CCRIF SPC
The Caribbean Catastrophe Risk Insurance Facility

Covered Area Rainfall Events (12/06/2024 to 14/06/2024)

Excess Rainfall

Event Briefing

The Bahamas – Extreme North

21 June 2024

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1 INTRODUCTION

This event briefing describes the impact of rainfall on the extreme north region of The Bahamas which was associated with a Covered Area Rainfall Event (CARE) from 12 June, 2024, to 14 June, 2024. This event did not affect the other regions of The Bahamas. The Rainfall Index Loss (RIL) for the Covered Area Rainfall Event was below the attachment point of the country's Excess Rainfall policy for the extreme north region (The Bahamas – Extreme North), and therefore no payout is due to the Government of The Bahamas[1].

The Wet Season Trigger (WST)[2] component of the XSR3.0 model did not identify this CARE as a "Wet Event" and thus, the WST component was not activated by this CARE. Therefore, no payout is due under the Wet Season Trigger endorsement of The Bahamas – Extreme North Excess Rainfall policy.

This rainfall did not activate a CARE for the other regions of The Bahamas.

2 EVENT DESCRIPTION

On 11 June at 0000 UTC, abundant tropical moisture surging northward across the western Caribbean, combined with middle to upper-level diffluent flow, supported scattered showers and thunderstorms across parts of the northwestern Caribbean (north of latitude 20°North, west of longitude 80°West) and the southeastern Gulf of Mexico. At 1200UTC, a low pressure system formed over the southeastern Gulf of Mexico, causing a further intensification of the convection activity over the region.

On 12 June, the low pressure system and an associated surface trough moved gradually eastward, with the minimum pressure being located over Florida (Figure 1). Clusters of rain showers from scattered moderate to strong intensity developed over a large area from parts of western Cuba to the waters between the NW Bahamas and Florida, and the waters to the north of The Bahamas westward of longitude 70°West. Moreover, isolated thunderstorms, from moderate to locally strong intensity, formed over the NW corner of the Caribbean Sea.

On 13 June, the weather configuration was almost unvaried with the surface trough extending from latitude 31°North, longitude 78°West, to the low pressure sited over Florida (approximately centred near latitude 28.5°North, longitude 81°West) to the north central Yucatan Peninsula.

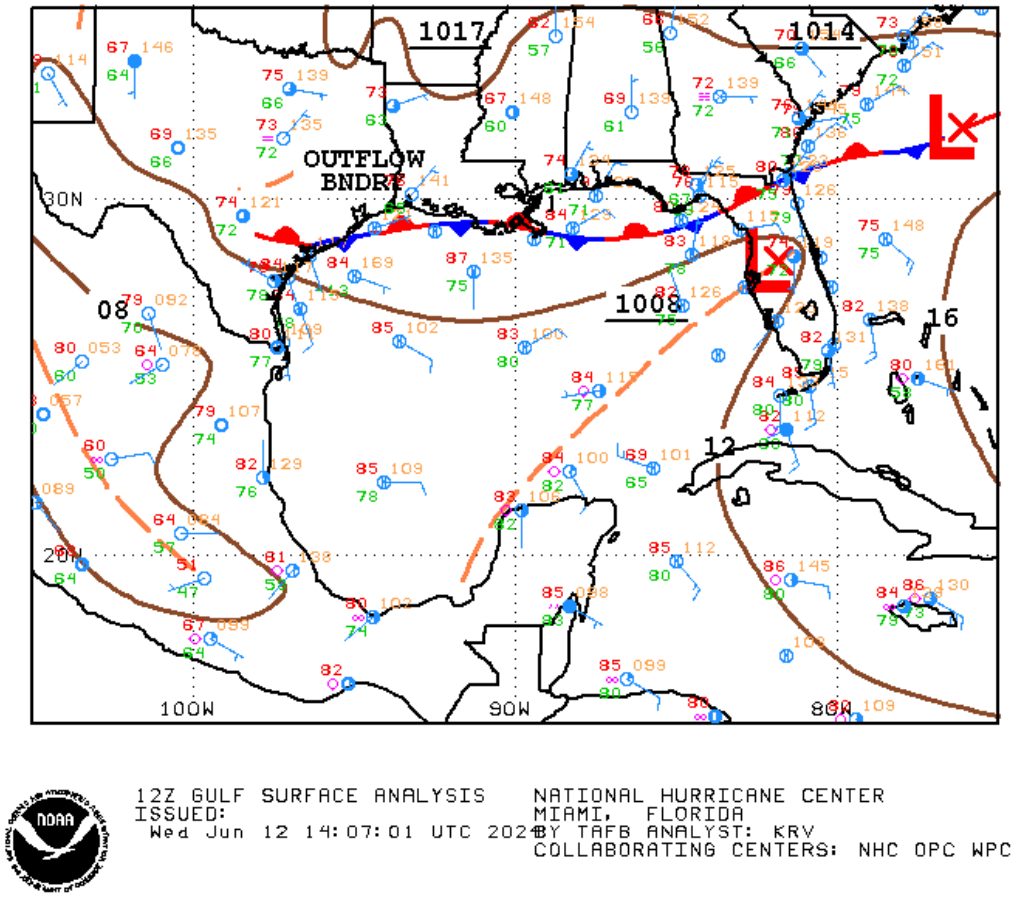
[1] The Bahamas has 4 Excess Rainfall policies that cover different regions of the country: Extreme North, North, Central, South East

[2] The WST endorsement provides a fixed payout for rainfall events that happen when the soil is already saturated and has limited absorption ability. The WST endorsement is activated based on two factors: the Wet Index (the average 1-month Standardized Precipitation Index for all grid cells in the country) and Wet Periods (the period of time where the Wet Index exceeds 1, which indicates that the soil is wetter than its long-term average and serves as an indicator of soil saturation). A CARE qualifies as a "Wet Event" if during any period of consecutive days, the Wet Index (WI) is equal or greater than 1. The WST policy endorsement provides a payment when one or more CAREs with a modelled loss greater than zero occur within a Wet Period and the corresponding value of the Wet Index during the Wet Period exceeds a predetermined threshold.

Numerous strong rain showers occurred in the Straits of Florida between Andros Island in The Bahamas and longitude 82°West in the Gulf of Mexico. This area included: south Florida, the Florida Keys, the extreme northern region of The Bahamas and Cuba between longitudes 78°West and 82°West.

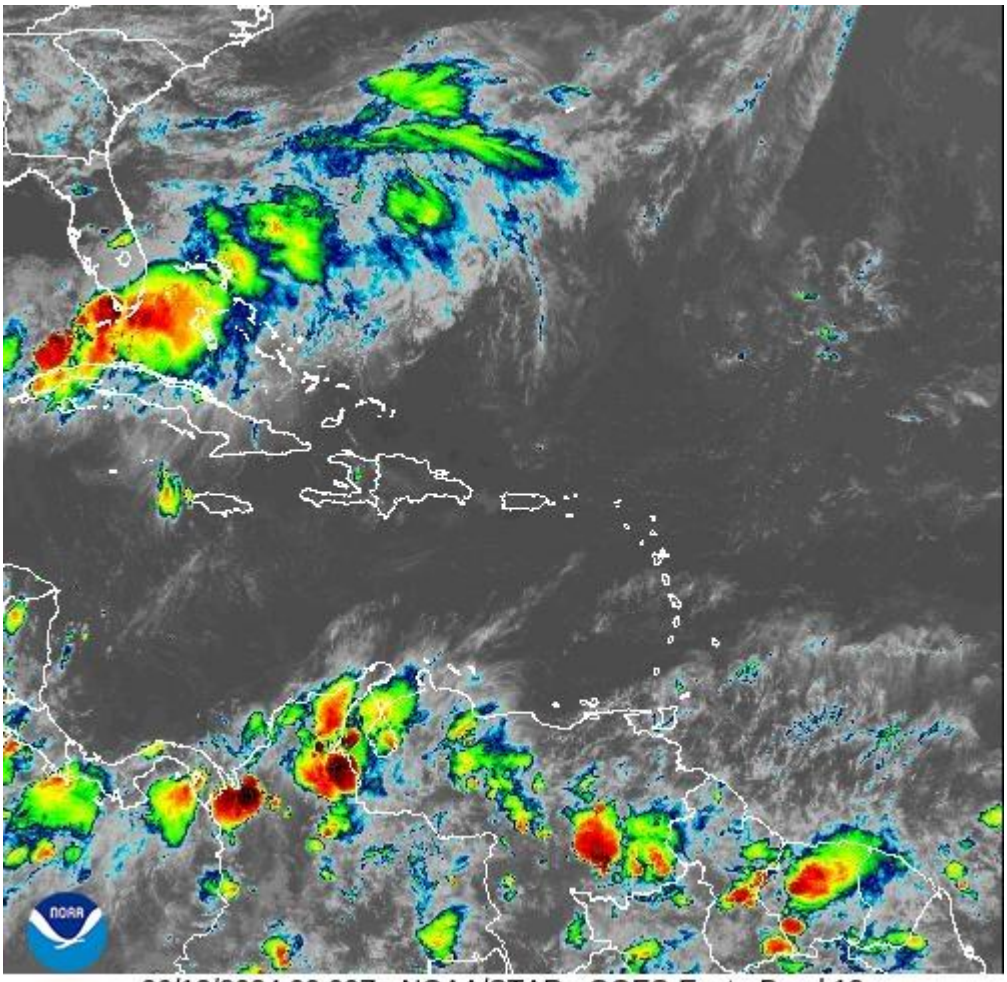
The same meteorological configuration persisted on 14 June, with the surface trough trailing southwestward from the Atlantic waters to the northeast of Florida to the Yucatan Peninsula. The instability associated with the trough continued to support the advection of ample deep tropical moisture across the southeastern Gulf of Mexico, South Florida, The Bahamas and northward. Aided by a mid- to upper-level trough that was just northwest of the surface trough, scattered heavy showers and strong thunderstorms continued over the Atlantic waters off South Florida, the northwestern and central Bahamas and over the southeastern Gulf of Mexico.

The heavy rainfall ceased over this region on 15 June, with the convection shifting northeastward over the Atlantic waters off the southeastern United States.



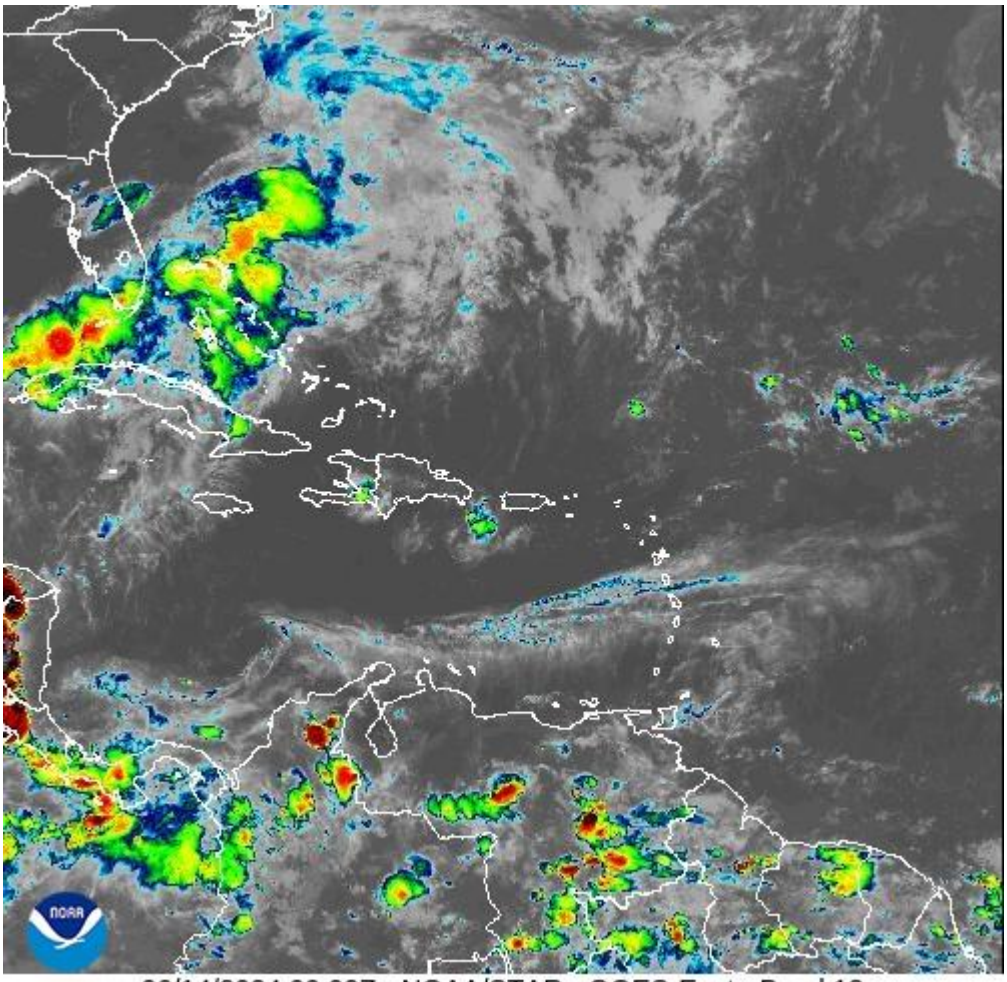
12 June at 1200 UTC

Figure 1. Surface analysis over the Gulf of Mexico area on 12 June at 1200UTC, 2024. Source: US National Hurricane Center[3]



a)13 June at 0000 UTC

3 National Oceanic and Atmospheric Administration - FTP, National Hurricane Center, review date: 12 June 2024, available at: *https://www.nhc.noaa.gov/tafb/GULF_12Z.gif*



b) 14 June at 0000 UTC

Figure 2 Satellite imagery on 13 and 14 June, 2024, at different times as indicated in the labels. Blue/green colours represent high altitude clouds (top cloud temperature between -50°C and -70°C), while the red/yellow colours represent very high altitude clouds (top cloud lower than -70°C). High altitude clouds indicate strong convection associated with intense precipitation. Source: NOAA, National Environmental Satellite, Data and Information Service[4].

4 RAMSDIS Online Archive, NOAA Satellite and Information Service, available at: https://cdn.star.nesdis.noaa.gov/GOES16/ABI/SECTOR/car/13/20241650000_GOES16-ABI-car-13-500x500.jpg

3 REPORTED IMPACTS

At the time of writing this report, no information was available related to damage or loss in the northeastern region of The Bahamas due to this Covered Area Rainfall Event during the indicated period.

However, the Bahamas Department of Meteorology published a flood watch for the extreme northwest Bahamas on 12 June, until 14 June, 2024. They expected some localized flooding due to excessive rainfall, with 3.5 total inches of rain and higher values in isolated areas.[5]

4 RAINFALL MODEL OUTPUTS

All data sources used by the XSR 3.0 model, CMORPH, IMERG, WRF5, WRF7, WRF11 and WRF15[6], detected the occurrence of precipitation over The Bahamas and the surrounding waters during the period 10 to 14 June, 2024. Each data source reported a specific distribution and accumulation of rainfall, as discussed below and shown in Figure 3. A CARE for The Bahamas-Extreme North was activated on 12 June and lasted until 14 June. The CARE was activated due to the use of the 12-hour and the 48-hour aggregation intervals for precipitation[7] and thus the period considered by the XSR 3.0 model for the loss estimate based on the accumulated precipitation in The Bahamas-Extreme North was 10 to 14 June.

CMORPH reported total accumulated values of precipitation in the range between 90 mm and 240 mm, with increasing values moving from the east to the west of The Bahamas-Extreme North region.

IMERG reported a similar geographic distribution of the total accumulated values of precipitation as that of CMORPH, but with higher values, reaching the range between 270 mm and 300m over the western edge of Grand Bahama. Rainfall values between 180 mm and 210 mm were reported over southern Great Abaco.

WRF5 showed total accumulated values of precipitation in the range between 60 mm and 90

[5] Eyewitness News: Northwest Bahamas under flood watch, excessive rain expected – Eye Witness News (ewnews.com)

6 CMORPH Model: the satellite-based rainfall precipitation estimates provided by the NOAA Climate Prediction Center (CPC) using the so-called Morphing Technique *http://www.cpc.ncep.noaa.gov/products/janowiak/cmorph_description.html*. Further details are provided in the Definitions section of this report

IMERG Model: The satellite-based rainfall estimation model developed by NASA, expressed in mm, derived by aggregating the IMERG 30-minute Rainfall Data at 10km spatial resolution and available at *https://jsimpsonhttps.pps.eosdis.nasa.gov/imerg/late*. Further details in the Definitions section of this reportWRF5,

WRF7, WRF11 and WRF15 Models: the Weather Research and Forecasting Model weather model-based Configuration #1 and #2 data *https://www.mmm.ucar.edu/weather-research-and-forecasting-model*. These data are initialised by the NCEP FNL dataset. (NCEP FNL Operational Model Global Tropospheric Analyses [*http://rda.ucar.edu/datasets/ds083.2/*]). Further details are provided in the Definitions section of this report.

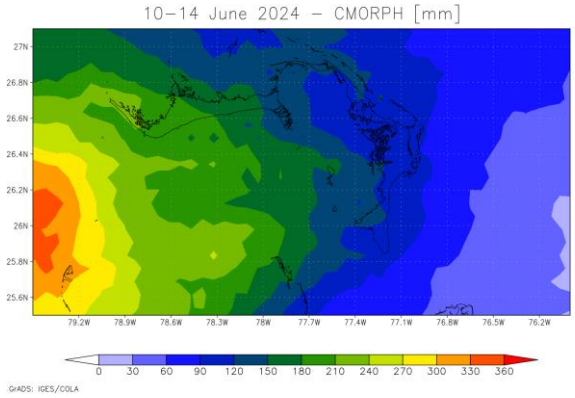
7 The two aggregation periods correspond to the Rainfall Aggregation Period #1 and Rainfall Aggregation Period #2, as indicated in the Schedule. Further details in the Definitions section of this report.

mm over most of Grand Bahama, while lower values, between 30 mm and 60 mm, were reported over the rest of The Bahamas-Extreme North region.

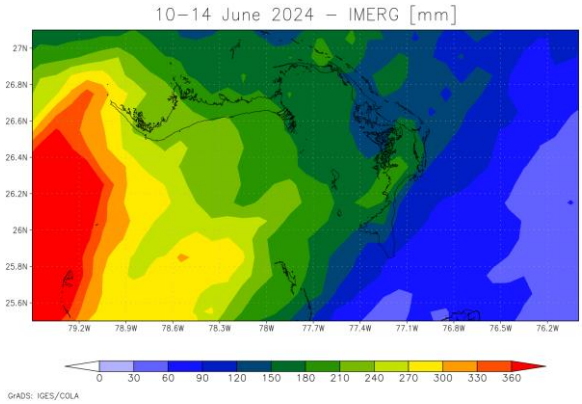
WRF7 reported a similar geographic distribution of the total accumulated values of precipitation as that of WRF5, but with lower values. The maximum values, between 60 mm and 90 mm, were shown over southwestern Grand Bahama.

WRF11 showed total accumulated values of precipitation higher than 90 mm over limited areas in Great Abaco and eastern Grand Bahama, with the maximum values, between 210 mm and 240 mm, at the extreme northern edge of Great Abaco. Lower values were reported over the rest of The Bahamas-Extreme North region.

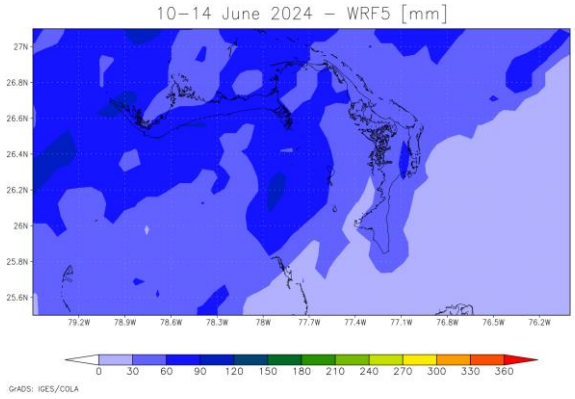
WRF15 showed total accumulated values of precipitation higher than 210 mm over most of The Bahamas-Extreme North region. The maximum values, between 360mm and 390 mm, were reported over the central portions of Great Abaco and Grand Bahama.



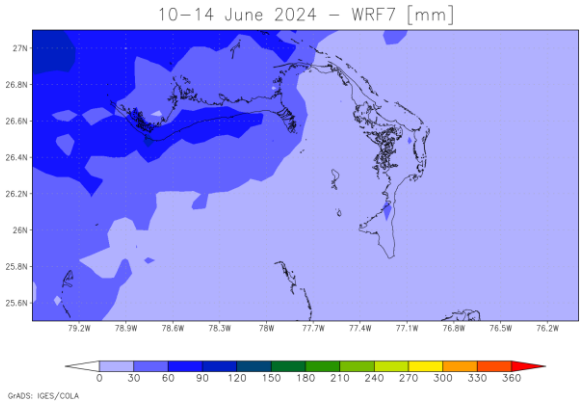
a) CMORPH



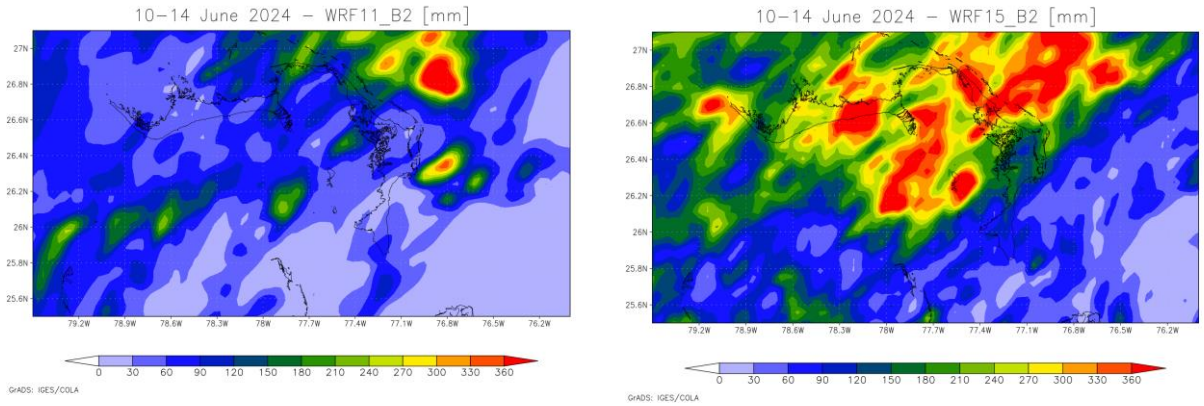
b) IMERG



c) WRF5



d) WRF7



e) WRF11 f) WRF15

Figure 3 Total accumulated precipitation during the period 10-14 June, 2024
estimated by CMORPH (a), IMERG (b), WRF5 (c), WRF7 (d), WRF11 (e), WRF15 (f). Source: CCRIF SPC

Daily rainfall maps by CMORPH, IMERG, WRF5, WRF7, WRF11 and WRF15 over the exposure map of XSR 3.0 are not included here and they can be downloaded at the following links for 12-hour aggregation and 48-hour aggregation respectively:

https://wemap.ccrif.org/OUTPUT/CCRIF/XSR/Events/BHS/BHS_EN/CARE_1_2024/daily_prec_short.mp4

https://wemap.ccrif.org/OUTPUT/CCRIF/XSR/Events/BHS/BHS_EN/CARE_1_2024/daily_prec_long.mp4

The Rainfall Index Loss (RIL) was above the loss threshold for The Bahamas-Extreme North Excess Rainfall policy for three of the data sources used by XSR3.0: CMORPH, IMERG and WRF15. The RIL was the highest for IMERG.

The final RIL (RIL_{FINAL}) was calculated as the average of the three RILs from CMORPH, IMERG and WRF15. The RIL_{FINAL} was greater than zero and therefore this CARE qualified as a loss event. However, the RIL_{FINAL} was below the attachment point of the Excess Rainfall policy for The Bahamas-Extreme North, and thus the policy was not triggered. Therefore, no payout is due under this Excess Rainfall policy is due to the Government of The Bahamas.

5 TRIGGER POTENTIAL

The Rainfall Index Loss calculated for the Covered Area Rainfall Event (CARE) on 12 June to 14 June, 2024, for The Bahamas – Extreme North was below the attachment point of the country's Excess Rainfall policy for The Bahamas – Extreme North and therefore no payout is due.

Also, no payout is due under the Wet Season Trigger endorsement of The Bahamas – Extreme North Excess Rainfall policy.

For additional information, please contact CCRIF SPC at: pr@ccrif.org

DEFINITIONS

Active Exposure Cell Percentage Threshold	The percentage of the total number of XSR Exposure Grid Cells within the Covered Area of the Insured, that must be exceeded to trigger a Covered Area Rainfall Event.
Active Exposure Grid Cells	The XSR Exposure Grid Cells for which in the same single day the Aggregate Rainfall #1 value computed using the CMORPH-based Rainfall Estimate equals or exceeds the Rainfall Event Threshold #1 or the Aggregate Rainfall #2 value computed using the CMORPH-based Rainfall Estimate equals or exceeds the Rainfall Event Threshold #2.
Aggregate Rainfall #1	The rainfall amount accumulated over the Rainfall Aggregation Period #1 (as defined in the Schedule) measured in millimeters (mm) in any of the XSR Exposure Grid Cells in the Covered Area of the Insured. For a given day and a Rainfall Aggregation Period #1 of n hours, the Aggregate Rainfall #1 is the maximum amount of rainfall accumulated over any of the n-hour windows that intersect the day itself considering a time interval of 3 hours.
Aggregate Rainfall #2	The rainfall amount accumulated over the Rainfall Aggregation Period #2 (as defined in the Schedule) measured in millimeters (mm) in any of the XSR Exposure Grid Cells in the Covered Area of the Insured. For a given day and a Rainfall Aggregation Period #2 of n hours, the Aggregate Rainfall #2 is the maximum amount of rainfall accumulated over any of the n-hour windows that intersect the day itself considering a time interval of 3 hours.
Calculation Agent	Entity charged with undertaking the primary calculation of the Rainfall Index Loss.
CMORPH-based Maximum Aggregate Rainfall #1	The maximum value during the Covered Area Rainfall Event of the Aggregate Rainfall #1 computed using the CMORPH-based Rainfall Estimates in any given XSR Exposure Grid Cell over the Covered Area of the Insured.
CMORPH-based Maximum Aggregate Rainfall #2	The maximum value during the Covered Area Rainfall Event of the Aggregate Rainfall #2 computed using the CMORPH-based Rainfall Estimates in any given XSR Exposure Grid Cell over the Covered Area of the Insured.
CMORPH-based Covered Area Rainfall Parameters	The CMORPH Model information provided on a continuous basis by the XSR Model Data Reporting Agency used by the

	Calculation Agent to obtain the CMORPH-based Rainfall Estimates using the XSR Rainfall Model. Parameters are drawn from XSR Exposure Grid Cells within the Covered Area of the Insured, by their respective latitude and longitude. Measurement units and precision of data ingested by the XSR Rainfall Model are identical to those provided by the XSR Model Data Reporting Agency and are further elaborated in the Attachment entitled 'Calculation of Rainfall Index Loss and Policy Payment'.
CMORPH Model	The satellite-based rainfall estimation model provided by NOAA CPC as described in the Rainfall Estimation Models section of the Policy.
Covered Area	The territory of the Insured as represented in the XSR Rainfall Model.
Covered Area Rainfall Event	Any period of days, with an interruption less than or equals to the Event Tolerance Period, during which the number of Active Exposure Grid Cells is greater than or equal to the product of (a) Active Exposure Cell Percentage Threshold multiplied by (b) the total number of XSR Exposure Grid Cells within the Covered Area.
Country Disaster Alert	An official disaster alert issued by ReliefWeb (*http://reliefweb.int/*) for the country in question for one of the following types of events: tropical cyclone, flood, flash flood and severe local storm. Any disaster alert issued later than seven (7) days after the completion of the Covered Area Rainfall Event (CARE) event will not be considered. The Disaster Alert description issued by ReliefWeb and/or its attached documentation must include specific reference to the CARE dates with a tolerance period of 2 calendar days.
Maximum Aggregate Rainfall #1	The highest value during a Covered Area Rainfall Event of the Aggregate Rainfall #1 amount in any of the XSR Exposure Grid Cells in the Covered Area of the Insured computed.
Maximum Aggregate Rainfall #2	The highest value during a Covered Area Rainfall Event of the Aggregate Rainfall #2 amount in any of the XSR Exposure Grid Cells in the Covered Area of the Insured computed.
Rainfall Event Threshold #1	Aggregate Rainfall #1 level as defined in the Schedule which should be exceeded to trigger an Active Exposure Cell.

Rainfall Event Threshold #2	Aggregate Rainfall #2 level as defined in the Schedule which should be exceeded to trigger an Active Exposure Cell.
Rainfall Aggregation Period #1	The number of hours over which the Aggregate Rainfall #1 is computed for all XSR Exposure Grid Cells during a Covered Area Rainfall Event.
Rainfall Aggregation Period #2	The number of hours over which the Aggregate Rainfall #2 is computed for all XSR Exposure Grid Cells during a Covered Area Rainfall Event.
Rainfall Index Loss	For any Covered Area Rainfall Event affecting the Insured, the US Dollar loss calculated by the Calculation Agent using the XSR Rainfall Model, as described in the Attachment entitled 'Calculation of Rainfall Index Loss and Policy Payment'. The Rainfall Index Loss can only be calculated once the Covered Area Rainfall Event is completed.
WRF5 Model	The weather research and forecasting rainfall model by NOAA with Configuration #5 data initialized with and assimilating the data provided by the National Center for Environmental Prediction as described in the Rainfall Estimation Models and in the Input Data to the Rainfall Estimation Models sections of this Attachment.
WRF7 Model	The weather research and forecasting rainfall model by NOAA with Configuration #7 data initialized with and assimilating the data provided by the National Center for Environmental Prediction as described in the Rainfall Estimation Models and in the Input Data to the Rainfall Estimation Models sections of this Attachment.
XSR Rainfall Model	The computer model used to calculate the Rainfall Index Loss, as described in the Attachment entitled 'Calculation of Rainfall Index Loss and Policy Payment'.
XSR Exposure Grid Cells	The 30 arc-second by 30 arc-second grid of cells each of which is attributed with an XSR Grid Cell Exposure Value greater than zero.
XSR Grid Cell Exposure Value	The value, used to calculate the CMORPH-based Exposure Grid Cell Loss, the WRF5-based Exposure Grid Cell Loss, and the WRF7-based Exposure Grid Cell Loss.