



**CLIMATE CHANGE AND INLAND FLOODING IN JAMAICA
RISK AND ADAPTATION FOR VULNERABLE COMMUNITIES**

Research Project

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Flooding from short duration high intensity rainfall associated with or without tropical storms and hurricanes are a cause of serious concern for Jamaica and other Small Island Developing States of the Caribbean. Flood risk is defined as the product of flood probability or hazard, exposure of capital and population, and vulnerability to the effects of flooding, including damage to infrastructure and the economy and health risks. There are reported occurrences of repeated flooding in Jamaica (2004, 2007, 2008, 2010) as a result of disharmony between human use of the environment and natural systems.

Jamaica by virtue of its location in the path of the Atlantic hurricane tracks gets severely affected by tropical storms and hurricanes which cause extensive flooding and consequent damage to life and property. As reported in the IPCC Assessment reports the intensity of hurricanes and tropical storms in the Atlantic basin is projected to increase, and this will thus significantly affect Jamaica. **Dr Arpita Mandal of the Department of Geography and Geology at the University of West Indies Mona Campus (Principal Investigator) and Dr Matthew Wilson of the Department of Geography, University of the West Indies, St Augustine (Co-PI)** embarked on this interesting and highly relevant project for two watersheds of Jamaica (**Yallahs in the east and South Negril -Orange river in the west**). The project commenced in January 2013 and was funded by **Climate and Development Knowledge Network (CDKN)** under their **Caribbean Climate and Development Research Call**, managed by **The CARIBSAVE Partnership**.

One of the main driving questions of the project was "*What are the potential impacts of climate change on Jamaica's vulnerability to flooding from extreme events?*"

To respond to this the project involved building flood inundation models for the Yallahs and South Negril Orange river watersheds using present and future climate projections of rainfall data. Hydrological and hydraulic model were created for the above mentioned watersheds using HEC HMS (hydrological modelling systems software) and LISFLOOD-FP (hydraulic model). The models were run for tropical

storm Gustav and for 25, 50 and 100 yr rainfall return periods. Future climate projections for the end of the century (2080's) , received from the **Climate Studies Group, UWI MONA, headed by Professor Michael Taylor** were conditioned on the present rainfall data to create future flood risk maps for the watersheds. The project also targeted vulnerable communities of the study areas (Yallahs in the Blue and John Crow Mountain National Park) and Negril in the South Negril Orange river watershed. Community surveys, meetings and an awareness programme was conducted in Yallahs by **Jamaica Conservation and Development Trust (JCdT)** and by student of **UWI Institute of Sustainable Development** for the Negril area.

The findings from this project were presented at a stakeholder consultation workshop at the University of the **West Indies, Mona Campus from May 14-16, 2014**. The workshop was led by **Dr Arpita Mandal and Dr Matthew Wilson** and was well attended by 35 participants from different Government agencies. Some of the agencies which attended the workshop were the Water Resources Authority of Jamaica, Office of Disaster Preparedness and Emergency Management , Planning Institute of Jamaica, Meteorological Service of Jamaica , students and academics from UWI (Dept of Geography and Geology and Physics). The workshop involved presentation of the project findings as well as training session on Hydrological Model (HEC HMS) and Hydraulic Model (LISFLOOD-FP) by **Drs Mandal and Wilson**. Participants were involved in group assignments and were actively involved in discussions on flood hazards in Jamaica, impacts of climate change and possible adaptation measures. The workshop was joint venture of the two UWI campuses and it was a very innovative idea of dealing with a very highly emerging and consistent problem in the Caribbean - FLOODING. A few results of the project particularly related to Yallahs as well as the study areas are shown in figures 1-3 below.

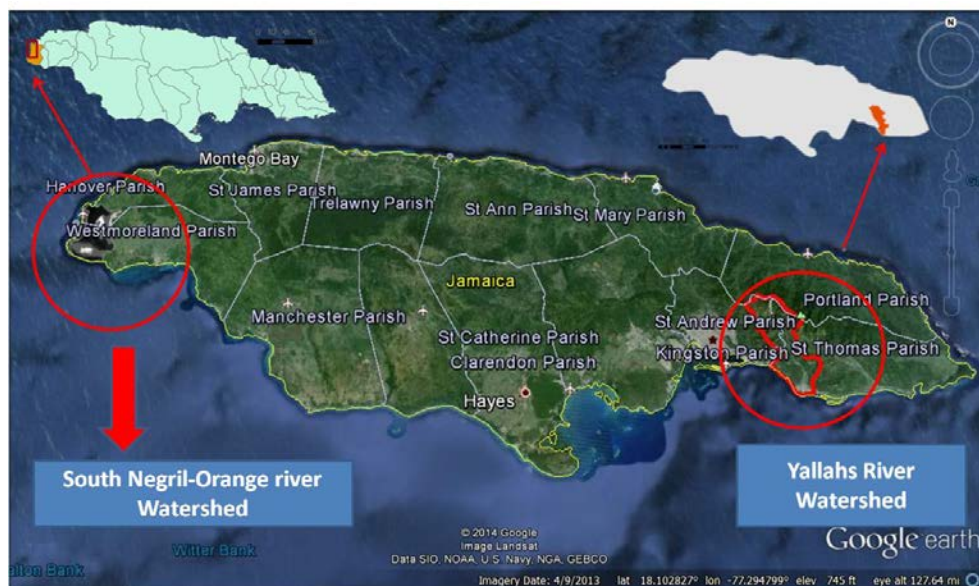


Figure 1. Location of the two project study areas with respect to the island of Jamaica



Figure 2 : Flood damages in Jamaica (Gleaner newspaper archives)

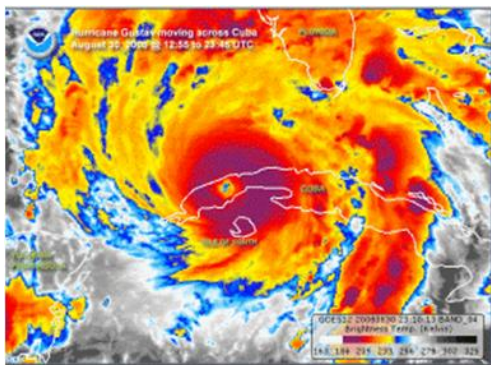
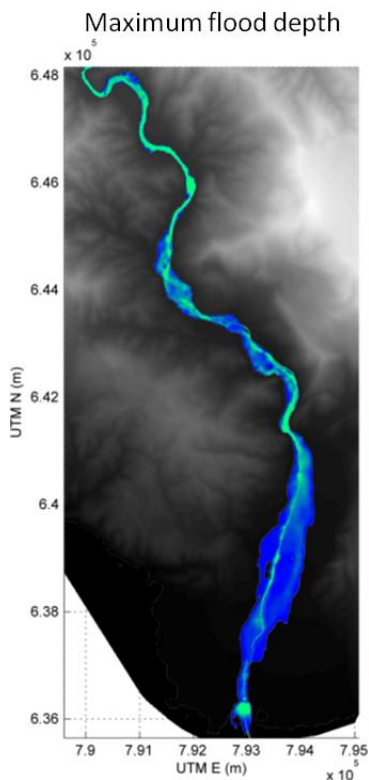


Figure 3 a



Flood peak upstream
occurred ~1 hour before it
reached downstream

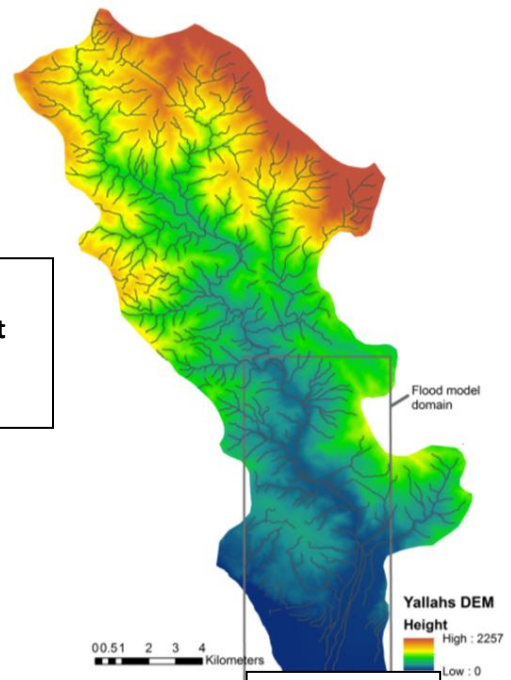


Figure 3 b

Figure 3 (a-e) Tropical Storm Gustav, Yallahs flood study area, maximum flood depth for Gustav and future flood risk for Yallahs.

Figure 3 c

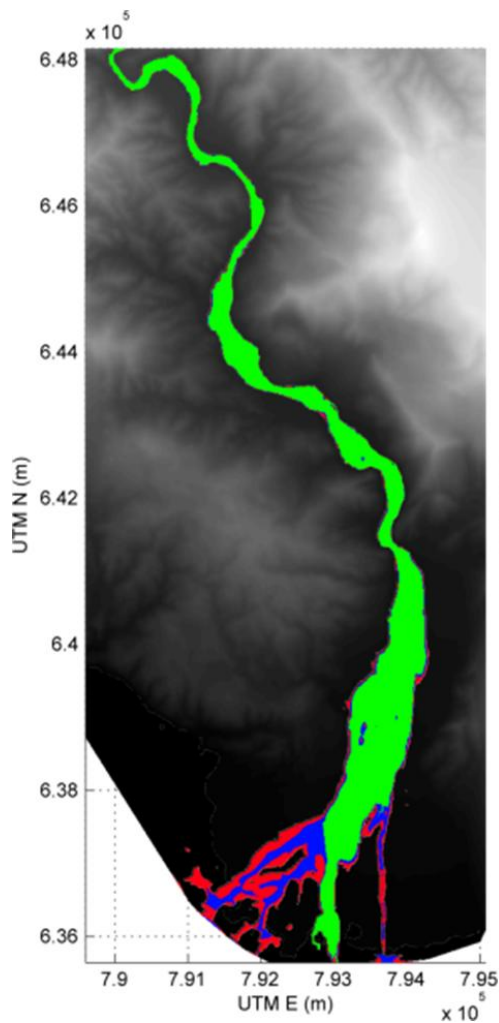


Figure 3 d, Presence exceedance probability

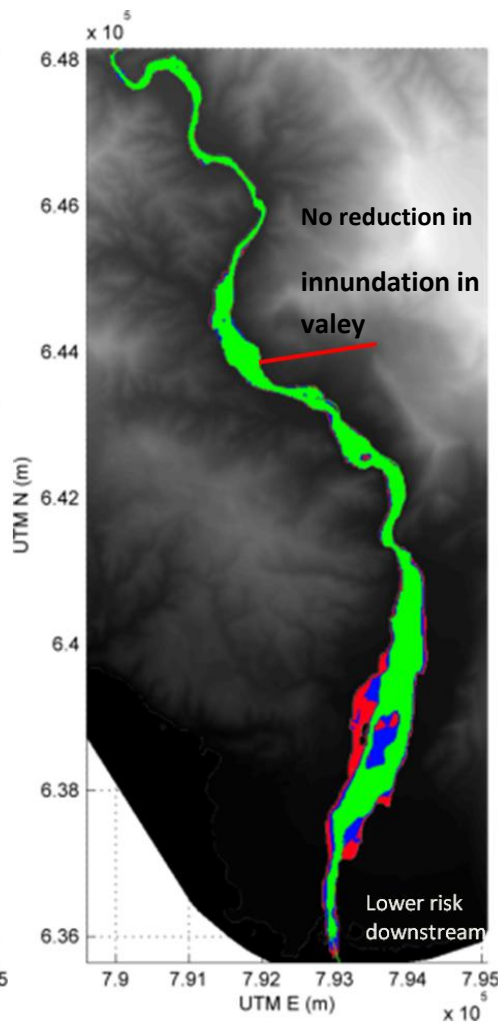


Figure 3 e, (2070-2099) annual exceedance probability, ECHAM B1

Maps of exceedance probability:

- Green: 4% (25 year return period)**
- Blue: 2% (50 year return period)**
- Red: 1% (100 year return period)**

Climate projections suggest a decline in future flood frequency although inundation extending in the valley does not reduce substantially.

Some of the pictures taken at the workshop are attached below



Training on HEC HMS carried out during the workshop at the Dept of Geography and Geology, UWI MONA



Participation of stakeholders in group exercises



Workshop Participants and Dr Matthew Wilson (extreme left, workshop co -chair)

Acknowledgements

- **CDKN (Climate Development and Knowledge Network)**
- **CARIBSAVE**
- **Office of Disaster Preparedness and Emergency Management, Jamaica**
- **Water Resources Authority , Jamaica**
- **Meteorological Services of Jamaica**
- **CEAC Solutions Ltd**
- **MONA Geoinformatix Ltd**