of the major natural hazards affecting Jamaica.
 - Has been negatively affected by severe weather events
 - Repeated flooding (2004, 2007, 2008, 2010) has been very costly both in terms of lives and livelihoods.
- Analysis of the number of hurricanes/ tropical storms affecting Jamaica and the variability of the rainfall pattern has shown changes in trends in the years 2001-2012.
 - Shifts in traditional peak rainfall months of May and September-October has shifted to June and November in some years.
 - Shorter duration high intensity rainfall associated with stationery fronts and troughs
 - IPCC outlook shows an increasing likelihood of more intense hurricanes, which would result in increased frequency of flooding due intensive rainfall.



Types of flooding in Jamaica



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Study site: Yallahs River



GRAPHIC ID 3

Title of Graphic : Upland catchment in south-east Jamaica, draining the Blue Mountains.

Major riverine flooding associated with Hurricane Gustav (28 August 2008).



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1. Past flood analysis: Tropical Storm Gustav

- Landfall in Jamaica 28 August 2008
- Major impact (US \$210 M), including flooding in Yallahs
- 24-hr data for Mavis Bank and Ramble gauges
- NRCS Type II method used to generate 15-minute rainfall
- Flows generated from rainfall using HEC-HMS





http://en.wikipedia.org/wiki/File:Gustav 29 August 2008.jpg



http://en.wikipedia.org/wiki/File:Gustav 2008 track.png



Hour

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1. Tropical Storm Gustav: Results



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1. Tropical Storm Gustav: Results



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2. Estimation of current flood risk



- Daily data (24-hour) obtained for 1992-2012 from Jamaica Met Service for Mavis Bank and Ramble
 - Data prior to 1992 unavailable due to loss of records in fire
 - Some historical data (1922-1966) obtained from "Jamaica Weather Reports" from NOAA central library (http://docs.lib.noaa.gov/rescue/data_rescue_jamaica.html)
 - Annual maximum extracted:



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2. Estimation of current flood risk



- 24-hour maximum temporally downscaled using NRCS Type-II rainfall
 - IDF curves generated for return period calculations



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FUTURE CLIMATE ANALYSIS



2. Estimation of current flood risk: results

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- HEC-HMS run for 25, 50 and 100 year rainfall events
- Flows from HEC-HMS routed through the LISFLOOD-FP model to predict inundation extents and depths



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2. Estimation of current flood risk: results

Depth difference:

100-year event maximum depth minus 25-year event maximum depth.



Although the flood extents are similar, water depths are up to 2 m higher on the floodplain during a 100-year event

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3. Estimation of future flood risk



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INTRODUCTION

1. PAST FLOOD EVENT

2. RETURN PERIOD ANALYSIS

3. FUTURE CLIMATE ANALYSIS

SUMMARY

3. Estimation of future flood risk: results



• 25, 50 and 100 year rainfall scaled by change factor from ECHAM and temporally downscaled using NRCS

Area of flood inundation

 HEC-HMS run for future return periods and flows routed through the LISFLOOD-FP model to predict inundation extents and depths



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