



UNOSAT

Tropical Cyclone IRMA-17.

Population exposure analysis in Caribbean

11 September 2017 (Update 3)

Population Exposure Analysis

11 September 2017

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Overview

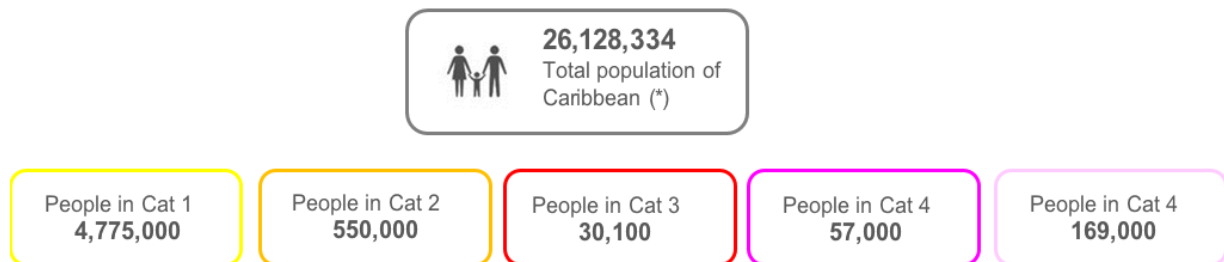
Hurricane IRMA moved across western, north-western counties of Florida and south-western Georgia on 11 September, weakening into a tropical depression. Over the next 48 hours, it is forecast to pass over Alabama and western Tennessee. Heavy rain and strong winds could affect these areas. Media have reported ten deaths across the United States.

As of 12 September, damage and needs assessments are ongoing in the affected countries. Preliminary reports indicate that the most severely affected areas are Anguilla, Barbuda, British Virgin Islands, Cuba, Saint Martin, St Maarten, Saint Barthélemy and Turks and Caicos Islands. At least 35 people have been reported dead in the Caribbean. In addition, severe damages to infrastructure and health centers, loss of electricity and limited access to clean water are reported.

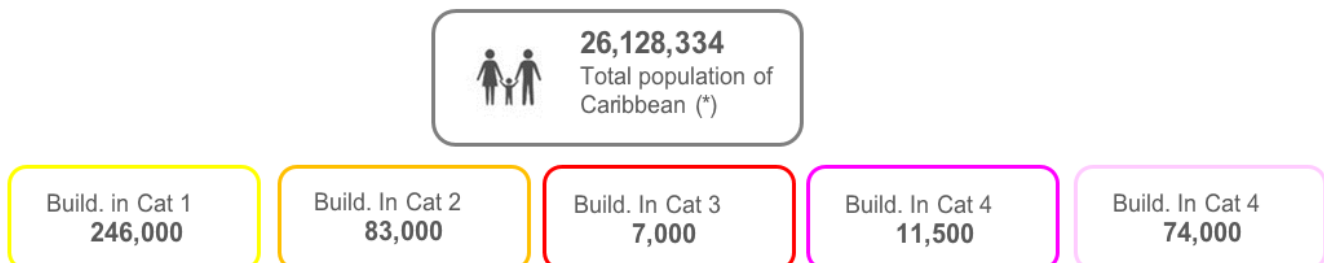
Tropical cyclone JOSE continued moving north-northeast over the Atlantic Ocean, weakening but remaining a category 1 hurricane. Over the next 24 hours, it could slowly turn toward south on 13 September and northwest on 14-15 September (ECHO Flash Updates).

Based on observed tropical cyclone related data (JRC, NOAA-HWRF) released on 11th September 2017, building footprints (OSM) and spatial demographic data (WorldPop), UNITAR-UNOSAT has carried out a population exposure analysis covering cyclone affected Islands in the Caribbean:

Population Exposure Analysis in the Caribbean



Building Exposure Analysis in the Caribbean



**Population Exposed to sustained wind speed zones (as of 11 Sept. 2017) :
Tropical Cyclone IRMA-17**

Country /Territory	Total population	Wind speed zones - Saffir Simpson Scale					Total exposed population	%
		Category 1	Category 2	Category 3	Category 4	Category 5		
United States Virgin Islands	93,173	39,092	-	-	-	49,633	88,725	95
Sint Maarten	39,921	-	-	-	-	39,921	39,921	100
Saint Martin	32,419	-	-	-	-	32,419	32,419	100
British Virgin Islands	27,248	-	-	-	-	27,248	27,248	100
Anguilla	12,316	-	-	-	2	12,314	12,316	100
Saint Barthelemy	5,191	-	-	-	-	5,191	5,191	100
Barbuda	1,780	-	-	-	-	1,780	1,780	100
Cuba	11,266,280	3,378,659	67,334	19,395	17,438	168	3,482,994	31
Bahamas	343,735	1,052	369	597	439	114	2,571	1
Turks and Caicos islands	45,020	-	1,020	4,857	39,030	113	45,020	100
Puerto Rico	3,651,232	1,196,151	398,802	1,805	28	-	1,596,786	44
Antigua	87,569	9,527	76,382	1,660	-	-	87,569	100
Saba	1,228	-	-	1,228	-	-	1,228	100
Sint Eustatius	2,390	-	1,795	595	-	-	2,390	100
Saint Kitts and Nevis	48,059	46,928	1,131	-	-	-	48,059	100
Dominican Republic	10,470,773	105,372	-	-	-	-	105,372	1
Total	26,128,334	4,776,781	546,833	30,137	56,937	168,901	5,579,589	21

The population exposure has been calculated using a 1Km resolution WorldPop dataset. This is a preliminary analysis & has not yet been validated in the field.

Sources:

Cyclone Track: Joint Research Center-GDACS (Warning 49 issued on 11 September 2017 at 09:00 UTC)

Surface wind data: NOAA-HWRF (11 September 2017 at 06:00 UTC)

Administrative Levels: GADM

Spatial Demographic Data: WorldPop (2015)

Analysis: UNITAR-UNOSAT (07/09/2017)

Note:

(*) Total population of Caribbean is considering only the following countries and territories: Anguilla, Antigua and Barbuda, Bahamas, British Virgin Islands, Cuba, Dominican Republic, Puerto Rico, Saba, Saint Barthelemy, Saint Kitts and Nevis, Saint Martin and Sint Maarten, Sint Eustatius, Turks and Caicos Islands and United States Virgin Islands. These countries and territories are within surface wind data derived from NOAA-HWRF (11 September 2017 at 06:00 UTC)

Buildings Exposed to sustained wind speed zones (as of 11 Sept. 2017) : Tropical Cyclone IRMA-17

Country /Territory	Total population	Wind speed zones - Saffir Simpson Scale					Total exposed buildings (**)
		Category 1	Category 2	Category 3	Category 4	Category 5	
United States Virgin Islands	93,173	1,090	-	-	-	21,016	22,106
Saint Martin	32,419	-	-	-	-	15,950	15,950
Sint Maarten	39,921	-	-	-	-	12,423	12,423
British Virgin Islands	27,248	-	-	-	-	10,057	10,057
Anguilla	12,316	-	-	-	-	7,055	7,055
Saint Barthelemy	5,191	-	-	-	-	5,724	5,724
Barbuda	1,780	-	-	-	-	1,464	1,464
Turks and Caicos islands	45,020	-	1,184	1,930	10,886	339	14,339
Cuba	11,266,280	71,466	2,986	1,646	541	6	76,645
Bahamas	343,735	240	751	67	67	-	1,125
Puerto Rico	3,651,232	166,597	40,052	1,731	-	-	208,380
Antigua	87,569	4,361	36,565	831	-	-	41,757
Saba	1,228	-	-	771	-	-	771
Sint Eustatius	2,390	-	1,168	83	-	-	1,251
Saint Kitts and Nevis	48,059	986	4	-	-	-	990
Dominican Republic	10,470,773	1,338	-	-	-	-	1,338
Total	26,128,334	246,078	82,710	7,059	11,494	74,034	421,375

Sources:

Cyclone Track: Joint Research Center-GDACS (Warning 49 issued on 11 September 2017 at 09:00 UTC)

Surface wind data: NOAA-HWRF (11 September 2017 at 06:00 UTC)

Building Footprints: HOT-OSM (11 September 2017)

Administrative Levels: GADM

Spatial Demographic Data: WorldPop (2015)






Analysis: UNITAR-UNOSAT (07/09/2017)

Note:

(*) Total population of Caribbean is considering only the following countries and territories: Anguilla, Antigua and Barbuda, Bahamas, British Virgin Islands, Cuba, Dominican Republic, Puerto Rico, Saba, Saint Barthelemy, Saint Kitts and Nevis, Saint Martin and Sint Maarten, Sint Eustatius, Turks and Caicos Islands and United States Virgin Islands. These countries and territories are within surface wind data derived from NOAA-HWRF (11 September 2017 at 06:00 UTC).

(**) Total exposed buildings depends on the completeness of baseline data (building footprints) derived from HOT-OSM.

Expected structural damage within sustained wind speed zones greater than 120 km/h according to the Saffir-Simpson Hurricane Wind Scale:

Category	Sustained Winds	Type of Damage	Type of Damage Description
 1	74-95 mph 64-82 kt 119-153 km/h	Very dangerous winds will produce some damage	Well-constructed frame homes could have damage to roof, shingles, vinyl siding and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days
 2	96-110 mph 83-95 kt 154-177 km/h	Extremely dangerous winds will cause extensive damage	Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks
 3	111-129 mph 96-112 kt 178-208 km/h	Devastating damage will occur	Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes
 4	130-156 mph 113-136 kt 209-251 km/h	Catastrophic damage will occur	Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months
 5	157 mph or higher 137 kt or higher 252 km/h or higher	Catastrophic damage will occur	A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months

Source: National Hurricane Center & Business Insider



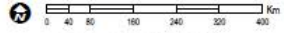
Tropical Cyclone IRMA-17 : Path and Wind Speed Zones Update 3 (as of 11 September 2017)

This map illustrates the tropical cyclone IRMA-17 path with low, medium and strong wind impact zones observed at 11 September 2017. The tropical cyclone path and wind speed zones were derived from Joint Research Centre data (Warning 49 issued the 11 th September 2017 at 09:00 UTC). As well, the surface wind data and categories (associated damage) according to Saffir-Simpson Scale were derived from NOAA-HWRF (11 September 2017 at 06:00 UTC). This is a preliminary analysis and has not yet been validated in the field. Please send ground feedback to UNITAR-UNOSAT.

Legend

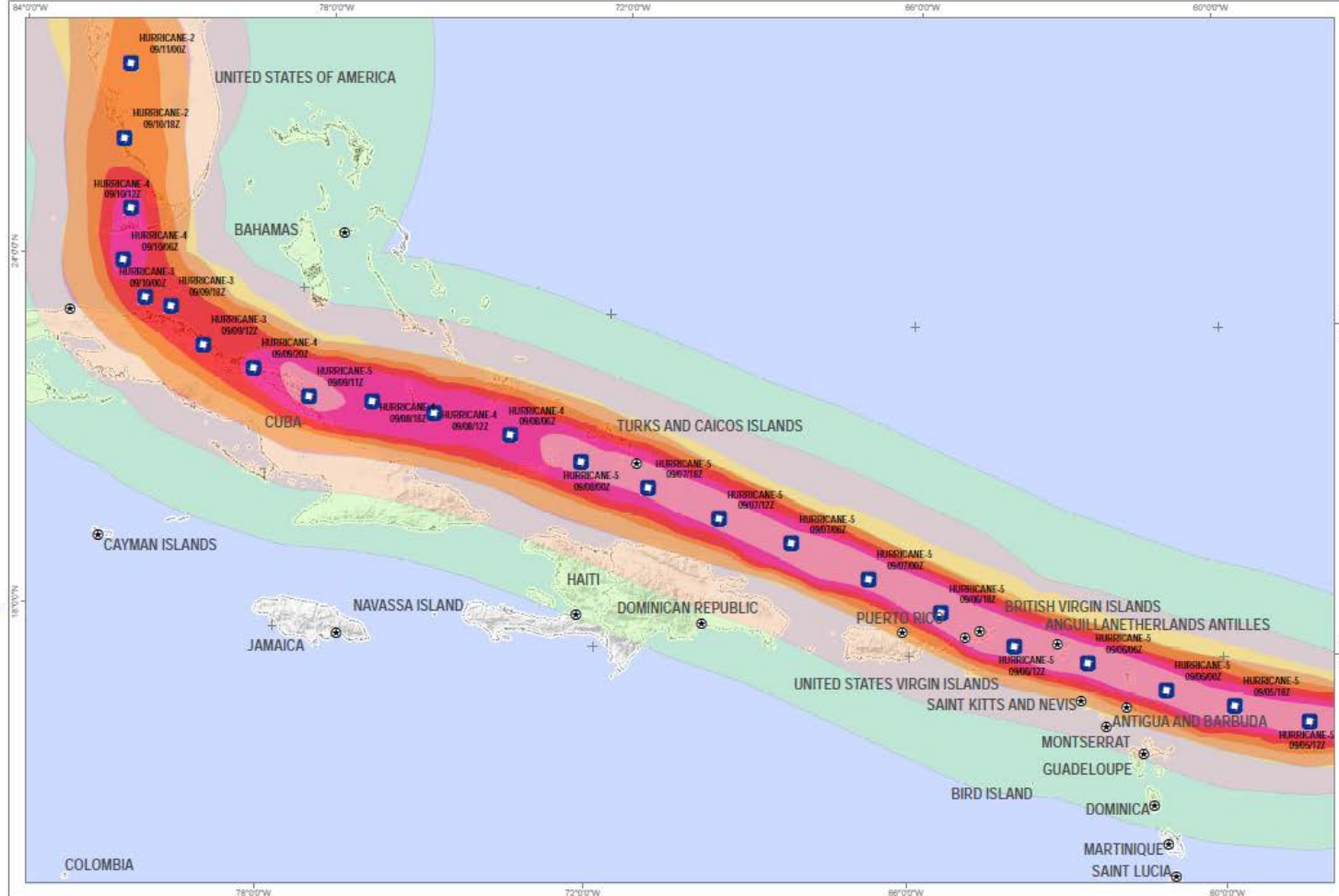
-  IRMA-17 Position
-  Capital
-  Wind Speed Zone - JRC
-  120 km/h
-  90 km/h
-  60 km/h
-  International boundary
-  Category 1
-  Category 2
-  Category 3
-  Category 4
-  Category 5

Map Scale for A3: 1:8,000,000



Analysis conducted with ArcGIS v10.4


Coordinate System: WGS 1984 UTM Zone 20N
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



Wind Speed Data: Joint Research Centre
Date Series: 30 August 2017 - 11 September 2017
Copyright: JRC
Source: JRC
Cyclone Track: Joint Research Center+GOACS (Warning 49)

Issued on 11 September 2017 at 09:00 UTC
Surface wind data: NOAA-HWRF (11 September 2017 at 06:00 UTC)
Building Footprints: HOT-OSM (11 September 2017)
Administrative Levels: GADM

Spatial Demographic Data: WorldPop (2015)
Analysis: UNITAR-UNOSAT
Production: UNITAR - UNOSAT



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Map1: IRMA - 17 Cyclone path, wind speed zones and surface wind data. Download pdf map from [here](#)