



# BOTSWANA ENVIRONMENT STATISTICS

CLIMATE DIGEST



**STATISTICS BOTSWANA**

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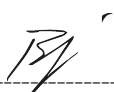
## PREFACE

This report represents Statistics Botswana's progress towards the focused monitoring of climate statistics, and the availing of data for climate trends analysis. It is the first wholly climate statistics digest and will be published biannually. The indicators covered in this report are guided in part by the United Nations Framework for the Development of Environment Statistics (UNFDES).

Climate statistics are useful for trends analysis and review of climate related performances in human livelihoods, health, social and economic activities. All aspects of life are affected directly by climate, which is the core determining factor of how people and other organisms live and interact on planet earth. Climate determines food availability and the habitability of regions and environments. Extreme climate events are recorded and monitored for better understanding and planning to ensure minimum casualties and disturbances to lives, as well as for adaptation strategies to climate change phenomena. Statistics Botswana strives to facilitate informed planning and decision making through trends analysis and climate statistics reporting in these submissions.

I would like to extend my gratitude and appreciation to stakeholders and data providers, particularly the Department of Meteorological Services and Southern African Science Service Centre for Climate Change and Adaptive Land Management (SASSCAL) whose contributions were invaluable in the production of this Digest.

For more information and further enquiries, contact the Directorate of Stakeholder Relations at 3671300. All Statistics Botswana outputs/publications are available on the website at [www.statsbots.orgbw](http://www.statsbots.orgbw) and at the Statistics Botswana Resource Centre (Head-Office, Gaborone).



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**Dr. Burton S. Mguni**  
Statistician General  
December 2019

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## EXECUTIVE SUMMARY

This report covers the period October 2018 to March 2019, which is Botswana's warm and wet season. Botswana's climate is largely affected by the climate phenomena called the El Niño and La Niña phases. The reported period is that of the El Niño.

Botswana's rainfall is highly erratic. Pandamatenga received the highest rainfall in one month in February 2019. The highest rainfall recorded in a 24 hours period is that for Mahalapye in December 2018. The wettest area was Pandamatenga during the October 2018 to March 2019 wet season, followed by Mahalapye and Baines Drift.

Botswana's diurnal temperature range is high and varies spatially. The coolest mean monthly minimum air temperatures for the period were recorded in the south-westerly parts of the country, with 13.5°C at Tsabong followed by Werda at 13.6 °C both in October 2018.

The highest mean monthly maximum temperatures for the study period were for Tsabong in January 2019 at 38.2 °C followed by Werda at 37.2 °C. The highest maximum temperature for the period was recorded at Werda during December 2018 at 42.0 °C.

Wind speed is measured in metres per second (m/s) while wind direction is expressed in degrees.

During the period under study, winds were strongest in Goodhope, with the highest mean monthly maximum wind speeds, recorded in November 2018 at 8.2 m/s. Mahalapye had the lowest mean monthly maximum wind speeds, recorded in March 2019 at 0.6 m/s. The highest wind speed recorded during the period under study was for Lephephe at 14.4 m/s in January 2019.

The highest wind direction predominance by percentage is that at Baines Drift, where 59.3 percent of the winds were from an east north easterly direction. Botswana's winds were predominantly from the east north east direction.

Maximum wind speed direction indicates the direction of the strongest winds for the stations and the country. The highest predominance by maximum wind speed is that for Baines Drift with 47.8 percent of the days recording the strongest winds blowing from the east north east. The strongest winds for the country blew mainly from the north east at 17.8 percent of the days of November 2018, followed by 17 percent of the days in October 2018, and 16.6 percent of the days in December 2018.

## 1. INTRODUCTION

This report covers the period October 2018 to March 2019, which is Botswana's warm and wet season. Climate is important to human livelihoods. It influences human life directly through wellbeing and health and indirectly through human activities such as economic or agricultural practices.

Botswana is climatically classified as arid to semi-arid, and is drought prone, with erratic rainfall that ranges from 250mm in the southwest to around 650mm in the north. Most of the rainfall is received between October and March, which is also the period of warmer temperatures.

## 2. EL NIÑO AND LA NIÑA

Botswana's climate is largely affected by the climate phenomena called the El Niño and La Niña phases. Table 1 shows the phases over the past years from 2000 to present. The latest phase recorded is that of the El Niño, up to mid-2019.

**Table 1: El Nino and La Nina years 2000-2019**

El Niño	La Niña
	2000-2001
2002-2003	
2004-2005	
	early 2006
2006-2007	
	2007-2008
2009	
	late 2010 - early 2011
2015- mid 2016	late 2016
late 2018 – mid 2019	

Source: Stormfax.com

### 3. RAINFALL

Precipitation is the general name given to all forms of moisture that falls from the atmosphere to the ground, and it includes rainfall and hail. Rainfall is the amount of rain that falls in a location over a period of time and therefore a type of precipitation. (Selase et. Al. 2015).

The Department of Meteorological Services (DMS) measures and monitors rainfall around the country. The rainfall season in Botswana is from the beginning of October to the end of March every year, and forms part of the meteorological year, which starts in July and ends in June.

Botswana's rainfall is highly erratic. It is normally higher during the La Niña than during the El Niño years.

#### 3.1. Monthly rainfall

Table 2 shows the total monthly rainfall in millimetres (mm) for the stations with data available.

**Table 2: Total monthly Precipitation (mm) October 2018 to March 2019**

	October	November	December	January	February	March
<b>Mahalapye</b>	0.4	50.2	162.4	93.2	44.6	14.4
<b>Shakawe</b>	7.4	11.6	33.2	10.4	122.4	13.2
<b>Ngwatle</b>	19.6	-	0.0	0.0	35.6	11.8
<b>Lephephe</b>	13.8	2.1	92.2	80.6	13.0	11.6
<b>Tubu</b>	0.4	12.8	30.6	14.8	56.6	8.6
<b>Werda</b>	1.0	6.8	28.8	44.2	67.4	5.4
<b>Tsabong</b>	1.2	4.8	7.0	11.2	31.6	4.2
<b>Ghanzi</b>	30.2	3.3	72.6	27.6	36.0	3.8
<b>Tshane</b>	35.6	2.3	7.2	33.2	79.6	1.4
<b>Loitlhakane East</b>	0.0	1.2	2.8	0.4	12.8	1.2
<b>Sowa</b>	0.0	5.2	0.4	1.8	0.8	0.4
<b>Pandamatenga</b>	0.4	69.9	24.4	86.6	229.6	0.2
<b>Baines Drift</b>	2.2	27.5	71.4	50.0	100.4	0.0
<b>Mababe</b>	0.2	8.9	0.0	13.9	0.0	0.0
<b>Ramotswa</b>	21.8	12.4	94.2	5.2	0.0	0.0
<b>Ranaka</b>	39.4	13.4	63.6	57.6	16.4	0.0
<b>Xade</b>	2.4	-	-	0.0	0.0	0.0
<b>Goodhope</b>	11.0	16.1	86.8	18.2	35.2	29.4
<b>Mogobane</b>	0.8	0.2	0.0	23.4	60.0	43.4

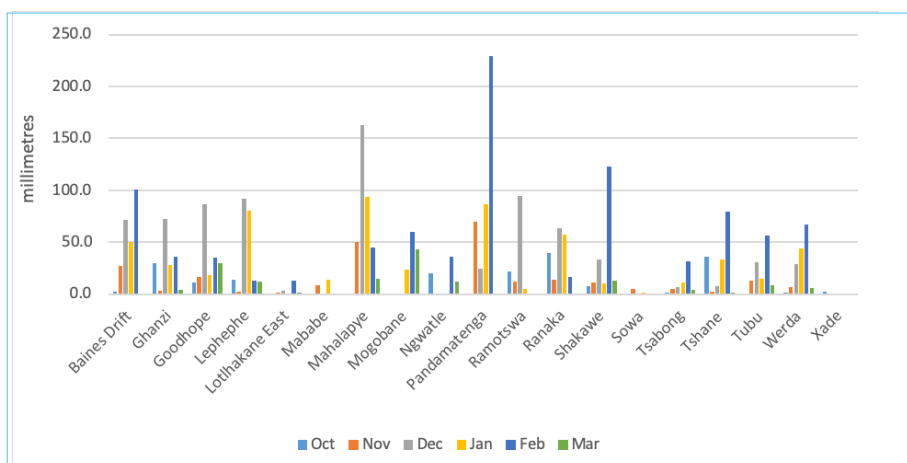
Dash (-) = no data

Source: Department of Meteorological Services and SASSCAL

Pandamatenga received the highest rainfall in one month, at 229.6 mm in February 2019, followed by Mahalapye rainfall at 162.4 mm recorded in December 2018 and that for Shakawe at 122.4 mm recorded in February 2019. Figure 1 shows the monthly total rainfall.



Figure 1: Monthly total rainfall (mm) October 2018 to March 2019



### 3.2. Rainfall extremes

Table 3 shows the highest ten (10) daily rainfalls recorded in a 24 hours period by station. For the study period, the highest rainfall recorded in a 24 hours period is that for Mahalapye, at 96.4 mm in December 2018, followed by that recorded in Pandamatenga at 79.8 mm in February 2019, and that recorded in Mahalapye at 68.6 mm in January 2019.

Table 3: Highest ten rainfall (mm) recorded in 24 hours October 2018 to March 2019

Rainfall (mm)	Month	Station
96.4	Dec-18	Mahalapye
79.8	Feb-19	Pandamatenga
68.6	Jan-19	Mahalapye
48.8	Feb-19	Shakawe
45.0	Feb-19	Pandamatenga
38.6	Nov-18	Pandamatenga
38.4	Dec-18	Mahalapye
37.6	Feb-19	Tshane
36.0	Oct-18	Ranaka
34.8	Dec-18	Ramotswa

Table 4 shows the total rainfall by station during the wet season from October 2018 to March 2019. Indications are that the wettest area was Pandamatenga, followed by Mahalapye and Baines Drift.

Table 4: Total rainfall by station (mm) October 2018 to March 2019

Station	Total
Pandamatenga	411.1
Mahalapye	365.2
Baines Drift	251.5
Lephephe	213.3
Shakawe	198.2
Goodhope	196.7
Ranaka	190.4
Ghanzi	173.5
Tshane	159.3
Werda	153.6
Ramotswa	133.6
Mogobane	127.8
Tubu	123.8
Ngwatle	67.0
Tsabong	60.0
Mababe	23.0
Lotlhakane East	18.4
Sowa	8.6
Xade	2.4

Source: Department of Meteorological Services and SASSCAL

## 4. TEMPERATURES

Botswana's diurnal temperature range is high. This is normal for semi-arid and arid climates. The temperatures also vary spatially, with extremes common in the north-eastern and the south-western regions of the country.

### 4.1. Minimum air temperatures

Table 5 shows the mean monthly minimum air temperatures in degrees Celsius (°C). The period October to March is characterised by spring and summer temperatures in Botswana. The minimums indicate the cooler months and areas. Minimum temperatures are often recorded in the early morning hours before sunrise.

The coolest mean monthly minimum air temperatures during the period October 2018 to March 2019 were recorded in the south-westerly parts of the country.

**Table 5: Mean monthly minimum air temperatures (degrees Celsius) October 2018 to March 2019**

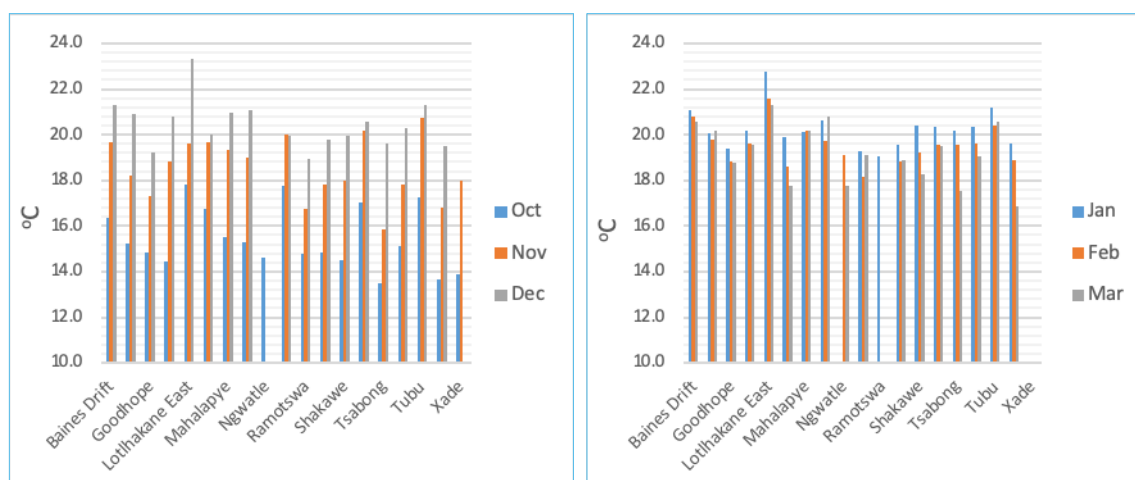
Station	Oct	Nov	Dec	Jan	Feb	Mar
Lothakane East	17.8	19.6	23.3	22.7	21.6	21.3
Mogobane	15.3	19.0	21.1	20.6	19.7	20.8
Baines Drift	16.3	19.7	21.3	21.1	20.8	20.6
Tubu	17.2	20.8	21.3	21.2	20.4	20.6
Ghanzi	15.2	18.2	20.9	20.1	19.8	20.2
Mahalapye	15.5	19.3	20.9	20.1	20.2	20.2
Lephephe	14.5	18.8	20.8	20.2	19.6	19.6
Sowa	17.0	20.2	20.6	20.3	19.6	19.5
Pandamatenga	17.7	20.0	20.0	19.3	18.2	19.1
Tshane	15.1	17.8	20.3	20.4	19.6	19.0
Ranaka	14.9	17.8	19.8	19.6	18.8	18.9
Goodhope	14.9	17.3	19.2	19.4	18.8	18.8
Shakawe	14.5	18.0	19.9	20.4	19.2	18.2
Mababe	16.8	19.7	20.0	19.9	18.6	17.8
Ngwatle	14.6	-	-	-	19.1	17.8
Tsabong	13.5	15.8	19.6	20.2	19.6	17.5
Werda	13.6	16.8	19.5	19.6	18.9	16.9
Ramotswa	14.8	16.7	19.0	19.1	-	-
Xade	13.9	18.0	-	-	-	-

Dash (-) = no data

Source: Department of Meteorological Services and SASSCAL

The lowest mean monthly minimum air temperature is that for Tsabong at 13.5°C, followed by that of Werda at 13.6°C and that of Xade at 13.9°C all for October 2018. Figure 2 shows the mean monthly minimum temperatures graphically.

**Figure 2: Mean monthly minimum temperatures (degrees Celsius) October to December 2018 and January to March 2019**



## 4.2. Minimum temperature extremes

Table 6 shows the lowest minimum air temperatures recorded for the stations during the period October 2018 to March 2019. The lowest minimum temperature was recorded for Xade at 5.7°C in October 2018, followed by that for Werda at 5.9°C in November 2018, and Werda again at 6.4°C in October 2018.

**Table 6: Lowest minimum temperatures recorded (degrees Celsius) October 2018 to March 2019**

Temperature (°C)	Month	Station
5.7	October	Xade
5.9	November	Werda
6.4	October	Werda

Source: Department of Meteorological Services and SASSCAL

## 4.3. Maximum air temperatures

Table 7 shows the mean monthly maximum temperatures for the period October 2018 to March 2019. This period is characterised by the warmest temperatures of the year, covering the spring and summer seasons

**Table 7: Mean monthly maximum air temperatures (degrees Celsius) October 2018 to March 2019**

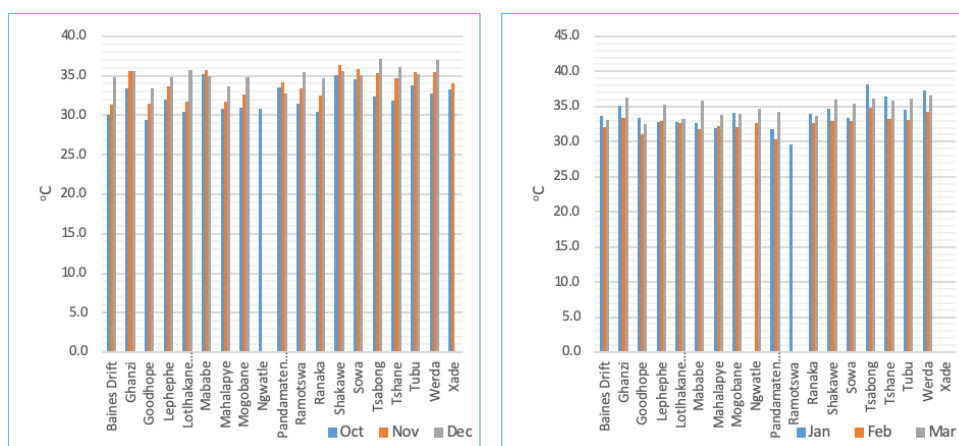
Station	Oct	Nov	Dec	Jan	Feb	Mar
Werda	32.8	35.5	37.0	37.3	34.2	36.5
Ghanzi	33.4	35.6	35.5	35.1	33.3	36.2
Tsabong	32.4	35.3	37.1	38.2	34.9	36.1
Tubu	33.9	35.5	35.2	34.5	33.2	36.1
Shakawe	35.1	36.3	35.6	34.7	32.9	36.0
Tshane	31.8	34.7	36.2	36.4	33.3	35.9
Mababe	35.3	35.8	35.0	32.6	31.8	35.8
Sowa	34.5	35.8	35.1	33.3	32.9	35.5
Lephephe	32.0	33.7	34.9	32.9	33.0	35.3
Ngwatle	30.8	-	-	-	32.6	34.7
Pandamatenga	33.5	34.2	32.7	31.8	30.3	34.2
Mahalapye	30.9	31.7	33.7	31.9	32.1	33.9
Mogobane	31.0	32.6	34.8	34.1	32.0	33.9
Ranaka	30.4	32.6	34.7	34.0	32.6	33.7
Lothakane East	30.4	31.7	35.8	32.8	32.7	33.2
Baines Drift	30.1	31.3	34.9	33.7	32.0	33.0
Goodhope	29.4	31.5	33.4	33.3	31.1	32.6
Ramotswa	31.5	33.4	35.4	29.5	-	-
Xade	33.3	34.0	-	-	-	-

Dash (-) = no data

Source: Department of Meteorological Services and SASSCAL

The highest mean monthly maximum temperatures for the period October 2018 to March 2019 were for Tsabong at 38.2°C in January 2019, followed by that of Werda at 37.3°C in January 2019, and Tsabong at 37.1°C in December 2018. Figure 3 shows the mean monthly maximum temperatures graphically.

**Figure 3: Mean monthly maximum temperatures (degrees Celsius) October to December 2018 and January to March 2019**



#### 4.4. Maximum temperature extremes

Table 8 shows the highest maximum air temperatures recorded for the stations, during the period October 2018 to March 2019. The highest maximum temperature for the period was recorded at Werda at 42.0 °C during December 2018, followed by that recorded at Tsabong and Werda, both at 41.7 °C in December 2018.

**Table 8: Highest maximum temperatures recorded (degrees Celsius) October 2018 to March 2019**

Temperature (o°C)	Month	Station
42.0	December	Werda
41.7	December	Werda
41.7	December	Tsabong

Source: Department of Meteorological Services and SASSCAL

#### 5. WIND SPEED AND DIRECTION

Wind speed is measured in metres per second (m/s) while wind direction is expressed in degrees. Wind direction is expressed in terms of the direction that the wind is blowing from. For example, northerly winds blow from the north to the south.

##### 5.1. Monthly maximum wind speeds

Table 9 shows the mean monthly maximum wind speeds for the period October 2018 to March 2019.

**Table 9: Mean monthly maximum winds speeds (m/s) October 2018 to March 2019**

Station	Oct	Nov	Dec	Jan	Feb	Mar
Baines Drift	6.1	6.2	5.9	5.2	4.8	5.0
Ghanzi	6.5	6.8	7.4	6.6	6.5	6.1
Goodhope	7.4	8.2	7.9	8.0	7.1	7.6
Lephephe	7.3	7.6	7.6	7.1	6.3	6.0
Lothakane East	3.9	3.5	3.0	2.8	2.8	3.0
Mababe	6.6	6.9	6.7	5.4	5.1	5.1
Mahalapye	6.4	6.8	2.8	2.1	1.3	0.6
Mogobane	4.5	4.7	4.5	4.4	4.3	3.7
Ngwatle	5.9	-	-	-	5.3	4.9
Pandamatenga	6.0	6.5	5.0	4.9	4.7	4.5
Ramotswa	3.6	3.7	3.8	2.8	-	-
Ranaka	3.3	3.4	3.4	2.9	3.3	3.1
Shakawe	4.7	5.2	5.1	4.9	4.4	4.0
Sowa	6.1	6.7	6.4	5.7	5.2	5.1
Tsabong	6.6	6.7	6.9	6.8	6.5	6.5
Tshane	5.6	5.7	5.9	6.2	5.4	5.1
Tubu	6.3	6.4	6.2	5.8	5.6	4.9
Werda	5.6	6.1	6.2	5.8	5.6	5.5
Xade	6.4	5.8	-	-	-	-

Dash (-) = no data

Source: Department of Meteorological Services and SASSCAL

During the period under study, winds were strongest in Goodhope, with highest mean monthly maximum wind speed of 8.2 m/s during November 2018, 8.0 m/s in January 2018 and 7.9 m/s during December 2018. Mahalapye had the lowest mean monthly maximum wind speeds at 0.6 m/s in March 2019, 1.3 m/s in February 2019 and 2.1 m/s in January 2019.

## 5.2. Highest wind speeds recorded

Table 10 shows the highest wind speeds recorded during the period October 2018 to March 2019. The highest wind speed recorded during the period under study was for Lephephe at 14.4 m/s in January 2019, followed by that for Goodhope at 13.7 m/s in December 2018 and that for Goodhope at 12.5 m/s in January 2019.

**Table 10: Maximum wind speeds (m/s) October 2018 to March 2019**

Speed m/s	*Beaufort classification	Month	Station
14.4	Near gale	Jan	Lephephe
13.7	Strong breeze	Dec	Goodhope
12.5	Strong breeze	Jan	Goodhope

\*See table 15 in appendix

Source: Department of Meteorological Services and SASSCAL

## 5.3. Wind direction

Botswana's winds are predominantly easterly to north easterly except for the south west of the country where northerly winds are dominant. (Department of Meteorological Services: 2003).

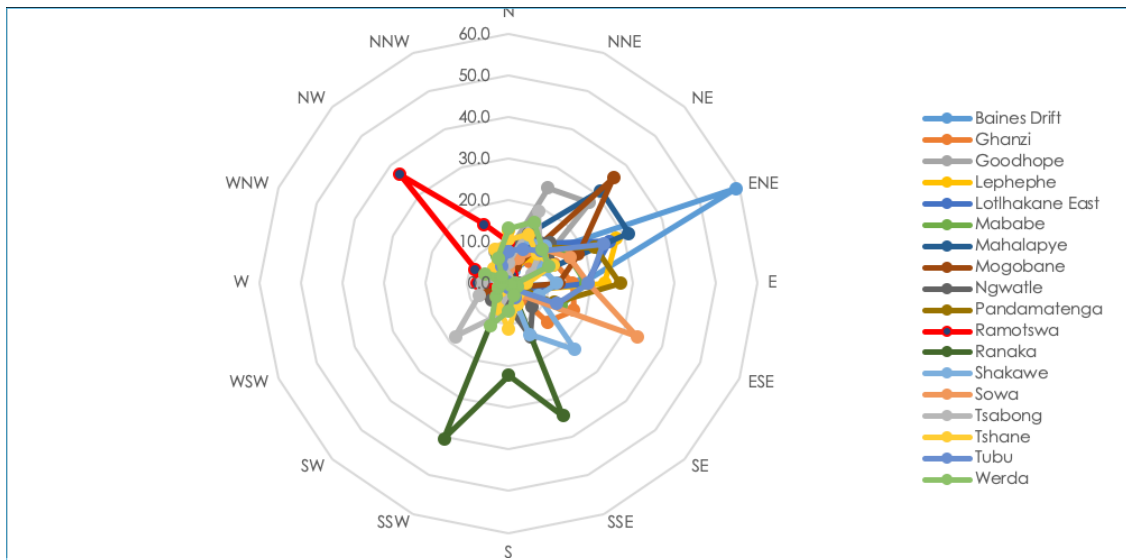
Table 11 shows the stations' predominant winds as a percentage of the days recorded between October 2018 and March 2019. The highest predominance is that of Baines Drift, where 59.3 percent of the winds were from an east north easterly direction, followed by Ranaka's predominantly south south westerly winds at 40.6 percent, and Ramotswa's 37.0 percent north westerly winds. Figure 4 shows this graphically.

**Table 11: Percentage predominant winds by station October 2018 to March 2019**

	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Total
Baines Drift	1.6	3.3	9.9	59.3	17.6	1.6	1.6	1.6	0.0	0.5	0.0	0.5	0.5	0.5	1.1	0.0	100.0
Ghanzi	2.7	5.5	7.1	12.1	15.4	17.0	13.2	1.6	2.7	4.9	3.3	3.8	2.7	1.6	1.6	4.4	100.0
Goodhope	7.7	24.7	27.5	6.6	2.7	1.1	1.6	1.6	3.3	1.6	2.2	4.4	2.2	1.1	3.3	8.2	100.0
Lephephe	12.6	5.5	8.8	28.0	23.1	4.4	1.1	2.2	0.0	0.5	1.6	2.7	1.1	2.2	3.3	2.7	100.0
Lotlhakane East	6.9	9.1	13.7	26.3	18.9	4.6	1.1	1.7	0.0	3.4	2.9	4.0	2.3	2.3	1.7	1.1	100.0
Mababe	8.2	7.7	13.2	15.9	18.7	13.7	3.3	0.5	2.7	1.1	0.0	1.1	1.6	2.2	2.7	7.1	100.0
Mahalapye	8.2	12.6	31.3	31.3	1.6	1.1	0.0	1.1	0.5	0.0	0.0	0.0	2.7	2.2	3.8	3.3	100.0
Mogobane	5.5	4.4	35.7	18.1	12.1	2.7	1.1	0.5	1.1	2.2	3.3	6.0	2.2	1.6	1.1	2.2	100.0
Ngwatle	9.3	12.8	14.0	11.6	2.3	4.7	8.1	14.0	5.8	1.2	5.8	1.2	0.0	2.3	3.5	3.5	100.0
Pandamatenga	6.0	7.7	12.1	22.5	26.9	12.1	0.5	1.6	2.2	0.0	0.0	1.6	0.0	2.7	2.2	1.6	100.0
Ramotswa	9.8	2.2	0.0	1.1	1.1	0.0	3.3	2.2	2.2	3.3	4.3	2.2	7.6	8.7	37.0	15.2	100.0
Ranaka	1.1	0.0	0.0	0.0	0.0	0.0	0.6	34.4	22.2	40.6	1.1	0.0	0.0	0.0	0.0	0.0	100.0
Shakawe	4.4	11.6	12.7	8.8	11.6	7.7	22.7	13.3	0.6	2.2	0.0	1.1	0.6	0.6	1.1	1.1	100.0
Sowa	3.3	6.6	11.5	15.9	19.2	33.5	3.8	1.1	0.0	0.5	0.0	0.5	0.5	1.1	1.1	1.1	100.0
Tsabong	4.9	18.7	11.0	6.0	1.6	1.6	0.5	3.8	2.2	8.8	18.1	7.7	6.6	3.3	3.3	1.6	100.0
Tshane	10.4	12.6	9.9	11.5	4.4	2.2	3.3	5.5	11.0	6.6	2.7	2.7	1.1	2.2	4.9	8.8	100.0
Tubu	7.7	8.8	11.0	24.7	19.2	12.6	2.2	3.8	1.1	0.5	0.0	1.6	0.5	1.1	0.5	4.4	100.0
Werda	13.2	15.9	11.5	10.4	1.6	2.2	0.5	3.3	6.6	11.0	4.4	2.7	1.6	6.0	2.2	6.6	100.0

Source: Department of Meteorological Services and SASSCAL

Figure 4: Percentage predominant winds by station October 2018 to March 2019



5.4. National wind direction

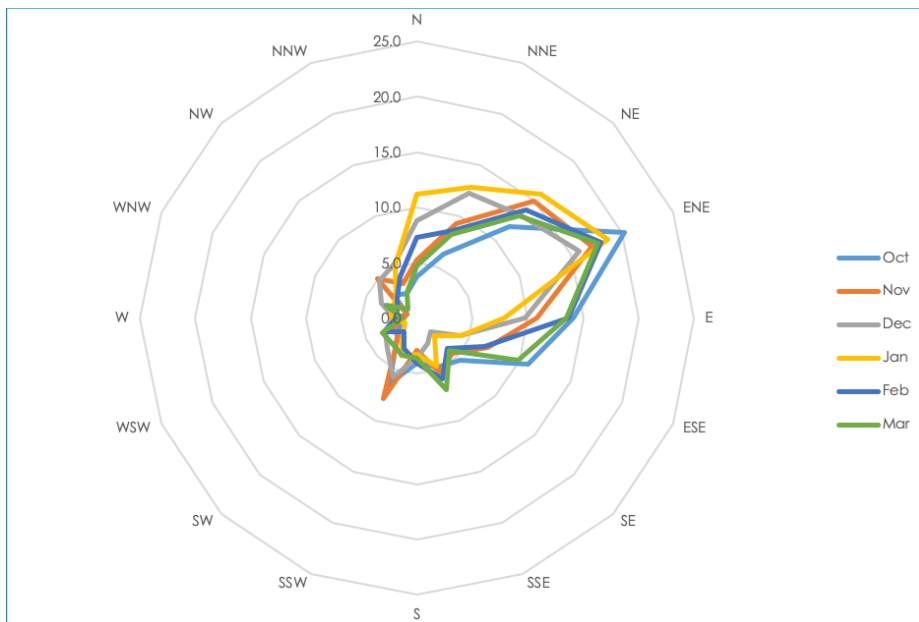
Table 12 shows the direction of the country's predominant winds for the period October 2018 to March 2019 as a percentage of the total number of days for that period. Botswana's winds were predominantly from the east north east direction. Figure 5 shows the country's predominant winds graphically.

Table 12: Wind direction by percentage of days October 2018 to March 2019

	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Total
<b>Oct</b>	3.7	6.3	11.7	20.2	14.1	10.9	5.4	4.8	4.1	6.5	2.6	1.7	1.7	1.0	2.9	2.4	100
<b>Nov</b>	5.3	9.2	14.9	17.1	10.8	6.9	4.5	5.3	2.9	7.8	2.4	2.4	1.2	1.0	5.1	3.3	100
<b>Dec</b>	8.8	12.2	13.2	15.8	9.7	4.2	1.7	2.5	3.6	5.7	3.8	3.1	2.1	3.4	4.8	5.3	100
<b>Jan</b>	11.2	12.8	15.8	18.7	7.9	4.3	2.2	4.7	3.2	3.7	1.8	1.2	2.4	2.4	2.6	5.1	100
<b>Feb</b>	7.2	8.5	13.9	17.9	13.6	6.6	3.8	6.0	4.1	3.0	1.7	3.2	1.9	1.9	2.6	4.1	100
<b>Mar</b>	4.7	8.2	13.1	17.6	13.5	9.9	4.2	7.0	3.6	3.6	3.2	3.4	1.3	3.0	1.1	2.5	100

Source: Department of Meteorological Services and SASSCAL

Figure 5: National predominant winds (percentage days) October 2018 to March 2019



### 5.5. Maximum wind speeds by direction

Maximum wind speed direction is an indication of the direction of the maximum wind speeds recorded. It indicates the direction of the strongest winds for the stations and the country.

Table 13 and Figure 6 show the percentage maximum wind speed directions for the stations as a percentage of the number of days the recordings were taken.

**Table 13: Percentage maximum wind speed directions by station October 2018 to March 2019**

	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Total
<b>Baines Drift</b>	1.6	3.3	13.7	47.8	18.7	2.7	1.1	1.1	1.6	2.7	1.1	2.7	0.0	0.5	0.5	0.5	100.0
<b>Ghanzi</b>	2.7	5.5	2.7	16.5	22.0	8.2	8.8	5.5	6.6	1.6	4.9	3.3	3.8	2.2	2.7	2.7	100.0
<b>Goodhope</b>	2.7	12.1	31.9	10.4	6.0	2.7	2.2	4.4	1.6	0.5	4.4	8.2	4.9	2.2	3.8	1.6	100.0
<b>Lephephe</b>	1.6	5.5	14.3	12.6	23.6	9.9	5.5	1.6	2.2	3.8	1.6	3.8	1.1	2.7	4.4	5.5	100.0
<b>Lothakane East</b>	2.3	6.9	16.0	11.4	32.6	4.0	0.6	2.3	2.3	4.0	1.7	4.0	7.4	1.7	1.1	1.7	100.0
<b>Mababe</b>	3.8	10.4	20.3	13.2	13.2	9.3	4.9	4.9	2.7	1.6	0.5	2.2	1.6	1.6	4.4	4.9	100.0
<b>Mahalapye</b>	4.9	9.9	26.9	20.3	7.7	6.6	3.8	3.3	1.1	2.2	0.0	1.1	1.1	1.1	6.0	3.8	100.0
<b>Mogobane</b>	4.4	3.8	39.0	5.5	12.1	10.4	3.8	0.5	0.5	3.8	1.6	6.0	4.9	0.5	2.2	0.5	100.0
<b>Ngwatle</b>	11.6	11.6	15.1	8.1	7.0	8.1	3.5	10.5	8.1	3.5	1.2	1.2	2.3	2.3	3.5	2.3	100.0
<b>Pandamatenga</b>	3.8	7.1	19.8	26.9	16.5	3.8	2.7	2.7	2.7	3.3	1.6	0.5	1.1	1.6	1.6	3.8	100.0
<b>Ramotswa</b>	2.2	1.1	5.4	5.4	0.0	0.0	0.0	1.1	6.5	4.3	5.4	3.3	8.7	2.2	18.5	35.9	100.0
<b>Ranaka</b>	1.1	0.0	0.0	0.0	0.0	0.0	1.7	36.1	20.6	36.7	3.9	0.0	0.0	0.0	0.0	0.0	100.0
<b>Shakawe</b>	3.3	3.9	7.7	9.4	8.8	16.6	14.9	16.6	1.7	3.9	1.1	2.8	2.8	1.1	1.7	3.9	100.0
<b>Sowa</b>	0.5	1.6	13.7	15.4	12.6	19.8	11.0	3.8	1.6	3.3	4.4	3.3	1.1	0.0	2.2	5.5	100.0
<b>Tsabong</b>	4.9	11.0	15.4	6.6	3.3	3.8	2.7	1.6	3.8	8.2	10.4	12.6	5.5	4.4	1.1	4.4	100.0
<b>Tshane</b>	8.8	7.1	9.9	12.6	6.0	3.3	4.9	4.4	8.2	6.0	4.9	2.7	4.9	3.8	4.4	7.7	100.0
<b>Tubu</b>	6.0	11.0	17.0	13.2	24.2	6.0	8.2	2.7	3.3	1.1	0.0	1.1	1.1	0.0	2.7	2.2	100.0
<b>Werda</b>	10.4	17.6	11.5	4.4	3.8	5.5	2.7	1.6	4.4	4.9	6.6	6.0	3.8	3.8	4.4	8.2	100.0

Source: Department of Meteorological Services and SASSCAL

The highest predominance by maximum wind speed is that for Baines Drift with 47.8 percent of the days recording strongest winds blowing from the east north east, followed by Mogobane where 39.0 percent of the strongest winds blew from a north east direction, and Ranaka where 36.7 percent of the strongest winds blew from the south south west.

**Figure 6: Percentage maximum wind speed directions by station October 2018 to March 2019**

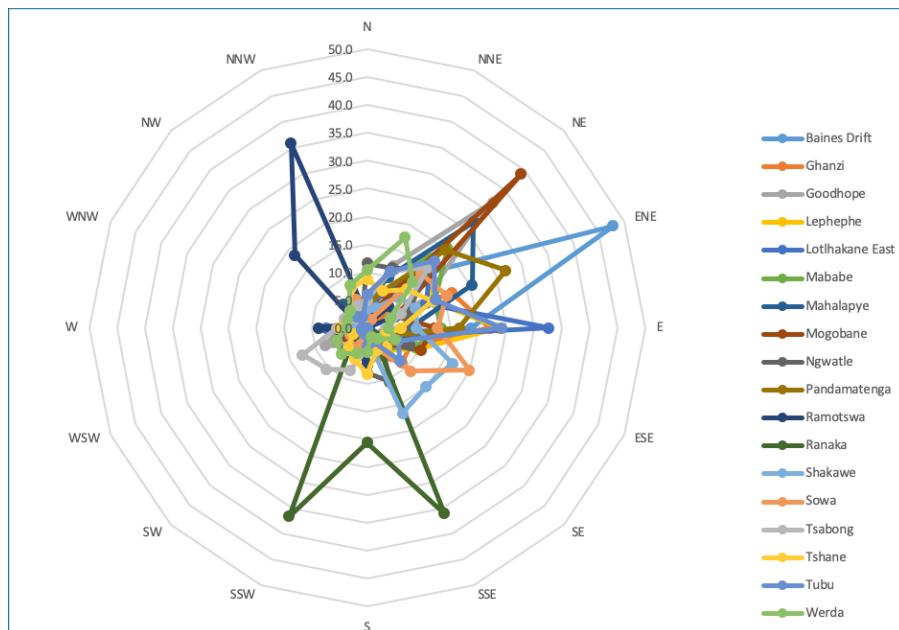


Table 14 and Figure 7 show the maximum wind speed directions for the country as a percentage of the days recordings were taken by month.

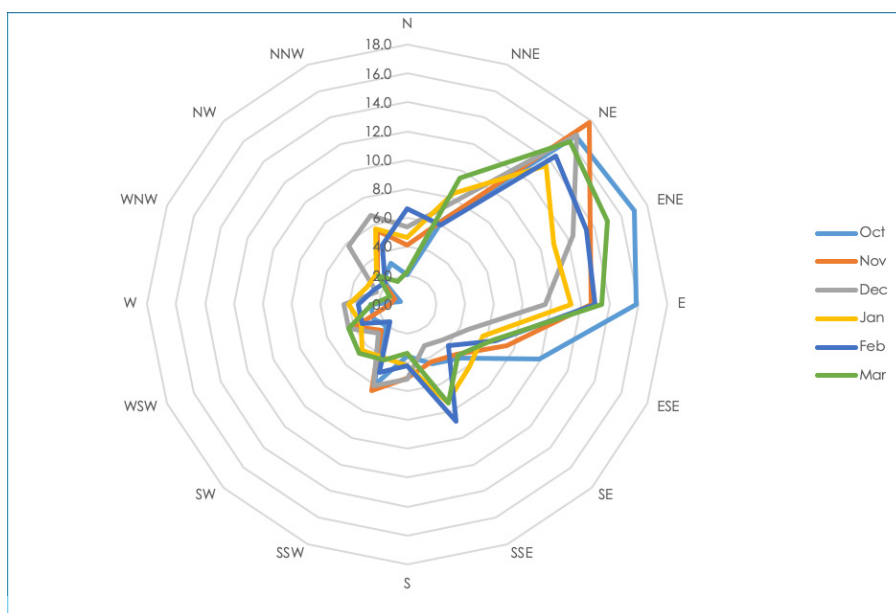
**Table 14: National percentage maximum wind speed directions October 2018 to March 2019**

	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Total
<b>Oct</b>	2.0	6.3	16.5	17.0	15.8	9.9	5.3	4.4	3.6	6.1	2.0	2.6	2.6	0.5	2.4	3.1	100.0
<b>Nov</b>	4.1	6.3	17.8	13.7	12.7	7.5	4.9	4.3	5.1	6.5	2.5	3.9	1.2	1.0	2.9	5.5	100.0
<b>Dec</b>	5.3	7.4	16.6	12.4	9.5	4.6	3.4	3.1	5.2	6.1	2.9	4.4	4.4	2.3	5.7	6.7	100.0
<b>Jan</b>	4.7	8.3	13.6	11.0	11.4	5.7	6.1	7.3	4.3	4.1	4.5	3.4	4.1	3.0	3.0	5.7	100.0
<b>Feb</b>	6.6	6.0	14.5	13.4	13.0	6.6	4.1	8.7	4.3	5.1	1.7	3.4	3.4	2.6	2.1	4.5	100.0
<b>Mar</b>	2.3	9.5	15.9	15.0	13.5	6.5	4.9	7.4	3.4	4.2	4.7	4.4	2.5	1.3	2.8	1.7	100.0

Source: Department of Meteorological Services and SASSCAL

During the study period, the strongest winds for the country blew from mainly the north east at 17.8 percent of the days of November 2018, followed by east north east at 17 percent of the days in October 2018, and north east at 16.6 percent of the days in December 2018.

**Figure 7: National percentage maximum wind speed directions October 2018 to March 2019**



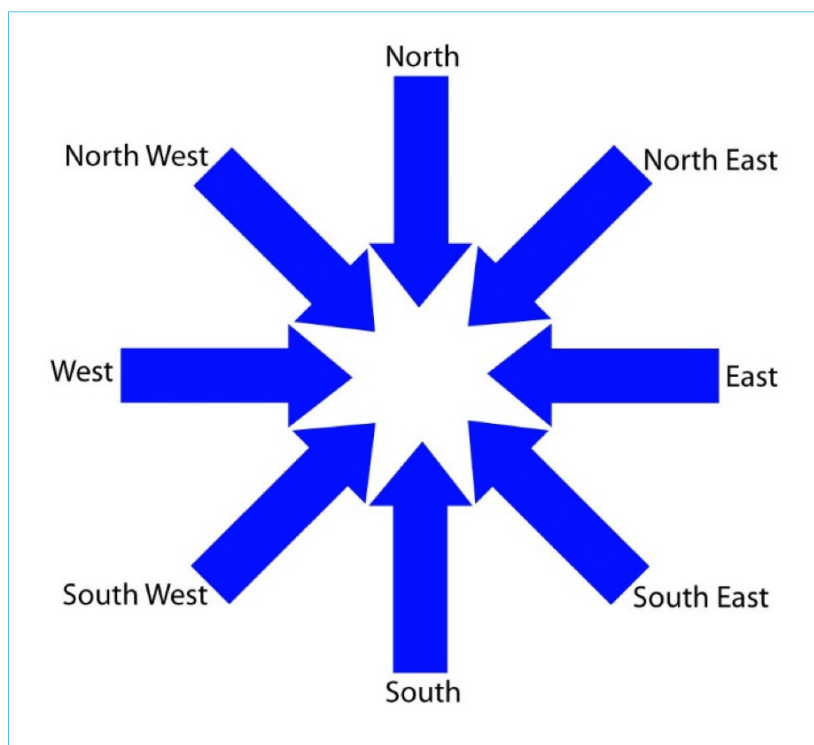


## 6. APPENDIX

Table 15: Wind Scale

m/s	Km/h	Beaufort scale	Label	Effects
0 - 0.2	1	0	Calm	Calm. Smoke rises vertically.
0.3-1.5	1-May	1	Light Air	Wind motion visible in smoke.
1.6-3.3	6-Nov	2	Light Breeze	Wind felt on exposed skin. Leaves rustle.
3.4-5.4	Dec-19	3	Gentle Breeze	Leaves and smaller twigs in constant motion.
5.5-7.9	20-28	4	Moderate Breeze	Dust and loose paper raised. Small branches begin to move.
8.0-10.7	29-38	5	Fresh Breeze	Branches of a moderate size move. Small trees begin to sway.
10.8-13.8	39-49	6	strong Breeze	Large branches in motion. Whistling heard in overhead wires. Umbrella use becomes difficult. Empty plastic garbage cans tip over.
13.9-17.1	50-61	7	Near Gale	Whole trees in motion. Effort needed to walk against the wind. Swaying of skyscrapers may be felt, especially by people on upper floors.
17.2-20.7	62-74	8	Gale	Twigs broken from trees. Cars veer on road.
20.8-24.4	75-88	9	Severe Gale	Larger branches break off trees, and some small trees blow over. Construction/ temporary signs and barricades blow over. Damage to circus tents and canopies.
24.5-28.4	89-102	10	Storm	Trees are broken off or uprooted, saplings bent and deformed, poorly attached asphalt shingles and shingles in poor condition peel off roofs.
28.5-32.6	103-117	11	Violent Storm	Widespread vegetation damage. More damage to most roofing surfaces, asphalt tiles that have curled up and/or fractured due to age may break away completely.
>32.7	>118	12	Hurricane	Considerable and widespread damage to vegetation, a few windows broken, structural damage to mobile homes and poorly constructed sheds and barns. Debris may be hurled about.

Figure 8: Winds Direction illustration



## REFERENCES

Selase et. Al. 2015. "Precipitation and Rainfall Types with Their Characteristic," Journal of Natural Sciences Research Volume 5 No. 20, Researchgate, Wuhan

Wingqvist G. Ö. and Dahlberg E. 2008. "Environmental and Climate Change Analysis," University of Gothenburg, Gothenburg.

# BOTSWANA ENVIRONMENT STATISTICS

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CLIMATE DIGEST

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