



# **Tropical Cyclone Irma (AL112017)**

## **Wind and Storm Surge**

### **Preliminary Event Briefing**

## **Haiti and the Turks and Caicos Islands**

**10 September 2017**

## 1 SUMMARY

Irma, now recognized as the most powerful Atlantic Ocean hurricane in recorded history, formed as a tropical storm on 30 August at 15UTC, west of the Cape Verde Islands and it was upgraded to hurricane status on 31 August at 15UTC. Irma intensified moving across the Atlantic Ocean, reaching the Leeward Islands as a major hurricane (category 5) on 6 September at approximately 12UTC. Antigua and Barbuda, Anguilla and St. Kitts and Nevis experienced hurricane-force winds and storm surge up to 2.2 m. In the following hours, Irma moved towards the west-northwest, affecting the British Virgin Islands, Puerto Rico, Dominican Republic, Haiti, Turks and Caicos Islands and Cuba. At the time of writing of this report, Irma is forecasted to affect The Bahamas, and the states of Florida, Georgia and South Carolina in the United States, before finally dissipating.

This report presents the impacts of Irma effects on CCRIF member countries Haiti and the Turks and Caicos Islands. Another Event Briefing Report will be issued for other CCRIF countries that could be affected.

The preliminary runs of CCRIF’s loss model for wind and storm surge produced government losses for the Turks and Caicos Islands above the attachment point for its Tropical Cyclone (TC) policy. In the case of Haiti, the preliminary runs of CCRIF’s loss model for wind and storm surge produced government losses. These losses were below the attachment point of Haiti’s TC policy but they activated the Aggregate Deductible Cover (ADC) for the policy. Preliminary calculations show that payouts are due to each country as follows:

Turks and Caicos Islands	US\$ 13,631,864
Haiti	US\$ 162,000
<b>Total</b>	<b>US\$ 13,793,864</b>

This event briefing presents the CCRIF modelled losses from wind and storm surge but not rainfall. A separate briefing that addresses losses from excess rainfall will be issued at another time.

## 2 INTRODUCTION

On 31 August 2017 at 15UTC, the US National Hurricane Center (NHC) reported that a tropical storm developed west of the Cape Verde Islands, with maximum sustained winds of 50 mph (85 km/h). In the next 24 hours, Irma moved toward the west at 13 mph (25 km/h) and it rapidly intensified due to the favourable thermodynamic environment: low wind shear, humid layers and the passage over warm water. On 31 August at 15UTC, Irma was upgraded to a category 2 hurricane on the Saffir-Simpson Hurricane Wind Scale. At that time, Irma was located at 16.9N, 33.8W. It featured maximum sustained winds of 100 mph (155 km/h), and the estimated minimum pressure was 979 mb (Figure 1).

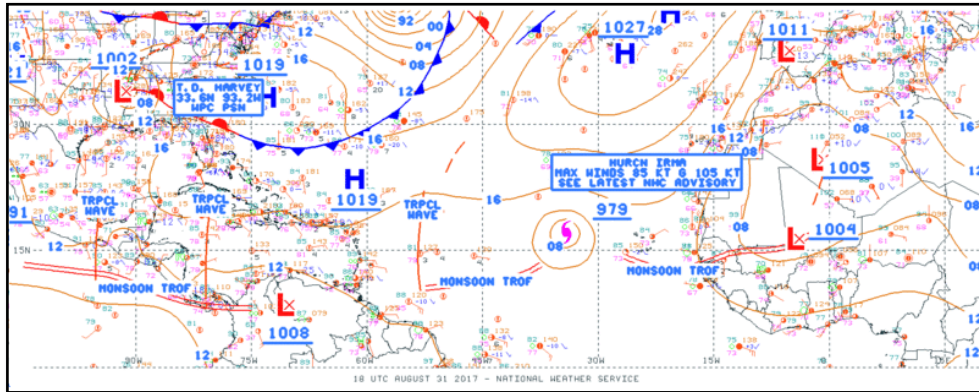


Figure 1 Surface analysis of the tropical Atlantic on 31 August 18UTC. Source: NOAA Ocean Prediction Center

After 12 hours, Irma was upgraded to a category 3 hurricane (thus becoming a major hurricane), with maximum sustained winds near 115 mph (185 km/h). At that time, the hurricane moved in a west-northwest direction at almost 12 mph (19 km/h), to the south of a subtropical high pressure system extending over the central Atlantic. However, Irma was still embedded in a favourable low wind shear environment; its passage over colder surface water and the close proximity to the dry air of the high pressure system stopped Irma’s rapid strengthening.

During the following days, Irma moved along the southern border of the subtropical high pressure system centred over the Azores and extending over the central Atlantic (Figure 1). That condition induced the hurricane track to steer firstly toward the west- southwest (from 2 September at 15UTC to 4 September at 3UTC), later toward the west (from 4 September at 3UTC to 5 September at 15UTC) and finally toward the west-northwest (from 5 September at 15UTC to 6 September at 6UTC) at an almost constant forward velocity of about 13-15 mph (20-24 km/h) (Figure 2).

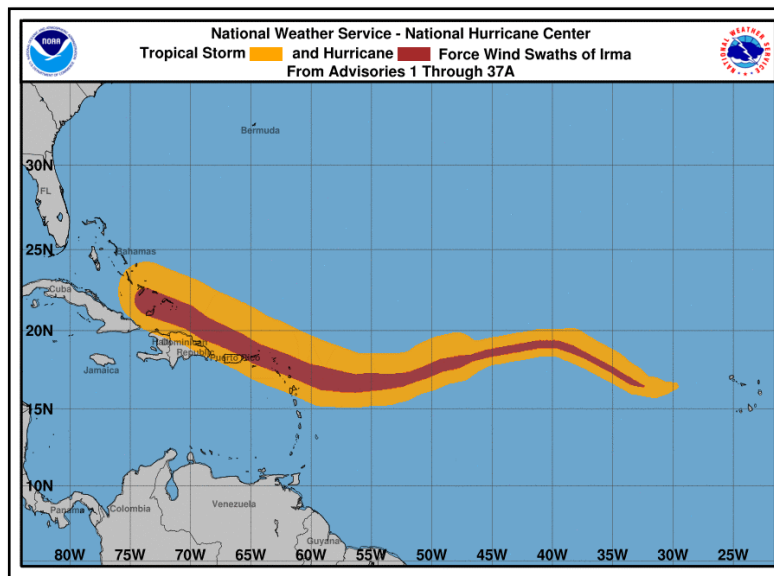


Figure 2 Irma's track and contouring of the wind speed intensity. Source: NHC

The hurricane force kept almost constant up to 4 September, when a further intensification took place. On 4 September at 21UTC, Irma became a category 4 hurricane, with maximum sustained winds of 140 mph (220 km/h) and minimum central pressure of 943 mb. At that time, the hurricane eye was located near 16.7N, 55.6W and the hurricane structure was well defined, showing a clear eye and a symmetrical cloud overcast ring around it, with very high top cloud (Figure 3).

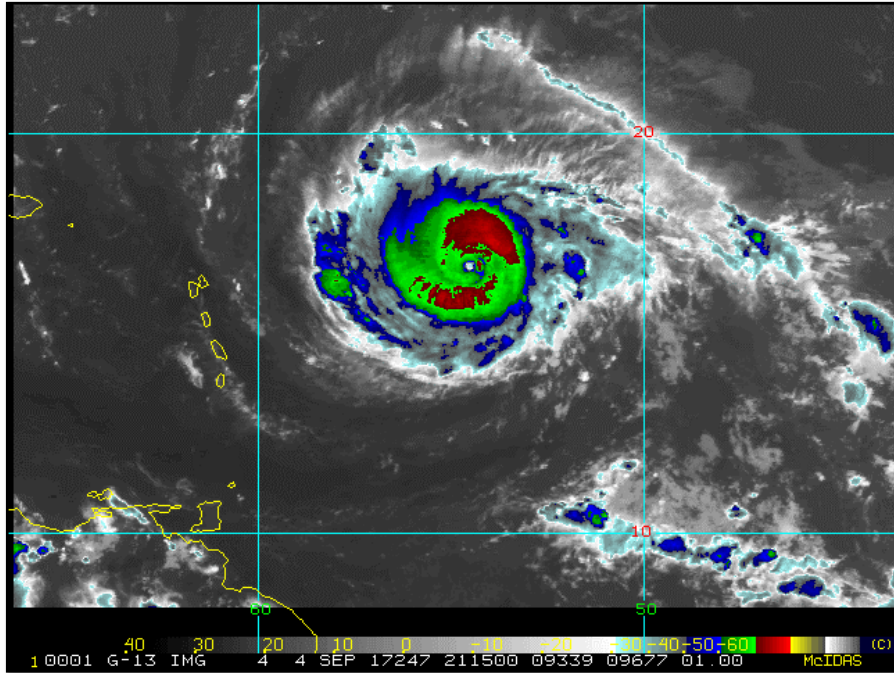


Figure 3 Enhanced infrared satellite image on 4 September at 21.15UTC. Red and green colours indicates very high and high top clouds. Source: NOAA

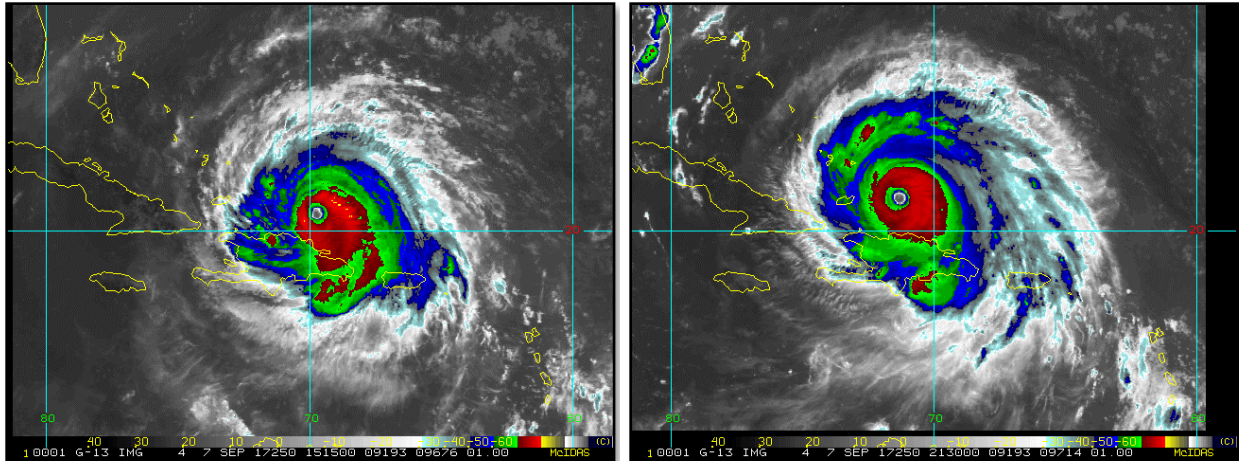
On 5 September at 15UTC, the NHC further upgraded Irma to a category 5 hurricane, with maximum sustained winds of 180 mph (285 km/h) and estimated minimum central pressure of 931 mb. Hurricane-force winds extended outward up to 60 miles (95 km) from the centre and tropical-storm-force winds extended outward up to 160 miles (260 km).

A few hours later, Irma reached the western edge of the subtropical high pressure system, gaining some latitude, and its track turned toward the west-northwest, heading toward the northern Leeward Islands.

On 6 September between 6UTC and 12UTC Irma's core passed over Antigua and Barbuda, Anguilla and St. Kitts and Nevis as a category 5 hurricane. During the following hours, the hurricane continued to move toward west-northwest heading for the Turks and Caicos Islands with a forward velocity of 16 mph (26 km/h). Wind intensity was almost unvaried, while the minimum central pressure decreased to approximately 921 mb, and later remained constant. Hurricane-force winds extended outward up to 70 miles (110 km) from the centre and tropical-storm-force winds extended outward up to 185 miles (295 km).

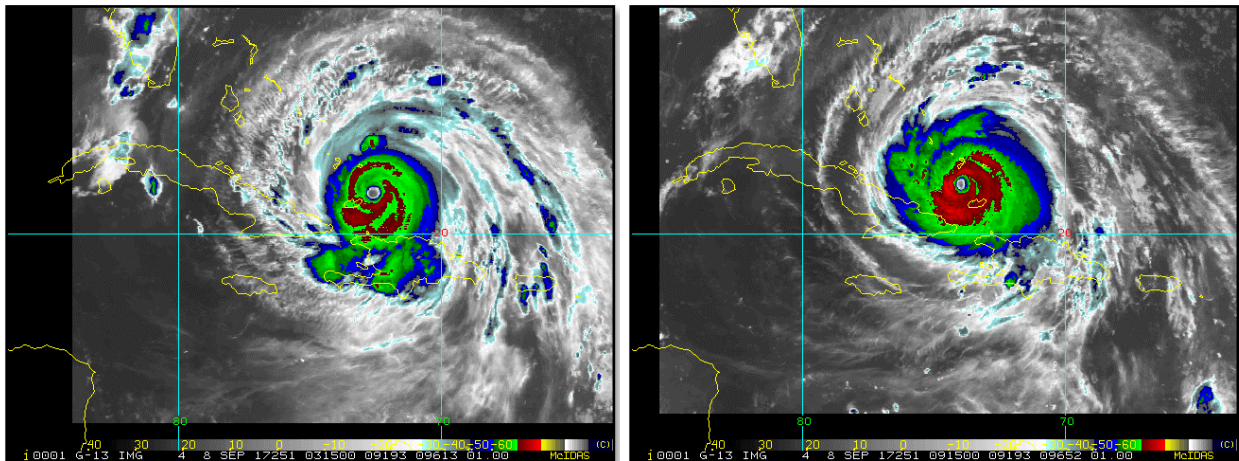
Between 7 September at 15UTC and 8 September at 09UTC, the eye of the hurricane moved between Hispaniola (Haiti/Dominican Republic) and the Turks and Caicos Islands (Figure 4).

The northern sector of Irma's core hit the Turks and Caicos Islands with hurricane-force winds starting on 7 September at 21UTC and continuing until 09UTC on 8 September. The estimated storm surge was about 15-20 feet (4-6 m). The southern sector of the Irma's core hit the northern coast of Haiti, which experienced hurricane-force winds between 00UTC and 06UTC on 8 September. The estimated storm surge was about 1-3 feet (0.3 - 1m).



a) 7 September 15:15UTC

b) 7 September 21:30UTC



c) 8 September 03:15UTC

d) 8 September 09:15UTC

Figure 4 Enhanced infrared satellite image at different times. Red and green colours indicates very high and high top clouds. Source: NOAA

### 3 CCRIF SPC MODEL OUTPUTS

Under CCRIF’s loss calculation protocol, a CCRIF Multi-Peril Risk Estimation System (MPRES) report is required for any tropical cyclone affecting at least one member country with winds greater than 39 mph (62.7 km/h). For Haiti and the Turks and Caicos Islands, Tropical Cyclone Irma qualified as a Triggering Event<sup>1</sup>.

The wind footprint (Figure 5 and Figure 7) and surge field (Figure 6 and Figure 8) are two of the outputs from the CCRIF model, which show the regions affected by certain magnitudes of wind velocity and storm surge in each country affected.

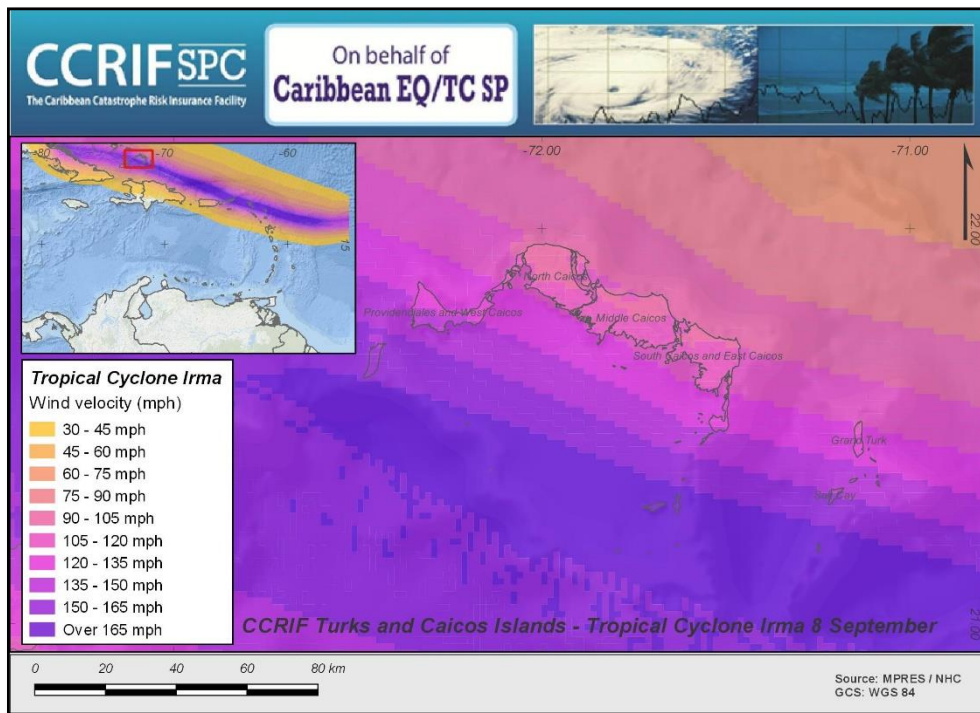


Figure 5 Map showing the wind field associated with Tropical Cyclone Irma on the Turks and Caicos Islands. Source: NHC & CCRIF/MPRES

<sup>1</sup> An event occurs and triggers one or more policies.

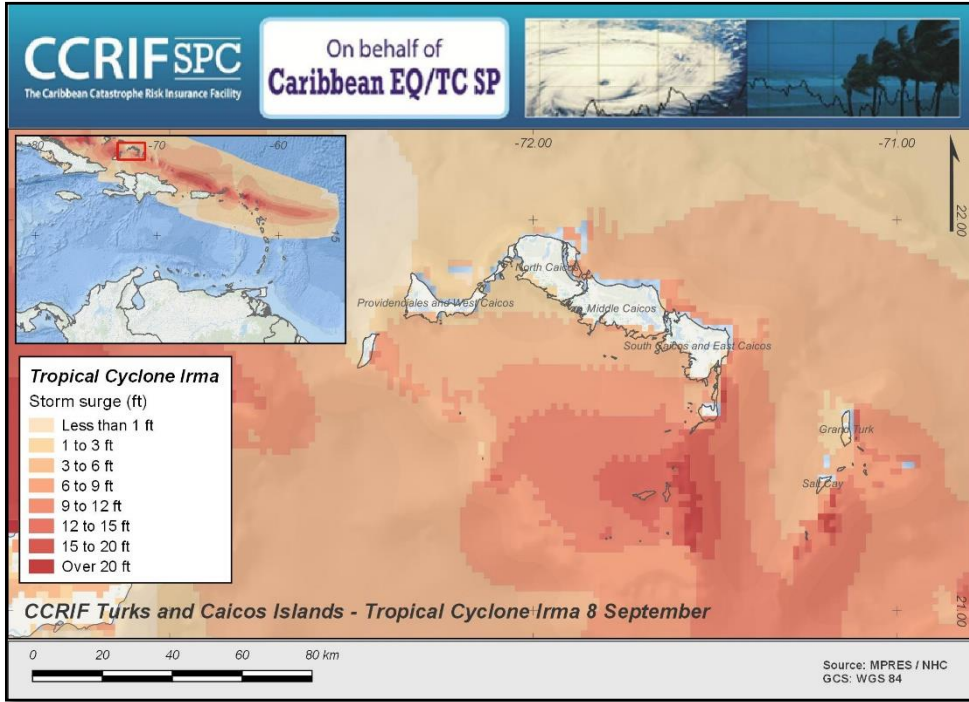


Figure 6 Map showing the storm surge field associated with Tropical Cyclone Irma on the Turks and Caicos Islands.  
Source: NHC & CCRIF/MPRES

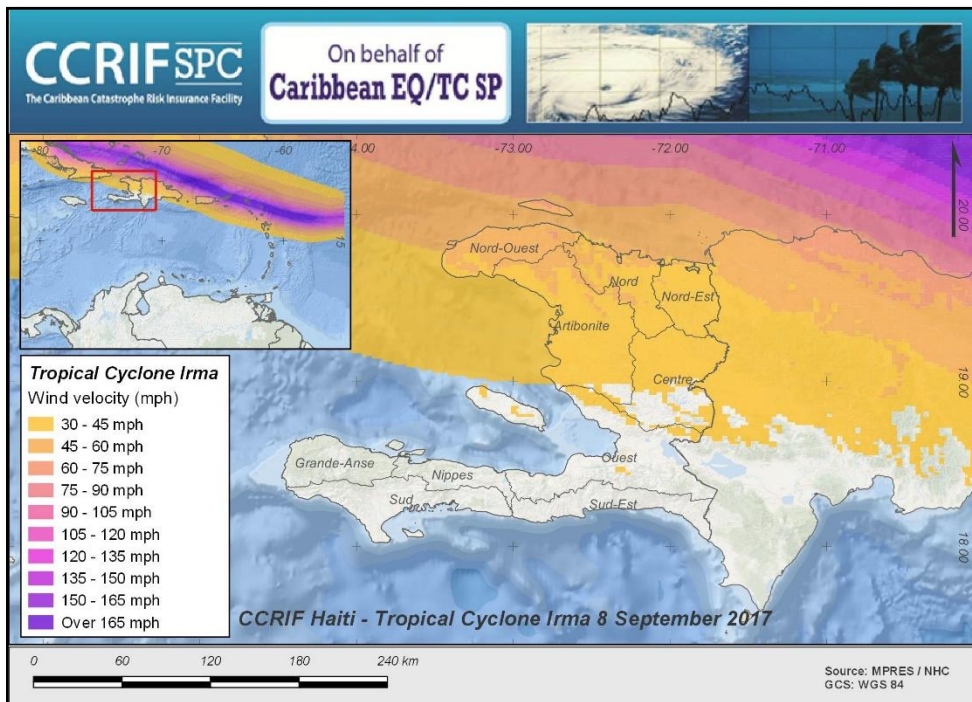


Figure 7 Map showing the wind field associated with Tropical Cyclone Irma on Haiti.  
Source: NHC & CCRIF/MPRES

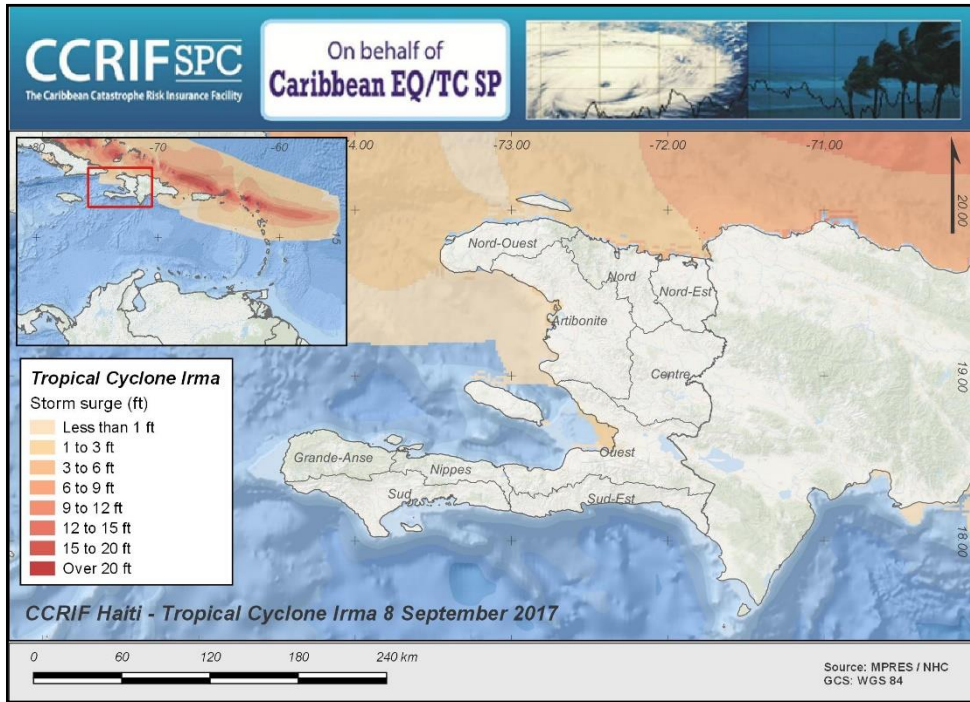


Figure 8 Map showing the storm surge field associated with Tropical Cyclone Irma on Haiti.  
Source: NHC & CCRIF/MPRES

## 4 IMPACTS

### Turks and Caicos Islands

The Disaster Management Agency reported that many trees and utility poles fell, making roads impassable. The Director of the Caribbean Tourism Organization (CTO), Mr. Ramon Andrews, reported that no lives were lost on the territory.

At the time of this report, the following information had been published in the local and regional news<sup>2 3</sup>:

- Dozens of roofs were torn off.
- Streets were flooded.
- The roof of the hospital in Cockburn Town was damaged.
- The Providenciales International Airport (PLS) was closed.

Prior to the arrival of hurricane Irma, precautionary measures were taken, including:

- The evacuation of coastal residents to higher ground.

<sup>2</sup> The New York Times, available in: <https://www.nytimes.com>

<sup>3</sup> Travel Agent Central, available in: <http://www.travelagentcentral.com>



## Haiti

According to Interior Minister Mr. Max Rudolph Saint-Albin, there was no significant damage in Haiti by the passage of Hurricane Irma. The Haitian authorities reported no casualties and no significant damages. The most affected Haitian departments were: Nord, Nord-Ouest, Centre and Nord-Est.

At the time of this report, damages were as follows:

- Roofs were torn from houses along the northern coast.
- Two people were injured in the northern port town of Cap-Haïtien when a tree crashed into their home.
- Northern villages from as far west as Môle-Saint-Nicolas to as far east as Ounaminthe, on the Haiti-Dominican Republic border were flooded.
- Roofs were removed, roads damaged and connections were cut off between major cities and farming communities.

Prior to the arrival of hurricane Irma, precautionary measures were taken, including:

- Evacuations took place in northern coastal areas.
- The National Emergency Operation Centre (NEOC) and the Emergency Operations Center (EOC) in the ten departments were activated.
- 793 shelters were opened; approximately 10,000 citizens occupied shelters.

Figure 9 show the damage caused by Hurricane Irma in Haiti.



Figure 9 Damage caused by Hurricane Irma in Haiti – September 2017.

Sources: *Daily Express* and *The Miami Herald*

## 5 CCRIF LOSS MODEL

Modelled losses due to wind and storm surge and any resultant payouts are based on the conditions selected by member countries for their Tropical Cyclone policies.

The preliminary runs of CCRIF's loss model for wind and storm surge produced government losses for the Turks and Caicos Islands above the attachment point for Tropical Cyclone policy. In the case of Haiti, the preliminary runs of CCRIF's loss model for wind and storm surge produced government losses. These losses were below the attachment point of Haiti's TC policy but they activated the Aggregate Deductible Cover (ADC) for the policy.

The ADC is a mechanism for CCRIF to help its members manage the basis risk inherent in the parametric nature of a policy, which arises when modelled losses are insufficient to trigger payouts or the modelled losses are not registered but governments and the population observe losses on the ground.

CCRIF has designed this voluntary "deductible cover" endorsement to the main policy which helps governments receive payouts in situations where:

- There is a modelled loss that falls between 50% and 99% of the Attachment Point in the main TC/EQ policy.
- The MPRES model does not register a loss but there is a disaster alert declaration from ReliefWeb related to a monitored event.

Preliminary calculations show that payouts are due to each country as follows:

Turks and Caicos Islands	US\$ 13,631,864
Haiti	US\$ 162,000
<b>Total</b>	<b>US\$ 13,793,864</b>

CCRIF expresses empathy with the Government and people of Haiti and the Turks and Caicos Islands for the impacts caused by hurricane Irma.

For further information, please contact ERN-RED, the CCRIF SPC Risk Management Specialist.

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