



Tropical Cyclone Irma (AL112017)

Wind and Storm Surge

Preliminary Event Briefing

Leeward Islands

8 September 2017

1 SUMMARY

Irma is one of the most powerful tropical cyclones on record. It 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 and it reached 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. The present report regards Irma’s effects on these CCRIF countries.

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 US states of Florida, Georgia and South Carolina before finally dissipating. An additional Event Briefing Report will be issued for other CCRIF countries that are affected.

The preliminary runs of CCRIF’s loss model for wind and storm surge produced government losses for Antigua and Barbuda, Anguilla and St. Kitts and Nevis which were above the attachment point for each country’s Tropical Cyclone policy. Preliminary calculations show that payouts are due to each country as follows:

Antigua & Barbuda	US\$ 6,794,875
Anguilla	US\$ 6,529,100
St. Kitts & Nevis	US\$ 2,294,603
Total	US\$ 15,618,578

This event briefing is designed to review the CCRIF modelled losses as well as damages from wind and storm surge but not rainfall. A separate briefing that addresses loss and damages from excess rainfall will be issued.

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 a maximum sustained wind 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-shear, humid layers and the passage over warm sea. 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).

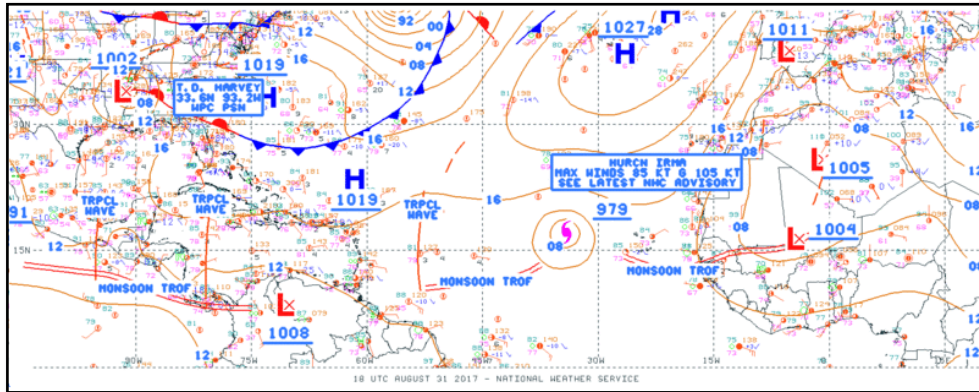


Figure 1 Surface analysis of the tropical Atlantic on 31 August 18 UTC. Source: NOAA Ocean Prediction Center

After 12 hours, Irma was upgraded to a category 3 hurricane (thus becoming a major hurricane), since the observed maximum sustained winds were 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 15 UTC to 4 September at 3 UTC), later toward the west (from 4 September at 3 UTC to 5 September at 15 UTC) and finally toward the west-northwest (from 5 September at 15 UTC to 6 September at 6 UTC) at an almost constant forward velocity of about 13-15 mph (20-24 km/h) (Figure 2).

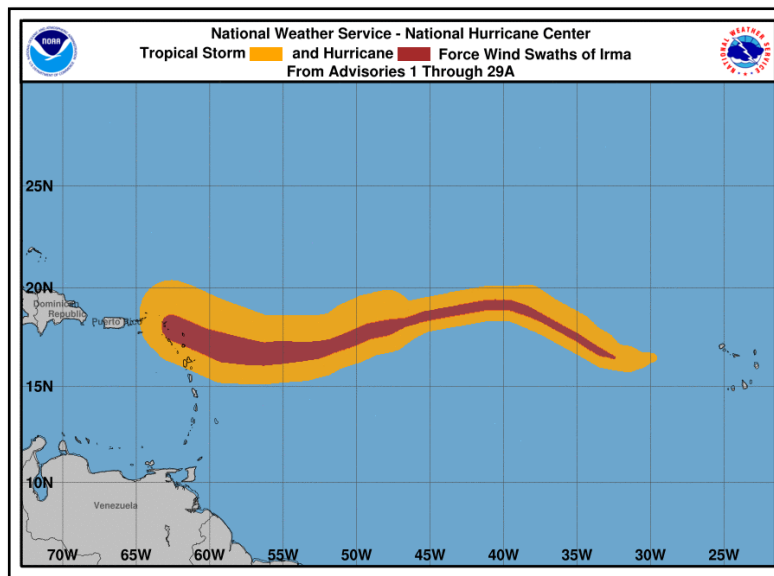


Figure 2 Irma's track and contouring of the wind speed intensity. Source: NHC

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).

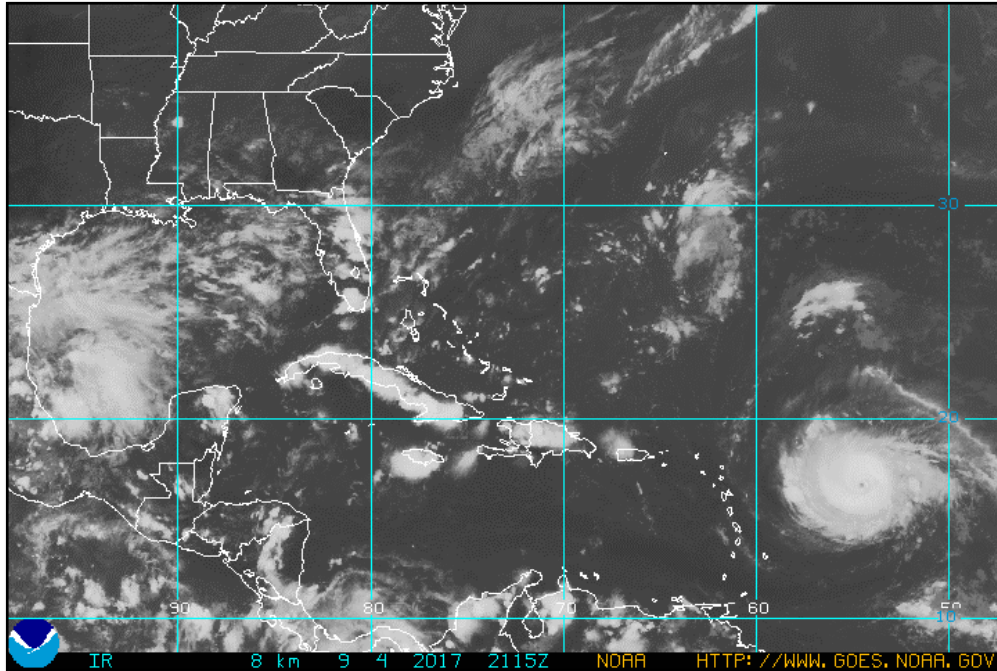


Figure 3 GOES infrared satellite image on 4 September at 21UTC

On 5 September at 15UTC, the NHC further upgraded it to a category 5 hurricane, with maximum sustained winds of 180 mph (285 km/h). The estimated minimum central pressure was 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, and thus it gained some latitude and its track turned toward the west-northwest, heading toward the northern Leeward Islands.

The wind intensity further increased on 6 September at approximately 06-09UTC, when the core of Irma passed over Antigua and Barbuda, Anguilla and St. Kitts and Nevis (see Figure 4, in which Barbuda and Antigua, respectively, are fully embedded in Irma's eye). The maximum sustained winds were near 185 mph (295 km/h) with higher gusts. A surface observation station on Barbuda reported sustained winds of 119 mph (191 km/h) and a wind gust of 155 mph (250 km/h). Hurricane-force winds extended outward up to 50 miles (85 km) from the centre and tropical-storm-force winds extended outward up to 175 miles (280 km). The estimated minimum central pressure was 914 mb. The storm surge was estimated between 7-11 ft. (2.10-3.35 m) along the northern Leeward Islands. The observed sea level at Barbuda reached a peak of 2.2 m at the time when the eye passed over the island.

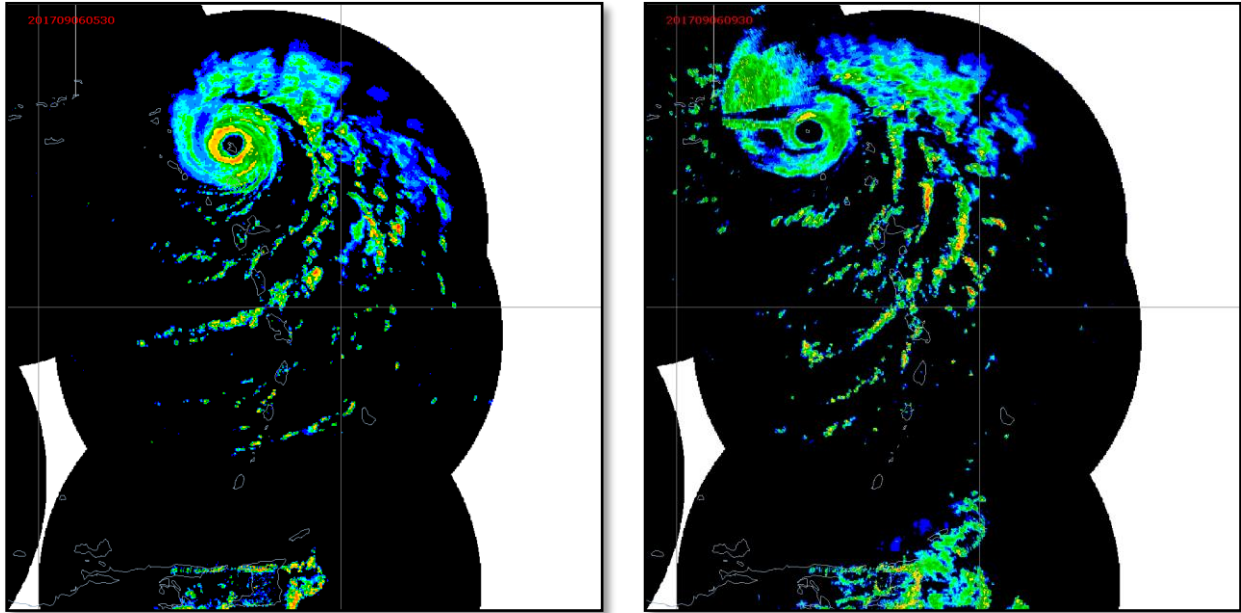


Figure 4 Reflectivity maps from the radar composite collected at different times

In the following hours, the hurricane moved toward the west-northwest with a forward velocity of 16 mph (26 km/h) and unvaried wind intensity and minimum pressure. The British Virgin Islands, Puerto Rico, Dominican Republic, Haiti, Turks and Caicos Islands have been affected at the time of writing this report. An additional Event Briefing Report will be issued for the CCRIF countries affected. Irma is forecasted to hit The Bahamas, and the US states of Florida, Georgia and South Carolina before finally dissipating.

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 Anguilla, Antigua and Barbuda and St. Kitts and Nevis, Tropical Cyclone Irma qualified as a Triggering Event¹.

The wind footprint (Figure 5, Figure 7 and Figure 9) and surge field (Figure 6, Figure 8 and Figure 10) are two of the outputs from the CCRIF model, these figures show the regions affected by certain magnitudes of wind velocity and storm surge in each country.

¹ An event occurs and triggers one or more policies.

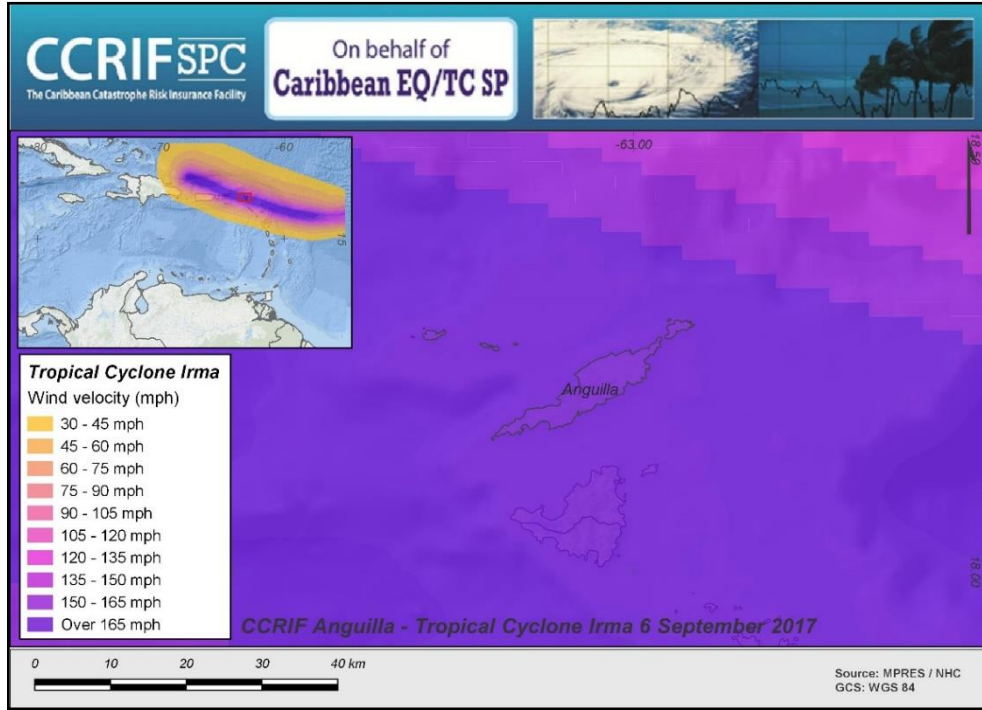


Figure 5 Map showing the wind field associated with Tropical Cyclone Irma on Anguilla.
Source: NHC & CCRIF/MPRES

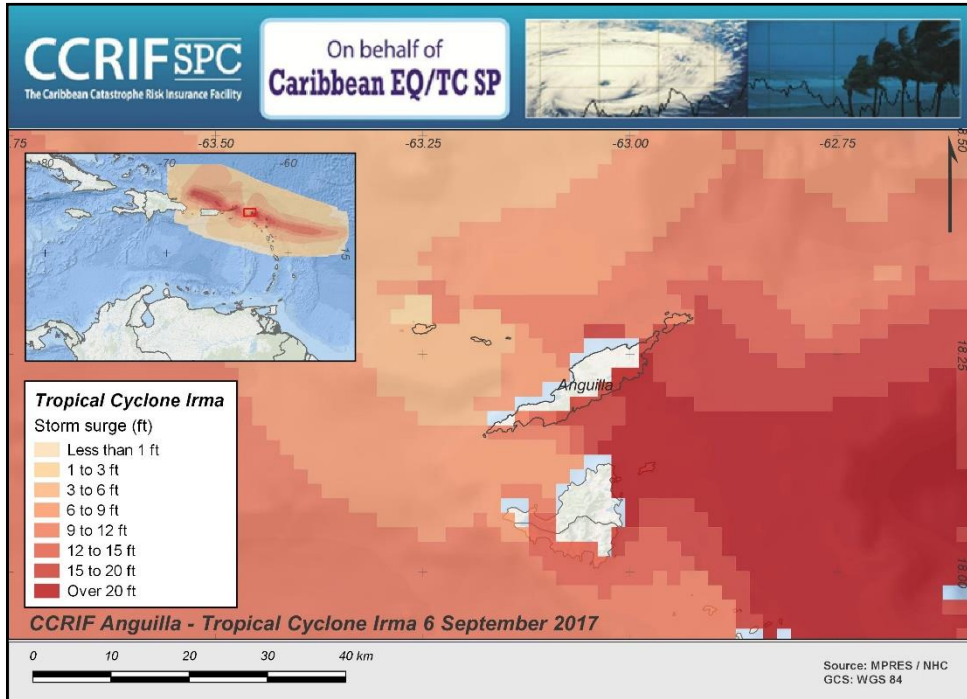


Figure 6 Map showing the storm surge field associated with Tropical Cyclone Irma on Anguilla.
Source: NHC & CCRIF/MPRES

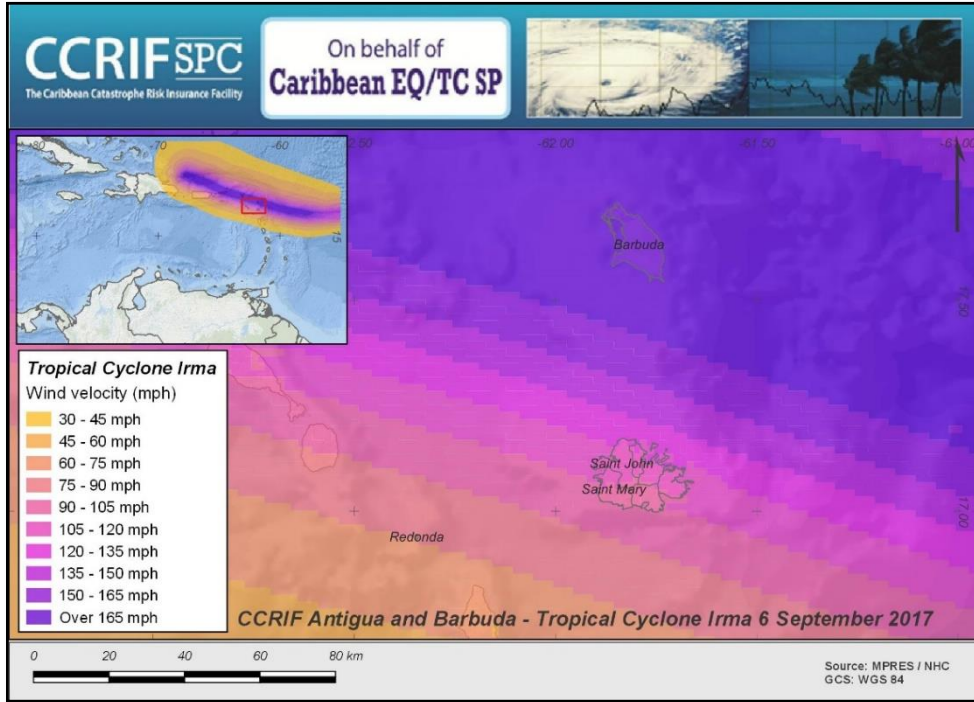


Figure 7 Map showing the wind field associated with Tropical Cyclone Irma on Antigua and Barbuda.
Source: NHC & CCRIF/MPRES

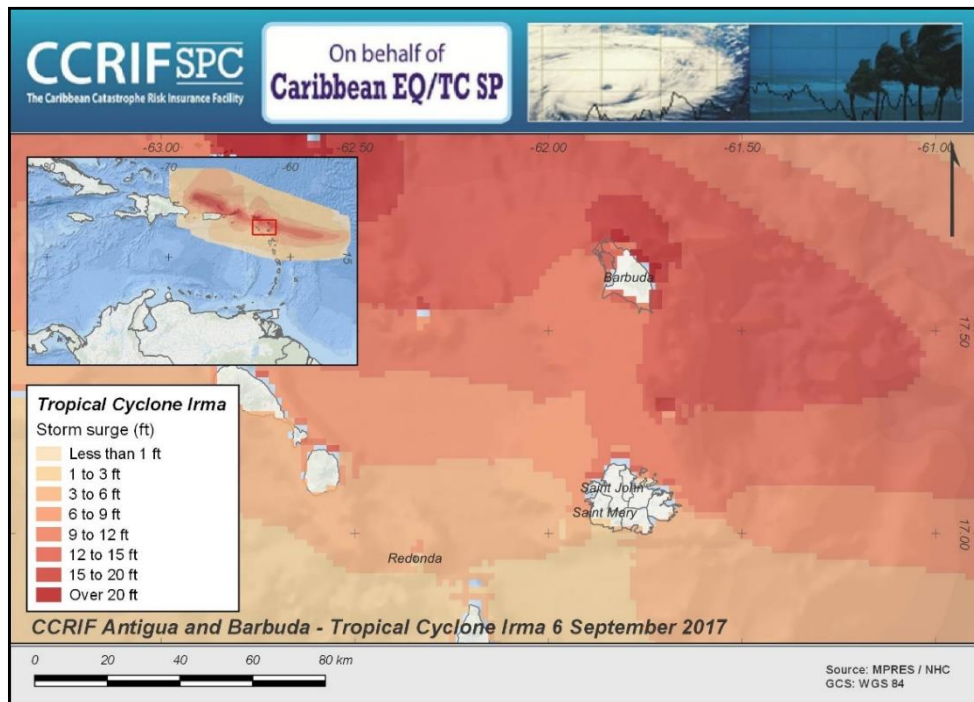


Figure 8 Map showing the storm surge field associated with Tropical Cyclone Irma on Antigua and Barbuda.
Source: NHC & CCRIF/MPRES

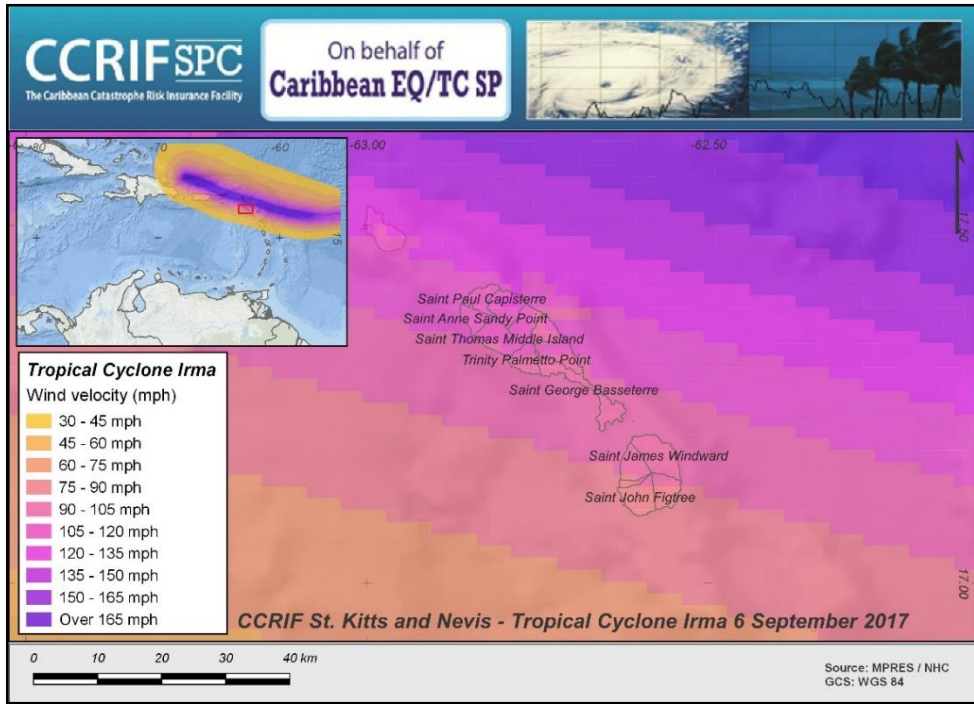


Figure 9 Map showing the wind field associated with Tropical Cyclone Irma on St. Kitts and Nevis.
Source: NHC & CCRIF/MPRES

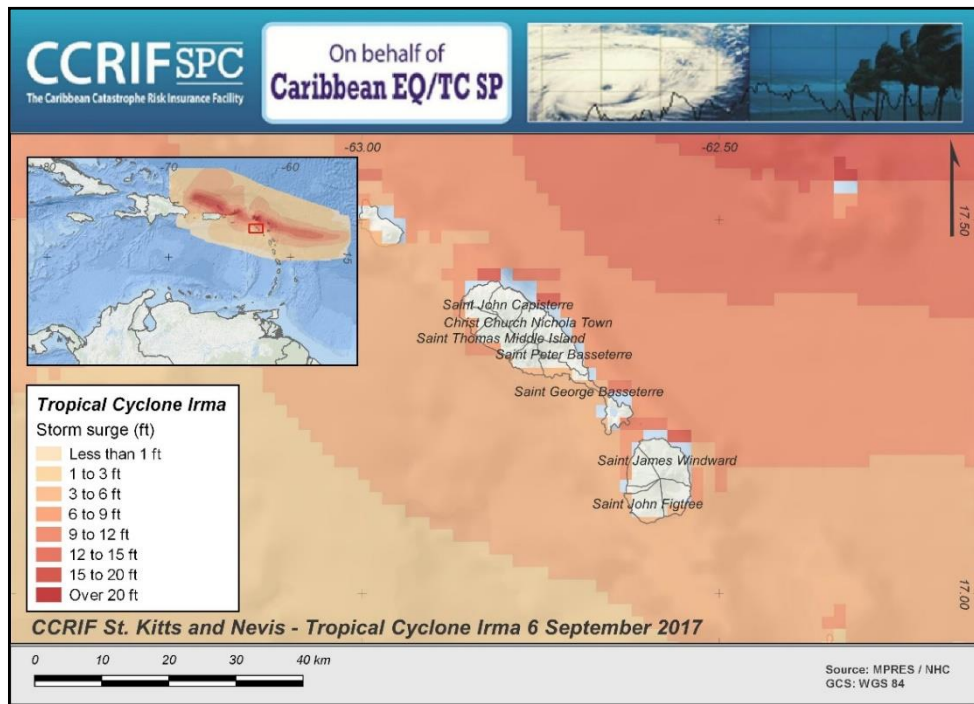


Figure 10 Map showing the storm surge field associated with Tropical Cyclone Irma on St. Kitts and Nevis.
Source: NHC & CCRIF/MPRES

3 IMPACTS

Anguilla

According to Mr. John McKendrick, Anguilla's Attorney General, the island suffered "huge devastation" by hurricane Irma. Executive Director of the Caribbean Disaster and Emergency Management Agency, Mr. Ronald Jackson, reported that one person died due to the hurricane. Police stations, hospitals, school facilities, emergency shelters, as well as the fire station were damaged.

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

- 90% of houses were damaged.
- Fallen trees blocked many roads.
- Phone service was interrupted.
- Ports and the airport were closed.

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

- Schools and government offices were closed.
- Three shelters were opened.

Antigua and Barbuda

According to Prime Minister Gaston Browne, Antigua was spared the worst by Hurricane Irma. However, the passage of the hurricane through Antigua's sister island Barbuda was terribly devastating, resulting in one confirmed death, catastrophic damage and total destruction. At the time of this writing, reported damage in Antigua and Barbuda from the National Office of Disaster Services (NODS) and other sources was as follows:

- In Antigua, there were downed trees and power lines as well as blocked roads and roof damage
- Potable water service and electric power were affected.
- Telecommunications infrastructure was damaged by strong winds.
- In Barbuda, 90% of the buildings were destroyed and 50% of the population left homeless.
- Government buildings were destroyed.
- The Barbuda airport was damaged.
- Authorities had declared a state of emergency on Thursday, 7 September.

Figure 11 show the damage caused by hurricane Irma in Antigua and Barbuda.



Figure 11 Damage caused by Hurricane Irma in Antigua and Barbuda – September 2017.
Sources: *Cable News Network, The Telegraph and The Weather Channel*

St. Kitts and Nevis

According to Prime Minister Dr. Timothy Harris, the passage of Hurricane Irma through St. Kitts and Nevis left significant damage to infrastructure, property as well as the interruption of electric power and the temporary closure of the airport.

The Nevis Disaster Management Department (NDMD), reported minimal damage such as: flooding of the airport, fallen trees, broken electricity lines and erosion of some of the coast on the southern, western and northern areas of Nevis.

4 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 Antigua and Barbuda, Anguilla and St. Kitts and Nevis which were above the attachment point for each country's Tropical Cyclone policy. Preliminary calculations show that payouts are due to each country as follows:

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CCRIF expresses sympathy with the Government and people of Anguilla, Antigua and Barbuda and St. Kitts and Nevis for the loss of life and impacts on communities and infrastructure caused by this event.

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

Evaluación de Riesgos Naturales
Vito Alessio Robles No.179
Col. Hda Gpe Chimalistac.
Del. Álvaro Obregón. CP 01050, México D.F.
+52 (55) 5616-8161, 62, 64
cavelar@ccrif.org