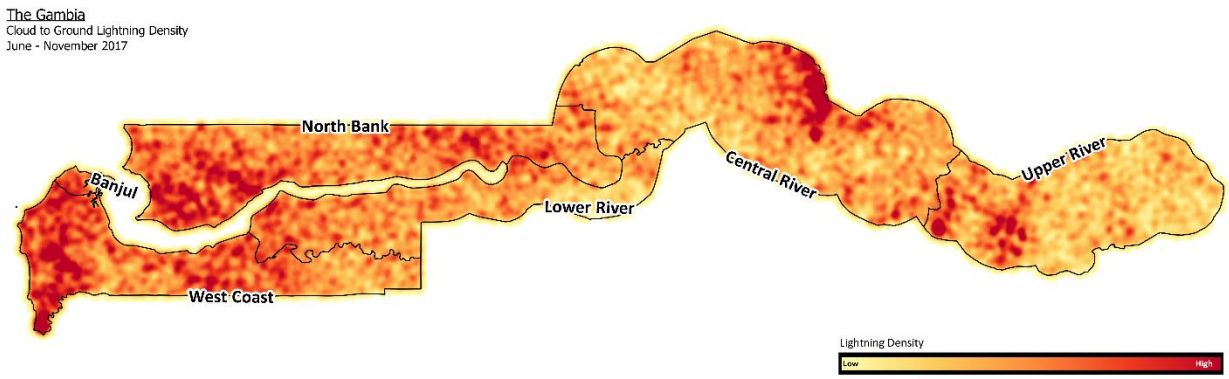
http://www.rainwatch-africa.org

http://owc.enterprise.earthnetworks.com/OnlineWeatherCenter.aspx?aid=7144&stat=L2GAM&pid=3&layerID=Radar.Global&Units=1

Government of The Gambia
Department of Water Resources
TEL: (+220) 4227631 / 4224122 - FAX: (+220) 422 50 09
E-MAIL: dwr@mofwrnam.gov.gm / WEB: www.mofwrnam.gov.gm

THE GAMBIA ANNUAL CLIMATE REPORT

2017



1.0 CAUSES OF CLIMATE:

The Earth's Climate system is dynamic and highly complex consisting of five major components, viz; The Atmosphere, Hydrosphere, Lithosphere, Cryosphere and Biosphere. As climate is changing, it is getting warmer also other aspects of the climate are changing particularly precipitation patterns due to the following:-

- The dominant source of heat affecting our atmosphere comes from the Sun; i.e. 'Solar radiation or insolation'.
- The atmosphere is kept in motion and develops its ***Weather*** characteristics primarily through energy input as heat. Heat actions produce various temperature variations (*differential heating*) which give rise to differences in air density; hence, pressure variance. Pressure gradients then develops that drive gases into motions causing "wind".
- Radiation emitted by Earth is entirely long wave radiation. Most of the terrestrial radiation is absorbed by water vapour in the atmosphere and by other greenhouse gases. This radiant energy is reradiated in the atmosphere horizontally and vertically. Horizontal energy flux (advection) enhances Global Warming.
- The vertical, upward or downward, flux is of extreme significance. Convection and turbulence carry aloft some of this radiation. Water vapour, undergoing the hydrological cycle i.e. the condensation process produce precipitation; while, the evaporation cycle carries the remainder into the atmosphere.
- Differential Heating coupling with Earth's rotation and revolution sets off a chain of reaction that leads to a series of global ***Climate*** phenomena that makes our Biosphere very diverse, productive and could be very delicate.

1.1 Weather denotes the short-term (hours up to about a week) behaviour of the atmosphere. Thus, each place is said to have a set of particular conditions, which tend to change over short time periods.

1.2 Climate is the average weather conditions of a region, or the statistical description in terms of the mean and variability of relevant weather quantities over a period of time, ranging from months to several years. However, WMO classical reference period is 30 years. Climate in a wider sense is the weather state of the atmosphere, including the statistical description of specific weather elements for established weather conditions of the Climate system.

2.0 MAIN CHARACTERISTICS of the Climate of the Gambia:

Apart from the Cryosphere, The Gambia's Climate is influenced by four of the above mentioned systems in **1.0**.

The country is largely semi-arid with two distinct seasons (wet and dry). The Wet (rainy) season is from June to October; whereas, the Dry season is from December to April while May and November are considered as transitional months.

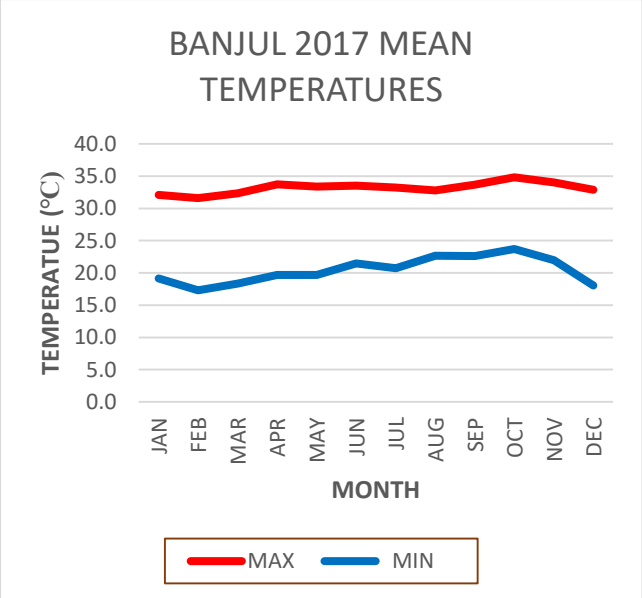
The two main weather variables considered in this report are Temperature and Rainfall. As depicted on the plotted diagrams, most regions within The Gambia are currently experiencing a slight increase in Temperature while Rainfall patterns are irregular and highly variable.

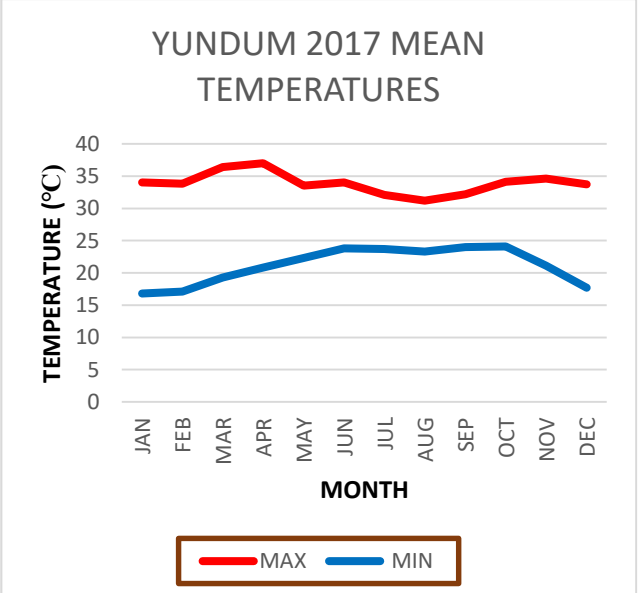
2.1 Temperature

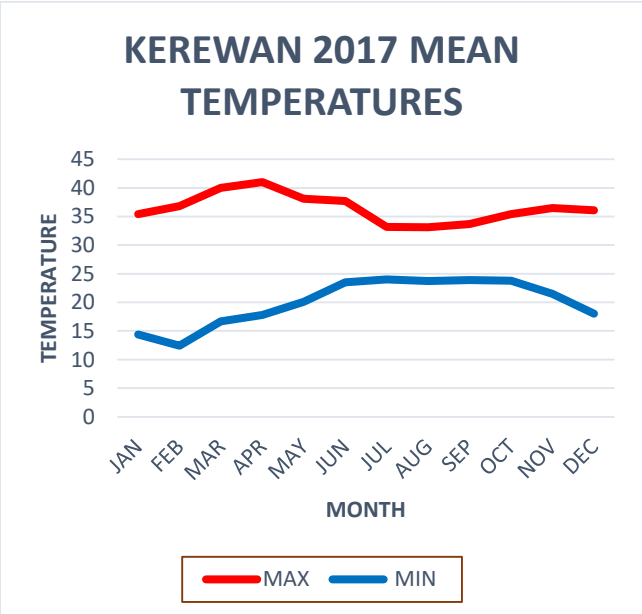
The western half of the country experiences a daytime warming episode as depicted on the Mean Maximum Temperature plots for Banjul, Yundum and Kerewan; whereas, normal conditions dominates over the middle and eastern sectors of the country.

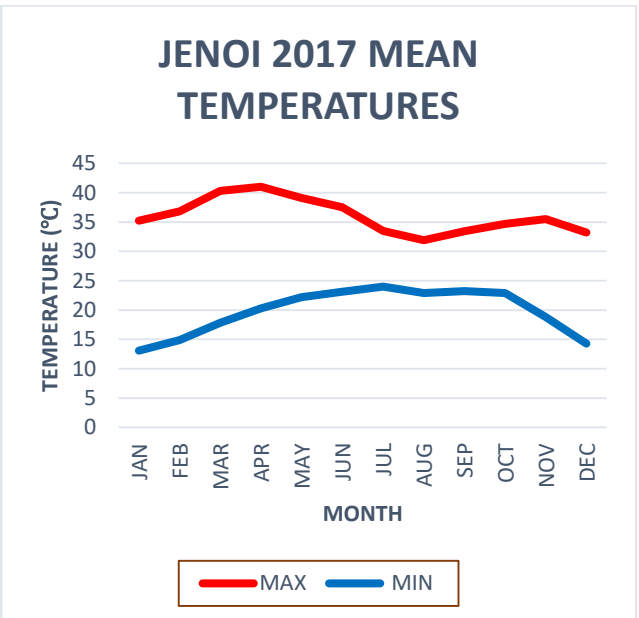
Pertaining to the Mean Minimum Temperature Banjul and Janjangbureh due to Island effect had a cooling trend as the temperature is been modified by the influence of the water bodies (Atlantic Ocean & River Gambia), Kerewan, Jenoi and Basse had near normal scenarios with slight cooling during the Northern Hemisphere Winter months which may be attributed to radiant energy loss.

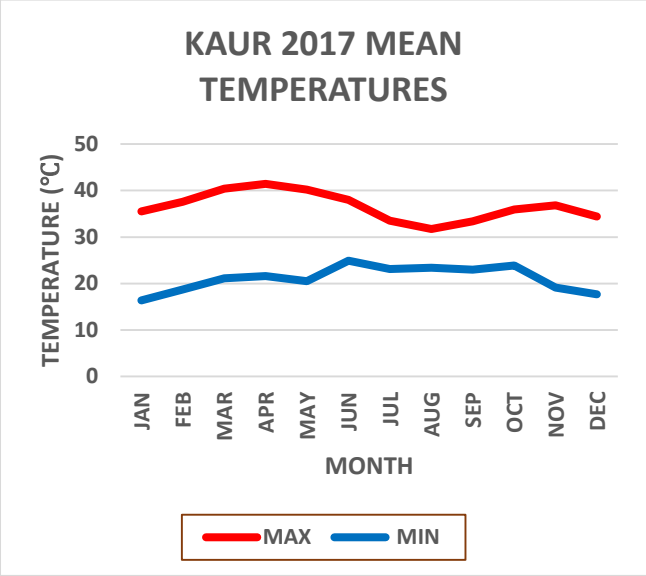
Furthermore, Banjul being a coastal station the difference in its monthly mean temperature range is not well pronounced as compared to the inland areas. The long term (43years) annual mean maximum temperature series indicate a general warming trend of about 1.5 degree Celsius.

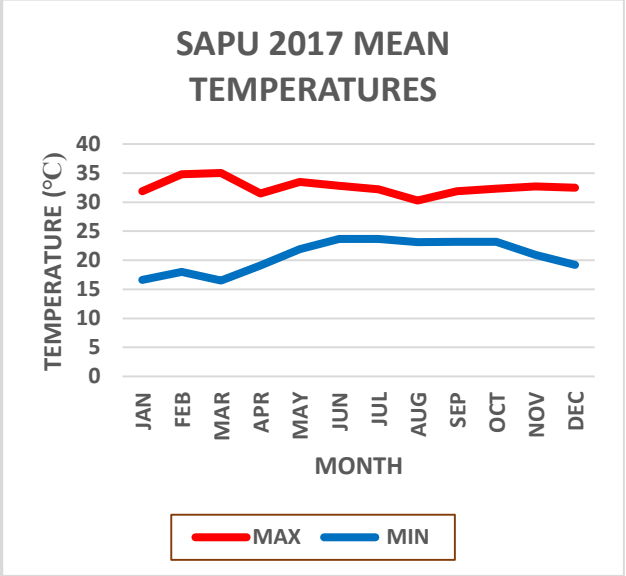


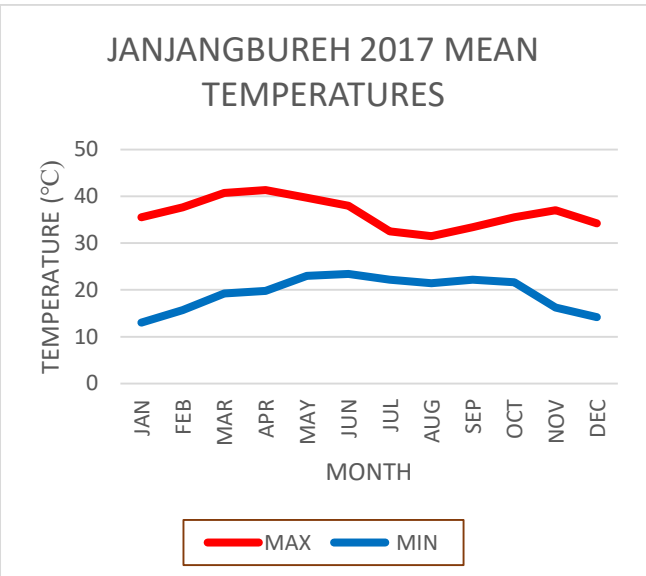


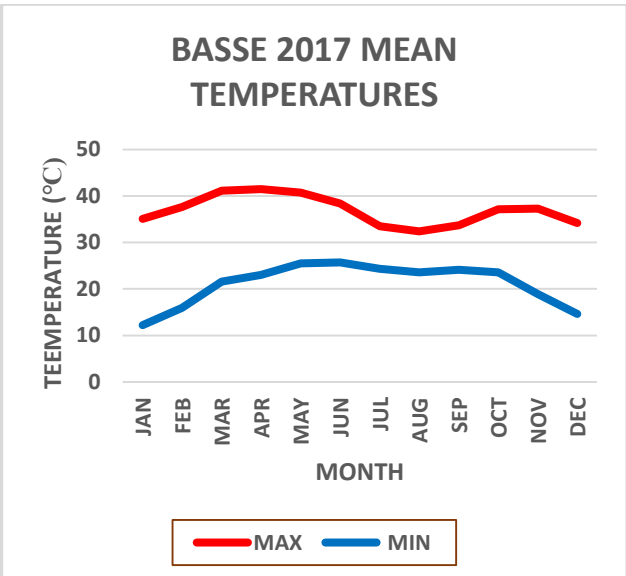


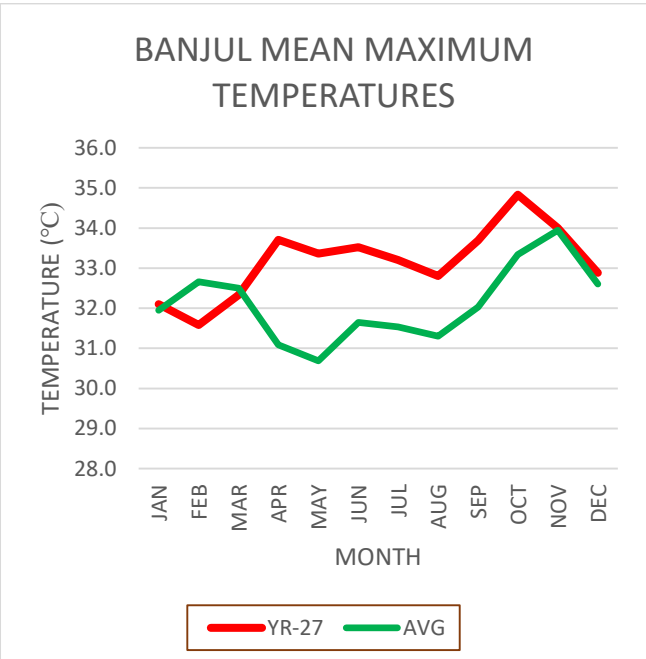


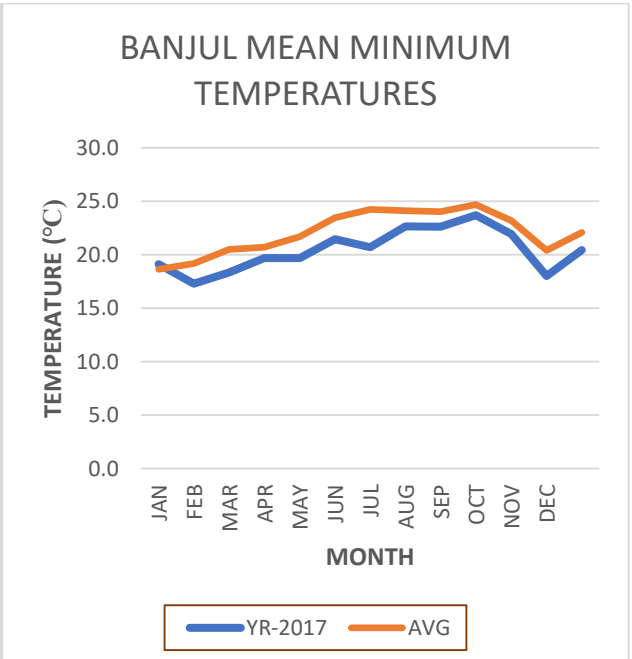

KAUR 2017 MEAN TEMPERATURES
TEMPERATURE (°C)
50
40
30
20
10
0
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
MONTH
MAX
MIN

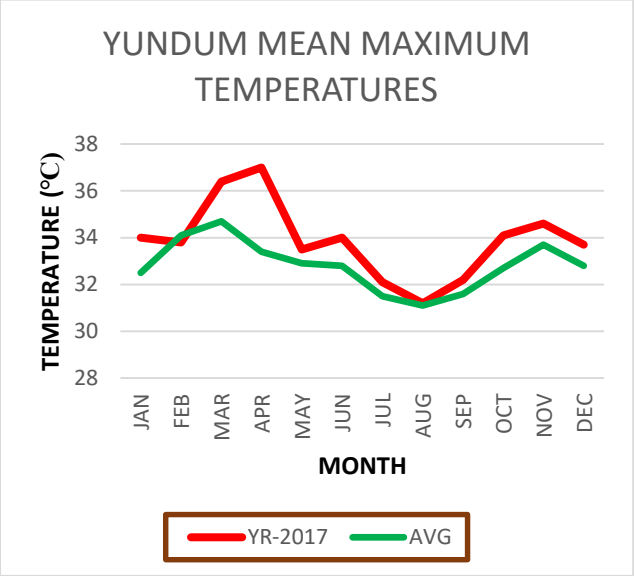

SAPU 2017 MEAN TEMPERATURES
TEMPERATURE (°C)
40
35
30
25
20
15
10
5
0
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
MONTH
MAX
MIN

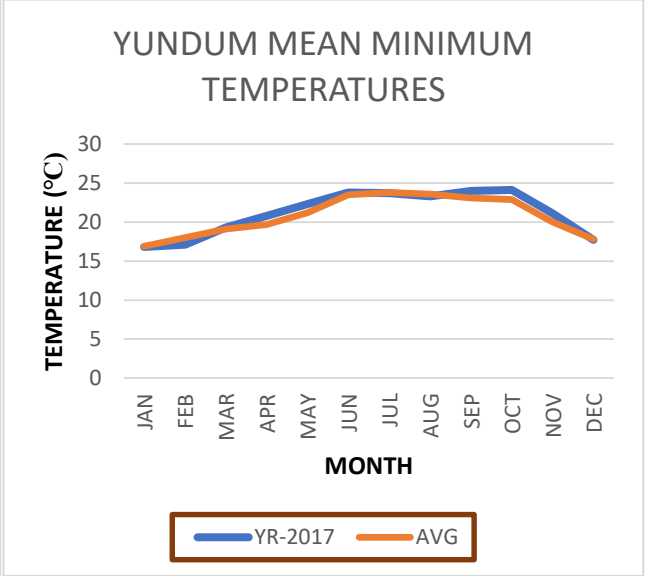

JANJANGBUREH 2017 MEAN TEMPERATURES
TEMPERATURE (°C)
50
40
30
20
10
0
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
MONTH
MAX
MIN

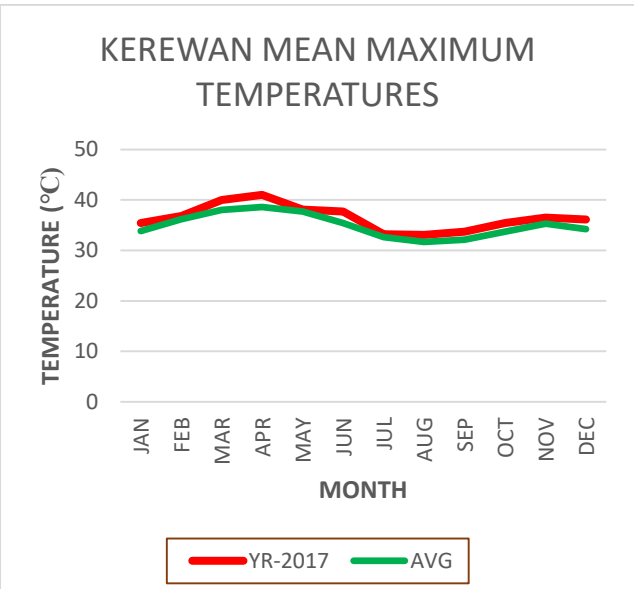

BASSE 2017 MEAN TEMPERATURES
TEEMPERATURE (°C)
50
40
30
20
10
0
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
MONTH
MAX
MIN

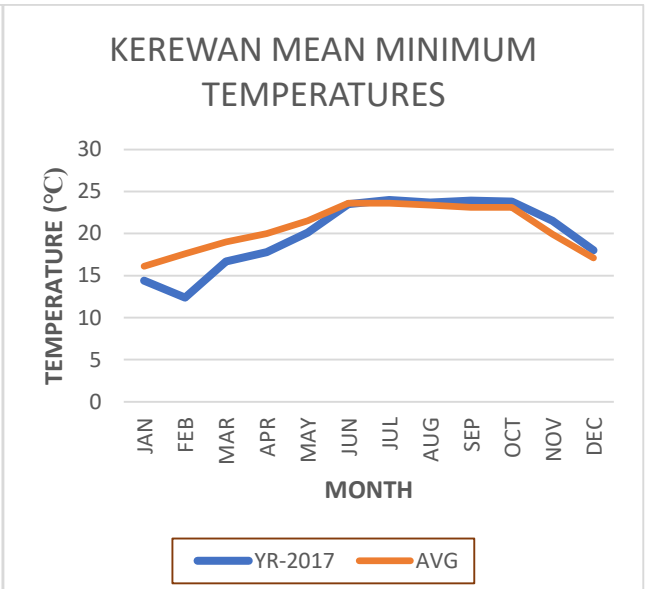

BANJUL MEAN MAXIMUM TEMPERATURES
TEMPERATURE (°C)
36.0
35.0
34.0
33.0
32.0
31.0
30.0
29.0
28.0
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
MONTH
YR-27
AVG

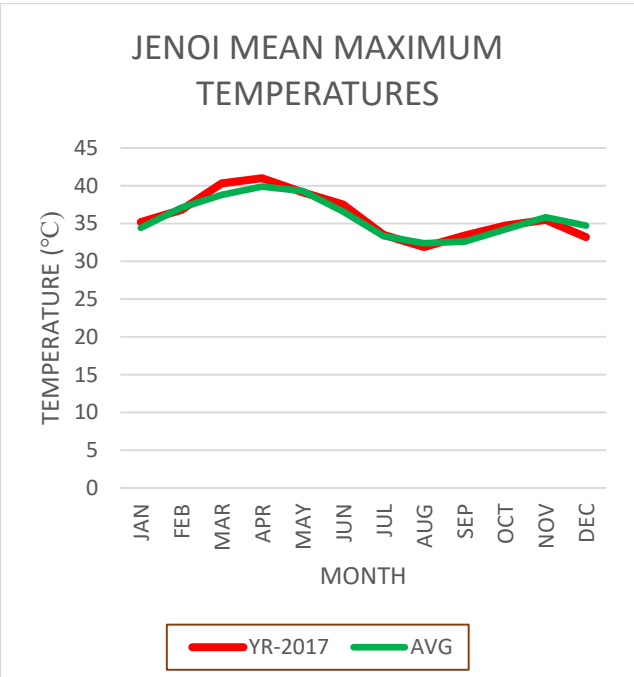

BANJUL MEAN MINIMUM TEMPERATURES
TEMPERATURE (°C)
30.0
25.0
20.0
15.0
10.0
5.0
0.0
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
MONTH
YR-2017
AVG

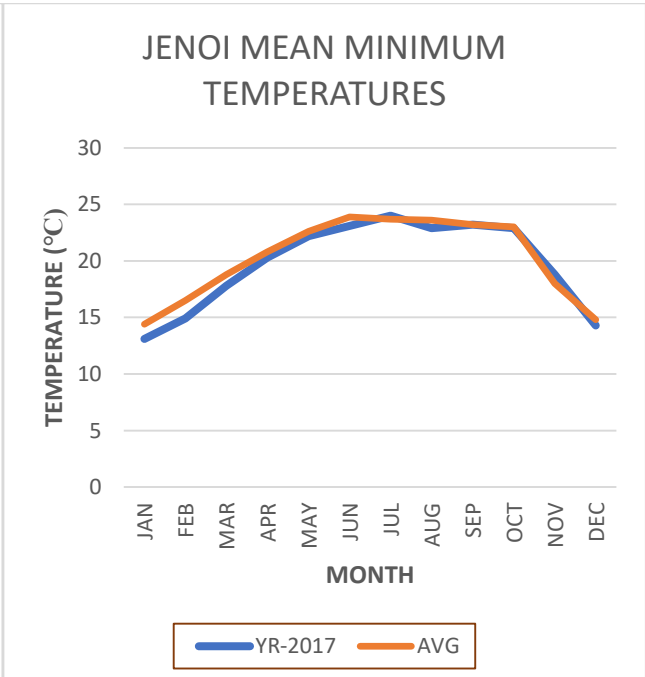

YUNDUM MEAN MAXIMUM TEMPERATURES
TEMPERATURE (°C)
38
36
34
32
30
28
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
MONTH
YR-2017
AVG

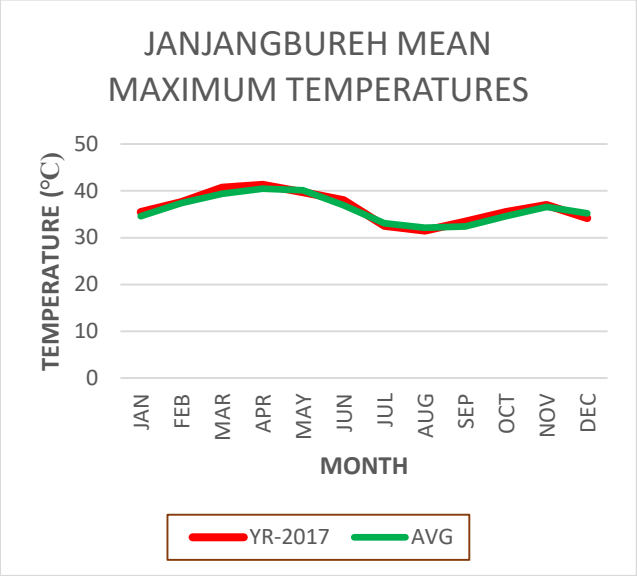

YUNDUM MEAN MINIMUM TEMPERATURES
TEMPERATURE (°C)
30
25
20
15
10
5
0
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
MONTH
YR-2017
AVG

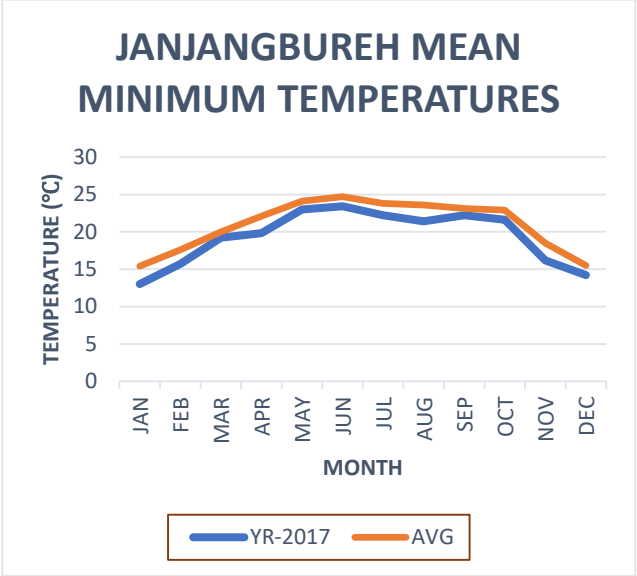

KEREWAN MEAN MAXIMUM TEMPERATURES
TEMPERATURE (°C)
50
40
30
20
10
0
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
MONTH
YR-2017
AVG

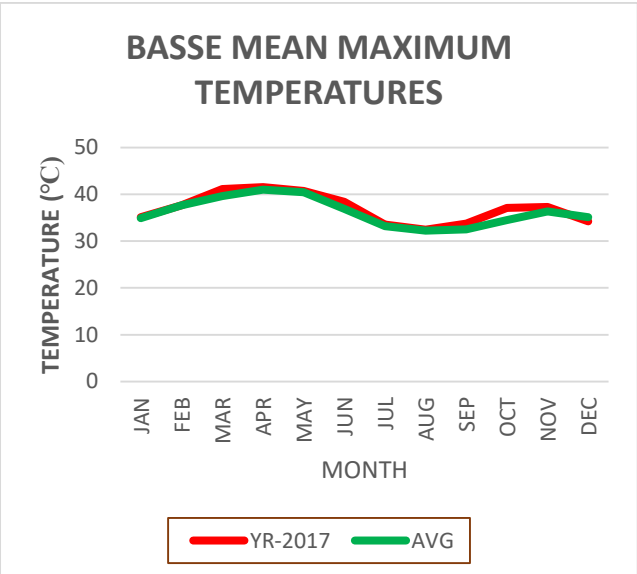

KEREWAN MEAN MINIMUM TEMPERATURES
TEMPERATURE (°C)
30
25
20
15
10
5
0
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
MONTH
YR-2017
AVG

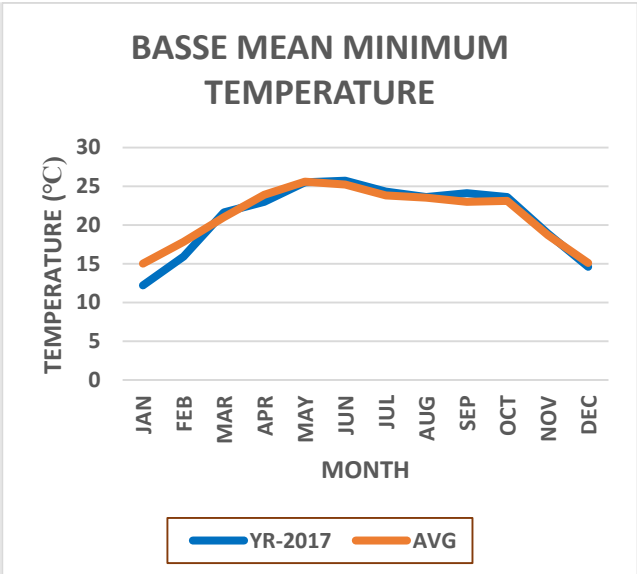

JENOI MEAN MAXIMUM TEMPERATURES
TEMPERATURE (°C)
45
40
35
30
25
20
15
10
5
0
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
MONTH
YR-2017
AVG

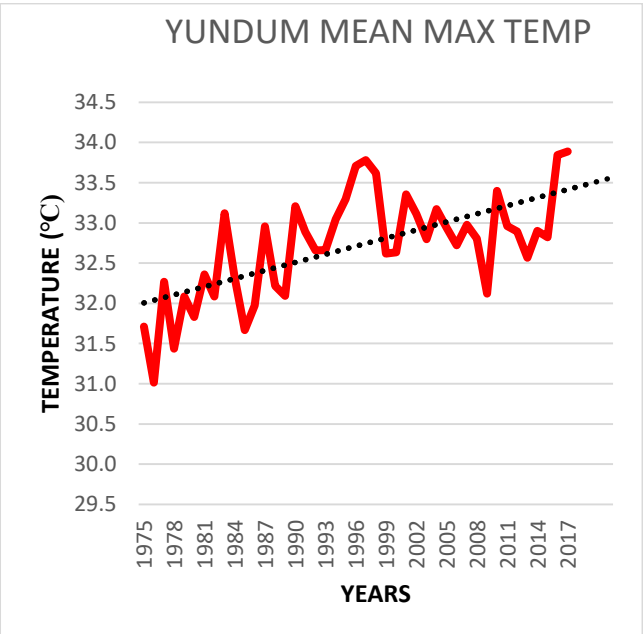

JENOI MEAN MINIMUM TEMPERATURES
TEMPERATURE (°C)
30
25
20
15
10
5
0
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
MONTH
YR-2017
AVG

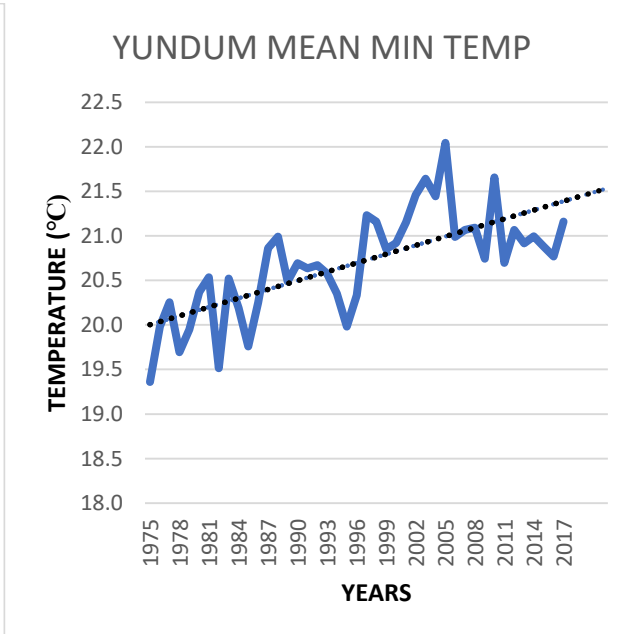

JANJANGBUREH MEAN MAXIMUM TEMPERATURES
TEMPERATURE (°C)
50
40
30
20
10
0
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
MONTH
YR-2017
AVG

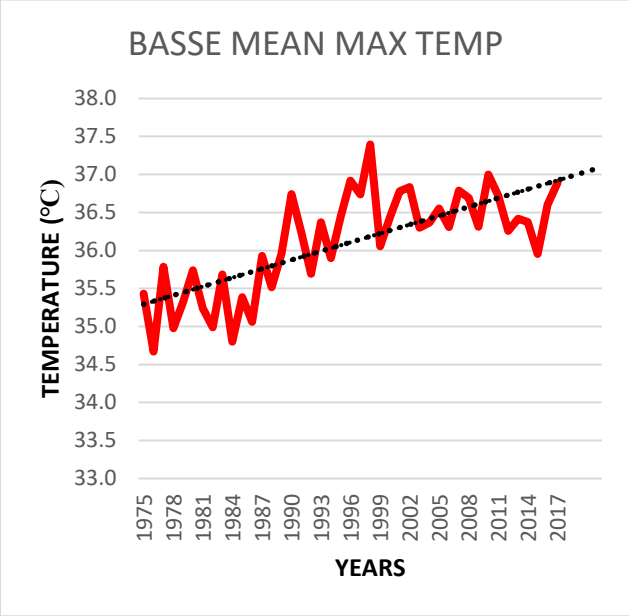

JANJANGBUREH MEAN MINIMUM TEMPERATURES
TEMPERATURE (°C)
30
25
20
15
10
5
0
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
MONTH
YR-2017
AVG

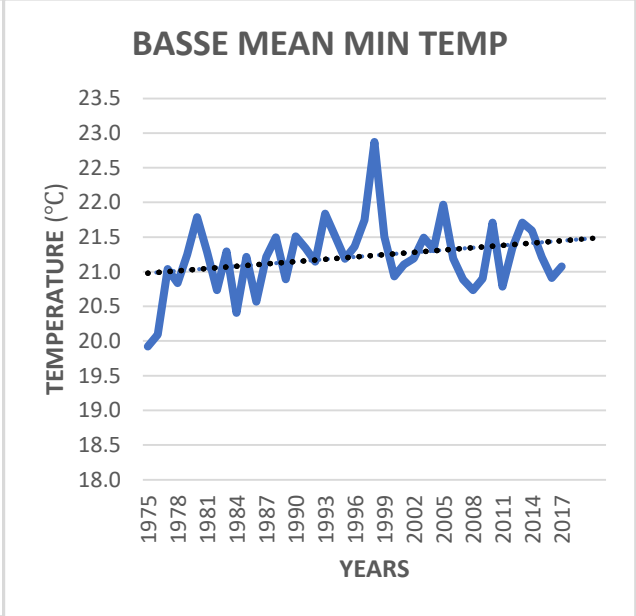

BASSE MEAN MAXIMUM TEMPERATURES
TEMPERATURE (°C)
50
40
30
20
10
0
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
MONTH
YR-2017
AVG


BASSE MEAN MINIMUM TEMPERATURE
TEMPERATURE (°C)
30
25
20
15
10
5
0
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
MONTH
YR-2017
AVG


YUNDUM MEAN MAX TEMP
TEMPERATURE (°C)
34.5
34.0
33.5
33.0
32.5
32.0
31.5
31.0
30.5
30.0
29.5
1975 1978 1981 1984 1987 1990 1993 1996 1999 2002 2005 2008 2011 2014 2017
YEARS


YUNDUM MEAN MIN TEMP
TEMPERATURE (°C)
22.5
22.0
21.5
21.0
20.5
20.0
19.5
19.0
18.5
18.0
1975 1978 1981 1984 1987 1990 1993 1996 1999 2002 2005 2008 2011 2014 2017
YEARS



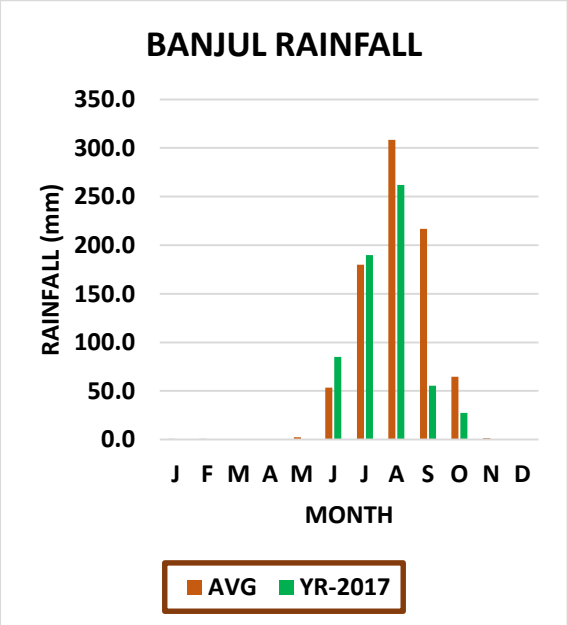


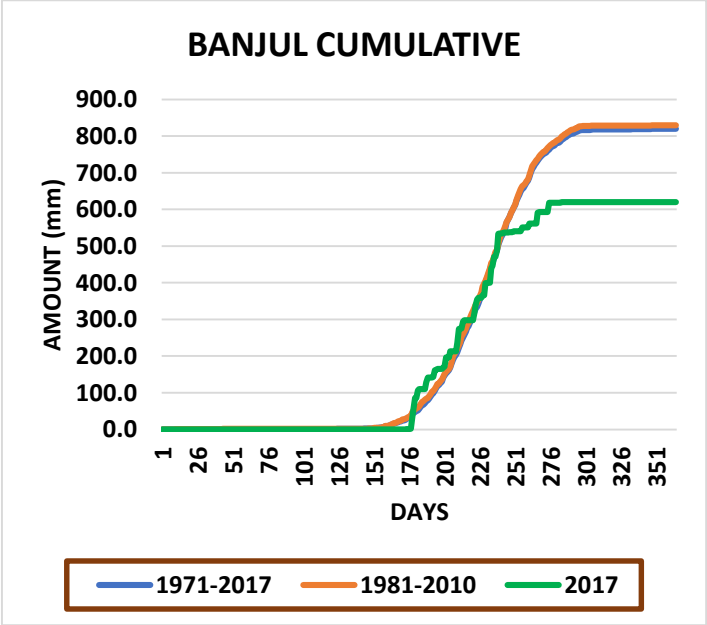
2.2 Rainfall

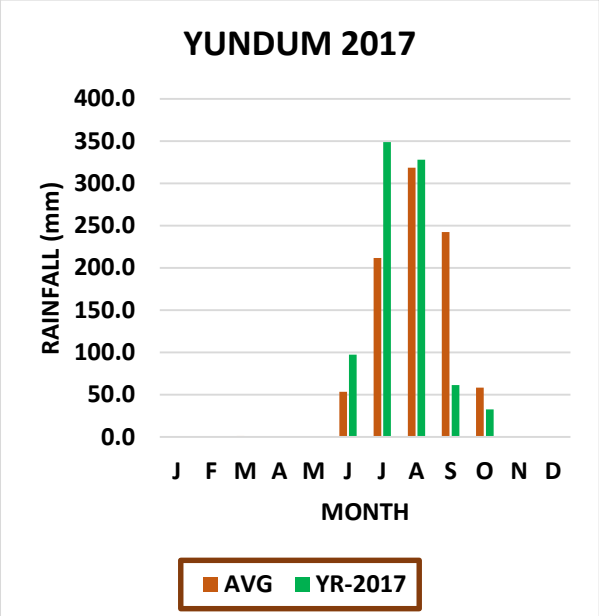
Generally, It is evident on most of the plotted diagrams below that rainfall peak is in the month of August followed by September then July. Without reasonable doubt there is a 2-3 weeks shift from the normal commencement dates of rain in different regions of The Gambia.

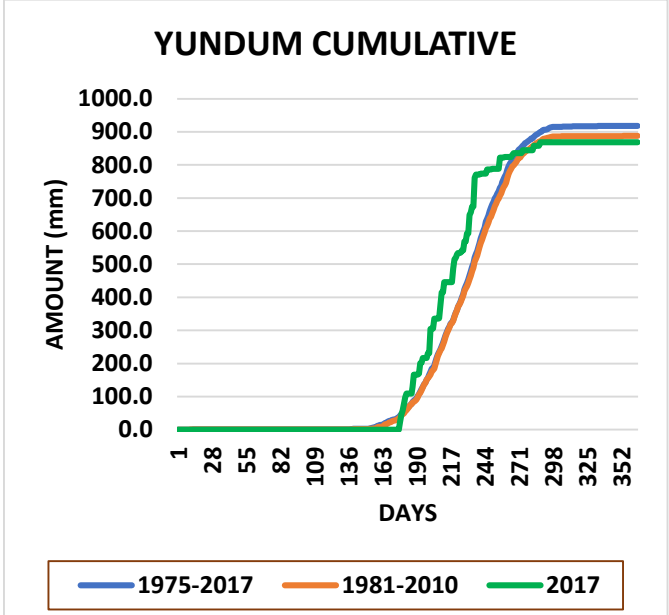
Despite the late onset (i.e. turning point at base of plots) and early cessation (i.e. turning point at top of plots) from the normal scenario as depicted on the Cumulative frequency – Ogive curves below; September-2017 was critical on an agro-ecological point of view in the sense that not much rain was recorded as indicated on the Rainfall histograms.

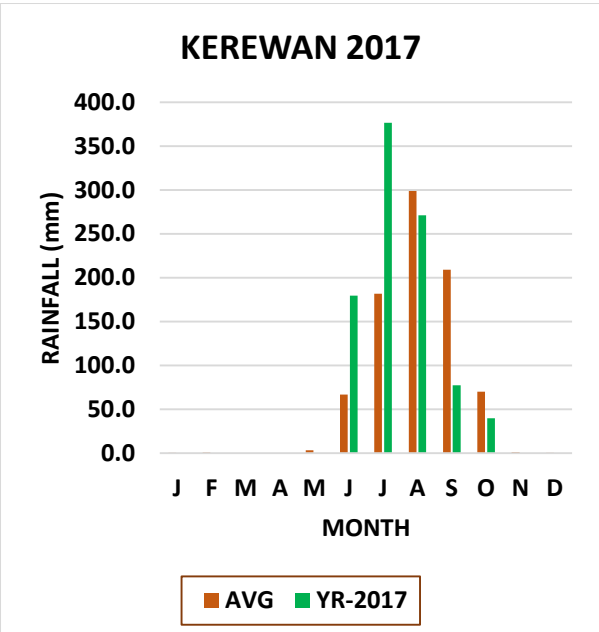
It Is noteworthy that Banjul recorded below normal scenario (619.9mm); whereas, Jenoi was the only station in the country that recorded well above average rainfall (1367mm). However, Kwinella being the nearest neighbouring rainfall monitoring station to Jenoi recorded an appreciable rainfall amount as it falls well within the normal rainfall trend for Jenoi. Hence, Jenoi may be consider an outlier as manifested on the lightning density maps; since there might have been errors during the measuring, recording and data processing phases.

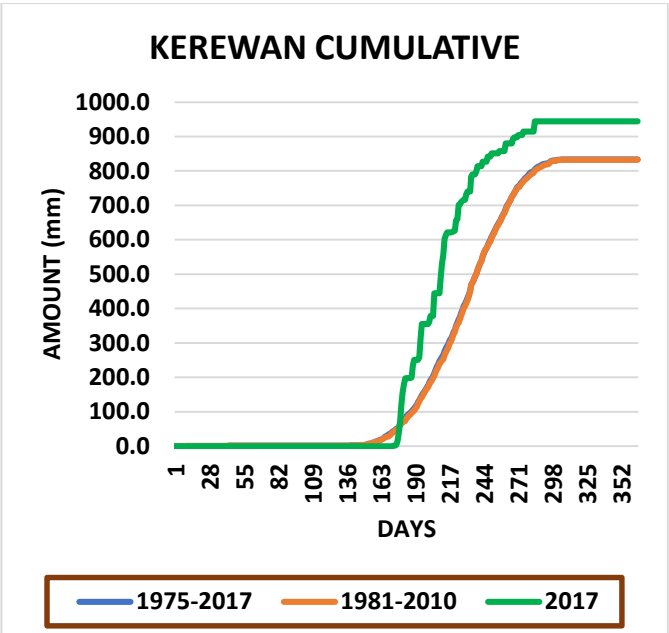


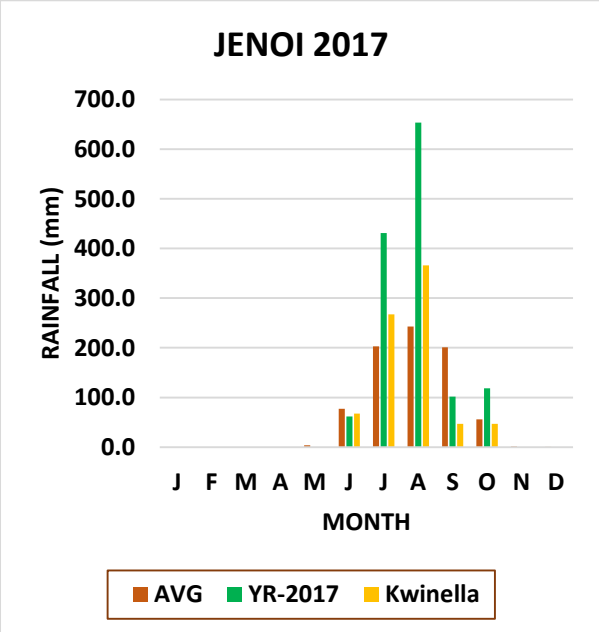


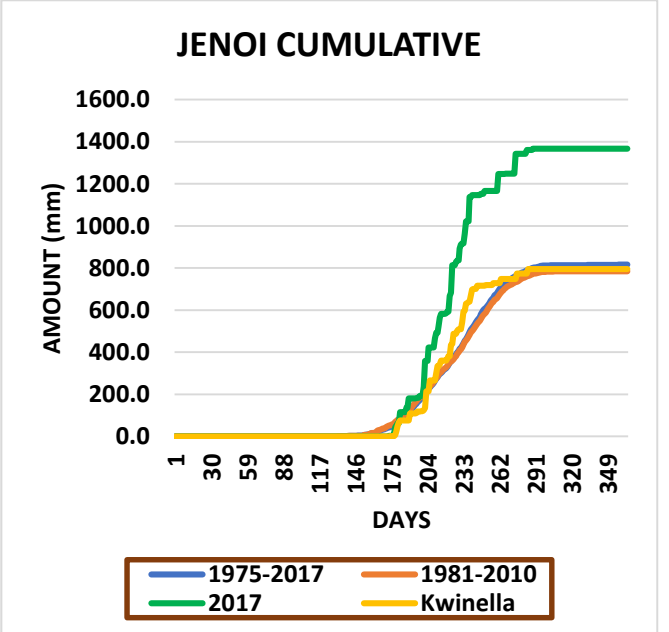

YUNDUM 2017
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
RAINFALL (mm)
J F M A M J J A S O N D
MONTH
AVG
YR-2017

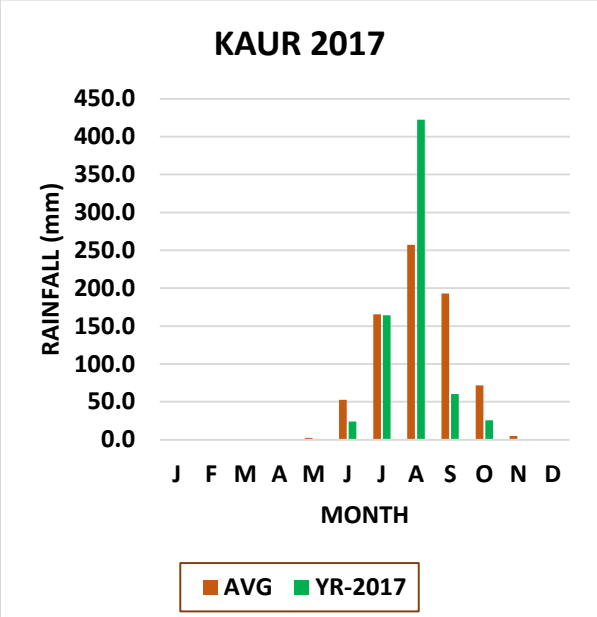

YUNDUM CUMULATIVE
1000.0
900.0
800.0
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
AMOUNT (mm)
1 28 55 82 109 136 163 190 217 244 271 298 325 352
DAYS
1975-2017
1981-2010
2017

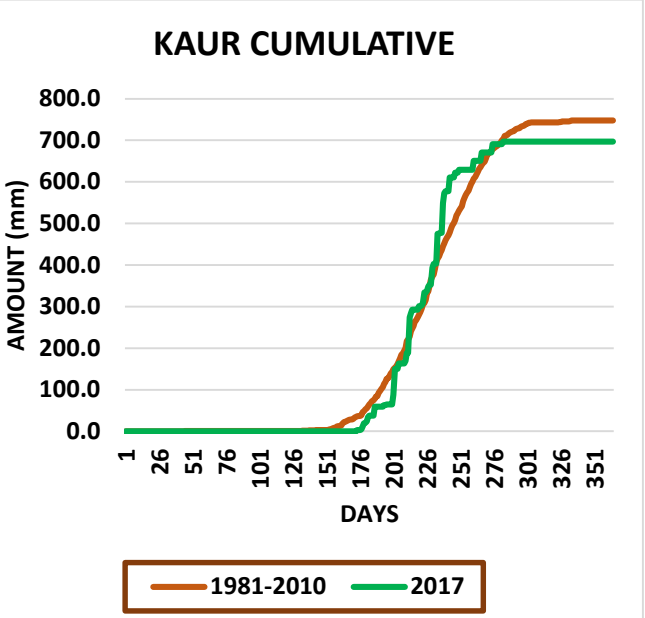

KEREWAN 2017
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
RAINFALL (mm)
J F M A M J J A S O N D
MONTH
AVG
YR-2017

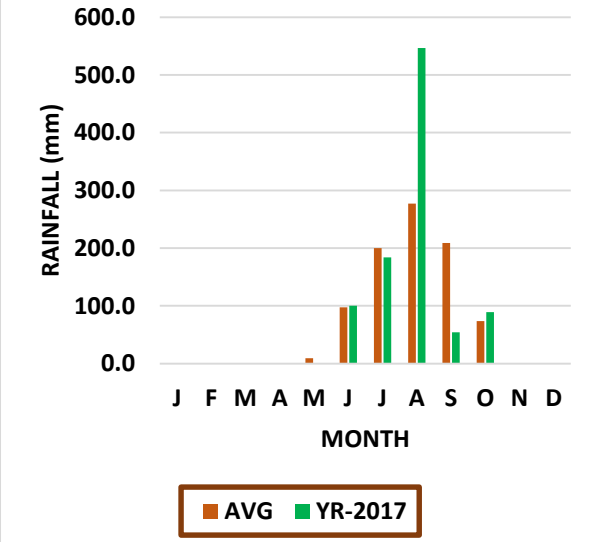

KEREWAN CUMULATIVE
1000.0
900.0
800.0
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
AMOUNT (mm)
1 28 55 82 109 136 163 190 217 244 271 298 325 352
DAYS
1975-2017
1981-2010
2017

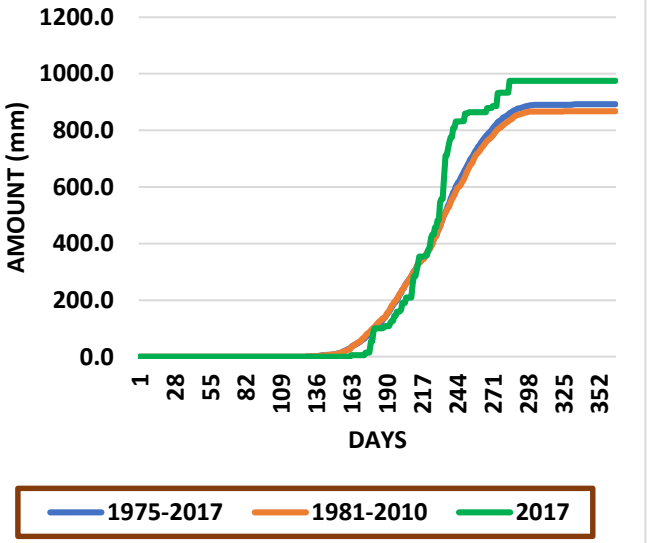

JENOI 2017
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
RAINFALL (mm)
J F M A M J J A S O N D
MONTH
AVG
YR-2017
Kwinella

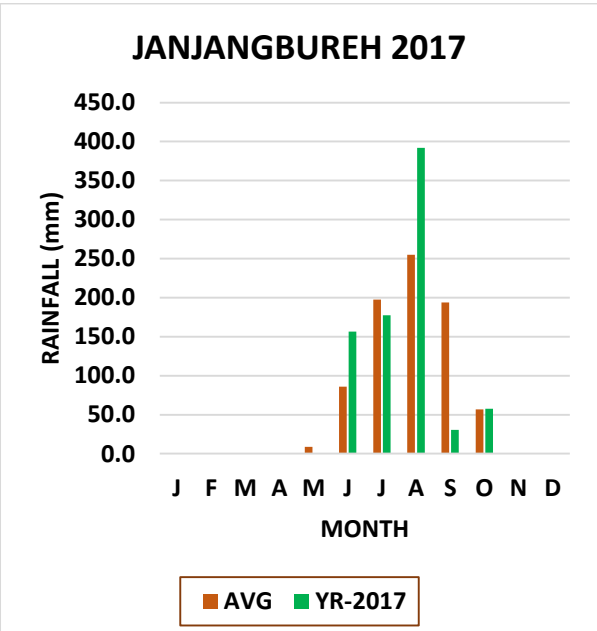

JENOI CUMULATIVE
1600.0
1400.0
1200.0
1000.0
800.0
600.0
400.0
200.0
0.0
AMOUNT (mm)
1 30 59 88 117 146 175 204 233 262 291 320 349
DAYS
1975-2017
1981-2010
2017
Kwinella

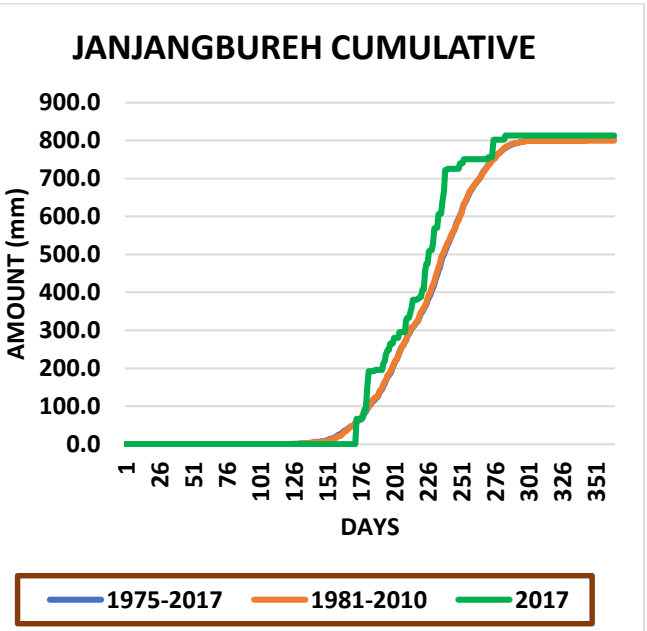

KAUR 2017
RAINFALL (mm)
450.0
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
J F M A M J J A S O N D
MONTH
AVG
YR-2017

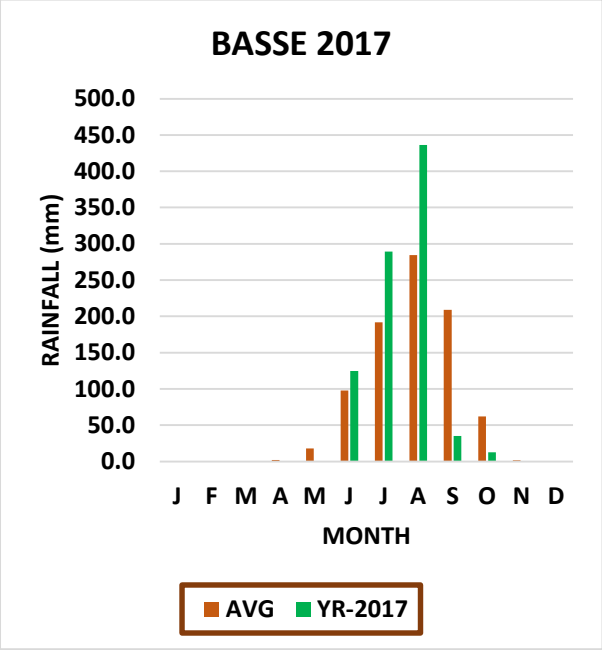

KAUR CUMULATIVE
AMOUNT (mm)
800.0
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
1 26 51 76 101 126 151 176 201 226 251 276 301 326 351
DAYS
1981-2010
2017

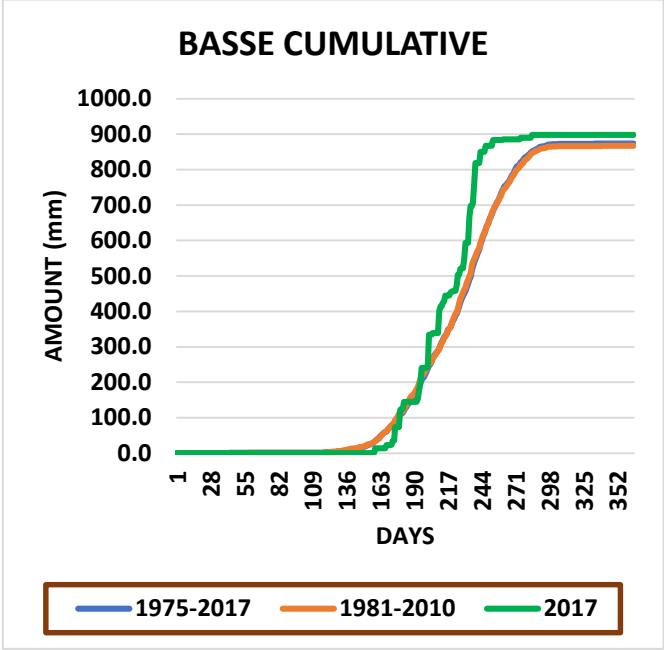

SAPU 2017
RAINFALL (mm)
600.0
500.0
400.0
300.0
200.0
100.0
0.0
J F M A M J J A S O N D
MONTH
AVG
YR-2017


SAPU CUMULATIVE
AMOUNT (mm)
1200.0
1000.0
800.0
600.0
400.0
200.0
0.0
1 28 55 82 109 136 163 190 217 244 271 298 325 352
DAYS
1975-2017
1981-2010
2017


JANJANGBUREH 2017
RAINFALL (mm)
450.0
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
J F M A M J J A S O N D
MONTH
AVG
YR-2017


JANJANGBUREH CUMULATIVE
AMOUNT (mm)
900.0
800.0
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
1 26 51 76 101 126 151 176 201 226 251 276 301 326 351
DAYS
1975-2017
1981-2010
2017



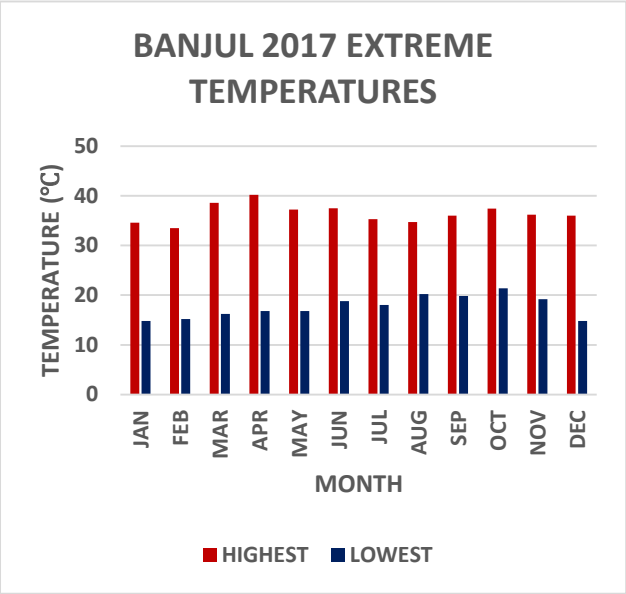


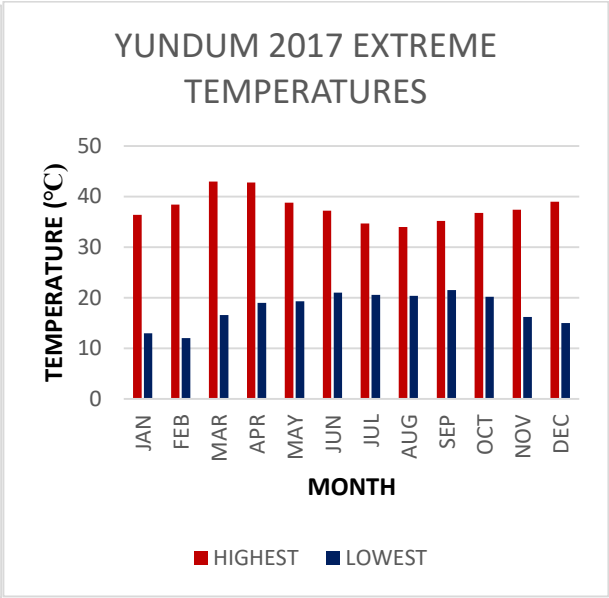
3.0 EXTREME TEMPERATURE & RAINFALL:

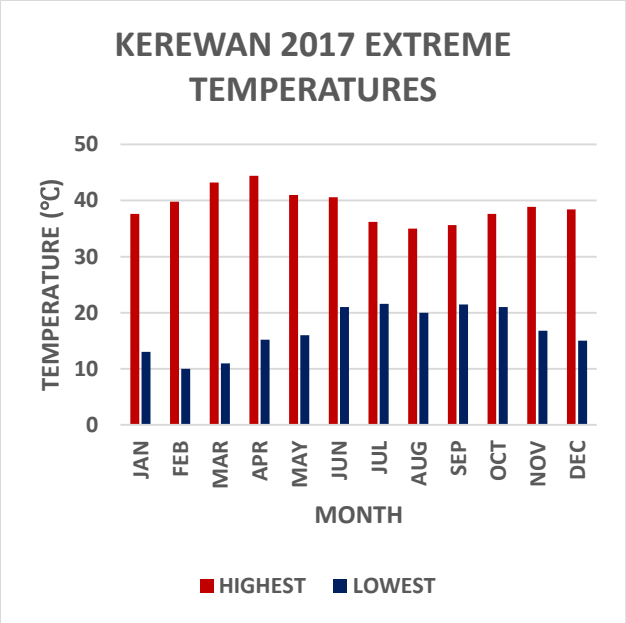
The highest temperatures occurred in March, April, May and lowest in December, January, February. However, there is a decrease in the diurnal-monthly temperature ranges in the months of July, August, September due to the prevalence of Low and Medium level Cloud coverage which increased thereafter with the dominance of clear skies. It is quite evident from the temperature plots below that temperature extremes are greatest inland.

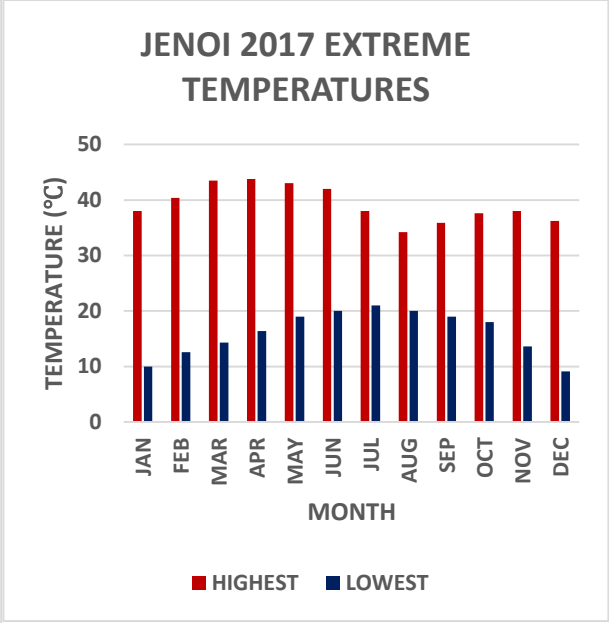
Due to the nature of the terrain with its associated geomorphology, there is a potential for flash flooding especially when rainfall exceeds 50mm. The Extreme Rainfall Event plots indicate that for a threshold greater than 50mm, one should expect at least 3 events or more seasonally during a wet year and less during a dry year. Conversely, for a heavy rainfall event with threshold greater than 100mm, the likelihood of occurrence is 50% over the West Coast Region, 40% in the Upper River Region, 30% for Greater Banjul Area and Central River Region, and 20% for North Bank Region respectively.

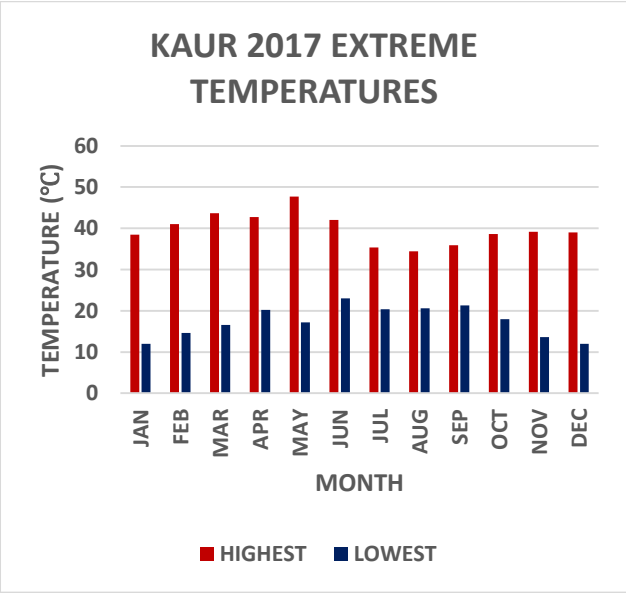
Pertaining to the Significant Wet and Dry period plots, it is envisaged that years with forty days or more of significant wet periods may be a good cropping season and this can be inferred from the areas of convergence. Also worth mentioning is that the ideal planting/sowing dates for 2017 as depicted from the analysis were as follows: 23rd June in Upper River Region and 28th June for the rest of the country; except for Central River north, where the signal was featured to be on 02nd July, 2017.

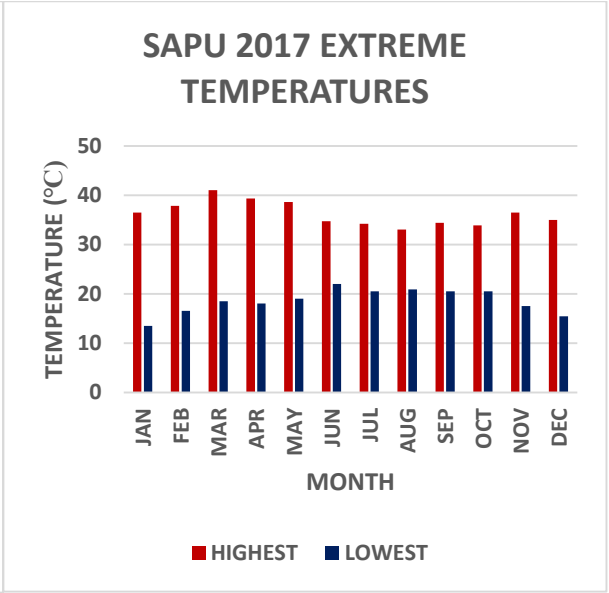

BANJUL 2017 EXTREME TEMPERATURES
TEMPERATURE (°C)
50
40
30
20
10
0
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
MONTH
HIGHEST
LOWEST

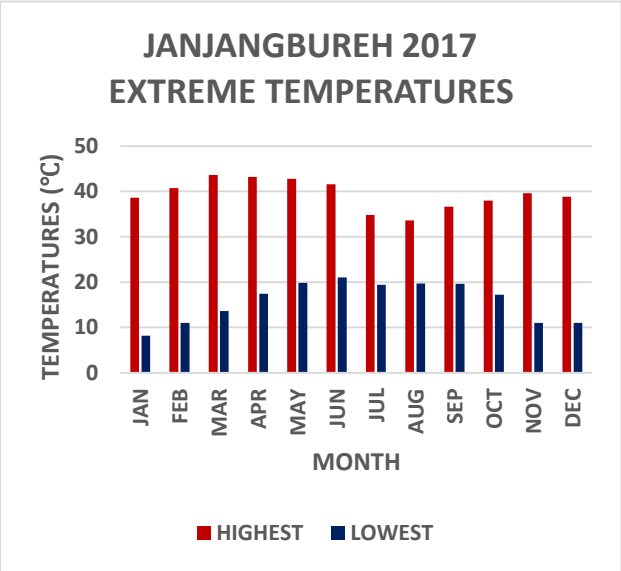

YUNDUM 2017 EXTREME TEMPERATURES
TEMPERATURE (°C)
50
40
30
20
10
0
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
MONTH
HIGHEST
LOWEST

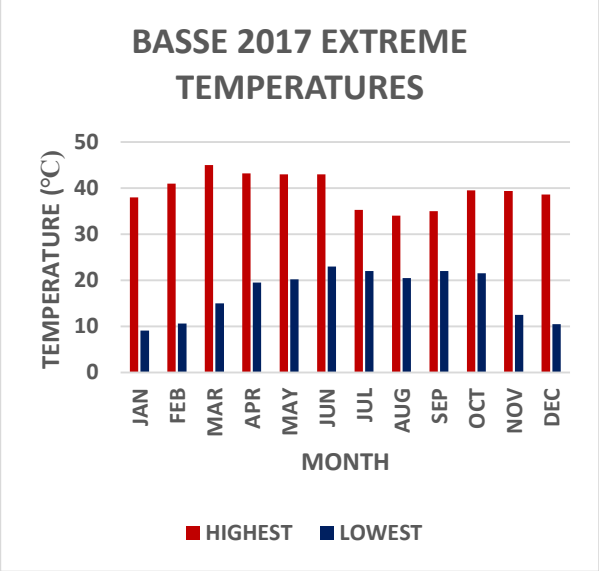

KEREWAN 2017 EXTREME TEMPERATURES
TEMPERATURE (°C)
50
40
30
20
10
0
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
MONTH
HIGHEST
LOWEST

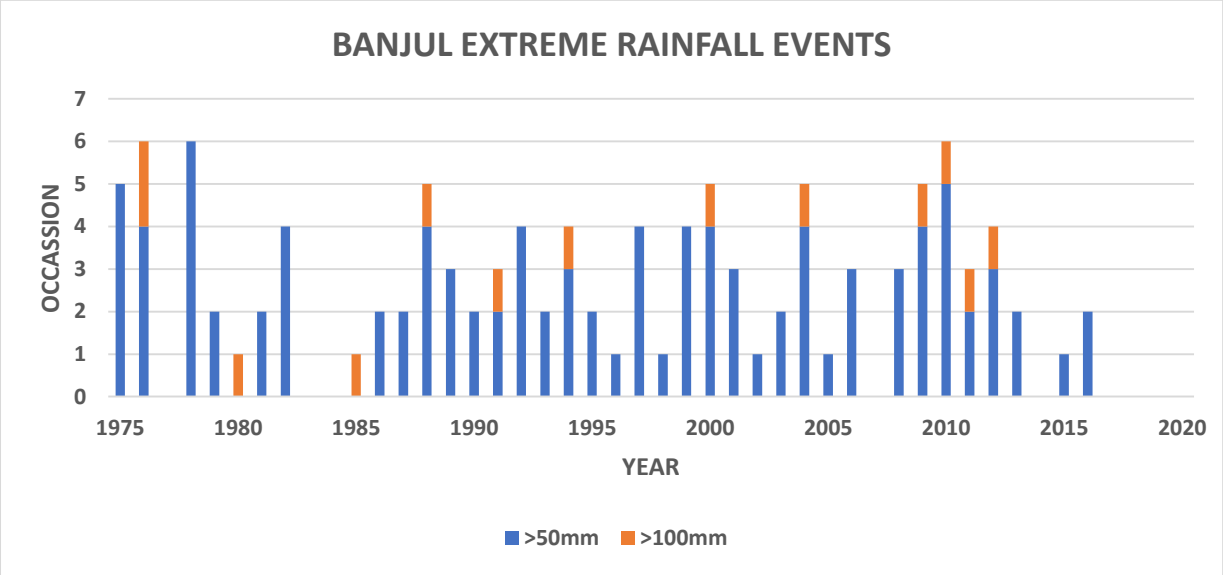

JENOI 2017 EXTREME TEMPERATURES
TEMPERATURE (°C)
50
40
30
20
10
0
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
MONTH
HIGHEST
LOWEST

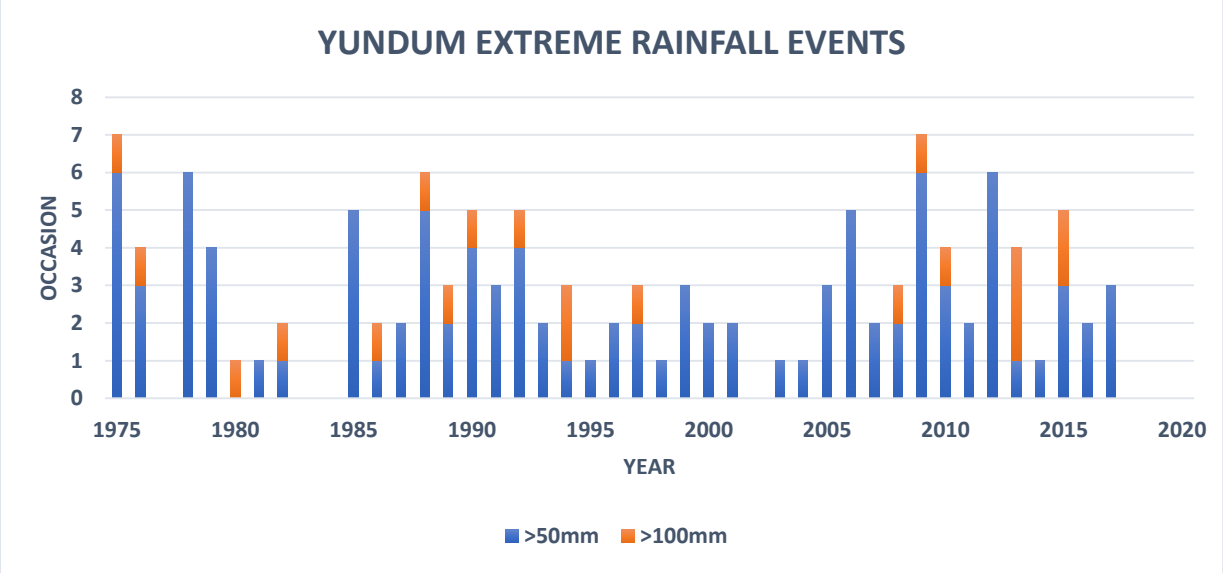

KAUR 2017 EXTREME TEMPERATURES
TEMPERATURE (°C)
60
50
40
30
20
10
0
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
MONTH
HIGHEST
LOWEST

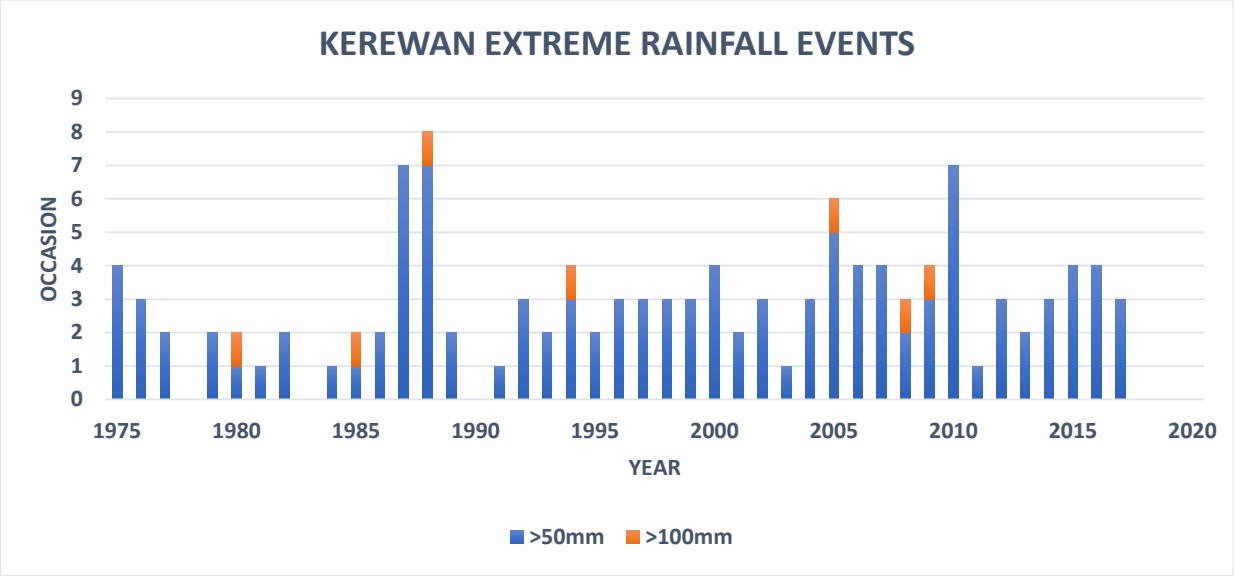

SAPU 2017 EXTREME TEMPERATURES
TEMPERATURE (°C)
50
40
30
20
10
0
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
MONTH
HIGHEST
LOWEST

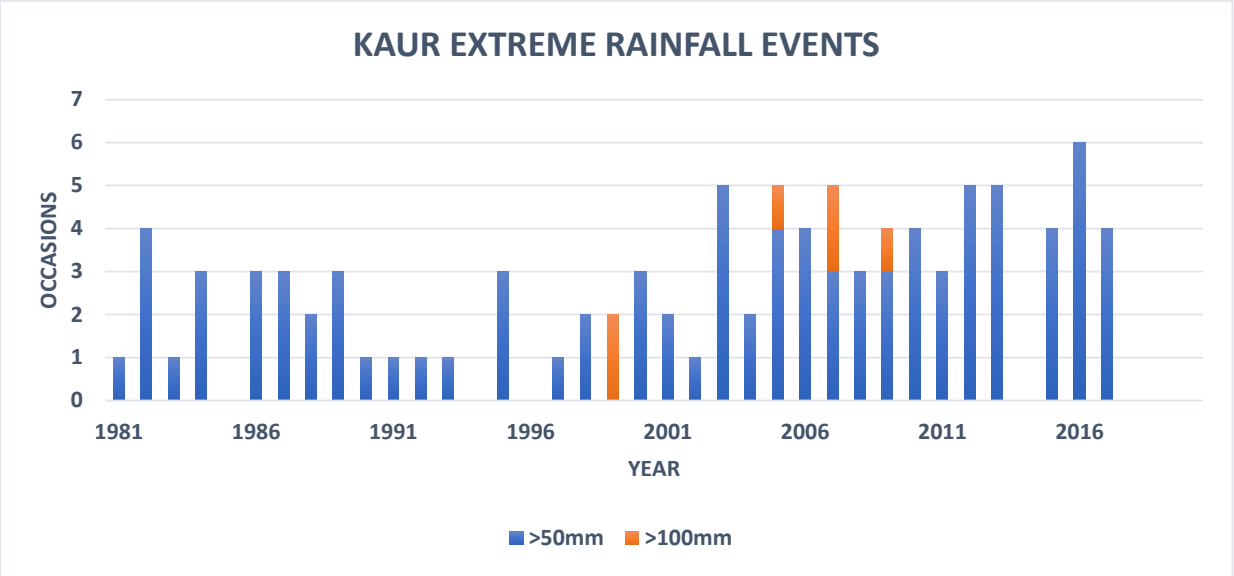

JANJANGBUREH 2017
EXTREME TEMPERATURES
TEMPERATURES (°C)
50
40
30
20
10
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
MONTH
HIGHEST
LOWEST

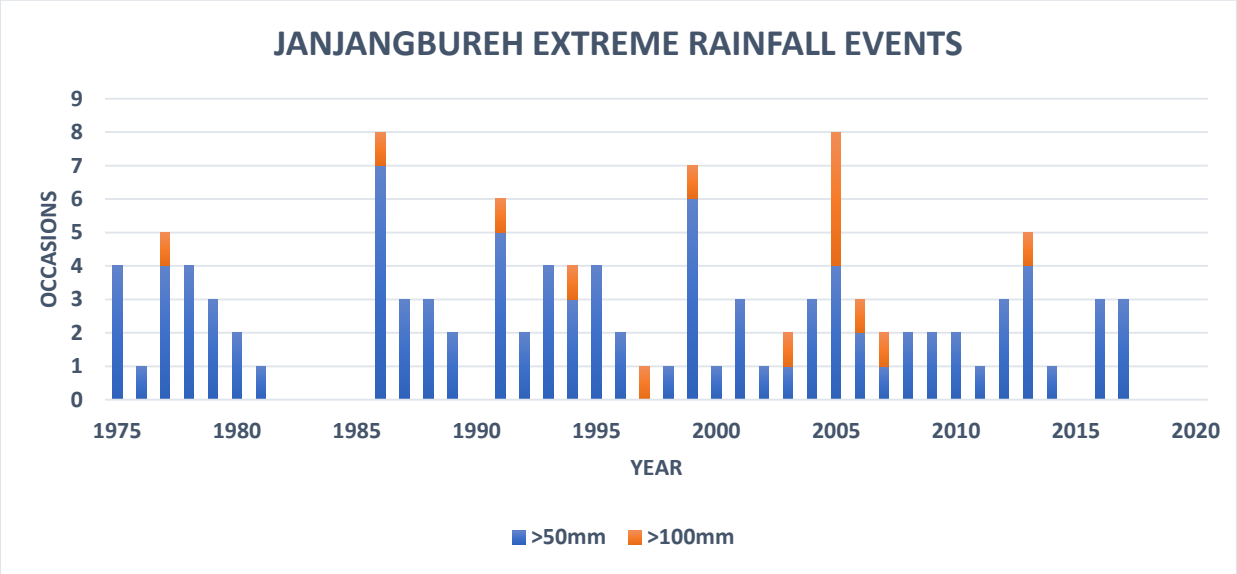

BASSE 2017 EXTREME
TEMPERATURES
TEMPERATURE (°C)
50
40
30
20
10
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
MONTH
HIGHEST
LOWEST

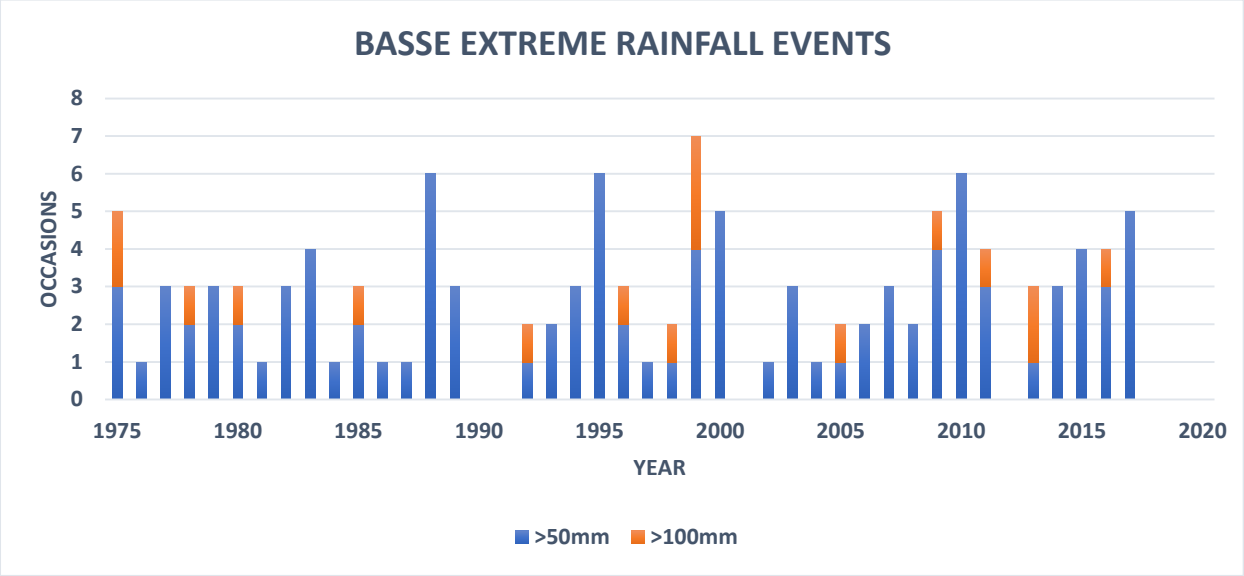

BANJUL EXTREME RAINFALL EVENTS
OCCASSION
7
6
5
4
3
2
1
0
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
YEAR
>50mm
>100mm

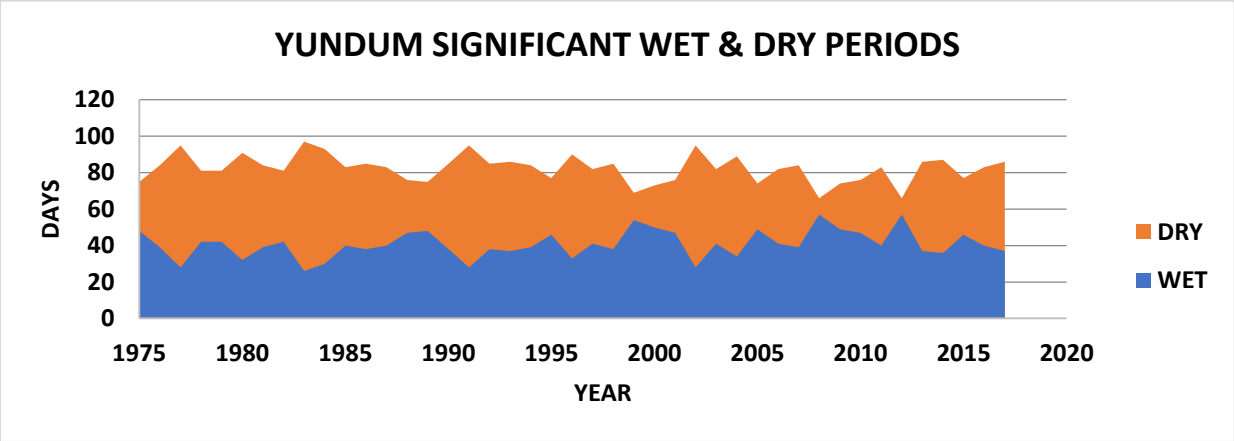

YUNDUM EXTREME RAINFALL EVENTS
OCCASION
8
7
6
5
4
3
2
1
0
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
YEAR
>50mm
>100mm

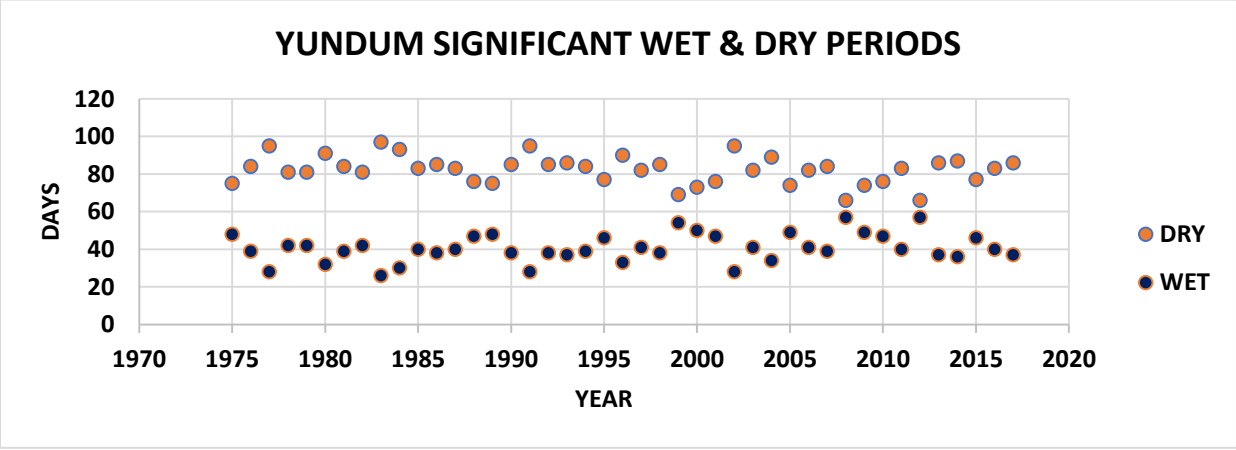

KEREWAN EXTREME RAINFALL EVENTS
OCCASION
YEAR
>50mm
>100mm

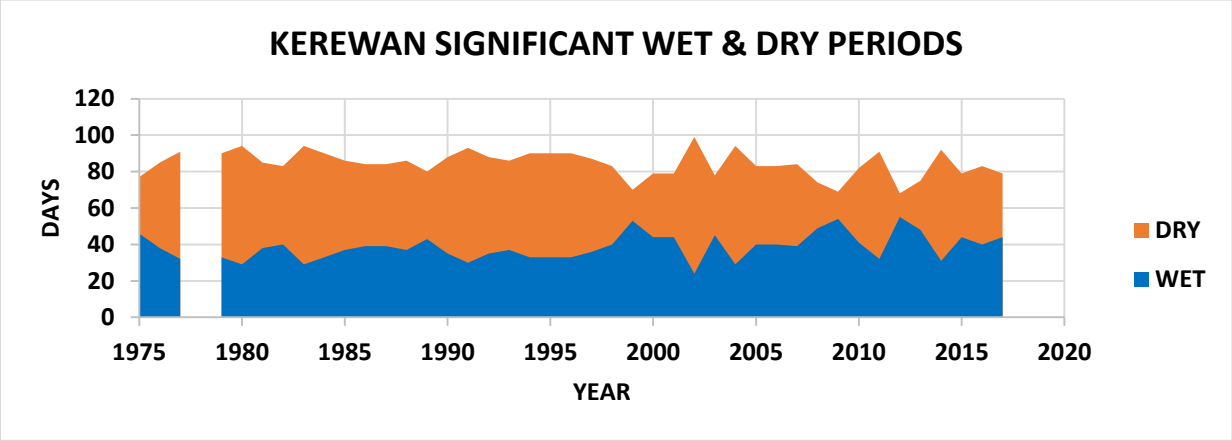

KAUR EXTREME RAINFALL EVENTS
OCCASIONS
YEAR
>50mm
>100mm

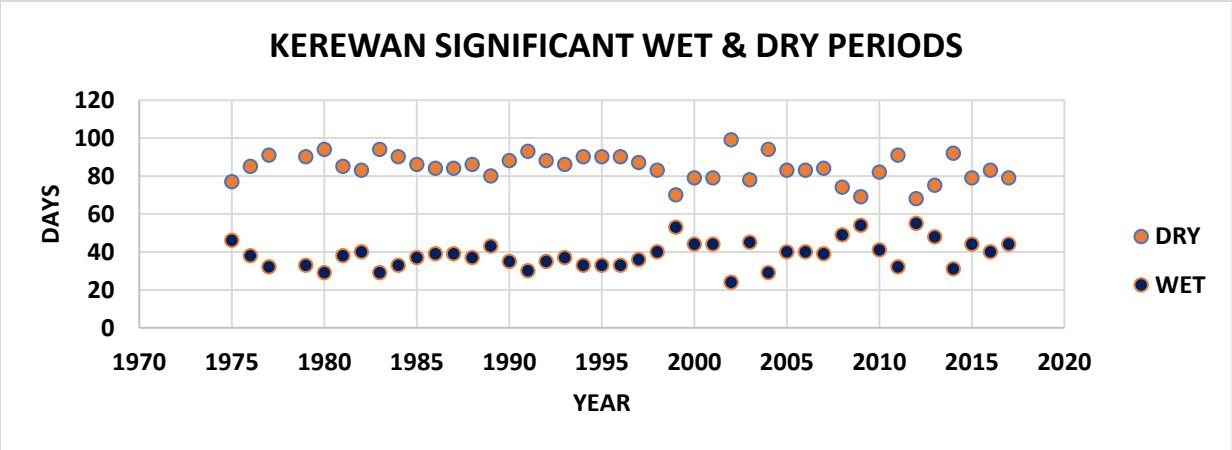

JANJANGBUREH EXTREME RAINFALL EVENTS
OCCASIONS
YEAR
>50mm
>100mm

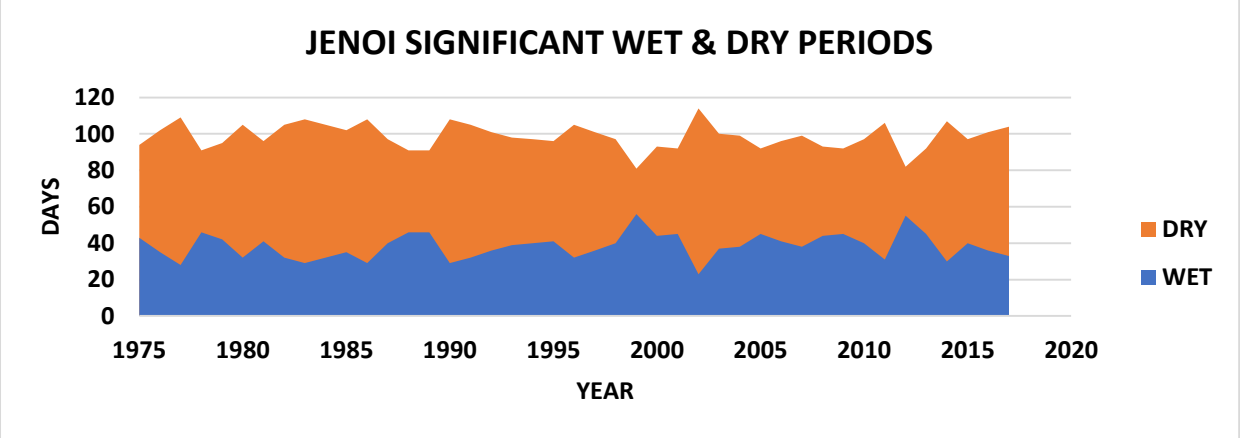

BASSE EXTREME RAINFALL EVENTS
OCCASIONS
YEAR
>50mm
>100mm

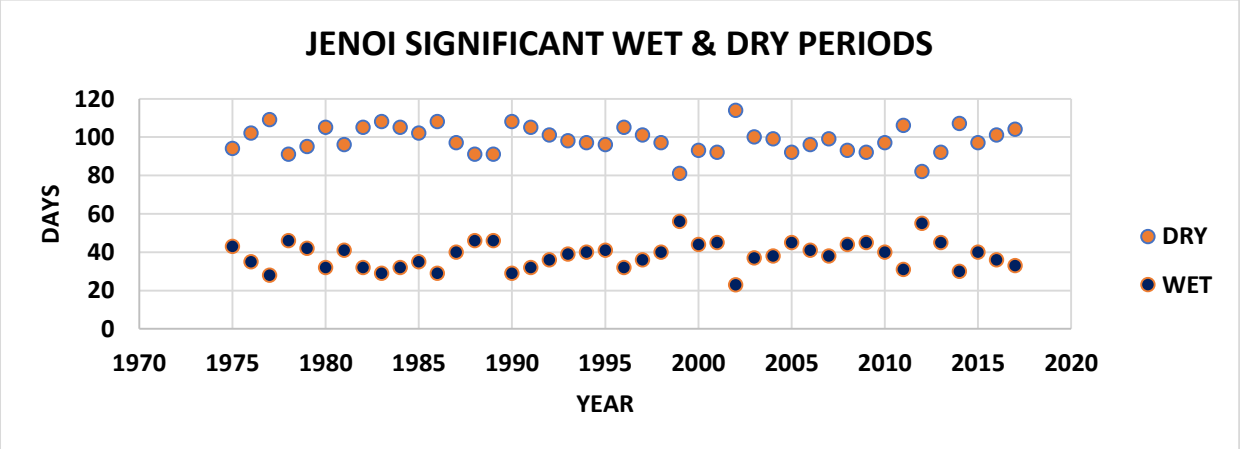

YUNDUM SIGNIFICANT WET & DRY PERIODS
DAYS
YEAR
DRY
WET

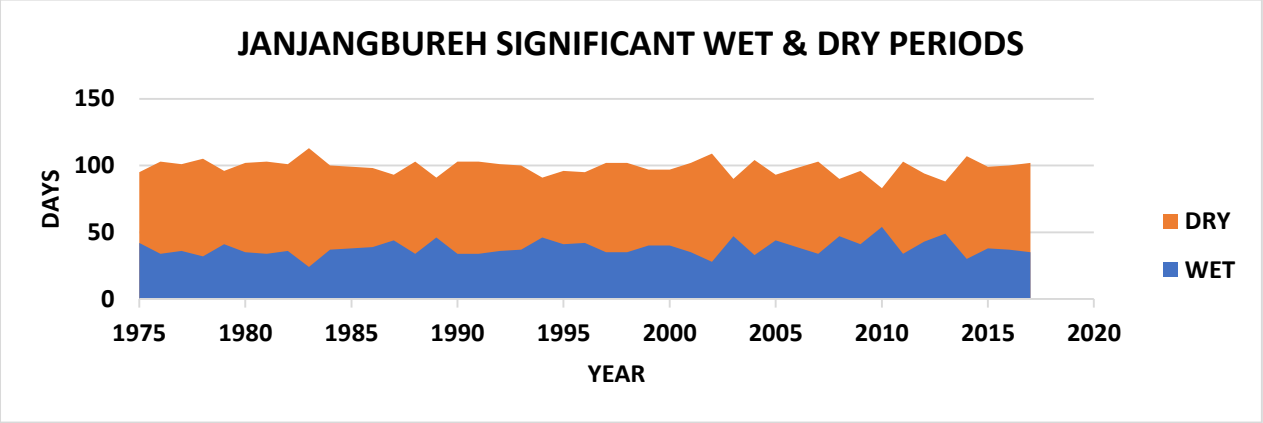

YUNDUM SIGNIFICANT WET & DRY PERIODS
DAYS
YEAR
DRY
WET

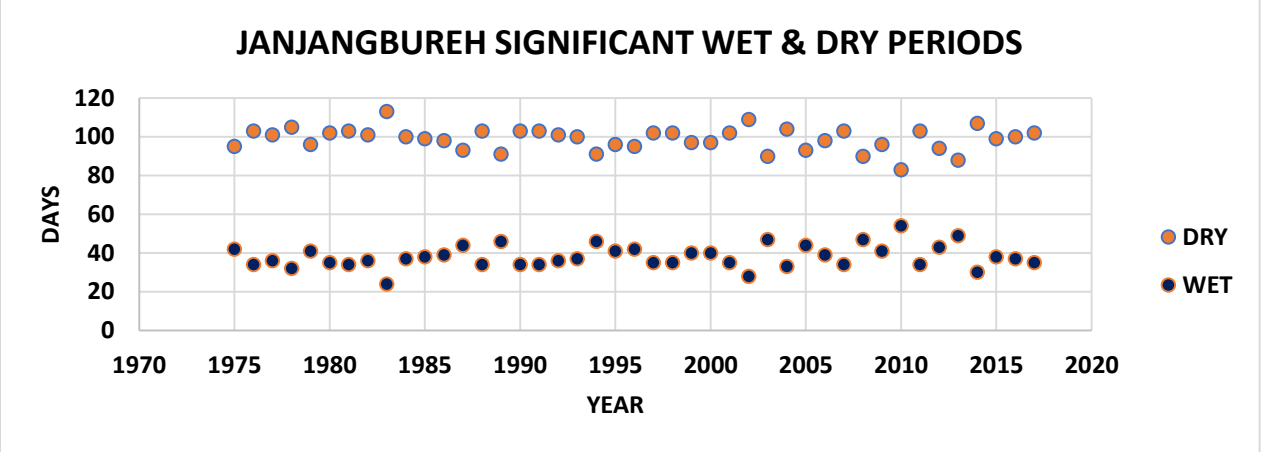

KEREWAN SIGNIFICANT WET & DRY PERIODS
DAYS
120
100
80
60
40
20
0
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
YEAR
DRY
WET

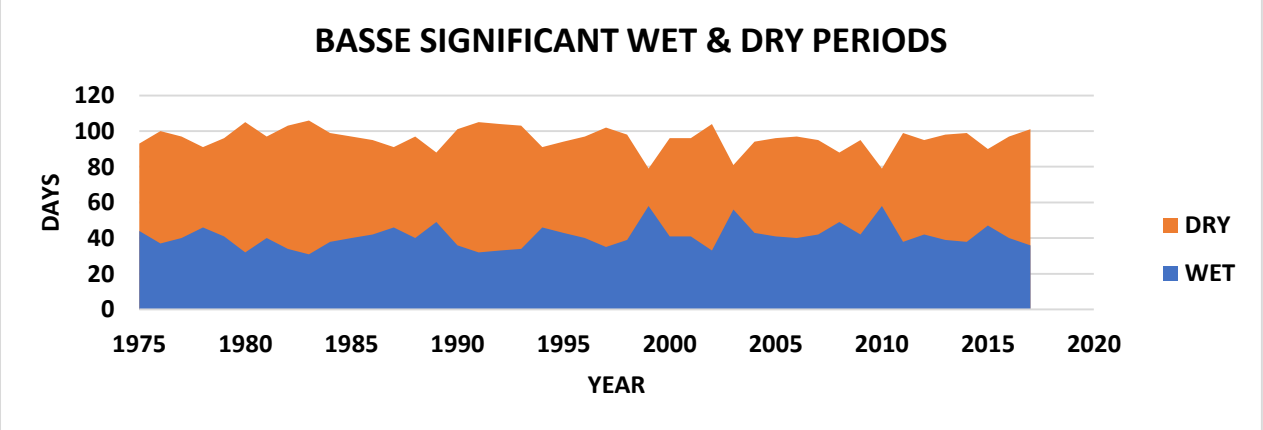

KEREWAN SIGNIFICANT WET & DRY PERIODS
DAYS
120
100
80
60
40
20
0
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
YEAR
DRY
WET

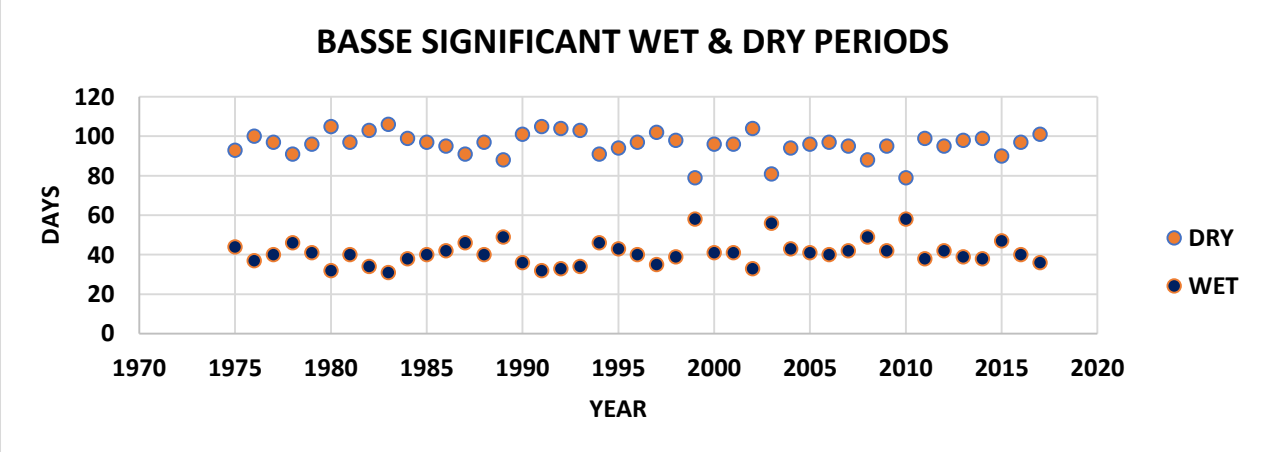

JENOI SIGNIFICANT WET & DRY PERIODS
DAYS
120
100
80
60
40
20
0
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
YEAR
DRY
WET

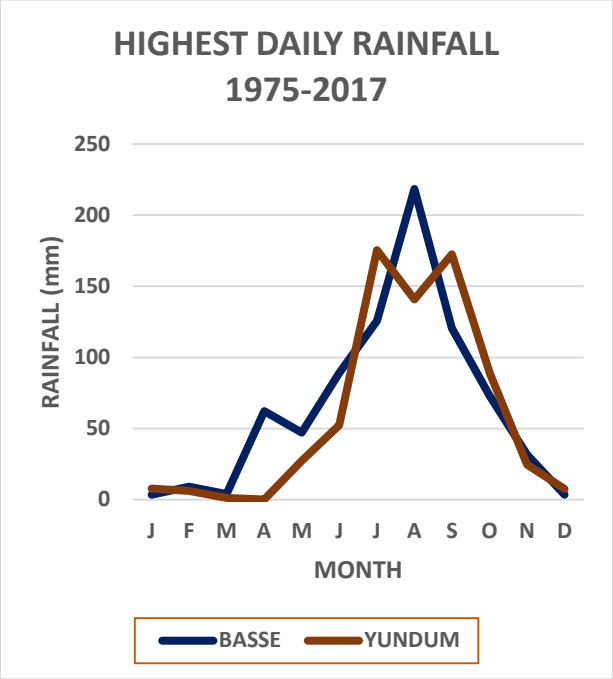

JENOI SIGNIFICANT WET & DRY PERIODS
DAYS
120
100
80
60
40
20
0
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
YEAR
DRY
WET

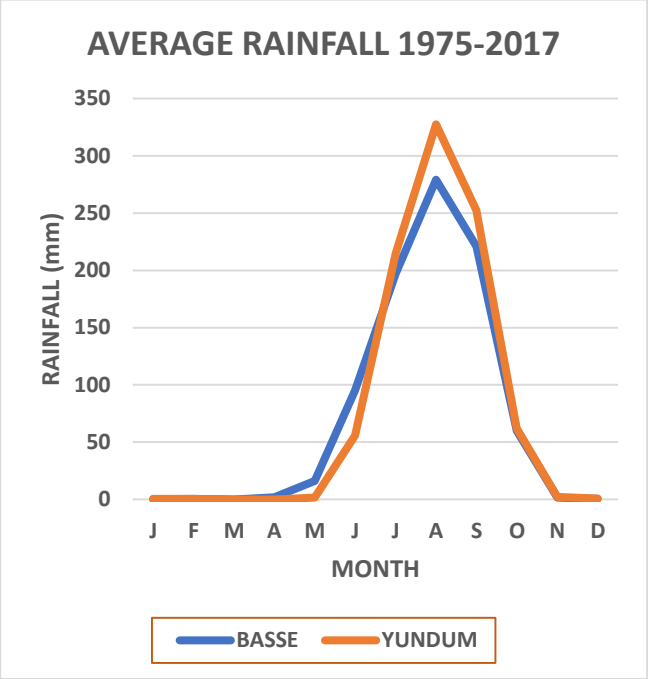

JANJANGBUREH SIGNIFICANT WET & DRY PERIODS
150
100
50
0
DAYS
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
YEAR
DRY
WET


JANJANGBUREH SIGNIFICANT WET & DRY PERIODS
120
100
80
60
40
20
0
DAYS
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
YEAR
DRY
WET


BASSE SIGNIFICANT WET & DRY PERIODS
120
100
80
60
40
20
0
DAYS
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
YEAR
DRY
WET


BASSE SIGNIFICANT WET & DRY PERIODS
120
100
80
60
40
20
0
DAYS
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
YEAR
DRY
WET





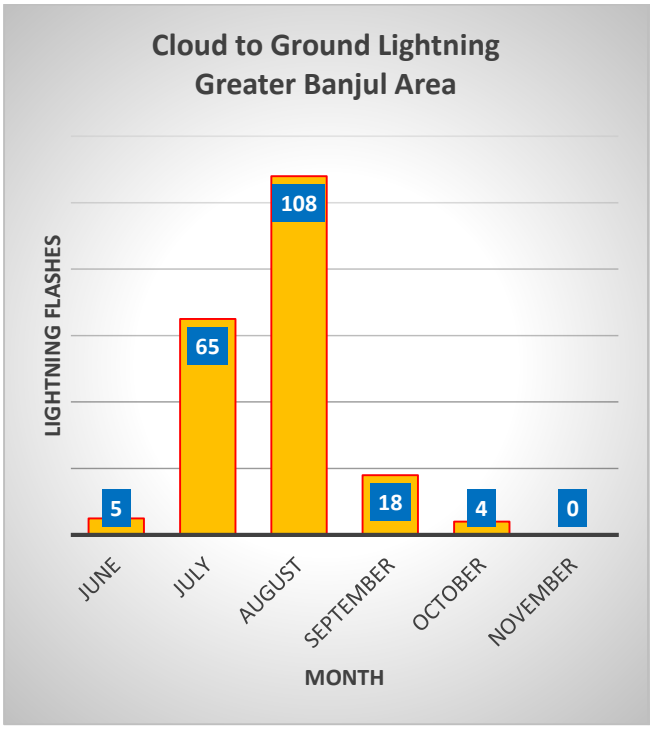
4.0 SEVERE WEATHER

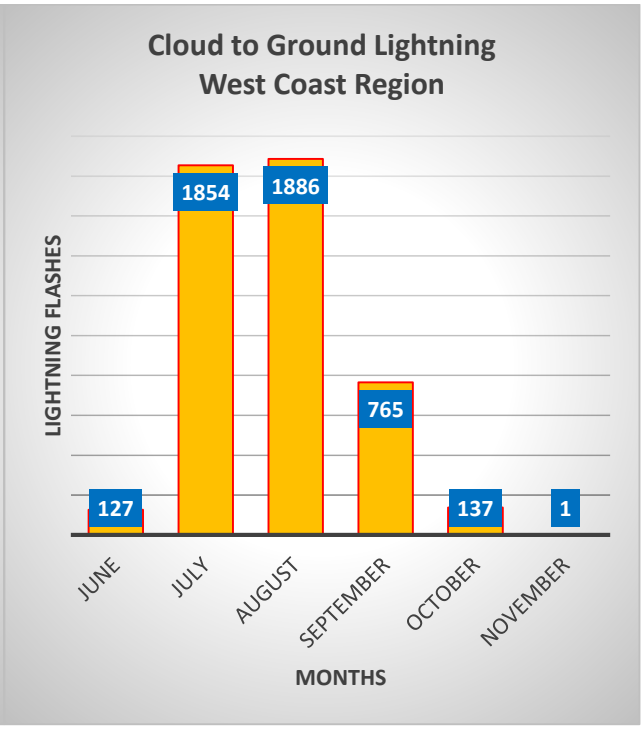
Thunderstorm is a series of sudden electrical discharges resulting from an atmospheric condition. These discharges result in sudden flashes of light commonly known as 'lightning' and trembling sound waves known as 'thunder'.

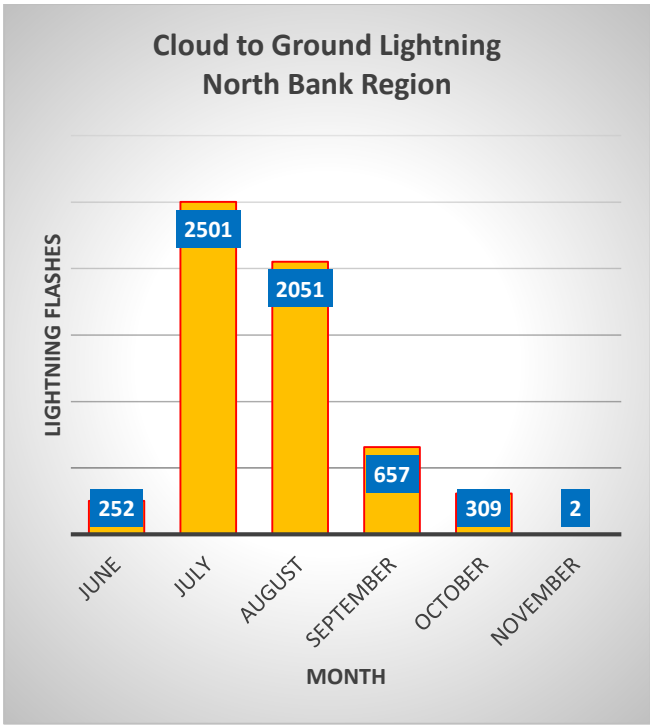
Thunderstorms are associated with convective (cumulonimbus) clouds and are often accompanied by severe weather, such as tornadoes, hail, icing, wind shear 'turbulence', downburst winds 'squalls', rain, and terrifying lightning flashes and roaring thunder claps.

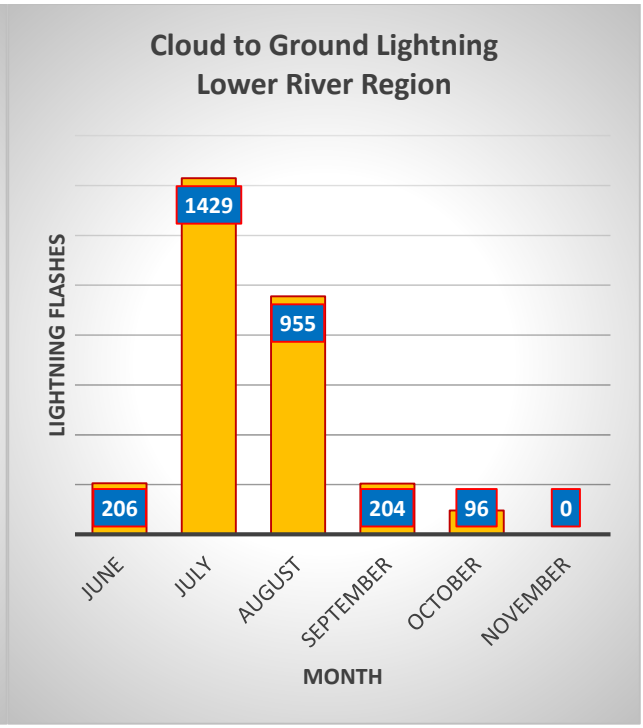
Thunderstorms with its related severe weather activities can create hazards and unsafe conditions such as injuries, deaths, damage to property and socio-economic disruptions and disadvantages.

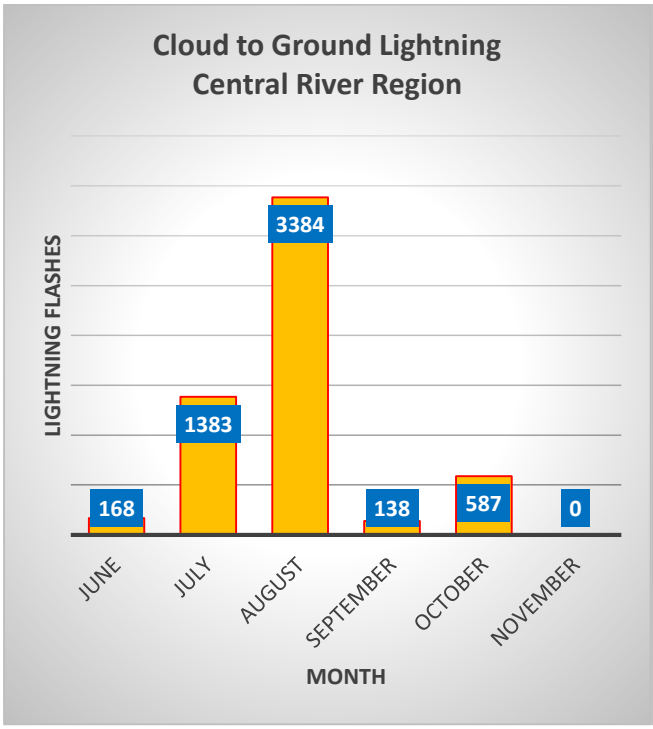
The following plotted graphs represent regional events of Cloud to Ground (CG) Lightning Flashes within The Gambia which fit perfectly well with the 2017 rainfall situation.

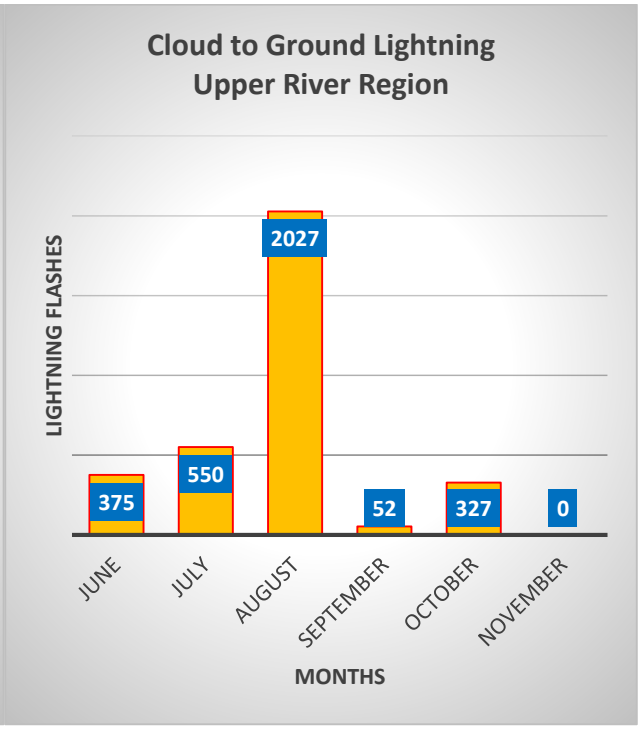

Cloud to Ground Lightning
Greater Banjul Area
LIGHTNING FLASHES
5
65
108
18
4
0
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
MONTH


Cloud to Ground Lightning
West Coast Region
LIGHTNING FLASHES
127
1854
1886
765
137
1
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
MONTHS

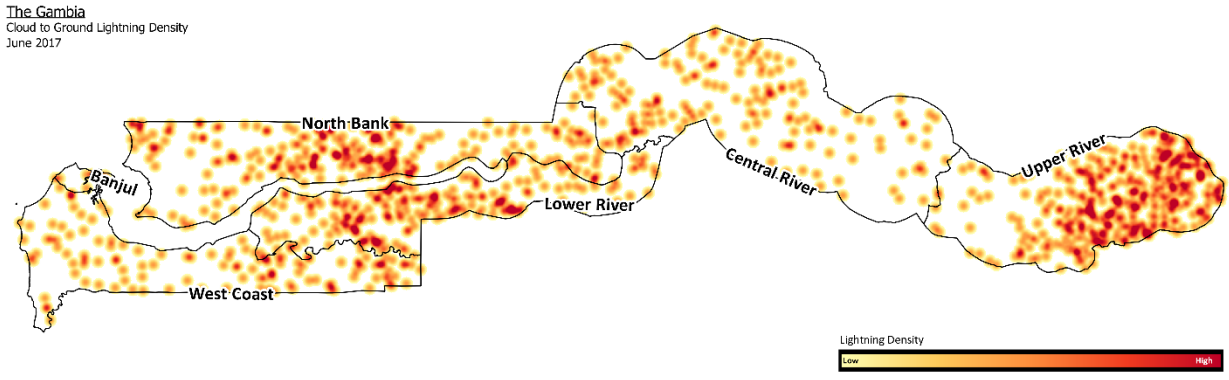

Cloud to Ground Lightning
North Bank Region
LIGHTNING FLASHES
252
2501
2051
657
309
2
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
MONTH

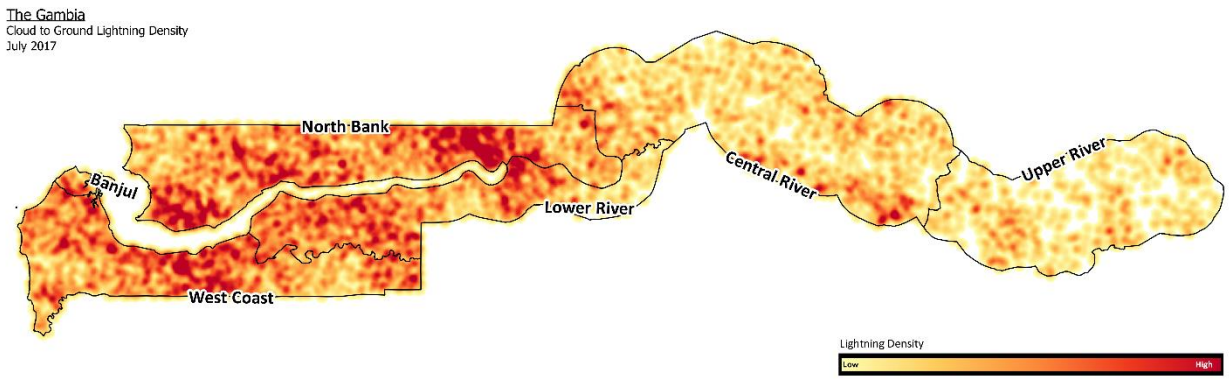

Cloud to Ground Lightning
Lower River Region
LIGHTNING FLASHES
206
1429
955
204
96
0
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
MONTH

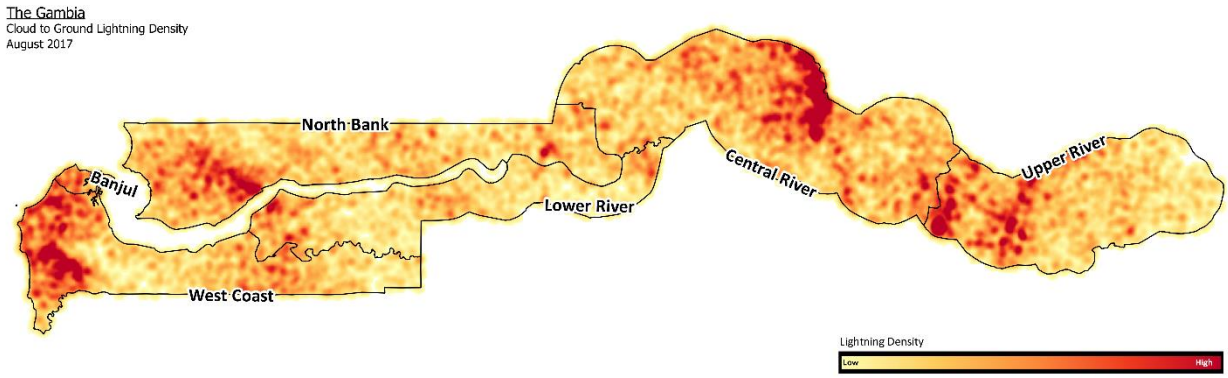


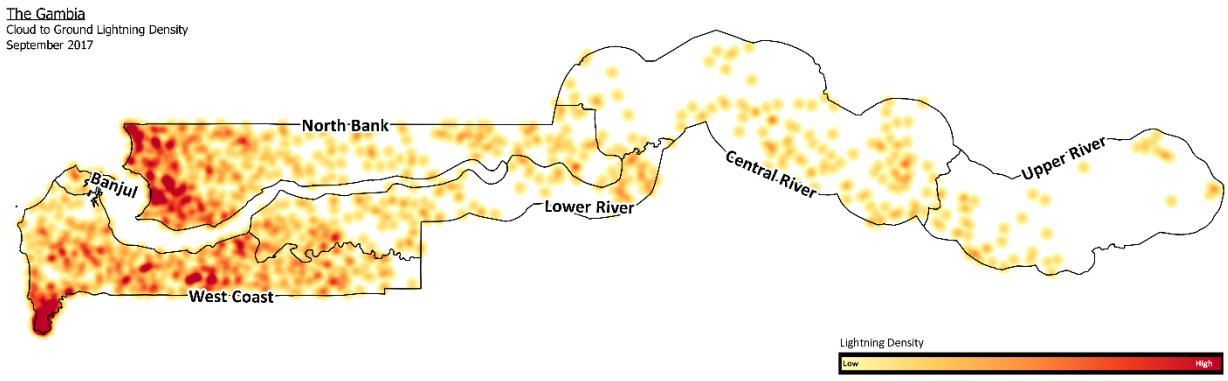


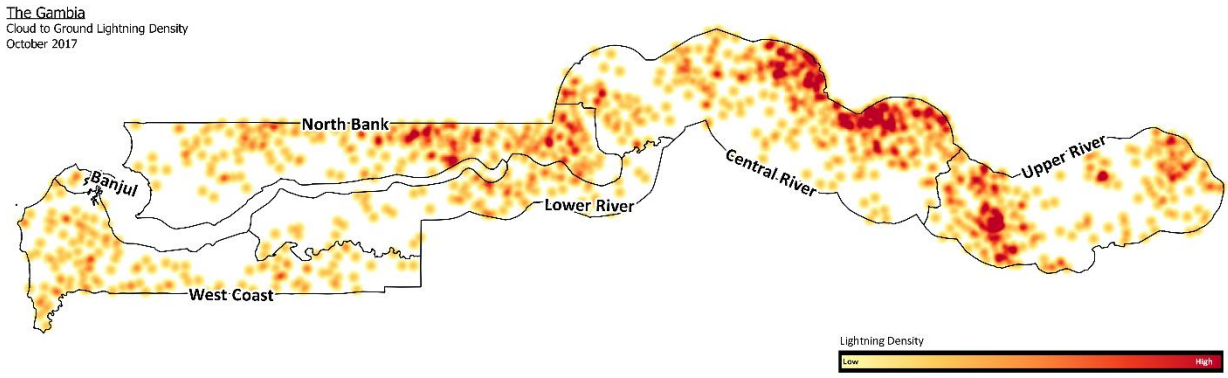
The CG-Lightning Density plots below indicates areas that had experienced Thunderstorm events with areas of high density in red indicating severe weather such as lightning strikes, occasional windstorms and heavy rain that may had led to flash-floods particularly during the months of July, August and September when soil moisture had increased.

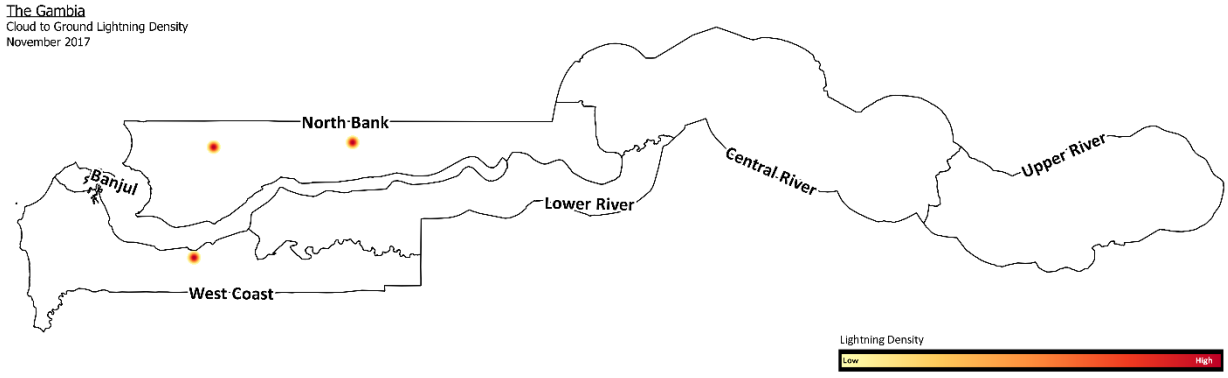


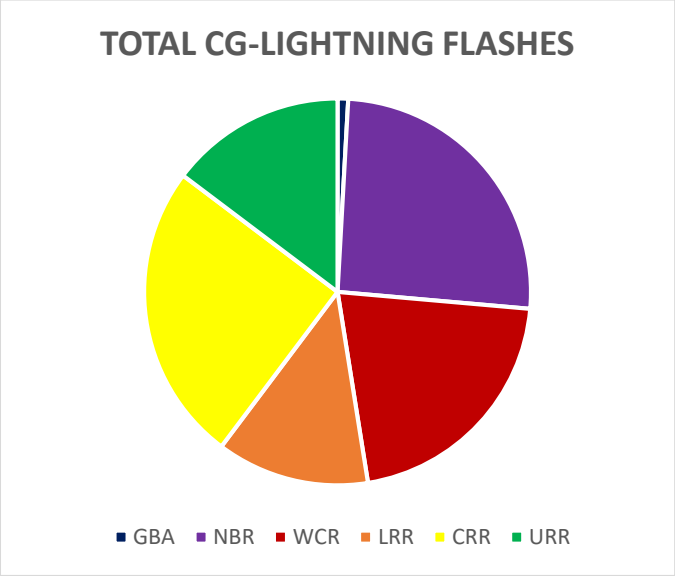


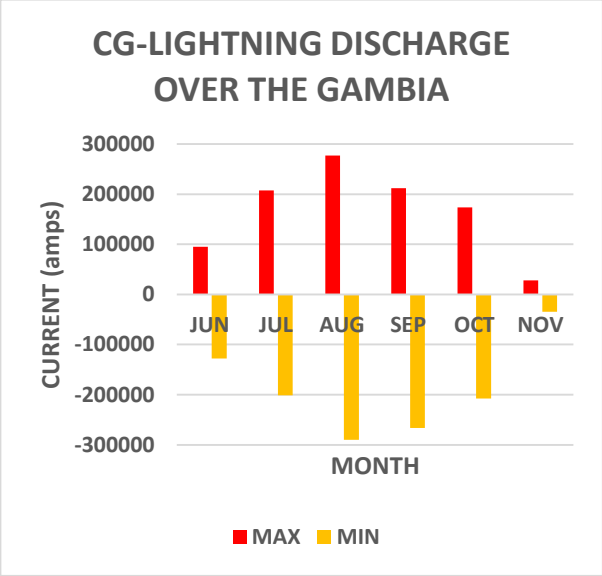

The Gambia
Cloud to Ground Lightning Density
August 2017
North Bank
Banjul
West Coast
Lower River
Central River
Upper River
Lightning Density
Low
High


The Gambia
Cloud to Ground Lightning Density
September 2017
North Bank
Banjul
West Coast
Lower River
Central River
Upper River
Lightning Density
Low
High


The Gambia
Cloud to Ground Lightning Density
October 2017
North Bank
Banjul
West Coast
Lower River
Central River
Upper River
Lightning Density
Low
High

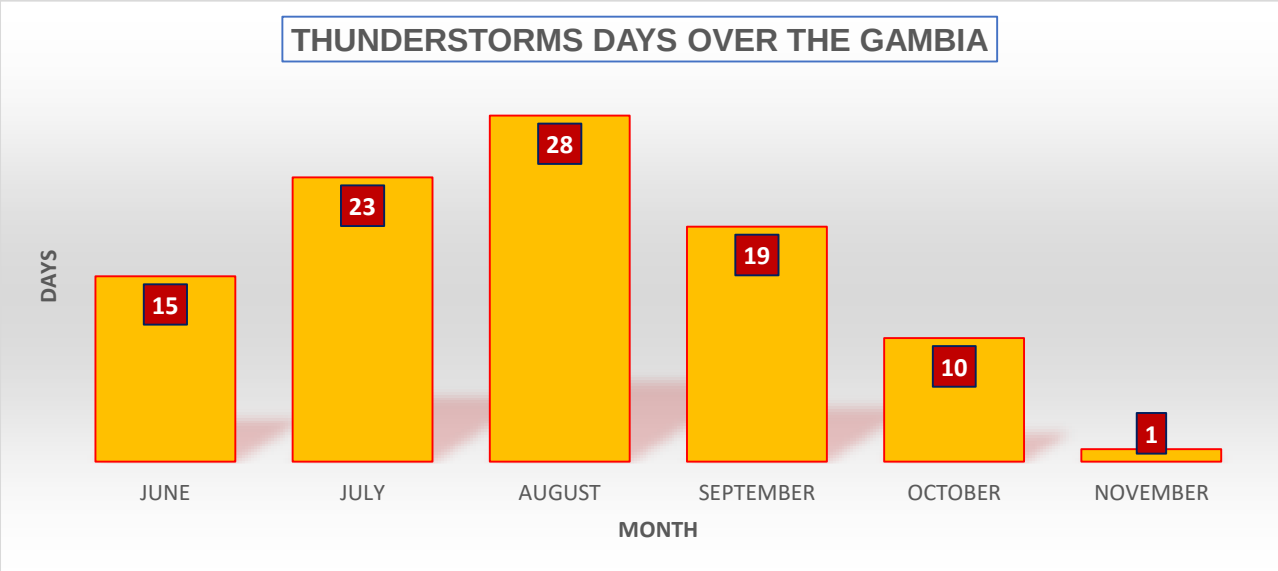

The Gambia
Cloud to Ground Lightning Density
November 2017
North Bank
Banjul
West Coast
Lower River
Central River
Upper River
Lightning Density
Low
High





The table below indicates the regional ideal dates for special rainfall events:

REGION	RAIN - ONSET	SOWING/PLANTING	CESSATION
GBA	26th June 2017	28th June 2017	02nd October 2017
NBR	25th June 2017	27th June 2017	11th October 2017
WCR	25th June 2017	28th June 2017	15th October 2017
LRR	26th June 2017	28th June 2017	11th October 2017
CRR North	27th June 2017	02nd July 2017	10th October 2017
CRR South	22nd June 2017	28th June 2017	11th October 2017
URR	08th June 2017	23rd June 2017	11th October 2017



From the above analysis, The Gambia recorded a total of Ninety-six (96) Thunderstorm days in the year-2017.

For further references, please access the websites on the cover page. All enquires, comments and queries should be forwarded to the Department of Water Resources or directly to the author whose contact details are provided at the bottom of each page.