



Environment, Natural
Resource
Conservation and
Tourism

MINISTRY



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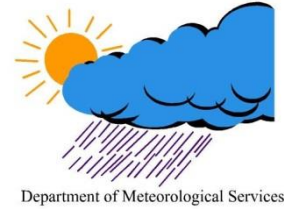
SEASONAL RAINFALL OUTLOOK

VER:1.0



Environment, Natural
Resources Conservation
and Tourism

MINISTRY



DEPARTMENT OF METEOROLOGICAL SERVICES

STATEMENT

SEASONAL RAINFALL AND TEMPERATURE OUTLOOK

FOR

OCTOBER TO DECEMBER (OND) 2019 AND
JANUARY TO MARCH (JFM) 2020

BY

BOTSWANA DEPARTMENT OF METEOROLOGICAL
SERVICES (BDMS)



03rd SEPTEMBER 2019



ABSTRACT

This statement is a presentation of the seasonal rainfall and temperature outlook presented by the Department of Meteorological Services for the 2019/2020 rainfall season, The statement consists of four sections:

- **Section 1:** Is introductory section that describes the scope of the seasonal rainfall and temperature outlook statement and provides the background behind the forecast.
- **Section 2:** Provides the methodology used for the production of the forecast, and this constitute the analysis of the current status of sea surface temperatures over the pacific and Indian Ocean, as well as the EL NINO/Southern Oscillation (ENSO) prediction
- **Section 3:** Provides seasonal rainfall and temperature outlook for the 2019/20 rainfall season presented in three-monthly periods: OND and JFM. Each of the three monthly periods describes the expected rainfall and temperature outlook.
- **Section 4:** Provides a summary of the 2019/2020 rainfall and temperature seasonal outlook.

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		SEASONAL RAINFALL OUTLOOK	VER:1.0

GLOSSARY



BDMS	Botswana Department of Meteorological Services
CSC	Climate Services Centre
ENSO	El-Nino /Southern Oscillation
IRI	International Research Institute
JFM	January, February, March
OND	October, November and December
SADC	Southern African Development Community
SARCOF	Southern African Regional Climate Outlook Forum
SST	Sea Surface Temperatures
STE	Short Term Expertise
SH	Southern Hemisphere
TEM	Thematic Expert Meeting
ToR	Terms of Reference

TABLE OF CONTENTS

Glossary.....	3
STATEMENT	5
1. INTRODUCTION	6
1.1 Scope of the document	6
1.2 Background.....	6
2. METHODOLOGY.....	7
2.1 STATE OF THE OCEANS:.....	7
2.1.1 Average SST Anomalies	8
2.1.2 Current ENSO Forecast.....	8
2.1.3 Dynamical and Statistical Models ENSO Predictions	9
3. SEASONAL RAINFALL OUTLOOK FOR OCTOBER 2019 TO MARCH 2019	10
3.1 Seasonal Outlook for October to December (OND) 2019.....	10
3.2 Seasonal Outlook for January to March (JFM) 2020	11
4. SUMMARY	

List of Figures

Figure 1: Shows SSTs Anomalies over the Equatorial Pacific Ocean.....	8
Figure 2: Latest ENSO Forecast 2019/20.....	8
Figure 3: Dynamical and Statistical Models ENSO Predictions	9
Figure 4: Seasonal Rainfall forecast for OND 2019.....	
Figure 5: Long term Rainfall Average for OND (1981 to 2010).....	10
Figure 6: Seasonal Temperature for OND 2019.....	10
Figure 7: Long term Temperature Average for OND (1971 to 2000).....	10
Figure 8: Seasonal Rainfall forecast for JFM 2020.....	11
Figure 9: Long term Rainfall Average for JFM (1981 to 2010).....	11
Figure 10: Seasonal Temperature for JFM 2020.....	11
Figure 11: Long term Temperature Average for OND (1971 to 2000).....	11

 Environment, Natural Resource Conservation and Tourism <hr/> MINISTRY	 Department of Meteorological Services	DOC.NO: METEO-CLD/AGMET-PR02	EFFECTIVE DATE: 30/08/2016
		SEASONAL RAINFALL OUTLOOK	VER:1.0

STATEMENT

EXECUTIVE SUMMARY:

The Department of Meteorological Services (DMS) has reviewed the state of the global climate systems and analyzed the rainfall and temperature prospects for the upcoming rainfall season, which starts in October 2019 and ends in March 2020. During the first half of the season, i.e. October to December 2019, the north and western parts of Botswana are expected to have **normal to above normal rainfall**. The eastern parts are expected to receive **normal to below normal rainfall**, whereas **below normal rainfall** is expected over the south east. Temperatures for this period are expected to be **above normal** except over the north where **normal to below normal** temperatures are anticipated.

During the second half of the season, from January to March 2020, **normal to above normal** rains are expected countrywide with the north and southwest being particularly **above average**. Temperatures will continue to be higher than normal over the west and east **but normal** to below over the north and central areas.

 Environment, Natural Resource Conservation and Tourism <hr/> MINISTRY	 Department of Meteorological Services	DOC.NO: METEO-CLD/AGMET-PR02	EFFECTIVE DATE: 30/08/2016
		SEASONAL RAINFALL OUTLOOK	VER:1.0

1. INTRODUCTION



1.1 SCOPE OF THE STATEMENT

The scope of this statement is to provide the National Seasonal Rainfall and Temperature Outlook for Botswana for the 2019/2020 rainfall season. It's aim is to be used for the benefit of policy-making-decisions in the climate sensitive sectors for socio-economic purposes as well as to manage risk arising from climate variability and climate change.

1.2 BACKGROUND

October to March constitutes the rainfall season over Botswana. The seasonal rainfall has been divided into three-monthly forecast namely; October-November-December (OND); and January-February- March (JFM). According to the models, ENSO neutral conditions are expected to continue throughout the season. For Botswana climate, warming and cooling of the Equatorial Pacific Ocean, south-western and north-western sectors of the Indian Ocean, and additional influence from the Atlantic Ocean, determines how rainfall over Botswana will evolve during the season. It must be noted however, although this is a major influencing factor, is not the only one. Other factors, including but not limited to the presence of tropical cyclones in the Indian Ocean are also contributing factors.

The outlook is relevant only for seasonal time scale and relatively large areas. Local and month-to-month variations might occur as the season progresses. Users are therefore strongly advised to contact the Department of Meteorological Services for interpretation of this forecast, finer details and additional guidance.

 Environment, Natural Resource Conservation and Tourism <hr/> MINISTRY	 Department of Meteorological Services	DOC.NO: METEO-CLD/AGMET-PR02	EFFECTIVE DATE: 30/08/2016
		SEASONAL RAINFALL OUTLOOK	VER:1.0

2. METHODOLOGY

In order to generate this seasonal forecast, the Department of Meteorological Services, through its participation in the Southern African Regional Climate Outlook Forum (SARCOF), developed statistical models for Botswana which were used to generate the seasonal rainfall and temperature outlook for 2019/20. The Sea Surface Temperatures (SSTs), 500mb and 850 Geopotential Heights as well as Mid Sea Level Pressure were used as a predictor whilst rainfall and temperature as the predictands.

The October 2019 to March 2020 rainfall performance were assessed using coupled ocean-atmosphere general circulation models (COAGCM) and some statistical models forecasts provided by Global Producing Centres (GPCs).

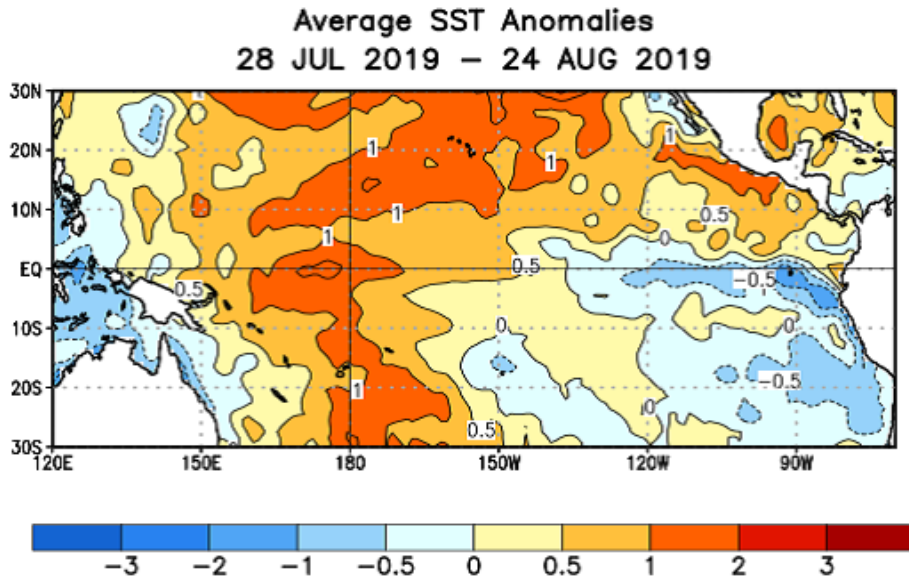
Experts in the Department established probability of distributions to indicate the likelihood of above, near, or below normal rainfall for each zone (refer to figures 4, 6, 8 and 10). Above-normal is defined as within the wettest(rain) and hottest(temperature) third of long term recorded rainfall and temperatures amounts in each zone, near-normal is defined as the third of the record of rainfall and temperature amounts centred around the climatology mean, below-normal rainfall as within the driest and coolest third of the rainfall and temperature amounts. Climatology refers to a situation where any of the three categories have equal chances of occurring.

2.1 STATE OF THE OCEANS:

- ENSO-neutral conditions are present. Equatorial sea surface temperatures (SSTs) are above average across the western and central Pacific Ocean and are below average in the eastern Pacific. ENSO-neutral is most likely to continue through Southern Hemisphere summer 2019-20 (50-55% chance).
- Climate models forecast positive Indian Ocean Dipole (IOD) conditions to continue for the southern hemisphere spring and it`s associated with above normal rainfall over parts of Southern Africa.
- Most climate models indicate the Subtropical Indian Ocean Dipole (SIOD) is likely to remain neutral for the rest of 2019
- Climate models suggest that the South Western Indian Ocean (SWIO) is likely to remain neutral throughout the rainy season.



2.1.1 Average SST Anomalies



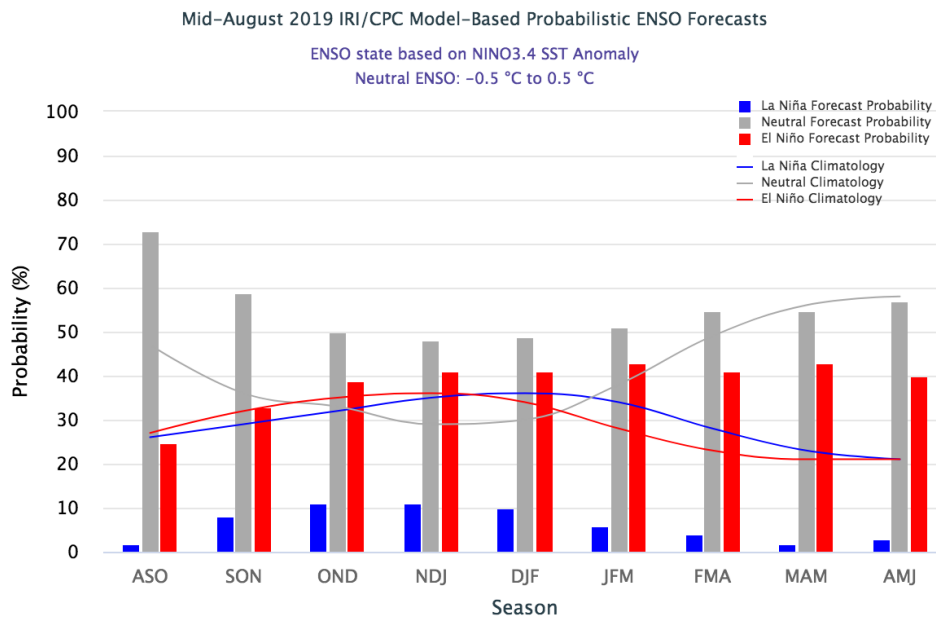
Source: IRI

Figure 1: Shows SSTs Anomalies over the Equatorial Pacific Ocean

SST Anomalies:

From the 28th July to 24th August 2019, equatorial SSTs were above average across the western-to-central Pacific Ocean, with the largest departures between 170°E and 170°W. Below-average SSTs were evident in the eastern Pacific.

2.1.2 Current ENSO Forecast



Source: IRI

Figure 2: Latest ENSO Forecast 2019/20

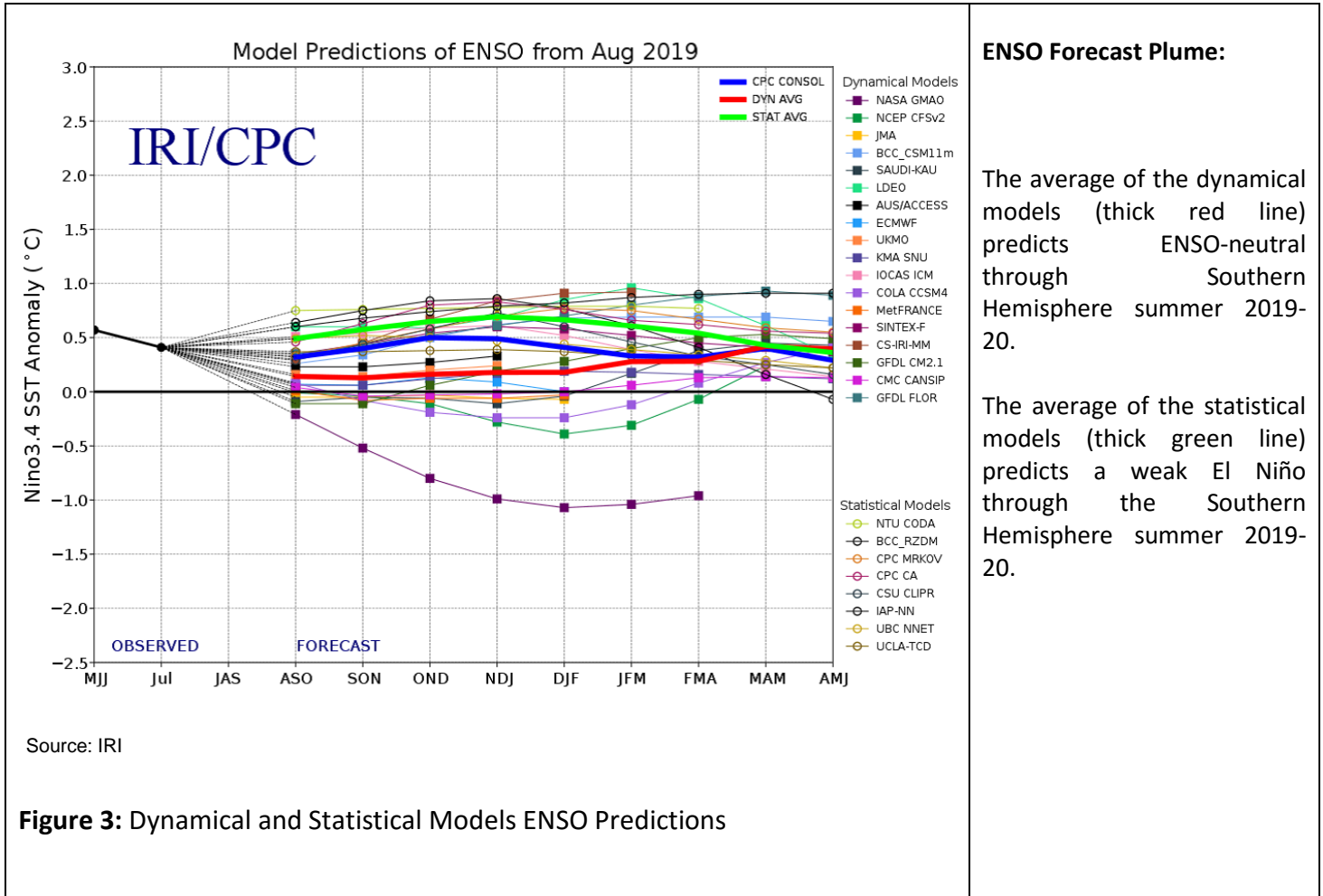
ENSO Status:

ENSO-neutral is most likely to continue through the Southern Hemisphere summer 2019-20.

Source: IRI



2.1.3 DYNAMICAL AND STATISTICAL MODELS ENSO PREDICTIONS



3. SEASONAL RAINFALL AND TEMPERATURE OUTLOOK FOR OCTOBER 2019 TO MARCH 2020

3.1 SEASONAL OUTLOOK FOR OCTOBER TO DECEMBER (OND) 2019

OND 2019 CONSENSUS RAINFALL OUTLOOK

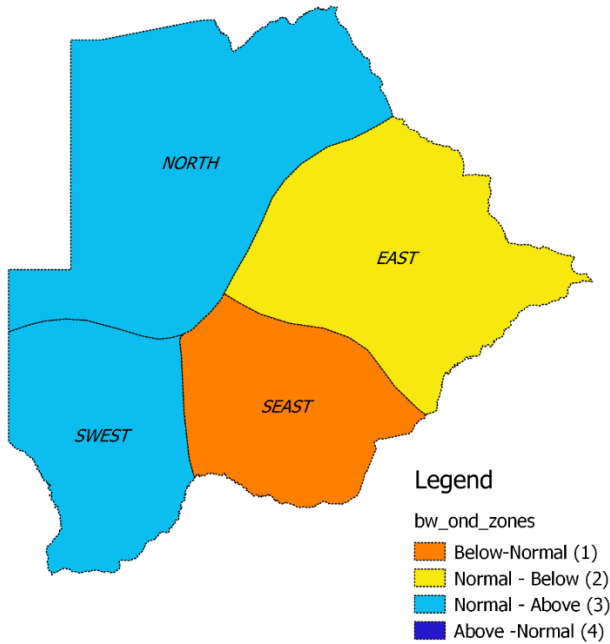


Figure 4: Seasonal Rainfall forecast for OND 2019

Map showing Rainfall Averages for OND 1981 to 2010

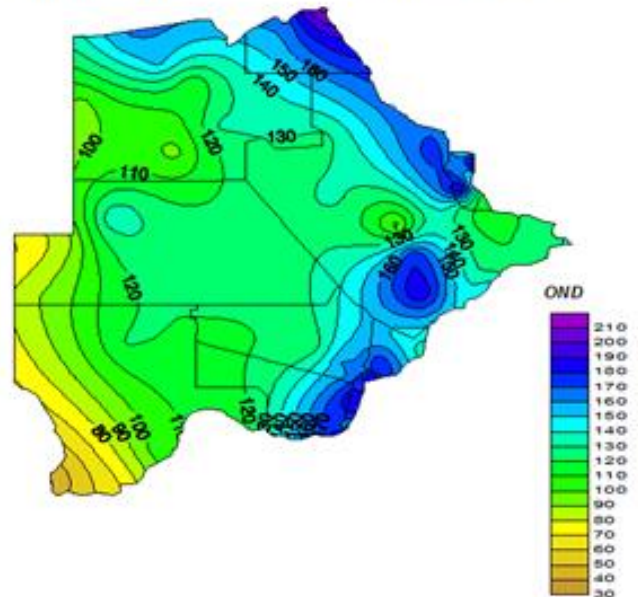


Figure 5: Seasonal averages for OND (1981-2010)

North and South West (Chobe, Ngamiland, Ghanzi and Kgalagadi Districts): Increased likelihood of normal to above rainfall.

East (Central and North East Districts): Increased likelihood of normal to below normal rainfall.

South East (Southern, South East, Kgatleng and Kweneng Districts): Increased likelihood of below normal rainfall.

Normal ranges from 65mm in the southwest to 200mm in the northeast.



**OND 2019 CONSENSUS MAXIMUM
TEMPERATURE OUTLOOK**

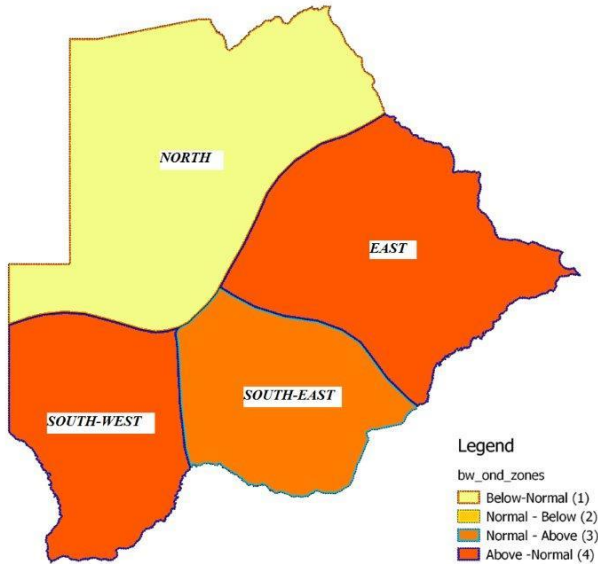


Figure 6: Seasonal Temperature forecast for OND 2019

**October to December Average Temperatures
(1971 to 2010)**

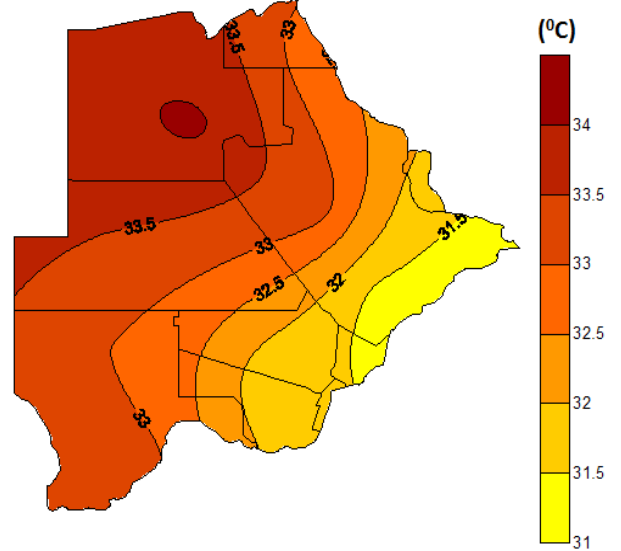


Figure 7: Seasonal averages for OND (1971-2010)

North (Chobe, Ngamiland and Ghanzi Districts): Increased likelihood of **below** normal max temperatures.

East and South West (Central, Northeast and Kgalagadi Districts): Increased likelihood of normal to above normal max temperatures.

South East (Southern, Southeast, Kgatleng and Kweneng Districts): Increased likelihood of normal to above normal max temperatures.

Normal range from 31°C to 34°C.



3.2 SEASONAL OUTLOOK FOR JANUARY TO MARCH (JFM) 2020

JANUARY TO MARCH 2020 RAINFALL OUTLOOK

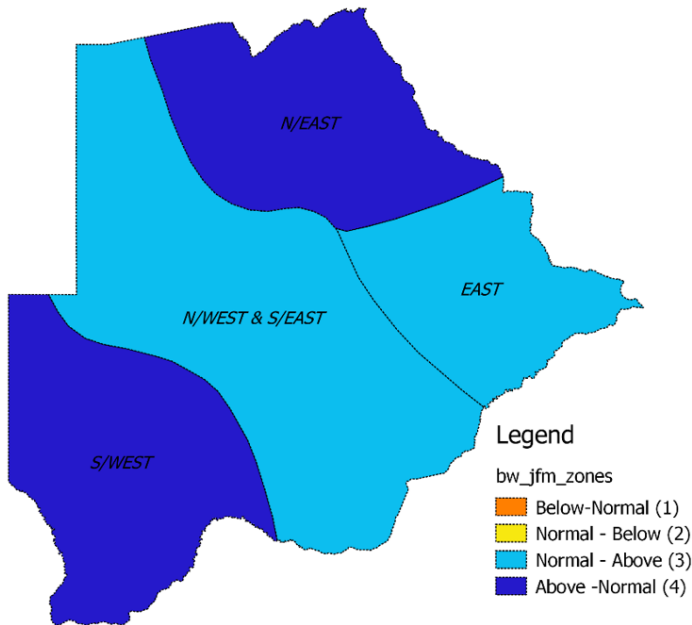


Figure 8: Seasonal Rainfall forecast for JFM 2019

Map Showing Long Term Averages for JFM (1981-2010)

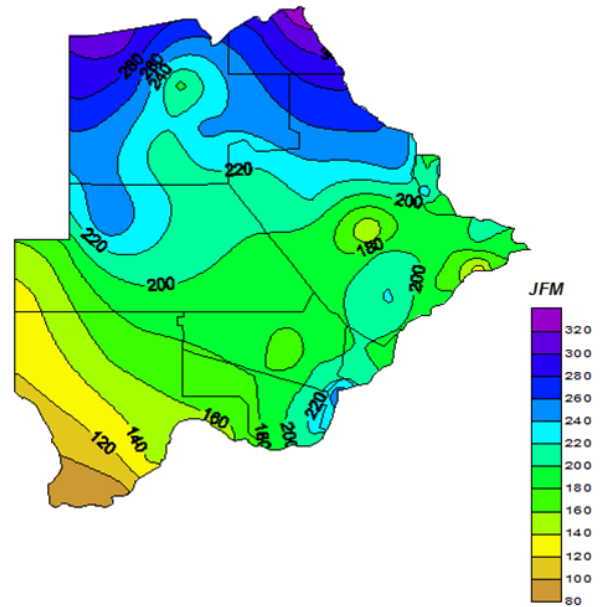


Figure 9: Seasonal averages for JFM (1981-2010)

North East and South West (Chobe, Eastern-Ngamiland and Kgalagadi Districts): Increased likelihood of above normal rainfall.

East (Central and Northeast Districts), North West and South East (Western Ngamiland, Ghanzi, Southern, Southeast, Kgatleng and Kweneng Districts): Increased likelihood of normal to above normal rainfall.

Normal ranges from 100mm over Kgalagadi to 320mm over Chobe.

Note: The numbers for each zone indicate the probabilities of rainfall in each of the three categories, above-, near-, and below-normal. The top number indicates the probability of rainfall occurring in the above-normal category; the middle number is for near-normal and the bottom number for the below-normal category. It is emphasized that boundaries between zones should be considered as transition areas.

JFM 2020 MAXIMUM TEMPERATURE CONSENSUS

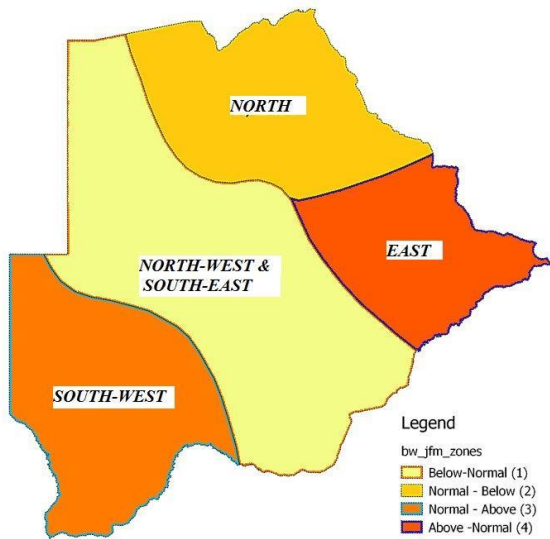


Figure 10: Seasonal Temperature forecast for OND 2019

***Average Temperatures for January to March
(1971 to 2010)***

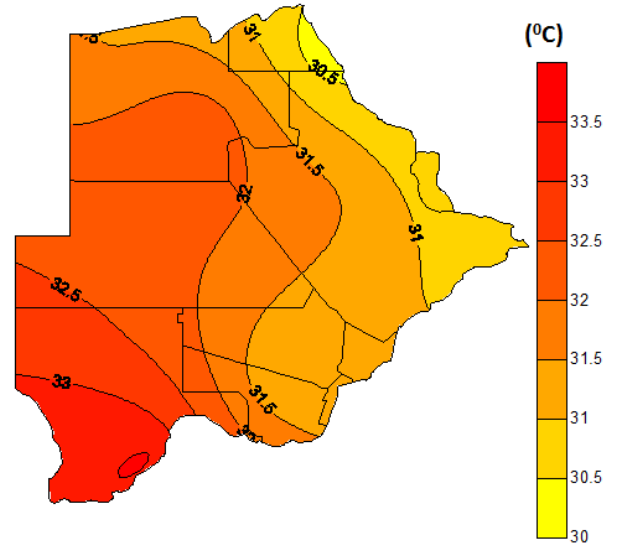


Figure 11: Seasonal averages for OND (1971-2010)

North (Chobe and Eastern-Ngamiland): Increased likelihood of normal to below normal maximum temperatures.

East (Central and Northeast Districts): Increased likelihood of above normal maximum temperatures.



North West and South East (Western-Ngamiland, Ghanzi, Southern, Southeast, Kgatleng and Kweneng): Increased likelihood of below normal maximum temperatures.

South West (Kgalagadi District): Increased likelihood of normal to above normal maximum temperatures.

Normal range from 30.0°C to 33.5°C.

4. SUMMARY

- Generally a moderately wet season is expected especially during the second half of the season (JFM 2020).
- During the early season (OND 2019) it will continue be moderately dry over the east with increased prospects of rain over the north and west.
- Temperatures will be normal to above over most areas except over the north.
- ENSO neutral conditions are expected to continue throughout the season.

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Advisory:

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Department of Meteorological Services
P.O. Box 10100, Gaborone
Tel: 3612200
Corner Maaloso - Metsimothaba Road
Gaborone Village

Our Vision: *A modern weather service that nurtures and harbours innovation and creativity in the provision of quality weather and climate information*

