Covered Area Rainfall Event (28/06/2020 to 05/07/2020)

Excess Rainfall

Event Briefing

Panama

14 July 2020

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1 INTRODUCTION

Panama was under the influence of a monsoon trough and several tropical waves resulting in adverse weather conditions that occurred in the period between 25 June and 5 July, 2020. During this period, Panama was affected by heavy rains and high winds over a large area of the territory.

This event briefing describes the impact of the rainfall on Panama, which is associated with a Covered Area Rainfall Event (CARE), starting on 28 June and ending on 5 July 2020. The Rainfall Index Loss (RIL) was below the attachment point of Panama's Excess Rainfall policy and therefore no payout is due to the Government of the Republic of Panama.

2 EVENT DESCRIPTION

From 25 June to 5 July, a monsoon trough persisted over the southern countries of Central America and particularly over Panama (Figure 1). During this period, it extended from northern Colombia near 07/09N 75W to the eastern Pacific Ocean beyond 85W, crossing Panama along the latitude 07/09N. This almost stationary configuration led to the development of scattered showers over Panama, mainly between 2000 UTC and 0300UTC (1500 and 2200 local time) each day.

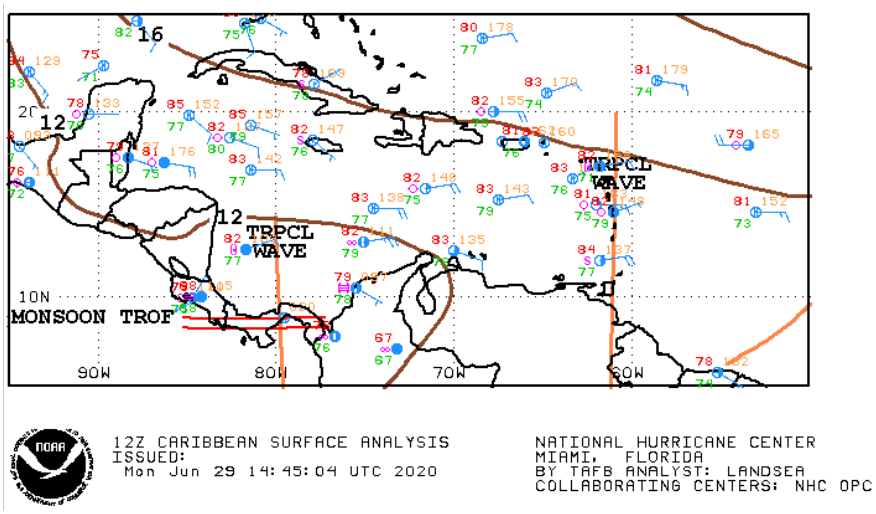


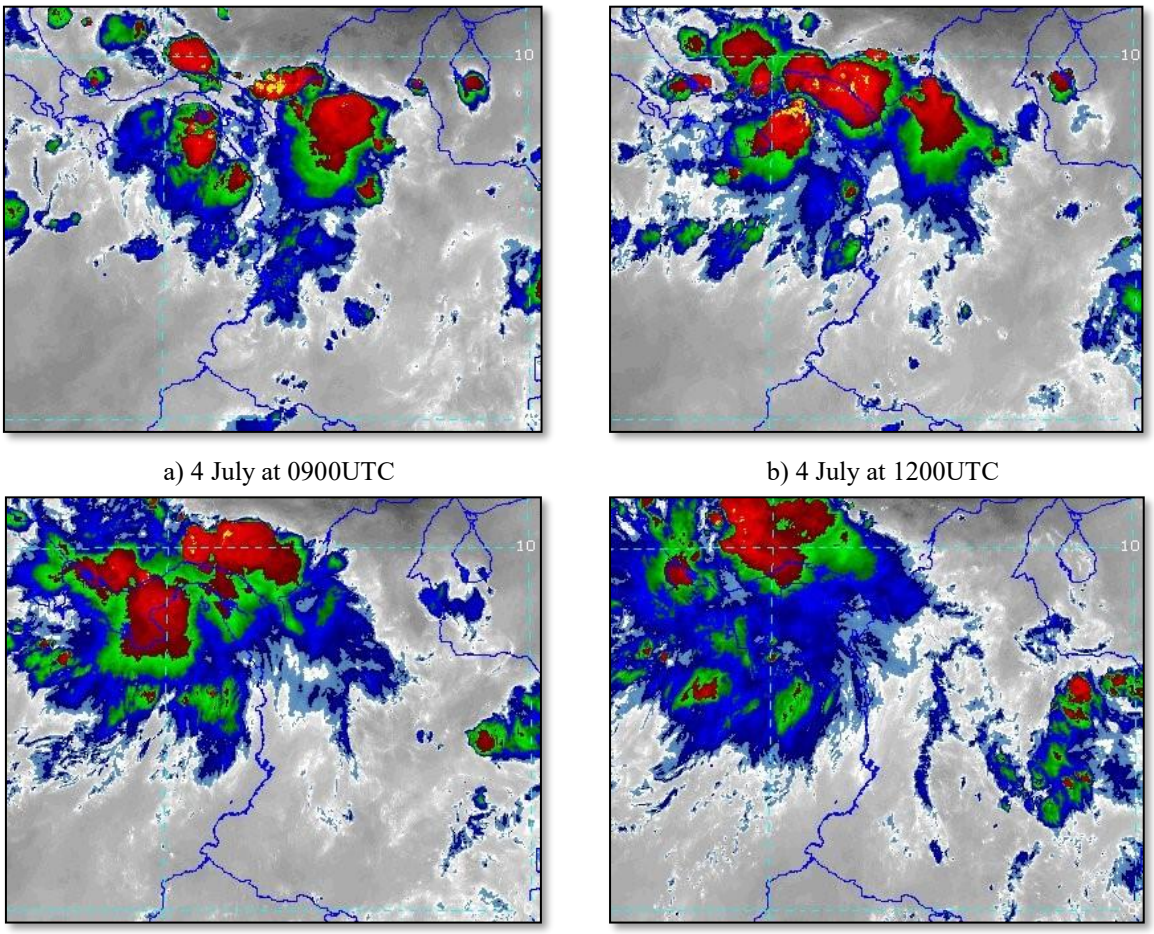
Figure 1 Surface analysis over the Central America and Caribbean area on 29 June at 1200UTC
Source: US National Hurricane Center[1]

Additionally, stronger and more organized convection activity was observed over Panama and the surrounding waters due to the combination of the instability caused by the monsoon trough and the westward transition of several tropical waves (26 June, 27 June, 28-29 June as shown in Figure 1, 01 July and 03 July). This was followed by the formation of minimum pressure along the monsoon trough over the waters to the north-west of Panama (from 3 to 5 July). On these days, particularly between 2000 UTC and 0300UTC, clusters of moderate to strong

[1] National Oceanic and Atmospheric Administration - FTP, National Hurricane Center, review date: 29 June 2020, available at: https://www.nhc.noaa.gov/tafb/CAR_12Z.gif

thunderstorms developed in the interior of Panama, affecting the country with moderate to heavy precipitation.

Of significance was the development of a large cluster of thunderstorms on 4 July from 0900UTC to 1800UTC. It initially affected the Gulf of Panama and the waters to the north of Panama, then later extended inland (Figure 2). The associated heavy precipitation affected mainly the central portion of Panama.



a) 4 July at 0900UTC

b) 4 July at 1200UTC

c) 4 July at 1500UTC

d) 4 July at 1800UTC

Figure 2 Satellite imagery at different times as indicated by the captions from 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: Source: NOAA Satellite and Information Service[2]

On 5 July, the activation of a high-level subsidy flow over southern Central America and the south-west Caribbean Sea suppressed the showers and thunderstorms activity over Panama.

[2] RAMSDIS Online Archive, NOAA Satellite and Information Service, review date: 04 July 2020, available at: *http://rammb.cira.colostate.edu/ramsdis/online/archive.asp?data_folder=tropical/tropical_ge_14km_wv&width=640&height=480*

3 IMPACTS

At the time of this report and according to an evaluation from Panama's Disaster Management Agency (in Spanish: Sistema Nacional de Protección Civil - SINAPROC) due to the impacts of this adverse weather the districts most affected were San Miguelito (Province of Panamá), David (Province of Chiriquí), Natá (Province of Coclé) and Chame (Province of Panamá Oeste).

Due to the heavy rains, the greatest damage was generated by flooding, roads obstructed by falling trees, power poles and some landslides. Some houses were flooded but there were no injuries recorded. Reports indicated damage to infrastructure but no casualties were reported.

Figure 3 shows some of the damage caused by this adverse weather in Panama.

Figure 3 Damage caused by this adverse weather period in Panama – 28 June to 5 July, 2020
Sources: *Sistema Nacional de Protección Civil*

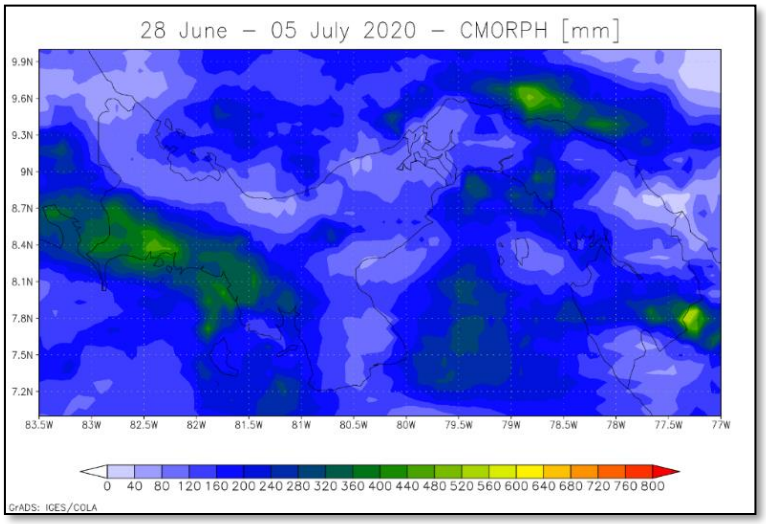
4 RAINFALL MODEL OUTPUTS

All three data sources used by the XSR 2.5 model, CMORPH[3], WRF5 and WRF7[4], simulated the occurrence of precipitation over Panama and the surrounding waters during the period 28 June – 5 July 2020.

CMORPH reported total accumulated amounts of precipitation higher than 80 mm over most of Panama. The largest values of precipitation were shown over the south-west portion (onshore the Gulf of Chiriquí) with amounts between 280 mm and 480 mm, onshore the Gulf of Panama with values between 160 mm and 280 mm and over the north-east area of the country with amounts larger than 240 mm and reaching 280 mm – 320 mm along the coast.

WRF5 simulated lower total accumulated amounts of rainfall compared with CMORPH over the majority of Panama, with values generally greater than 40 mm. However, it reported higher peaks in localized areas: along the east coast of the Gulf of Panama with maximum between 440 mm and 640 mm, and along the south-west cost, with maximum amounts locally reaching 900 mm.

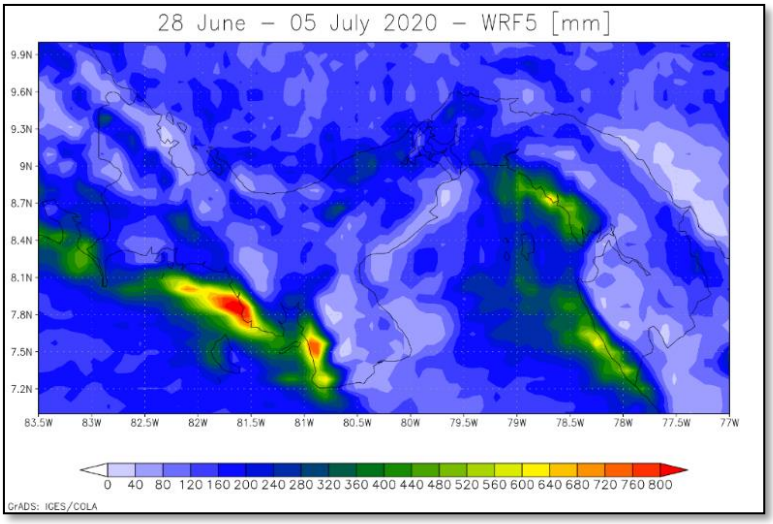
WRF7 showed a similar pattern of total accumulated precipitation to WRF5, but with higher amounts over interior of the country (particularly over the south-western side, with values locally reaching 520 mm) and lower amounts along the Pacific coast.



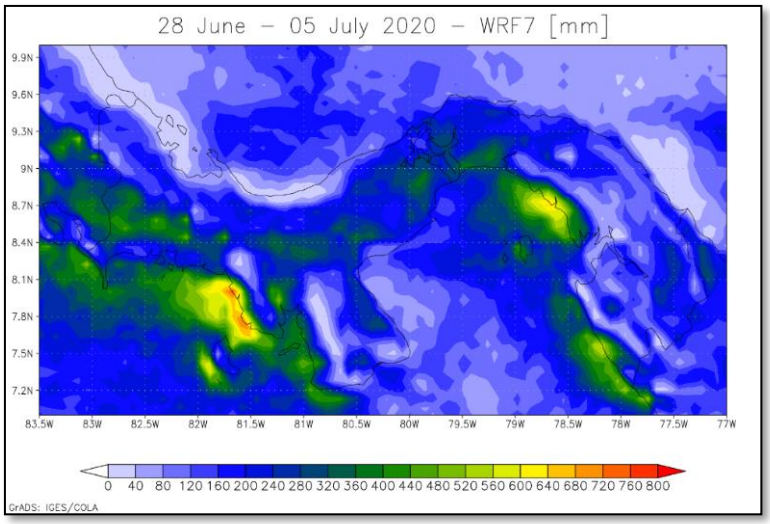
a) CMORPH

[3] 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 in the Definitions section of this report.

[4] WRF5 and WRF7 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 in the Definitions section of this report.



b) WRF5



c) WRF7

Figure 4 Total accumulated precipitation during the period 28 June – 05 July 2020 estimated by CMORPH (a), WRF5 (b) and WRF7 (c). Source: CCRIF SPC

Daily rainfall maps by CMORPH, WRF5 and WRF7 over the exposure map of XSR 2.5 are not included here and they can be downloaded at the following links for 24-hour aggregation and 72-hour aggregation respectively:

https://wemap.ccrif.org/OUTPUT/CCRIF/XSR/Events/PAN/CARE_1_2020/daily_prec_short.mp4

https://wemap.ccrif.org/OUTPUT/CCRIF/XSR/Events/PAN/CARE_1_2020/daily_prec_long.mp4

The Rainfall Index Loss (RIL) was above the loss threshold for Panama for all three data sources used by XSR2.5. The associated RIL was higher for CMORPH, although the precipitation peaks were greater for WRF5 and WRF7. Indeed, CMORPH presented larger amounts of accumulated precipitation in the internal territory, particularly over the south-west portion, an area characterized by high exposure.

The final RIL (RIL_{FINAL}) was calculated as the average of the RILs from the three data sources . 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 Panama's Excess Rainfall policy and thus did not trigger a policy payout.

5 TRIGGER POTENTIAL

The Rainfall Index Loss calculated for this Covered Area Rainfall Event was below the attachment point of Panama's Excess Rainfall policy and therefore no payout is due.

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.