

CCRIF

The Caribbean Catastrophe Risk Insurance Facility



CCRIF: Application of Risk Analysis and Modelling in the Insurance Sector

***Technical Cooperation Workshop for Development of the Caribbean
Regional Cooperation Programme in Multi-Hazard Early Warning System***

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Prepared by:
Caribbean Risk Managers Ltd, Facility Supervisor





PART I

- CCRIF overview and background
- CCRIF role in disaster risk management
- Performance to date

PART II

- Application of Risk Analysis and Modeling in the Insurance Sector
 - 2nd Generation Model
 - Excess Rainfall Model
 - Real Time Forecasting System (RTFS)
- Challenges
- Looking Forward – A wish List





- Caribbean countries are highly vulnerable to natural disasters, which have caused them average losses amounting to 2% of GDP since 1970.
- Only 3% of potential loss is currently insured in developing countries vs 45% in developed countries.
- Immediate access to liquidity is critical for governments and individuals post disaster.
- Smaller nations with high debt burdens can no longer afford to self-finance disaster risk.

Vulnerability

Low Coverage

Liquidity

Debt Burden





- Pooled re/insurance solution for Caribbean governments first called for by CARICOM Working Party on Insurance after Hurricane Andrew ('92)
- Andrew resulted in US\$250 million in damage in Bahamas alone
- Revived in 2004, after Hurricane Ivan inflicted almost 200% of GDP damage on Grenada and the Cayman Islands
- All parties identified the high exposure of small island economies across the region to natural hazards, and the consequential risk to sustainable development
- CARICOM Heads of Government asked the World Bank to assist in designing and implementing a cost-effective risk transfer programme for member governments





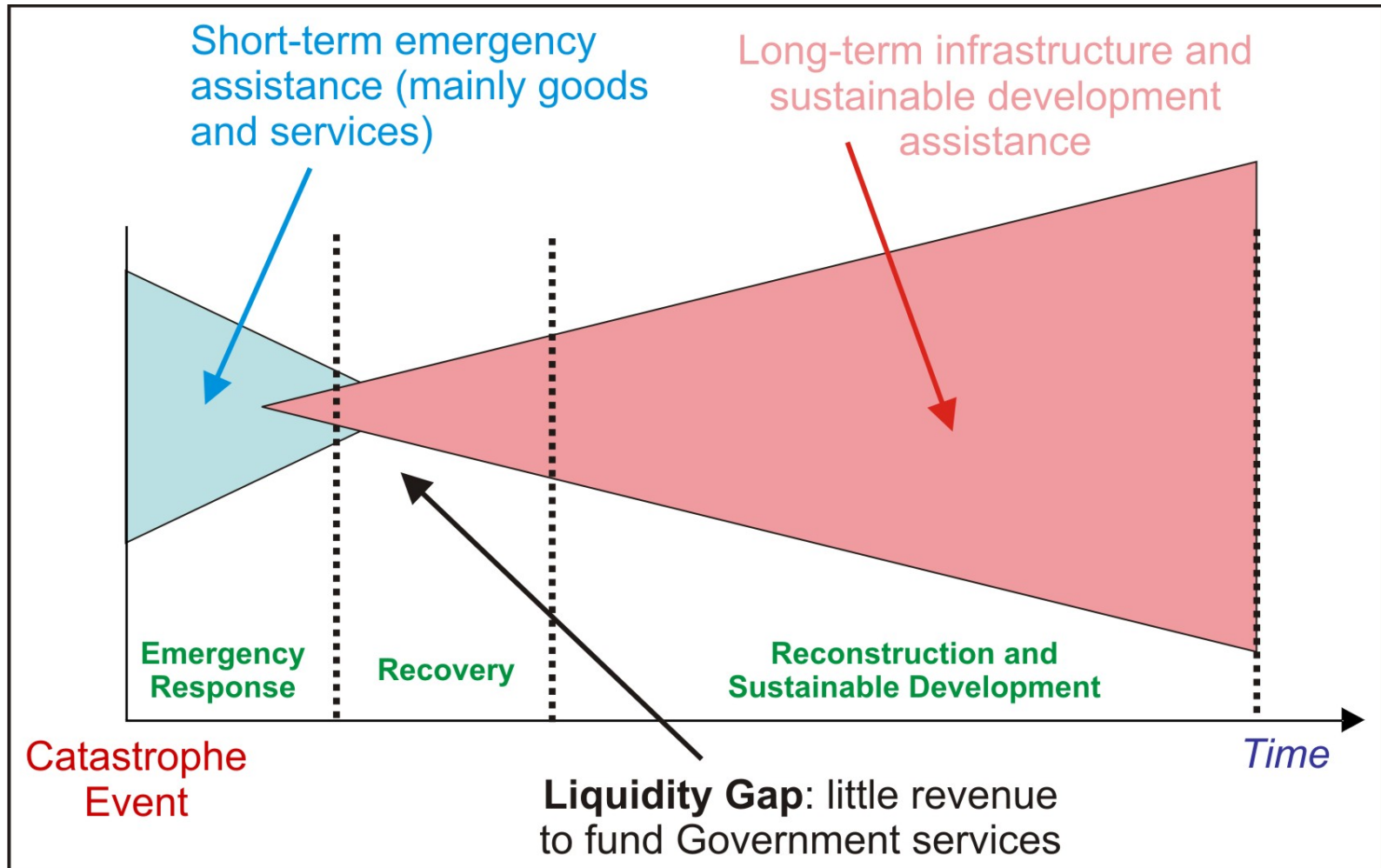
- Began operation in 2007
- CCRIF is the world's first multi-national risk pool to cover sovereign risk via parametric insurance
- A regional catastrophe fund for Caribbean governments designed to limit the financial impact of devastating hurricanes and earthquakes by providing liquidity very quickly after a major event
- Functions like business interruption insurance against Government revenue reductions in the aftermath of major natural catastrophes• Coverage is designed to cover short term revenue shortfall an NOT infrastructure, indirect social costs etc
- Capitalised by donors and participants (via a membership fee). CCRIF initially raised capital to cover claims and operating costs from donors (c. US\$50 M) and from its participants (c. US\$22 M). Donor capital now over US\$65 M
- Claims paying capacity is greater than the modelled aggregate annual loss with a 1 in 10,000 chance of occurring
- Uses parametric index which converts wind speed (for storm) or ground acceleration (for quake) into a government loss estimate at key sampling sites, which are aggregated to national loss





- Stakeholders identified the need for a mechanism to provide:
 - Funds to cover the post-disaster liquidity gap faced by governments between immediate emergency aid and long-term redevelopment assistance
 - A facility which would enable governments to receive money quickly, with the payout calculated in a completely objective way
 - A mechanism which would minimise the burden on governments to provide exposure information prior to coverage being initiated and loss information after a disaster







Paid out approximately US\$33 million since its inception (3.5 years)

<p>2007 – US\$1 M to St. Lucia and Dominica 29 November earthquake in Eastern Caribbean</p>	<p>2010 - US\$4.2 M to Anguilla Hurricane Earl (September)</p>
<p>2008 – US\$6.3 M to the Turks & Caicos Islands Hurricane Ike</p>	<p>2010 - ~US\$8.5M to Barbados Hurricane Tomas (October)</p>
<p>2010 – US\$7.75 M to Haiti 12 January earthquake The first set of funds to be received by the Government of Haiti inclusive of all pledges, regional and international Represented perhaps 50% of the TOTAL aid Government of Haiti received in first 10 weeks in the form of direct liquidity</p>	<p>2010 - ~US\$3.2M to ST. Lucia Hurricane Tomas (October)</p>
	<p>2010 - ~US\$1.1M to St. Vincent and the Grenadines Hurricane Tomas (October)</p>

Strong proof of concept





- Insurance is a natural companion to risk reduction within an overall risk management framework (parametric especially, because 'moral hazard' is removed)
- Risk reduction is vital and should be continuous
- Risk transfer (insurance) is cost efficient to handle risks that are too expensive to reduce/mitigate
- Catastrophe risk transfer is an efficient way to address 'residual' climate change risk (risk that cannot be adapted to in a cost efficient way), much of which is due to low-frequency, high impact events





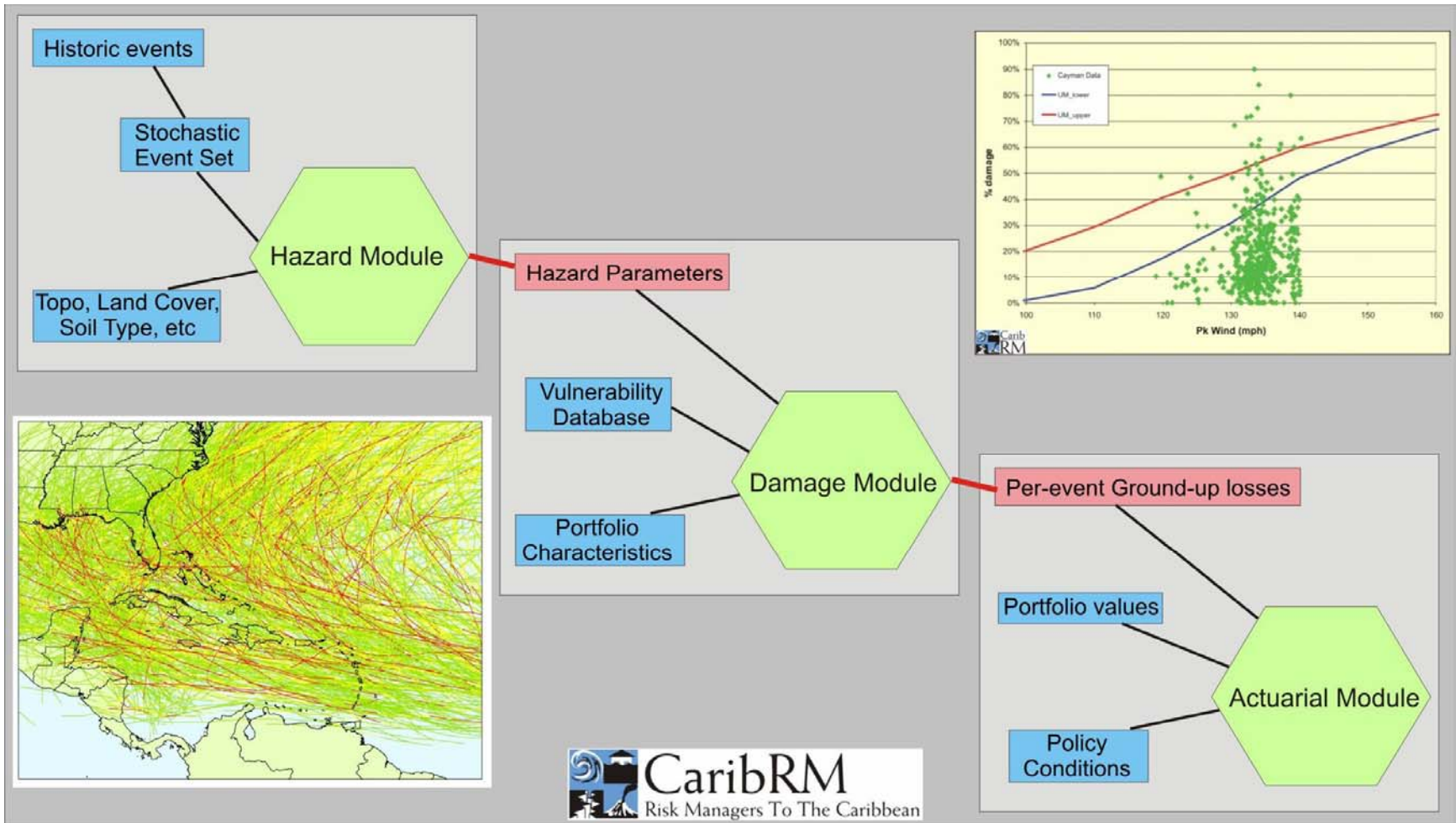
PART II

Application of Risk Analysis and Modelling in the Insurance sector

- CCRIF Second Generation Model
 - Rainfall Model
 - CCRIF RTFS
- Weather Forecasting Model for Haiti

- Challenges, Looking Forward – A wish List







- Apart from assisting in the recovery and reconstruction process through provision of liquidity, CCRIF is also engaged in the following:
 - Facilitating the implementation of risk management measures that reduce risk and heighten resilience
 - Promoting risk assessment and risk management tools at all levels (e.g. Real Time Forecasting System)
 - Involved in the design of suitable index-based or hybrid products at sub-national level either directly or via community-based partners
 - Also extending support to critical institutions which are key to informing this process





- Development of the Second Generation (2G) model by Kinetic Analysis Corporation in conjunction with CaribRM
- Further refinement for CCRIF, and
 - broadens the scope of potential financial instruments which could be made available for risk management and mitigation in both the public and private sectors
- This new platform enables the use of either a hazard index or modelled-loss as the basis for parametric contracts
- Its modular and highly scalable architecture enables new hazard modules and a variety of exposure database formats (including gridded and point-data exposure) to be simply added





- CCRIF decided to develop a new modelling framework to:
 - Create a platform on which to develop new coverages and bring in new countries
 - Reduce the basis risk induced by indexing (by moving to a modelled-loss approach)
 - Increase understanding of methodology used in loss calculations for given events
 - Provide a more open environment to assist in regional development of cat modelling expertise and stand-alone models





- In addition to the multi-hazard 2G model, CCRIF and KAC, in partnership with the Caribbean Institute for Meteorology and Hydrology (CIMH), has completed a rainfall model focused primarily on quantifying rainfall at high resolution for extreme events
- The model produces six-hourly rainfall estimates at ~1km resolution for the Caribbean Basin based on the Global Forecast System initialisation data, run with topographic enhancement
- CIMH currently runs the model 24/7, with the outputs being available
- The rainfall model is of particular interest in the agriculture sector
- CCRIF will be using the base rainfall accumulation as a basis for its new excess rainfall policy to offer CCRIF countries an opportunity to transfer catastrophic flooding risk
- Rainfall will be aggregated at the basin level in either flat or flow accumulations (depending on a verification exercise) and weighted according to relative exposure within a basin to produce an extreme rainfall impact index
- This new product will be aimed at helping to mitigate the economic consequences of major rainfall events on governments – it will NOT focus particularly on agriculture although agricultural exposure will be taken into account in the indexing methodology





- The insurance program will cover extreme rain events generated by Tropical Cyclones (TC), as well as by non tropical systems
- Countries will have the option to decide in which basins the coverage should apply
- The program will be integrated with the existing CCRIF Hurricane and Earthquake insurance program, and be part of the Facility Loss Model (FLM)

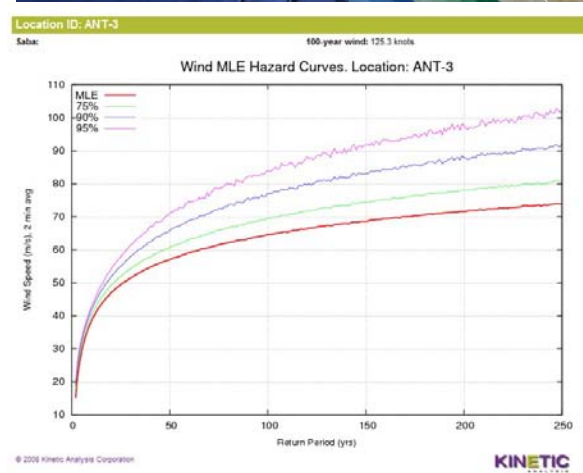
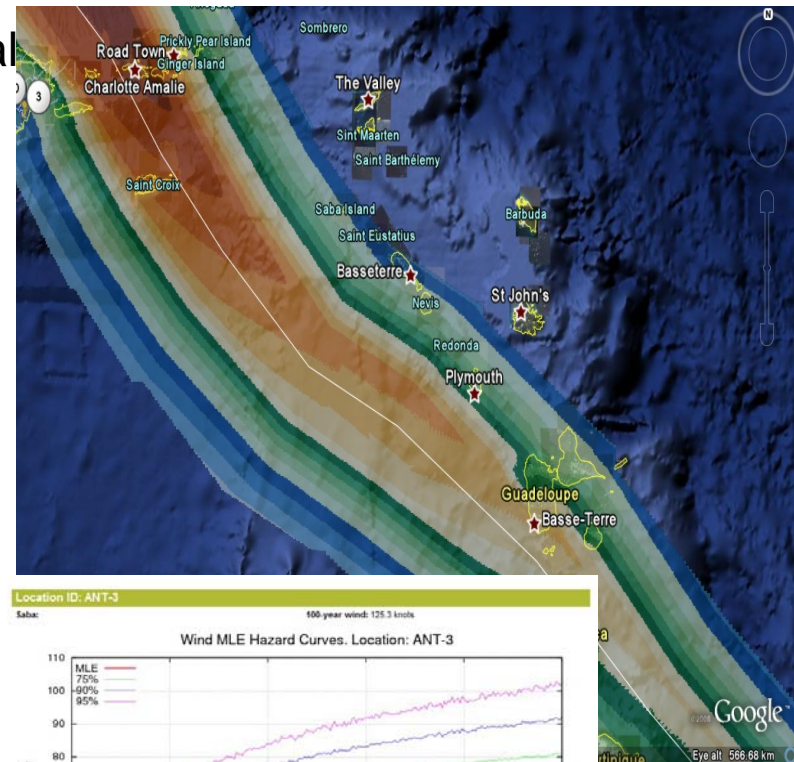
Challenges

- Pure volume of data – 4km resolution every 6 hours across the entire basin for 60 years is a lot of data, so had to completely change the database structure to handle this
- Seasonal variations in how rainfall is generated in the region and tweaking the model options to get the best results in each season





- Promote risk assessment and risk management tools at all levels (e.g. Real Time Forecasting System.)
- CCRIF provides real-time storm impact forecasts (RTFS) for all member countries. Forecasts cover:
 - Maximum wind speed, storm surge height, wave height, and cumulative rain in the swath of the storm
 - Expected damage levels, power outage, and disruption to port and airport operation
- Forecasts are updated with every new NHC advisory, and are available shortly after advisory.
- Available in Google Earth, and as ESRI shapefiles

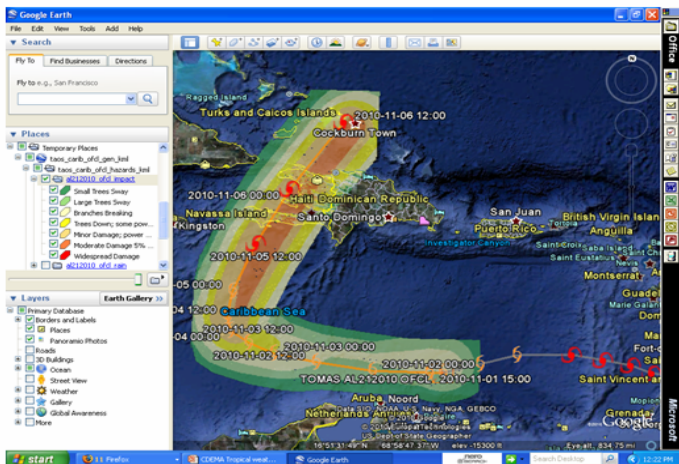




KAC-TAOS – Impact

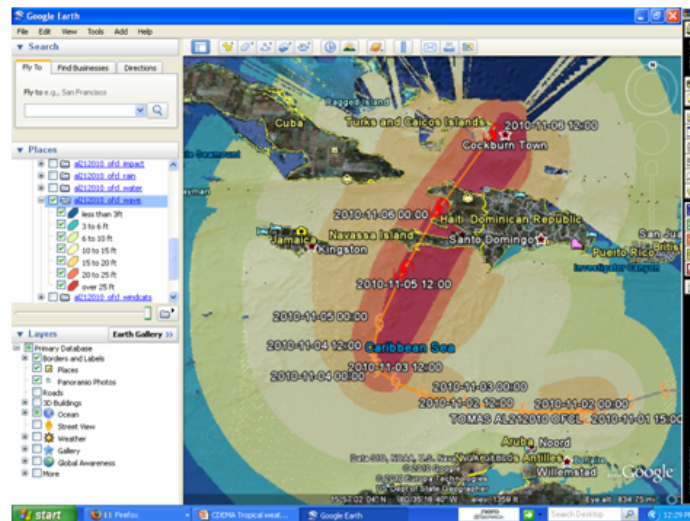
The following are projected storm force hazards related to the passage of Hurricane Earl; from KAC TAOS model for the CCRIFS (0932 UTC output)

Wave height

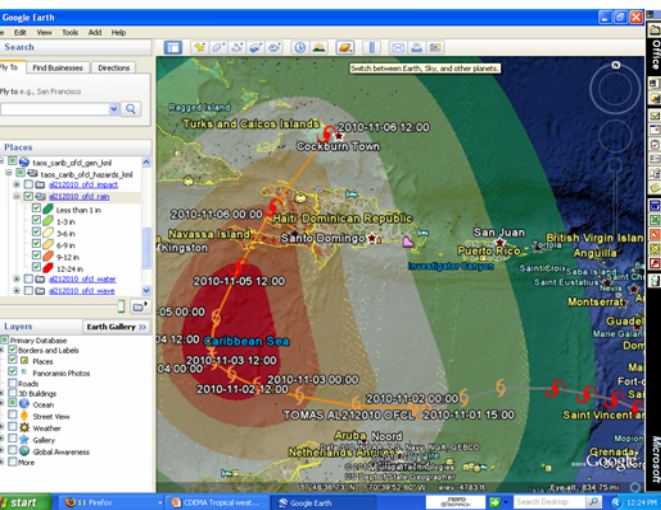


Rainfall

Tomas continues to weaken in the Caribbean sea the conditions are favorable for the northerly turn and intensification over Haiti



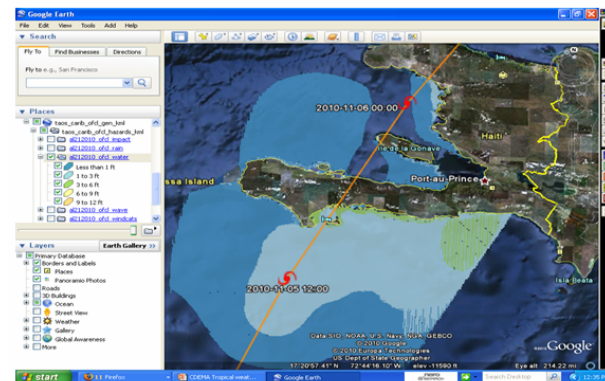
Rough Seas expected -- along the eastern side of the storm track, and right in the area of Haiti-waves ranging from 15 to 25 ft and more



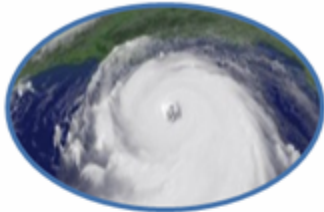
Storm Surge

Rainfall on the order of 3 to 9 in are possible.

As system draws close –will provide more detailed model forecasts



Storm surge – will affect much of the south coast of Haiti range – 3 to 6 ft.



CONTINGENCY PLANNING

- Obtain a preview of what might happen if a given storm continues along its projected path, and activate appropriate contingency plans based on this insight
- Update country plans as needed with new information from latest forecast



SHELTER MANAGEMENT

- Identify impact areas and shelter locations to support shelter allocation decisions
- Identify potential damage to shelters and plan for alternatives



EMERGENCY INTERVENTION

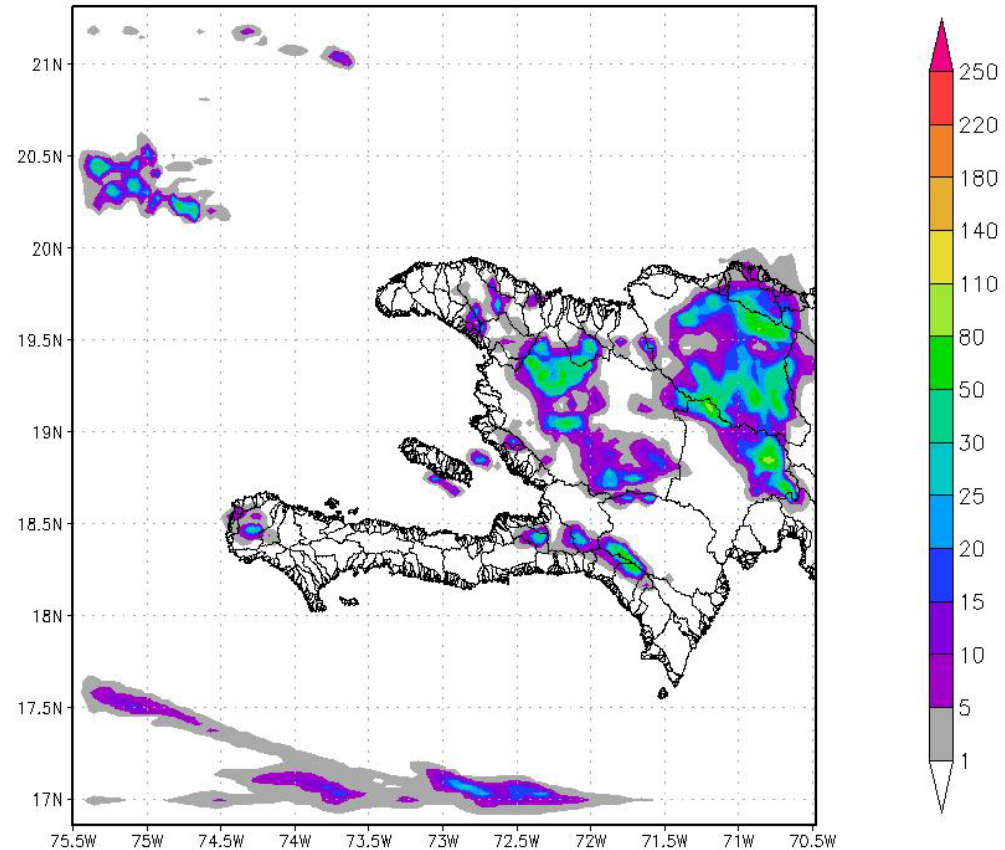
- Identify areas where population is at risk and issue warnings, plan for assistance





- Less than 24hrs after the January 12 earthquake CIMH began producing high resolution (4km) predicted rainfall over Haiti daily
- WRF rainfall forecast outputs for Haiti
 - produced on a operational basis
 - posted as quickly as possible
 - covering a 48-hour forecast period
- Provide early warning of potential heavy rain events and their location, which are superimposed on the overall drainage basin configuration (as well as draped over topography)
- Help end-users visualise the areas that could be impacted

Caribbean Institute for Meteorology and Hydrology
Aggregated precipitation (mm) Valid 02Z 11/08 2010





- Information/tools made available to:
 - Haitian Government
 - Civil Protection Directorate
 - Centre National de Meteorologie
 - World Bank
 - International Research Institute for Climate and Society (IRI) at the Columbia University Earth Institute
 - UN-OCHA (primarily interested in the information for short-term contingency planning)
 - IFRC (International Federation of Red Cross and Red Crescent Societies) – lead the Haiti Shelter Cluster
 - WFP (World Food Programme) – lead the Haiti Logistics Cluster
- CIMH provides technical assistance and training support in the use of the tools where and when required (training provided to several OCHA, IFRC and WFP representatives)





- CCRIF cementing its regional value in the area beyond just providing insurance. CCRIF Experience highlights the need to:
- Use available science in modelling cat risks in the developing world – even if it is not readily available or as comprehensive as in the developed world
- Support basic scientific and engineering research in the Caribbean, partnering with regional institutions, which are all poorly resourced to do much fieldwork or hi-tech data acquisition
- Better collection, analysis and archiving of loss data for natcat events, to calibrate models
- Critical for Caribbean to develop its own models based on existing and yet-to-be-collected data
- More fundamental research on natural hazards in the region, focussed on better understanding hazard event frequency and intensity
- Going forward, greater focus should be directed at understanding not just insured risks but national infrastructure and economic susceptibility – this work is confined to academia and IFIs right now, and **linking that to the work of meteorological institutions**
- Development of region-specific damage functions through engineering studies
- Need to continue building technical capacity/expertise to better understand and manage nat cat risk
- CCRIF's new model and the investment made in development of rainfall model, RTFS etc a good starting point



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The end



Thank you

