



Covered Area Rainfall Event (16/11/2023 to 19/11/2023)

Excess Rainfall

Event Briefing

Jamaica

28 November 2023

1 INTRODUCTION

This event briefing describes the impact of rainfall on Jamaica, which was associated with a Covered Area Rainfall Event (CARE), from November 16, 2023, to November 19, 2023. The Rainfall Index Loss (RIL) for the Covered Area Rainfall Event was below the attachment point of the Jamaica’s Excess Rainfall policy, and therefore no payout is due to the Government of Jamaica.

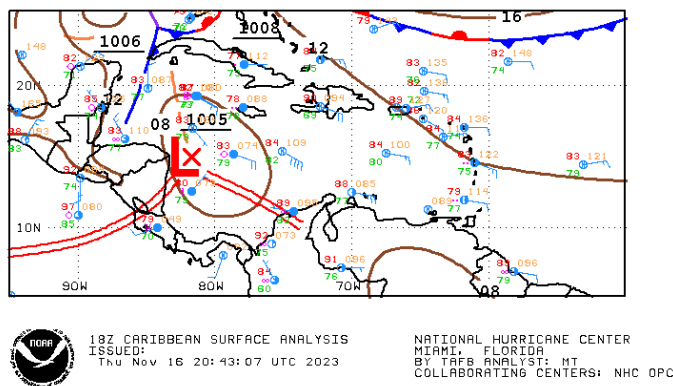
The Wet Season Trigger (WST) component of the XSR3.0 model did not identify this CARE as a “Wet Season” event. Therefore, no payout is due under the Wet Season Trigger endorsement of Jamaica’s Excess Rainfall policy of Jamaica.

The Localized Event Trigger (LET) component of the XSR3.0 model did not identify this CARE as a localized event. Therefore, no payout is due under the Local Event Trigger endorsement of Jamaica’s Excess Rainfall policy.

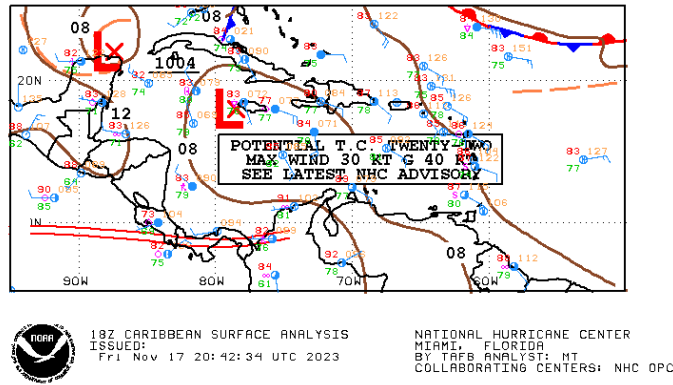
2 EVENT DESCRIPTION

On 16 November, a broad area of low pressure embedded in the eastern Pacific monsoon trough and connected to a north-south oriented surface trough was located over the western Caribbean Sea, just off the coast of northern Nicaragua (Figure 1a). The low-pressure system was characterized by a closed but broad circulation, without a well-defined centre. Elongated bands of deep convection extended over much of the eastern part of the circulation and were streaming northward toward the Greater Antilles. Scattered moderate to isolated strong convection was active over portions of Jamaica, eastern Cuba, and Haiti from 1800UTC (Figure 1a).

At 2100UTC, the US National Hurricane Center (NHC) started to monitor the development of the disturbance, since it presented the risk to be upgraded to a tropical storm, and it was named Potential Tropical Cyclone Twenty-two. At this time, the estimated circulation centre was located near latitude 15.2° North, longitude 81.5° West, about 365 mi (560 km) WSW of Kingston, Jamaica (Figure 1a).



a) 16 November at 1800UTC



b) 17 November at 1800UTC

Figure 1 Surface analysis over the Caribbean Basin on 16 and 17 November 2023 at 1800 UTC. Source: US National Hurricane Center¹

Potential TC Twenty-two was moving north-northeastward at about 8 mph (13 km/h), heading towards Jamaica and, on 17 November at 0300UTC, its estimated centre was sited near latitude 15.9° North, longitude 81.1° West, about 320 mi (515 km) WSW of Kingston. The disturbance maintained a broad and elongated circulation and the associated convection remained displaced well to the east of the surface trough axis, due to a strong southwesterly shear. Numerous thunderstorms continued to form over a large region from 15°North to 23°North, between 70°West and 79°West, including Jamaica (and particularly the waters to the east and the south of the country), eastern Cuba, and Haiti (Figure 2b and 2c) and persisted over the area until 17 November at 1800 UTC. At this time, the estimated centre of Twenty-two was near latitude 18.0° North, longitude 78.5° West, about 50 mi (85km) SW of Montego Bay, Jamaica (Figure 1b). During the next three hours its centre crossed the country and emerged off to the northern coast of Jamaica, heading towards eastern Cuba. The convective mass continued to move eastward and northward, spreading heavy precipitation mostly over the Dominican Republic and Haiti, but still affecting the eastern edges of Jamaica and Cuba. On 18 November, a thunderstorm was active over the eastern portion of Jamaica during the first hours of the day (Figure 2d).

On 18 November at 0300UTC, the NHC discontinued the monitoring of the disturbance. Given the lack of a well-defined surface centre, the poor convective organization, and the continued unfavourable environmental conditions it faced, the system was no longer expected to become a tropical cyclone. Afterwards, the remnants of this disturbance accelerated northeastward ahead of a shortwave trough and left the Caribbean Basin, merging with a frontal system over the southwestern Atlantic Ocean.

¹ National Oceanic and Atmospheric Administration - FTP, National Hurricane Center, available on 16 and 17 November 2023 at: https://www.nhc.noaa.gov/tafb/CAR_18Z.gif

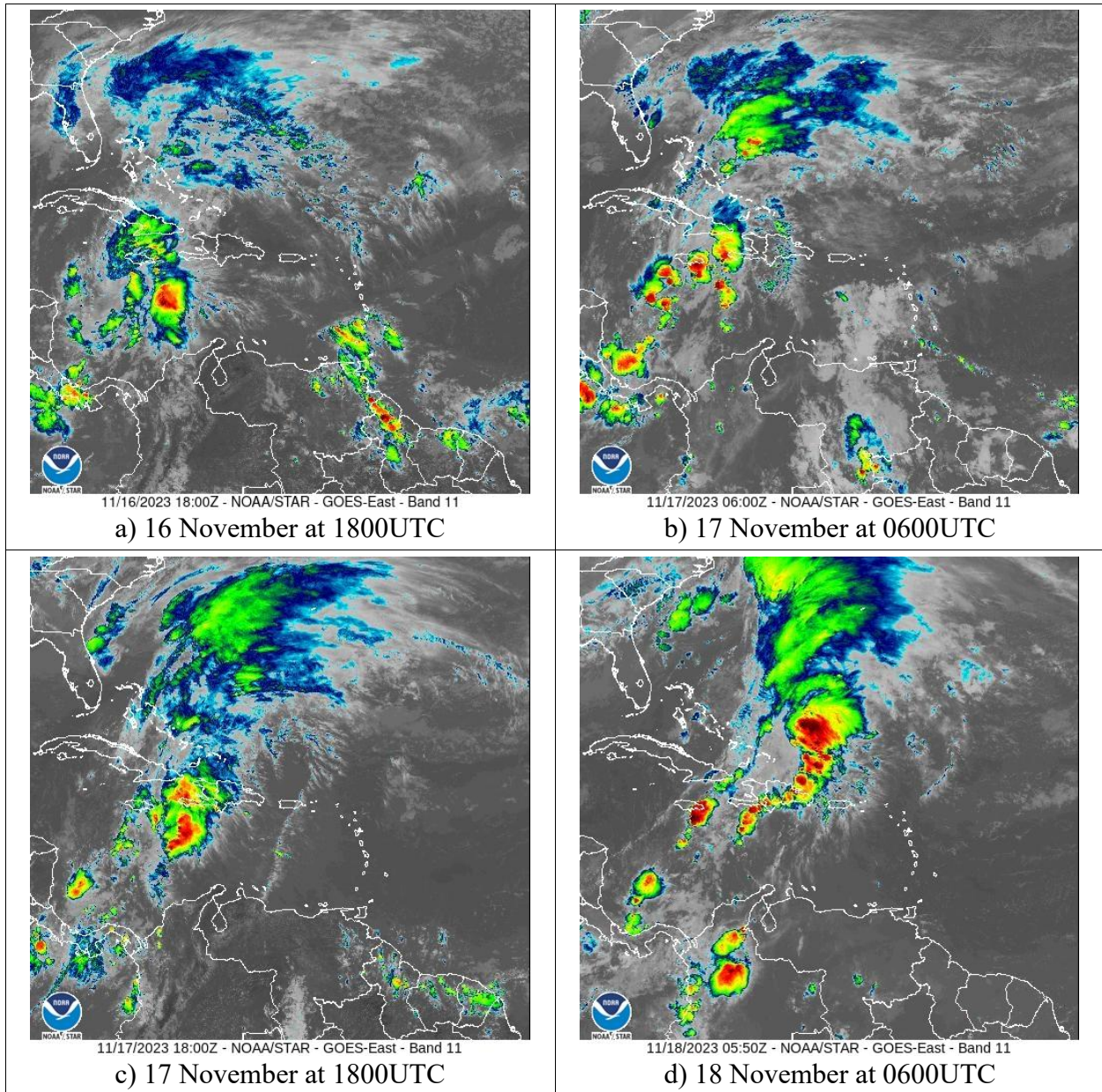


Figure 2 Satellite imagery on 16-17-18 November, 2023 at different times as indicated by the labels from the thermal infrared channel enhanced with colour. Blue/green colours represent high altitude clouds (top cloud temperature between -50°C and -70°C), while the red/yellow colours represent very high altitude clouds (top cloud lower than -70°C). High altitude clouds indicate strong convection associated with intense precipitation. Source: NOAA, National Environmental Satellite, GOES Image View².

2 NESDIS Online Archive, NOAA National Environmental Satellite, GOES Image View, available at: <https://www.star.nesdis.noaa.gov/GOES/sector.php?sat=G16§or=cam>

3 IMPACTS

At the time of writing this report, there were media reports of damage in Jamaica due to this Covered Area Rainfall Event during the indicated period. On November 16, the Ministry of Education issued an order to close all schools due to a Tropical Storm Watch in effect for Jamaica.

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Figure 3 Schools closed in order to prioritise the safety of all students and staff

On November 17, the National Works Agency received reports⁴ of 16 roadways which were impacted by the excessive rain, fallen rocks, landslides, fallen trees and flood waters. The Office of Disaster Preparedness and Emergency Management (ODPEM) reported that 22 persons were trapped at the Hortley Crossing in St. Thomas, who were rescued by the Jamaica Defence Force.

Local Government and Rural Development Minister, Desmond McKenzie, reported no loss of lives during the passage of the adverse weather system.⁵

4 RAINFALL MODEL OUTPUTS

All data sources used by the XSR 3.0 model, CMORPH, IMERG, WRF5, WRF7, WRF11 and WRF15⁶, detected the occurrence of precipitation over Jamaica and the surrounding waters during

3 The Gleaner: [Schools ordered closed across Jamaica on Friday | News | Jamaica Gleaner \(jamaica-gleaner.com\)](https://www.gleaner.com/news/education/schools-ordered-closed-across-jamaica-on-friday)

4 The Gleaner: [Fallen rocks, landslides and flood waters impact roads in eastern Jamaica | News | Jamaica Gleaner \(jamaica-gleaner.com\)](https://www.gleaner.com/news/transport/fallen-rocks-landslides-and-flood-waters-impact-roads-in-eastern-jamaica)

5 Loop News: [A tale of 2 realities: From Kgn to 'country', responses to rainfall | Loop Jamaica \(loopnews.com\)](https://www.loopnews.com/news/a-tale-of-2-realities-from-kgn-to-country-responses-to-rainfall)

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

the period 14 to 19 November 2023. However, each data source reported a specific distribution and accumulated rainfall, as discussed below and shown in Figure 4. A CARE for Jamaica was activated on 16 November and lasted until 19 November. The CARE was activated due to the use of the 12-hour and the 48-hour aggregation intervals for precipitation⁷ and thus the period considered by the XSR 3.0 model for the loss estimate based on the accumulated precipitation in Jamaica was 14-19 November.

CMORPH reported total accumulated values of precipitation higher than 80 mm along the southern coast and over the eastern portion of Jamaica, with the maximum values, between 200 mm and 280 mm, over the eastern edge of the island, in the parishes of Portland and St. Thomas. Lower values were shown over the remainder of the country.

IMERG reported total accumulated values of precipitation higher than 80 mm over most of Jamaica, with increasing values from north to south. The maximum values, between 160 mm and 200 mm, were shown in few localized areas: along the southern coast in the parish of St. Catherine, over the eastern edge of Jamaica in St. Thomas and inland in Clarendon.

WRF5 showed total accumulated values of precipitation higher than 80 mm over southeastern Jamaica and over a portion of St. Mary, in the north of Jamaica. The maximum values, between 280 mm and 320 mm, were reported over the eastern edge of Jamaica, over Portland and Saint Thomas. Lower values were shown over the remainder of the country.

WRF7 showed total accumulated values of precipitation higher than 80 mm over most of Jamaica, with values higher than 200 mm, in some areas between 280 mm and 320 mm, over the eastern edge of Jamaica, over Portland and St. Thomas.

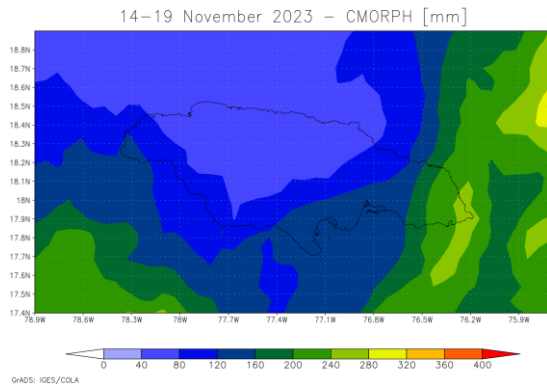
WRF11 showed total accumulated values of precipitation higher than 80 mm over most of Jamaica and higher than 200 mm over both the eastern side of the country and small areas in western Jamaica. The maximum values, between 400 mm and 440 mm, were reported east of Kingston, in St. Andrew.

WRF15 showed total accumulated values of precipitation higher than 160 mm over most of Jamaica. The maximum values, between 360 mm and 440 mm, were reported over small areas in several locations in the country, mainly over eastern Jamaica, in Surrey County (Portland, St. Thomas, Kingston, and St. Andrew), but also in the parishes of Westmoreland (western Jamaica) and Clarendon (central Jamaica).

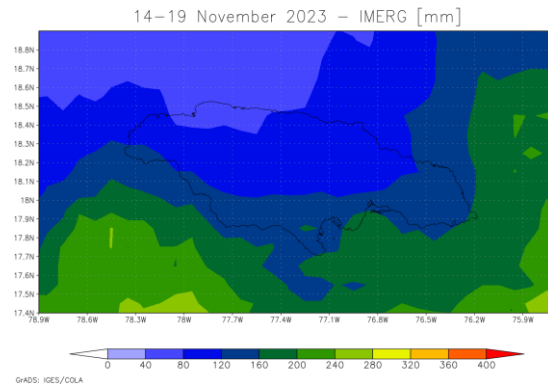
IMERG Model: The satellite-based rainfall estimation model developed by NASA, expressed in mm, derived by aggregating the IMERG 30-minute Rainfall Data at 10km spatial resolution and available at <https://jsimpsonhttps.pps.eosdis.nasa.gov/imerg/late>. Further details in the Definitions section of this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

WRF5, 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.

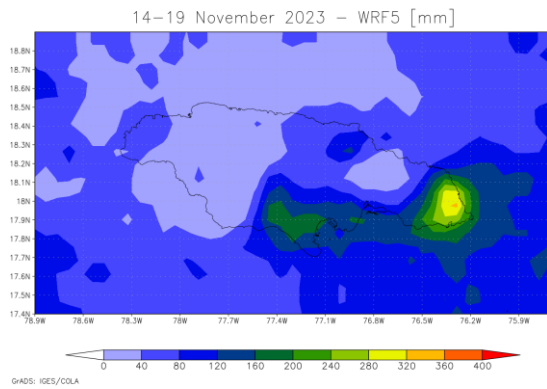
⁷ The two aggregation periods correspond to the Rainfall Aggregation Period #1 and Rainfall Aggregation Period #2, as indicated in the Schedule. Further details in the Definitions section of this report.



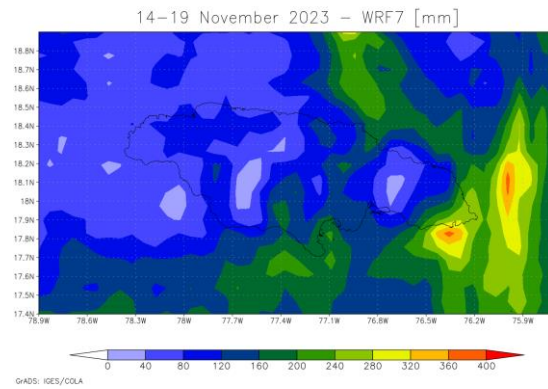
a) CMORPH



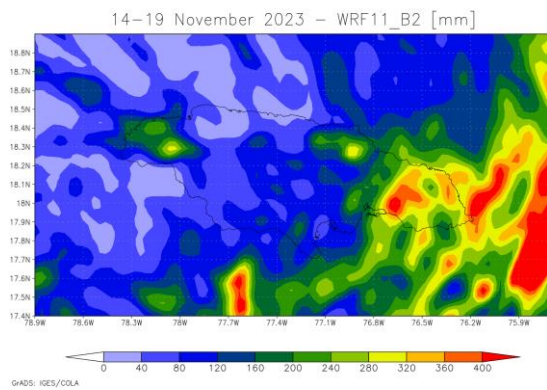
a) IMERG



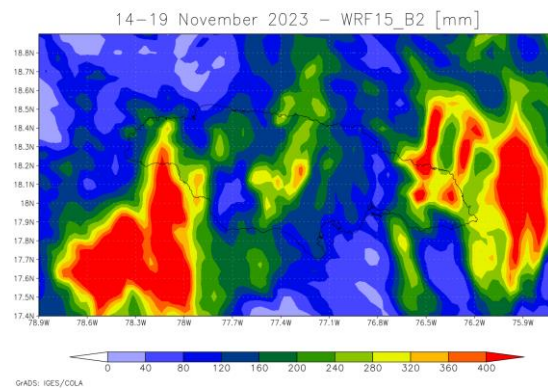
c) WRF5



d) WRF7



e) WRF11



f) WRF15

Figure 4 Total accumulated precipitation during the period 14-19 November, 2023 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/JAM/CARE_2_2023/daily_prec_short.mp4

https://wemap.ccrif.org/OUTPUT/CCRIF/XSR/Events/JAM/CARE_2_2023/daily_prec_long.mp4

The Rainfall Index Loss (RIL) was above the loss threshold for Jamaica for all six data sources used by XSR3.0: CMORPH, IMERG, WRF5, WRF7, WRF11 and WRF15. The RIL was the highest for WRF15.

The final RIL (RIL_{FINAL}) was calculated as the average of the six RILs from CMORPH, IMERG, WRF5, WRF7, WRF11 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 Jamaica's Excess Rainfall policy and therefore the policy was not triggered. Therefore, no payout is due to the Government of Jamaica under this policy.

The Wet Season Trigger (WST) component of the XSR3.0 model did not identify this CARE as a "Wet Season" event⁸. Therefore, no payout is due under the Wet Season Trigger endorsement of Jamaica's Excess Rainfall policy of Jamaica.

The Localized Event Trigger (LET) component of the XSR3.0 model did not identify this CARE as a localized event⁹. Therefore, no payout is due under the Local Event Trigger endorsement of Jamaica's Excess Rainfall policy.

8 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). 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.

9 To determine a qualifying localized event, two conditions must be met: the average precipitation in the 10% of the area with highest precipitation – known as the "Local Exposure" - from (i) either of the satellite datasets (CMORPH or IMERG) and (ii) at least three of the six WRF models must be greater than the local precipitation threshold (LPT).

5 TRIGGER POTENTIAL

The Rainfall Index Loss calculated for the Covered Area Rainfall Event (CARE) for Jamaica was below the attachment point of the Excess Rainfall policy for this country, and therefore no payout is due. This CARE did not activate the Wet Season Trigger or Localized Event Trigger endorsements of the Excess Rainfall policy and therefore no payout under either endorsement is due.

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

DEFINITIONS

<i>Active Exposure Cell Percentage Threshold</i>	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.
<i>Active Exposure Grid Cells</i>	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.
<i>Aggregate Rainfall #1</i>	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.
<i>Aggregate Rainfall #2</i>	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.
<i>Calculation Agent</i>	Entity charged with undertaking the primary calculation of the Rainfall Index Loss.
<i>CMORPH-based Maximum Aggregate Rainfall #1</i>	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.
<i>CMORPH-based Maximum Aggregate Rainfall #2</i>	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.
<i>CMORPH-based Covered Area Rainfall Parameters</i>	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

	<p>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’.</p>
<i>CMORPH Model</i>	<p>The satellite-based rainfall estimation model provided by NOAA CPC as described in the Rainfall Estimation Models section of the Policy.</p>
<i>Covered Area</i>	<p>The territory of the Insured as represented in the XSR Rainfall Model.</p>
<i>Covered Area Rainfall Event</i>	<p>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.</p>
<i>Country Disaster Alert</i>	<p>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.</p>
<i>Maximum Aggregate Rainfall #1</i>	<p>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.</p>
<i>Maximum Aggregate Rainfall #2</i>	<p>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.</p>
<i>Rainfall Event Threshold #1</i>	<p>Aggregate Rainfall #1 level as defined in the Schedule which should be exceeded to trigger an Active Exposure Cell.</p>
<i>Rainfall Event Threshold #2</i>	<p>Aggregate Rainfall #2 level as defined in the Schedule which should be exceeded to trigger an Active Exposure Cell.</p>

<i>Rainfall Aggregation Period #1</i>	The number of hours over which the Aggregate Rainfall #1 is computed for all XSR Exposure Grid Cells during a Covered Area Rainfall Event.
<i>Rainfall Aggregation Period #2</i>	The number of hours over which the Aggregate Rainfall #2 is computed for all XSR Exposure Grid Cells during a Covered Area Rainfall Event.
<i>Rainfall Index Loss</i>	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.
<i>WRF5 Model</i>	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.
<i>WRF7 Model</i>	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.
<i>XSR Rainfall Model</i>	The computer model used to calculate the Rainfall Index Loss, as described in the Attachment entitled ‘Calculation of Rainfall Index Loss and Policy Payment’.
<i>XSR Exposure Grid Cells</i>	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.
<i>XSR Grid Cell Exposure Value</i>	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.