

BOTSWANA ENVIRONMENT STATISTICS WATER AND CLIMATE DIGEST 2017



STATISTICS BOTSWANA

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Published by

Statistics Botswana
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Toll Free Number: 0800600200
Tel: (+267) 367 1300 **Fax:** (+267) 395 2201

E-mail: info@statsbots.org.bw
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ISBN: 978-99968-418-3-5

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Preface


This is Statistics Botswana's annual Botswana Environment Statistics: Water and Climate Digest. The purpose of the Digest is to provide data for use by decision-makers in water management and development as well as for monitoring trends related to climate.

The indicators in this report cover data on dam levels, water production, billed water consumption, non-revenue water, water supplied to mines, rainfall, temperature and wind speed and direction.

In compiling this report, international standards and guidelines were followed, particularly the United Nations Framework for the Development of Environment Statistics (UNFDES) and the United Nations International Recommendations for Water Statistics. Eventually, the data collected through these methodologies will feed into the UN System of Environmental Economic Accounting (SEEA) for water and hence facilitate an informed management of water resources. This data will also facilitate the tracking of some of the indicators of the Sustainable Development Goals (SDGs) and of the National Development Plan's performance monitoring systems.

I would like to extend my gratitude and appreciation to all stakeholders who assisted in the production of this digest, in particular the Water Utilities Corporation, the Department of Water Affairs and the Department of Meteorological Services for availing the water and climate data as required.

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.org.bw and at the Statistics Botswana Library (Head-Office, Gaborone).



Burton Mguni (Dr)
Statistician General
July 2018

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EXECUTIVE SUMMARY

This annual report looks at water and climate statistics, based on the indicators of dam levels, water production and billed water consumption, rainfall, temperatures, wind speed and wind direction. The report covers the financial year March 2016 to April 2017 and the meteorological year July 2016 to June 2017.

Dam levels

Botswana has nine dams from which surface water is sourced. The year 2017 recorded higher dam levels than the preceding year 2016. Gaborone dam had the highest percentage gains during the year 2017.

Water Production

The cities of Gaborone and Francistown continue to have the highest water production. The two cities also recorded increased water production in the year 2016/17. Southern MCs have higher water production than the northern MCs. Southern MCs recorded an increase in water production while northern MCs recorded a decrease. The country's overall water production decreased in 2016/17.

Billed Water Consumption

Gaborone, Francistown and Selebi Phikwe MCs continued to have the highest billed water consumption compared to the rest. Total billed water consumption was more in 2016/17 than in 2015/16 for both the southern and northern MCs.

Non-revenue water

Non-revenue water was highest in Lobatse for the southern MCs and highest in Maun for the northern MCs. Southern MCs continued to have higher non-revenue water than the northern MCs.

Water supplied to mines

2016/17 saw a major fall in the water supplied to the copper-nickel mines Tati Nickel and BCL due to the mine shut downs. Mupane and Morupule Colliery mines thus recorded the highest water supplied to them respectively, and had increased water supplied, including Botash mine.

Rainfall

There are various rainfall stations around the country. Only those with full monthly data for 2014/15 are used for total annual rainfall. More total rainfall was recorded in 2016/17 than in 2015/16. The highest total rainfall recorded for a station during the 2016/17 is that of Goodhope at 590.1 mm, most of which fell during the month of February.

Temperatures

The lowest mean monthly minimum temperature recorded during the 2016/17 meteorological year was 1.3°C for Werda in July 2016 and highest mean monthly maximum temperature was 38.5°C for Shakawe in October 2016. The lowest temperature recorded during the 2016/17 meteorological year was -7.98°C for Werda, on the 26th of July 2016 and the highest temperature recorded was 44.2°C for Tsabong on the 29th of October 2016.

Wind Speed and Direction

Wind speed and direction data is used for the meteorological year 2016/17, from ten (10) locations across the country. The locations are Ghanzi, Shakawe, Mahalapye, Tshane, Sua Pan, Tsabong, Werda, Pandamatenga, Lephephe and Goodhope.



The highest monthly average wind speed recorded was for Goodhope at 3.9 m/s, while the lowest was 1.1 m/s for Shakawe. Average monthly wind speed ranged between a light air and a gentle breeze. Goodhope recorded the highest wind speeds for most of the meteorological year 2016/2017.

The most predominant wind direction was north easterly winds at Mahalapye on 34 percent of the year's 334 daily recordings, and easterly winds at Pandamatenga on 33 percent of the year's 365 daily recordings. For most of the stations considered the winds were predominantly from the easterly directions.

1. WATER

1.1. Dam Levels

Botswana has nine dams from which surface water is sourced, namely Gaborone, Nnywane, Bokaa, Letsibogo, Shashe, Ntimbale, Thune, Lotsane and the Dikgathong dams. Botswana also imports water from Molatedi dam in the Republic of South Africa.

Table 1.1: Dam Capacities

Dam	Capacity (Mm ³)
Dikgathong	400.0
Molatedi (Republic of South Africa)	201.0
Gaborone Dam	141.4
Letsibogo	100.0
Thune	90.0
Shashe	85.0
Lotsane	40.0
Ntimbale	26.6
Bokaa Dam	18.5
Nnywane	2.3

Source: Statistics Botswana

Note: Molatedi dam is in South Africa and provides imported water to Botswana

The dam capacities are indicated above in Table 1.1. Dikgathong dam is the country's largest dam by capacity at 400 million cubic metres (Mm³) while Nnywane is the smallest at 2.3 million cubic meters.

Dam levels are determined by rainfall in the catchment areas as well as inflows and outflows of water into and out of the dams. Evaporation rates are also a determinant of the dam levels.

This report looks at dam level trends for the 2015, 2016 and 2017 years. **Table 1.2** below shows the percentage dam levels for the three (3) years. The year 2015 had the lowest dam levels on average. 2017 had the highest dam levels followed by 2016. For all the three (3) years the dam levels peaked during the February to April period.

Table 1.2: Percentage dam levels 2015 - 2017

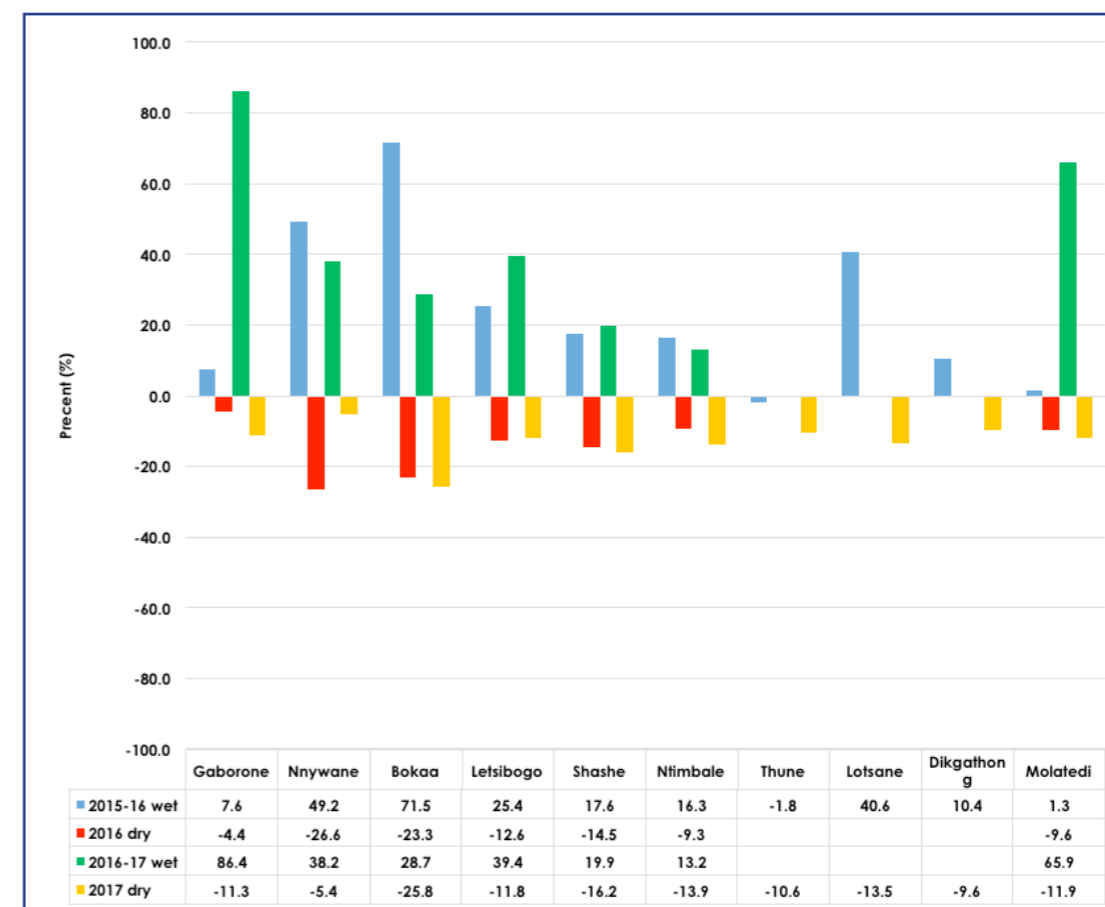
Year:		Gaborone	Nnywane	Bokaa	Letsibogo	Shashe	Ntimbale	Thune	Lotsane	Dikgathong	Molatedi
2015	Jan 15th	4.7	93.2	20.5	69.9	83.7	89.6	47.7	73.4	88.0	18.0
	Feb 17th	4.2	94.2	21.2	69.0	95.8	95.0	47.2	75.0	88.8	15.2
	Mar 9th	3.4	88.4	18.4	65.2	93.9	92.0	46.8	72.2	87.4	15.2
	Apr 15th	2.7	85.6	15.5	58.3	92.6	97.9	45.5	70.0	85.6	13.4
	May 15th	2.2	79.5	11.9	55.7	93.9	95.9	44.3	67.4	84.1	12.5
	Jun 15th	1.7	73.3	8.2	53.1	95.1	93.9	43.1	64.8	82.5	11.5
	Jul 17th	1.6	66.7	2.4	49.2	91.5	89.8	41.5	61.3	80.9	10.2
	Aug 26th	1.5	60.5	2.0	46.3	87.9	89.3	43.0	59.9	79.4	8.9
	Sep 22nd	1.4	56.2	2.0	43.8	85.1	86.3	39.1	58.3	78.3	8.4
	Oct 6th	1.4	53.4	2.0	43.3	83.2	85.3	39.1	57.4	77.6	7.6
	Nov 13th	1.1	46.2	2.0	38.3	79.6	83.6	37.6	51.7	74.5	5.2
	Dec 14th	1.3	65.3	45.8	36.4	76.5	81.0	0.0	0.0	72.5	5.0
2016	Jan 18th	1.7	100.0	51.7	35.6	83.8	82.7	36.5	46.5	70.4	7.3
	Feb 15th	1.7	93.3	49.4	36.5	80.7	91.0	37.0	44.4	70.0	7.0
	Mar 17th	9.0	102.6	73.5	68.7	100.8	101.6	37.3	98.0	88.0	8.9
	Apr 20th	18.8	94.6	99.0	75.9	98.1	97.8	39.9	96.9	97.9	39.3
	May 19th	18.6	88.2	91.5	72.9	95.4	95.4	37.0	93.2	95.9	36.0
	Jun 6th	17.2	80.1	88.5	71.1	93.7	93.8	37.0	91.0	94.5	35.0
	Jul 21st	16.1	77.3	82.5	67.9	89.4	90.6	36.2	87.8	92.1	33.7
	Aug 8th	15.5	74.1	80.0	66.0	87.2	88.0	-	-	91.0	-
	Sep 12th	14.4	68.0	75.7	63.3	83.6	88.5	-	-	-	29.7
	Oct 10th	13.2	61.5	71.4	60.6	80.5	87.0	-	-	-	-
	Nov 18th	13.7	54.0	71.8	57.3	77.8	79.8	29.9	91.5	84.2	24.7
	Dec 8th	14.6	74.5	99.8	56.3	76.3	78.7	29.9	92.6	83.2	24.9
2017	Jan 16th	22.2	100.0	100.0	67.9	100.8	100.9	47.2	100.9	101.8	30.4
	Feb 13th	35.8	100.0	100.8	100.0	100.0	103.6	72.4	100.9	104.0	37.6
	Mar 15th	99.6	99.7	100.0	100.0	100.4	100.2	87.4	100.8	101.8	65.9
	Apr 12th	97.0	91.9	95.8	97.2	97.7	99.0	85.4	96.4	99.3	64.4
	May 15th	94.7	91.9	90.8	95.0	94.3	92.7	80.9	94.2	96.9	61.9
	Jun 15th	91.6	91.9	85.1	92.4	91.1	95.5	80.5	89.1	95.1	59.0
	Jul 19th	89.6	91.2	80.5	89.6	87.2	91.8	78.4	88.8	93.2	57.2
	Aug 15th	87.7	89.4	75.4	88.0	84.5	90.6	76.0	86.1	91.8	54.9
	Sep 15th	85.7	86.5	70.0	85.4	81.5	85.1	74.8	82.9	89.7	52.5
	Oct 16th	83.7	79.0	64.9	83.8	79.3	82.9	72.9	81.3	88.2	49.7
	Nov 15th	80.7	73.9	58.4	80.8	76.8	80.2	72.1	77.5	86.1	46.4
	Dec 11th	79.4	72.3	55.8	85.1	74.8	80.0	67.8	74.8	84.9	44.1

NB. (-) Dashes show no data
Source: Water Utilities Corporation

1.1.1. Dry and wet season dam levels percentage change

Botswana's wet season is from October to March, while the dry season is from April to September. The main recharge in dams is inflow from streams and rivers that are seasonal. Figure 1.1 below shows the wet and dry seasonal changes in the dam levels for 2015/16 and the 2016/17 meteorological years. Bokaa, Gaborone and Molatedi dams are relatively small capacity dams that serve high populations, and therefore tend to have the highest fluctuations in their levels.

Figure 1.1: Percentage change in dam levels by wet and dry season



Bokaa dam gained and remained with the highest change in levels during the 2015-16 wet season, followed by Nnywane and Lotsane dams. During the 2016 dry season, Nnywane dam had the highest percentage loss in its level, followed by Bokaa dam.

During the 2016-17 wet season Gaborone dam had the highest gains, followed by South Africa's Molatedi dam. During the 2017 dry season Bokaa dam had the highest percentage loss in its level.

1.2. Water production

Water Utilities Corporation (WUC) is responsible for water production in Botswana. There are sixteen (16) management centres throughout the country through which WUC provides portable water. The management centres treat and provide water sourced from both surface and groundwater. The WUC management centres in the country are shown in **Table 1.3**.

Table 1.3: List of water management centres (MCs)

Region		Management Centre
Southern region	1	Gaborone
	2	Molepolole
	3	Lobatse
	4	Mochudi
	5	Kanye
	6	Tsabong
	7	Ghanzi
Northern region	8	Selibe Phikwe
	9	Palapye
	10	Serowe
	11	Lethakane
	12	Mahalapye
	13	Kasane
	14	Masunga
	15	Francistown
	16	Maun

1.2.1. Water Production by settlements

Table 1.4 below shows monthly water production for selected settlements for the year 2016/17. The more populated capital and second city, Gaborone and Francistown had the highest water production to supply the populations and industries.

Table 1.4: Monthly water production for selected settlements (Kilolitres)

	Gaborone	F/town	Mogoditshane	Phikwe	Lobatse	Serowe	Molepolole	Kanye	Tlokweneng	Palapye	Jwaneng
16-Apr	1,518,303.0	1,033,007.0	420,805.0	464,141.0	321,351.0	266,195.0	294,633.0	254,222.0	197,884.0	160,500.0	127,399.0
16-May	1,411,431.0	1,045,125.0	503,509.0	491,794.0	315,604.0	321,563.0	276,772.0	274,819.0	198,858.0	159,600.0	226,985.0
16-Jun	1,359,515.0	962,998.0	480,715.0	430,688.0	275,074.0	273,288.0	203,208.0	217,360.0	188,957.0	174,021.0	180,095.0
16-Jul	1,607,871.0	968,544.0	513,869.0	458,872.0	301,536.0	264,764.0	276,693.0	240,412.0	195,332.0	168,288.0	178,970.0
16-Aug	1,490,763.0	944,161.0	534,852.0	464,322.0	318,007.0	387,424.0	275,536.0	239,398.0	203,432.0	212,683.0	182,052.0
16-Sep	1,575,921.0	949,061.0	517,203.0	483,940.0	282,235.0	248,348.0	239,180.0	231,186.0	208,005.0	179,500.0	181,286.0
16-Oct	1,542,274.0	980,265.0	447,228.0	456,872.0	336,693.0	258,791.0	227,246.0	233,813.0	208,182.0	179,966.0	176,802.0
16-Nov	1,437,783.0	982,879.0	352,157.0	420,736.0	330,553.0	241,611.0	150,857.0	172,072.0	195,360.0	226,976.0	221,735.0
16-Dec	1,542,828.0	999,575.0	395,357.0	345,270.0	301,901.0	238,558.0	144,681.0	185,311.0	201,309.0	131,784.0	153,097.0
17-Jan	1,367,563.0	974,290.0	401,980.0	347,232.0	271,436.0	280,414.0	342,791.0	170,264.0	207,740.0	169,084.0	157,607.0
17-Feb	1,337,323.0	909,475.0	366,660.0	310,967.0	328,506.0	232,178.0	342,635.0	140,233.0	192,030.0	195,812.0	164,384.0
17-Mar	1,604,155.0	1,039,633.0	443,443.0	349,343.0	294,069.0	307,985.0	344,300.0	264,963.0	227,750.0	210,846.0	160,387.0
Total	17,795,729.0	11,789,013.0	5,377,778.00	5,024,177.0	3,676,965.0	3,321,119.0	3,118,532.0	2,624,053.0	2,424,839.0	2,169,060.0	2,110,799.0

NB. (-) Dashes show no data

Source: Water Utilities Corporation

Figure 1.2: Average monthly water production for selected settlements 2016/17 (Kilolitres)

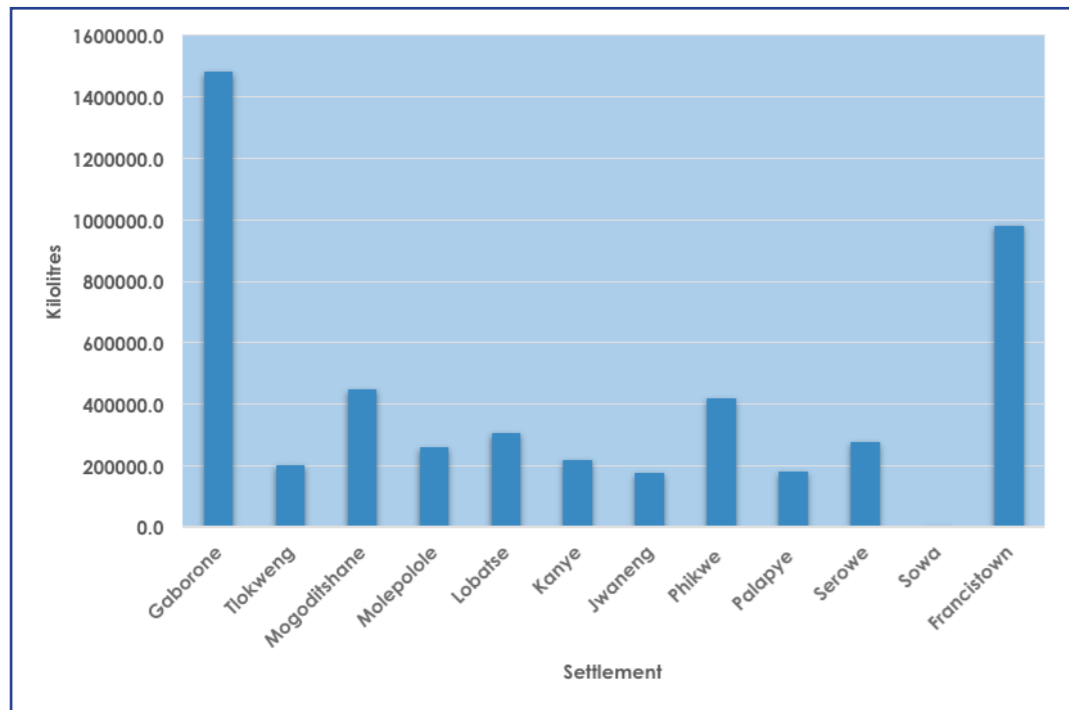


Figure 1.2 shows the average monthly water production for the selected settlements, for 2016/17. Gaborone and Francistown cities have the highest average water production.

Table 1.5 below compares the total annual water production for the urban settlements for the years 2016/17 and 2014/15.

Table 1.5: Change in total annual water production for urban settlements 2014/15 to 2016/17

Settlement	Water Production in kilolitres		Change in kilolitres	Percentage change (%)
	2016/17	2014/15		
Gaborone	17,795,729.5	15,752,777.0	2,042,952.5	13%
Francistown	11,789,013.0	11,140,935.0	648,078.0	6%
Jwaneng	2,110,799.0	2,194,692.0	-83,893.0	-4%
Selibe Phikwe	5,024,177.0	5,748,870.0	-724,693.0	-13%
Lobatse	3,676,965.0	4,453,725.0	-776,760.0	-17%

In comparing the two years 2014/15 and 2016/17, indications are that water production increased for Gaborone and Francistown, the capital and second cities, while Jwaneng, Sowa, Selibe Phikwe and Lobatse all had lower water production. The increase in water production for Gaborone may be recovery from water saving strategies implemented during the 2014/15 year of low dam levels at Gaborone dam.

Figure 1.3 shows the trends in monthly water production for the urban settlements.

Figure 1.3: Water production for selected settlements (2016/17 and 2014/15)



1.2.2. Water Production by management centers

Water Utilities Corporation's sixteen (16) Managements Centers (MCs) are designated as northern MCs and southern MCs. There are seven (7) MCs in the south and nine (9) MCs in the north. Botswana's population is concentrated along the south-eastern parts of the country while most of its surface water resources are located in the northern areas of the country.

Table 1.6: Southern water production by Management Centres 2016/17

		Gaborone	Molepolole	Lobatse	Mochudi	Kanye	Tsabong	Gantsi
2016/17	Apr	2,299,433.7	520,306.0	720,494.0	314,725.8	496,037.0	136,285.0	114,738.0
	May	2,245,715.4	489,953.0	717,334.0	321,217.7	640,545.0	131,881.2	104,995.0
	Jun	2,163,218.7	416,980.0	666,548.9	297,721.9	515,767.0	125,910.6	111,469.0
	Jul	2,457,406.6	507,977.3	688,729.0	320,670.7	551,045.0	137,619.2	123,612.2
	Aug	2,384,505.8	492,102.1	761,548.0	318,097.1	551,154.0	128,158.0	101,270.0
	Sep	2,472,386.5	475,228.2	749,496.0	319,529.0	551,105.2	136,535.4	116,965.5
	Oct	2,388,465.9	448,148.0	629,051.0	331,758.1	522,325.1	135,797.8	123,757.0
	Nov	2,152,616.4	353,924.4	710,223.7	330,588.6	516,396.9	145,925.2	130,441.0
	Dec	2,304,825.0	369,575.9	756,941.0	356,417.0	461,747.8	124,728.6	111,948.0
	Jan	2,136,847.0	476,780.0	699,984.0	356,723.0	433,109.4	129,607.8	114,011.0
	Feb	2,045,834.0	473,344.0	729,143.0	375,012.0	411,536.8	150,270.2	106,787.0
	Mar	2,446,067.0	478,246.0	691,670.0	324,889.0	547,968.8	164,748.6	121,474.0
	Total		27,497,322.1	5,502,564.9	8,521,162.6	3,967,349.8	6,198,738.0	1,647,467.6

NB. (-) Dashes show no data
Source: Water Utilities Corporation

Table 1.7: Northern water production by Management Centres 2016/17

		Selibe Phikwe	Palapye	Serowe	Letlhakane	Mahalapye	Kasane	Masunga	Francistown	Maun
2016/17	Apr	683,795.0	235,409.3	304,610.0	149,232.0	398,438.0	142,767.0	304,832.9	1,307,478.0	288,493.0
	May	699,985.0	241,349.0	361,791.0	129,997.0	414,104.0	103,762.0	317,286.6	1,359,242.0	319,449.0
	Jun	650,906.0	251,808.0	309,281.0	117,595.0	388,474.0	97,236.0	257,932.5	1,237,555.0	262,793.0
	Jul	727,734.0	342,802.0	298,277.0	148,366.0	416,038.0	108,455.0	231,132.8	1,280,024.0	294,309.0
	Aug	704,533.0	330,112.0	439,625.0	145,635.3	384,733.0	108,786.0	318,690.7	1,323,458.0	314,312.0
	Sep	694,180.0	267,564.0	281,389.0	134,153.0	425,018.0	127,638.0	272,271.3	1,433,864.0	370,201.7
	Oct	674,214.0	264,576.0	295,990.0	137,518.0	410,621.0	117,796.0	299,633.9	1,309,442.0	358,763.3
	Nov	636,556.0	426,844.0	277,144.0	130,291.0	409,145.0	161,947.0	295,331.4	1,267,789.0	355,859.0
	Dec	565,517.0	386,385.0	272,308.0	136,520.0	381,594.0	98,756.0	361,728.5	1,276,823.0	342,403.0
	Jan	574,255.0	316,492.0	314,947.0	129,701.0	363,598.0	126,511.0	311,701.3	1,226,768.0	342,643.0
	Feb	506,728.0	318,890.0	267,952.3	116,751.0	359,834.8	138,414.0	302,369.9	1,127,968.0	301,563.0
	Mar	542,444.0	368,235.0	343,042.7	125,184.0	362,880.2	135,836.0	256,077.6	1,279,638.0	349,327.0
	Total		7,660,847.0	3,750,466.3	3,766,357.0	1,600,943.3	4,714,478.1	1,467,904.0	3,528,989.4	15,430,049.0

NB. (-) Dashes show no data
Source: Water Utilities Corporation

Tables 1.6 and 1.7 show the monthly water production trends for the southern and the northern management centres. Water demand is higher for the southern MCs than the northern MCs. Gaborone MC has the highest water demand, followed by Francistown MC. This is mostly due to concentrations of population and economic activity in the two cities..

Table 1.8 shows total water production for MCs for the two years 2015/16 and 2016/17. Gaborone and Francistown MCs have the highest water production for both years. Southern MCs recorded an increase in water production from 2015/16 to 2016/17, while the northern MCs recorded a decrease in their water production. The greatest fall in water production for a single MC was recorded for Selibe Phikwe MC in the northern MCs. The fall may be explained by the BCL mine closure and the impact of water saving measures that were introduced in Selibe Phikwe and Masunga from 2014/15. The increase in Gaborone MC's water production may be due to improvements in water supply after the recovery of water levels at Gaborone dam. Overall water production for the whole country recorded a reduction between 2015/16 and 2016/17.

Table 1.8: Total production 2015/16 - 2016/17 (Kilolitres)

Southern MCs	Total 2015/16	Total 2016/17
Gaborone	24,435,785.0	27,497,322.1
Lobatse	6,891,735.0	8,521,162.6
Kanye	6,492,403.6	6,198,738.0
Molepolole	6,037,715.4	5,502,564.9
Mochudi	3,570,378.5	3,967,349.8
Tsabong	1,496,076.8	1,647,467.6
Ghantsi	1,411,126.0	1,381,467.7
Total	50,335,220.3	54,716,072.7
Northern MCs		
Francistown	15,889,994.0	15,430,049.0
Selibe Phikwe	11,119,405.0	7,660,847.0
Mahalapye	5,100,037.7	4,714,478.1
Maun	4,280,335.0	3,900,116.0
Serowe	4,262,267.0	3,766,357.0
Palapye	3,527,980.0	3,750,466.3
Masunga	4,600,709.3	3,528,989.4
Letlhakane	1,884,045.3	1,600,943.3
Kasane	1,554,640.0	1,467,904.0
Total	52,219,413.3	45,820,150.1

NB. (-) Dashes show no data
Source: Water Utilities Corporation

Table 1.11: Total billed water consumption 2015/16 and 2016/17 (kilolitres)

Southern MCs	2015/16	2016/17
Gaborone	20,792,005.0	23,980,590.0
Kanye	3,834,742.0	3,555,939.0
Lobatse	3,747,109.0	3,547,346.0
Molepolole	3,654,304.0	3,258,863.0
Mochudi	2,320,610.0	2,488,821.0
Ghanzi	1,074,239.0	1,068,637.0
Tsabong	958,380.0	904,723.0
Southern MCs Total	36,381,389.0	38,804,919.0
Northern MCs	2015-16	2016-17
Francistown	10,800,676	10,148,833
Selibe Phikwe	8,560,012	6,386,006
Serowe	2,306,358	3,308,364
Palapye	2,967,836	3,155,979
Masunga	2,788,723	2,726,562
Mahalapye	2,411,964	2,535,658
Maun	-	2,039,668
Letlhakane	1,216,807	1,464,876
Kasane	1,163,494	1,263,158
Northern MCs Total	32,215,870	33,029,104

NB. (-) Dashes show no data
Source: Water Utilities Corporation

Table 1.11 above compares the 2015/16 and 2016/17 total billed water for the management centres. An increase in total billed water consumption was recorded for the southern MCs of Gaborone and Mochudi. An increase was also recorded in the northern MCs of Palapye, Serowe, Mahalapye, Kasane and Letlhakane. A decrease in total billed water consumption was recorded for the southern MCs' Molepolole, Lobatse, Kanye, Tsabong and Ghanzi and the northern MCs' Francistown, Selibe Phikwe and Masunga.

Total billed water consumption was higher in 2016/17 than in 2015/16 for both the southern and the northern MCs.

1.4. Non-Revenue water

Table 1.12 below shows non-revenue water for 2016/17 by MCs. Non-revenue water includes water losses during distribution and any other water that was not accounted for through billing.

Lobatse recorded the highest non-revenue water for the southern MCs, while Maun recorded the highest for the northern MCs.

Table 1.12: Non revenue water (NRW) 2016/17

	MCs	NRW (%)
Southern MCs	Gaborone	13%
	Mochudi	37%
	Molepolole	41%
	Lobatse	58%
	Kanye	43%
	Tsabong	45%
	Ghanzi	23%
Northern MCs	Francistown	34%
	Selebi-Phikwe	17%
	Palapye	16%
	Serowe	12%
	Mahalapye	46%
	Kasane	14%
	Masunga	23%
	Maun	48%
	Letlhakane	8%
TOTAL	29%	

NB. (-) Dashes show no data
Source: Water Utilities Corporation

1.5. Water to mines

WUC supplies some of the water used by Botswana's key industry, mining. Table 1.13 below shows the monthly supply of raw (untreated) water to the mines for the 2015/16 and the 2016/17 years. Available data only applies to the mines listed in the table, and is not available for the diamond mines.

Table 1.13: Raw water supply to mines 2015/16 and 2016/17 (kilolitres)

		Botash	Morupule Colliery Mine	BCL	Tati Nickel	Mupane
2015/16	April	36,002.0	43,180.0	315,810.0	159,880.0	50,810.0
	May	18,267.0	12,955.0	185,490.0	183,266.0	90,590.0
	June	27,135.0	6,842.0	219,490.0	169,354.0	84,360.0
	July	23,893.0	49,256.0	167,040.0	207,108.0	91,350.0
	August	8,700.0	46,665.0	153,780.0	135,150.0	85,410.0
	September	12,897.0	19,693.0	158,330.0	128,890.0	74,380.0
	October	45,646.0	84,778.0	95,220.0	153,752.0	87,320.0
	November	35,113.0	27,308.0	66,950.0	134,660.0	94,930.0
	December	35,512.0	45,350.0	314,180.0	150,560.0	99,310.0
	January	27,529.0	72,734.0	225,300.0	47,270.0	86,850.0
	February	32,324.0	37,424.0	219,000.0	48,824.0	86,610.0
	March	25,586.0	3,523.0	209,060.0	48,286.0	64,890.0
		Total	328,604.0	449,708.0	2,329,650.0	1,567,000.0
2016/17	April	35,380.0	13,893.0	15,492.0	30,761.0	99,370.0
	May	26,216.0	18,899.0	20,170.0	55,907.0	109,560.0
	June	21,101.0	39,064.0	15,428.0	30,937.0	111,590.0
	July	28,648.0	17,060.0	15,922.0	61,800.0	109,580.0
	August	34,443.0	18,869.0	10,243.0	127,897.0	106,170.0
	September	25,840.0	1,707.0	11,451.0	234,113.0	106,890.0
	October	32,034.0	1,224.0	7,757.0	68,267.0	108,500.0
	November	23,531.0	127,937.0	6,366.0	33,250.0	109,260.0
	December	36,622.0	176,054.0	6,695.0	25,038.0	103,030.0
	January	25,959.0	47,830.0	6,651.0	17,088.0	86,560.0
	February	31,290.0	51,504.0	1,176.0	11,153.0	76,270.0
	March	11,917.0	85,643.0	163.0	9,775.0	81,380.0
		Total	332,981.0	599,684.0	117,514.0	705,986.0

NB. (-) Dashes show no data
Source: Water Utilities Corporation

The copper nickel mines BCL and Tati Nickel were the highest recipients of WUC raw water, they saw a decrease in the water received from WUC in the year 2016/17. This is accounted for by the closure of the mines in October 2016.

Figure 1.4: WUC potable water to mines

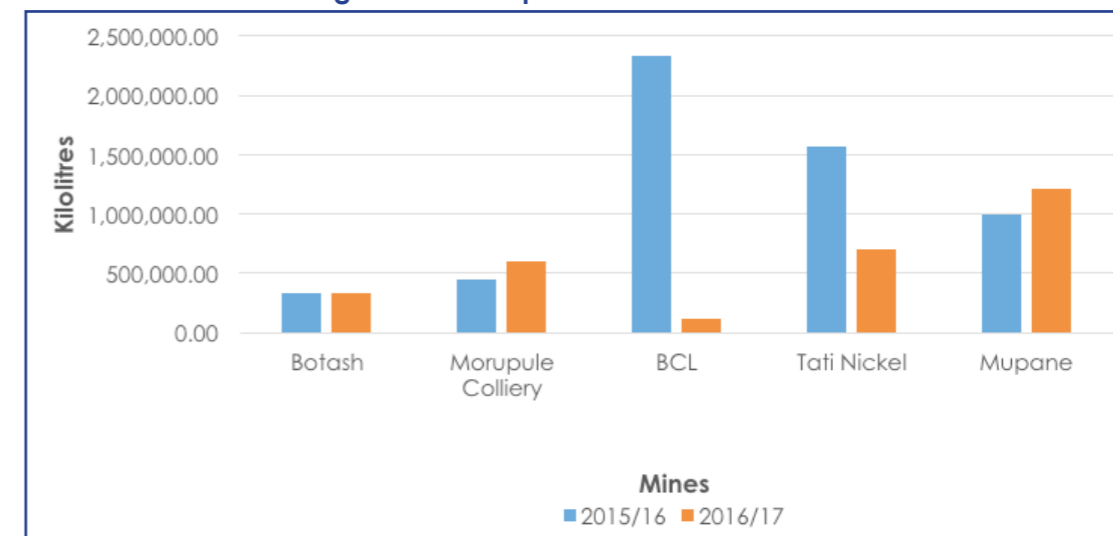


Figure 1.4 shows the potable water supplied to the mines by WUC for the years 2015/16 and 2016/17. Morupule Colliery and Mupane mines recorded increases in the water supplied to them by WUC in 2016/17; Botash also showed a marginal increase.

2. CLIMATE

2.1. Rainfall

Rainfall is measured by the Department of Meteorological Services (DMS) at various rainfall stations and seventeen (17) synoptic stations around the country. The synoptic stations are those manned by meteorologists, while rainfall stations are monitored by other members of the society such as police and schools.

The synoptic stations used are listed in **Table 2.1** while the rainfall stations used are listed in **Table 2.2**. Only those stations with some data available have been used in this Digest.

Table 2.1: List of synoptic stations used

1	Ghanzi
2	Mahalapye
3	Tsabong
4	Francistown
5	Maun
6	Sir Seretse Khama Airport
7	Tshane
8	Shakawe
9	Selibe Phikwe
10	Leflhakane
11	Good Hope
12	Sua Pan
13	Jwaneng
14	Werda
15	Pandamatenga
16	Kasane
17	Lephephe

Table 2.2: List of rainfall stations used

1	Francistown Airport
2	Gaborone Met H/Q
3	Ghanzi Airport
4	Kanye Seepapitso SSS
5	Lobatse Police Station
6	Mahalapye Met. Station
7	Maun Airport
8	Mochudi Police Station
9	Molepolole Police Station
10	Palapye Police Station
11	Serowe Police Station
12	Shakawe Met. Station
13	Tsabong Airport
14	Tshane Met. Station
15	Kasane Airport
16	Good Hope
17	Moshupa Police Station
18	Sowa Town
19	Lephephe
20	Lerala
21	Rakops
22	Oliphant's Drift
23	Jwaneng Met. Station
24	Selebi Phikwe Met. Station
25	Werda Met. Station
26	Leflhakane Met. station
27	Pandamatenga

2.1.1. Monthly total rainfall

The meteorological year starts in July and ends in June of the subsequent year. The rain season covers the period beginning in October and ending in March (Statistics Botswana: 2005). This report looks at the monthly total rainfall for the two meteorological years 2015/16 and 2016/17.

Tables 2.3 and **2.4** show the monthly total rainfall for selected rainfall stations for the two meteorological years 2015/16 and 2016/17. The monthly rainfall trends follow the usual seasonal variations of Botswana's rainfall.

Table 2.3: Monthly total rainfall 2015/16 and 2016/17 (Millimetres)

		Francistown Airport	Gaborone Met H/Q	Sir Seretse Khama Airport	Ganisi Airport	Goodhope	Lobatse Police Station	Mahalapye Met. Station	Maun Airport	Mochudi Police Station	Molepolole Police Station	Palapye Police Station
2015/16	Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Aug	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Sep	40.5	31.5	21.6	0.0	25.9	23.7	22.6	0.0	0.0	0.0	0.0
	Oct	0.0	5.8	1.3	0.0	1.5	0.0	0.0	4.1	5.5	0.0	0.0
	Nov	48.7	70.4	39.6	0.0	27.0	58.9	30.0	8.8	32.5	0.0	0.0
	Dec	8.4	11.2	6.4	37.7	15.4	8.4	41.0	10.1	0.0	0.0	0.0
	Jan	0.0	42.1	30.4	51.6	34.3	53.5	76.5	77.2	29.8	86.5	36.0
	Feb	0.0	18.1	43.7	16.8	0.0	35.0	201.0	60.6	18.0	8.5	210.1
	Mar	0.0	165.1	164.8	30.2	104.5	108.4	23.5	131.7	58.8	0.0	42.4
	Apr	0.0	13.0	32.3	18.0	7.8	20.0	8.9	26.1	16.0	0.0	3.0
	May	0.0	11.0	6.9	0.0	0.0	14.0	2.2	0.0	0.0	0.0	0.0
	Jun	0.0	25.6	19.6	0.0	4.1	19.3	10.5	0.0	15.0	35.5	0.0
	Total	97.6	393.8	366.6	154.3	220.5	341.2	416.2	318.6	175.6	130.5	291.5
2016/17	Jul	0.0	0.0	0.0	0.0	1.5	17.5	0.0	0.0	0.0	0.0	0.0
	Aug	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Sep	0.0	0.0	0.0	0.0	0.0	0.0	5.8	0.0	0.0	0.0	0.0
	Oct	0.8	74.1	28.5	0.0	50.7	17.6	9.3	0.0	25.0	14.0	0.0
	Nov	13.2	51.6	125.6	16.2	116.9	6.0	39.9	18.0	23.0	8.5	80.0
	Dec	54.6	13.1	44.6	8.8	88.2	34.0	66.3	38.5	75.5	0.0	14.0
	Jan	0.0	0.0	96.8	148.7	86.2	0.0	0.0	0.0	132.0	20.0	72.0
	Feb	0.0	0.0	42.0	78.6	164.1	0.0	0.0	0.0	78.0	27.0	0.0
	Mar	26.4	6.0	8.9	22.2	31.2	35.0	22.4	33.4	5.5	0.0	37.0
	Apr	12.1	24.8	34.6	68.5	51.3	24.0	12.5	44.4	34.0	0.0	14.0
	May	0.0	0.0	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total	107.1	169.6	382.2	343.0	590.1	134.1	156.2	134.3	373.0	69.5	217.0

NB. (-) Dashes show no data

Source: Department of Meteorological Services

Table 2.4: Monthly total rainfall 2015/16 and 2016/17 (Millimetres)

		Serowe Police Station	Shakawe Met. Station	Tsabong Airport	Tshane Met. Station	Kasane Airport	Moshupa Police Station	Sowa Town	Lephephe	Lerala	Panda matenga	Rakops	Oliphant's drift	Tutume
2015/16	Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Aug	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Sep	0.0	0.0	26.3	1.3	0.0	0.0	12.0	17.3	0.0	0.0	12.0	0.0	0.0
	Oct	0.0	0.0	4.2	32.0	0.0	0.0	0.0	3.7	25.6	8.0	2.5	0.0	0.0
	Nov	0.0	8.0	0.0	0.0	0.0	15.0	28.4	9.3	49.1	28.5	2.7	23.0	53.4
	Dec	6.0	1.7	0.0	5.4	0.0	0.0	4.0	16.2	0.0	36.6	4.5	0.0	24.3
	Jan	41.0	30.1	15.7	53.4	79.1	22.3	0.0	23.6	34.0	61.7	74.0	-	0.0
	Feb	33.0	0.0	21.0	2.8	164.0	22.0	52.8	144.6	79.3	182.8	5.0	59.0	0.0
	Mar	7.0	0.0	27.5	107.9	214.1	43.7	204.8	74.6	60.6	82.9	36.1	54.0	0.0
	Apr	0.0	0.0	112.1	9.8	20.4	75.7	12.2	11.3	4.2	2.3	26.8	0.0	0.0
May	0.0	0.0	8.6	9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Jun	11.0	0.0	0.0	0.0	0.0	0.0	0.0	16.0	0.0	0.0	0.0	0.0	0.0	
	Total	98.0	39.8	215.4	221.6	477.6	178.7	314.2	316.6	252.8	402.8	163.6	136.0	77.7
2016/17	Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Aug	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Sep	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.7
	Oct	2.0	0.0	1.3	0.0	2.8	77.0	1.7	15.3	0.0	0.6	0.0	14.0	14.1
	Nov	36.2	29.3	1.7	54.0	44.0	24.2	74.5	64.0	97.4	0.0	21.7	4.0	14.1
	Dec	15.0	39.1	12.1	8.8	167.7	0.0	200.5	15.1	120.6	30.6	115.2	1.3	271.5
	Jan	0.0	13.9	93.5	97.8	0.0	0.0	37.3	0.0	68.1	0.0	255.4	56.7	33.2
	Feb	0.0	0.0	67.8	115.1	0.0	0.0	0.0	0.0	61.5	0.0	74.8	0.0	55.3
	Mar	11.0	71.9	43.5	5.8	104.2	71.1	38.0	0.2	20.3	47.1	7.2	0.0	15.3
	Apr	26.9	0.0	44.1	46.3	23.3	10.5	67.0	0.0	0.0	5.3	24.0	0.0	63.5
May	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	Total	94.6	154.2	264.9	327.8	342.0	182.8	419.0	94.6	367.9	83.6	498.3	76.0	474.7

NB. (-) Dashes show no data
Source: Department of Meteorological Services

2.1.2. Total annual rainfall

Table 2.5 shows the analysis of total annual rainfall for the meteorological years 2015/16 and 2016/17.

Table 2.5: Total annual rainfall by location 2015/16 and 2016/17

	2015/16	2016/17
Goodhope	220.5	590.1
Rakops	163.6	498.3
Tutume	77.7	474.7
Sowa Town	314.2	419.0
Sir Seretse Khama Airport	366.6	382.2
Mochudi Police Station	175.6	373.0
Lerala	252.8	367.9
Gantsi Airport	154.3	343.0
Kasane Airport	477.6	342.0
Tshane Met. Station	221.6	327.8
Tsabong Airport	215.4	264.9
Palapye Police Station	291.5	217.0
Moshupa Police Station	178.7	182.8
Gaborone Met H/Q	393.8	169.6
Mahalapye Met. Station	416.2	156.2
Shakawe Met. Station	39.8	154.2
Maun Airport	318.6	134.3
Lobatse Police Station	341.2	134.1
Francistown Airport	97.6	107.1
Serowe Police Station	98.0	94.6
Lephephe	316.6	94.6
Pandamatenga	402.8	83.6
Oliphant's drift	136.0	76.0
Molepolole Police Station	130.5	69.5
Francistown Met. Station	0.0	0.6

Source: Department of Meteorological Services

The highest total annual rainfall recorded in 2015/16 was at Kasane with a total of 477.6 mm, most of which fell during the month of March. This was followed by Mahalapye at 416.2 mm, most of which fell in the month of February, and then by Pandamatenga at 402.8 mm which mostly fell in February.

For the year 2016/17, the station that recorded the highest total annual rainfall was Goodhope at 590.1 mm, most of which fell during the month of February. This was followed by Rakops at 498.3 mm, most of which fell during the month of January. This was followed in turn by Tutume at 474.7 mm which mostly fell during the month of December.

The meteorological year 2016/17 was wetter than 2015/16

2.2. Temperature

Data for temperature trends monitoring is available from seventeen (17) stations across the country. This report analyses the temperatures recorded during the 2016/17 meteorological year.

Table 2.6 shows the stations' mean monthly minimum temperatures for the meteorological year 2016/17.

Table 2.6: Mean monthly minimum temperatures 2016/17

	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Ghanzi	4.5	8.0	13.5	18.2	20.2	20.2	18.8	19.2	16.2	15.0	8.2	8.2
Shakawe	4.5	7.8	12.8	17.9	19.8	20.2	20.1	23.9	17.7	15.5	9.9	8.2
Kasane	7.8	11.1	14.2	18.6	20.8	19.0	19.0	18.8	16.9	15.1	12.6	10.0
Maun	8.2	-	16.9	22.0	22.3	21.2	20.5	20.5	18.3	15.6	11.7	10.1
Francistown	4.3	4.9	13.1	17.1	19.3	19.7	18.8	18.5	14.8	19.8	5.2	4.1
Mahalapye	5.5	8.3	15.5	19.0	19.0	20.4	19.3	19.4	16.6	14.2	9.6	7.1
Tshane	3.2	7.7	12.8	16.4	19.7	20.4	19.1	19.4	16.3	13.9	7.8	7.4
Jwaneng	3.7	7.6	13.2	16.6	18.9	19.9	19.0	18.8	14.9	12.8	6.7	5.6
SSKA	4.1	6.8	14.0	18.2	19.8	20.9	19.7	19.6	16.0	15.6	7.3	5.1
Sua pan	8.0	9.7	17.1	20.7	20.7	20.5	20.3	19.9	17.1	14.1	10.1	9.4
Tsabong	2.1	5.8	11.0	13.9	19.2	21.0	19.6	20.2	16.0	13.5	6.4	4.0
Werda	1.3	5.8	10.9	14.2	19.4	20.4	19.0	19.4	14.4	13.0	5.7	4.3
Pandamatenga	9.0	11.6	16.2	20.7	20.9	19.7	19.4	19.3	17.2	14.7	12.1	10.3
Selibe Phikwe	6.3	8.1	14.2	17.4	19.9	23.8	19.7	19.5	16.3	14.4	9.0	6.8
Lethakane	7.0	12.0	16.3	19.4	20.8	21.5	21.0	21.5	17.3	14.4	10.1	9.3
Lephepe	4.1	6.3	13.8	18.3	19.7	20.8	19.4	19.1	15.2	12.5	7.3	5.0
Goodhope	5.1	8.6	13.6	16.7	18.1	19.4	18.6	18.2	15.5	13.2	8.1	6.8

Nb. (-) Dashes show no data

Source: Department of Meteorological Services

The lowest mean monthly minimum temperature recorded during the period under review was 1.3°C for Werda in July 2016. The highest mean monthly minimum temperature for the same period was 23.9°C for Shakawe in February 2017.

Table 2.7 shows the stations' mean monthly maximum temperatures for the year 2016/17.

Table 2.7: Mean monthly maximum temperatures 2016/17

	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Ghanzi	24.3	28.1	32.9	36.5	35.0	33.6	28.3	28.7	29.6	29.9	26.0	25.7
Shakawe	26.6	30.2	35.1	38.5	36.0	31.7	28.3	29.9	29.1	30.9	27.7	26.8
Kasane	26.3	29.6	34.1	37.3	35.0	30.2	27.6	29.8	28.6	30.0	27.5	26.0
Maun	25.6	-	33.6	37.6	35.3	31.7	28.5	29.2	29.6	28.2	27.1	26.2
Francistown	24.2	27.1	32.4	35.0	33.7	31.2	28.3	27.9	27.7	27.7	26.3	25.1
Mahalapye	22.6	26.3	30.7	33.3	31.8	31.3	29.4	28.0	29.1	20.4	25.8	24.3
Tshane	22.2	26.8	31.0	34.9	34.8	34.3	30.1	29.1	31.5	20.3	25.8	25.2
Jwaneng	21.9	26.0	30.3	33.4	33.1	32.1	28.8	27.7	30.0	26.5	24.7	24.1
SSKA	22.2	26.2	30.9	33.5	32.7	32.1	30.2	28.1	29.5	28.9	25.3	23.6
Sua pan	25.6	29.5	34.2	37.3	35.2	32.4	29.8	29.5	29.5	20.7	27.3	26.3
Tsabong	21.3	26.6	30.2	35.1	36.1	36.3	31.2	30.5	32.4	21.0	27.5	27.2
Werda	22.1	27.0	31.2	34.8	35.8	34.9	30.6	29.5	32.2	28.2	26.2	25.0
Pandamatenga	25.4	28.6	33.1	36.4	33.7	31.1	27.4	29.0	28.5	20.8	27.8	26.0
Selibe Phikwe	23.6	27.0	31.6	33.8	33.2	31.3	29.1	28.0	28.2	34.6	26.1	24.9
Lethakane	25.1	28.3	33.1	36.1	34.7	31.9	28.8	28.4	29.0	27.5	26.8	25.8
Lephepe	23.3	26.8	31.9	34.4	32.6	32.2	29.3	27.7	29.7	19.7	26.1	24.9
Goodhope	19.8	24.2	28.6	31.3	30.9	31.1	28.0	26.4	28.4	18.5	23.3	21.9

Nb. (-) Dashes show no data

Source: Department of Meteorological Services

The highest mean monthly maximum temperature of the period under review was 38.5°C for Shakawe in October 2016, while the lowest was 18.5 °C for Goodhope in April 2017.

2.2.1. Daily Temperature extremes

Table 2.8: shows the temperature extremes that were reached during the meteorological year 2016/17.

Table 2.8: Daily Temperature extremes during the meteorological year 2016/17.

Criterion	Recording	Station	Date
Lowest	-7.98°C	Werda	26 th July 2016
Highest	44.2°C	Tsabong	29 th October 2016

From the data available, the lowest temperature recorded during the 2016/17 meteorological year was -7.98°C for Werda, on the 26th of July 2016. The highest temperature recorded was 44.2°C for Tsabong on the 29th of October 2016.

2.3. Wind speed and direction

The Department of Meteorological Services (DMS) monitors wind speed and direction at its meteorological stations and provides the data herein. Wind speed is measured in meters 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.

Wind speed and direction data for ten (10) locations and covering the 2016/17 meteorological year was analysed. The locations are Ghanzi, Shakawe, Mahalapye, Tshane, Sua Pan, Tsabong, Werda, Pandamatenga, Lephephe and Goodhope.

2.3.1. Wind speed Monthly Averages

Table 2.9 shows the monthly average wind speeds by location. The highest monthly average wind speed recorded was for Goodhope at 3.9 m/s, for September 2016, while the lowest was 1.1 m/s for December 2016, for Shakawe.

Table 2.9: Monthly average wind speeds 2016/17

	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Ghanzi	2.0	2.5	2.6	2.2	2.3	2.2	2.0	1.9	2.1	1.9	1.7	1.9
Shakawe	1.5	1.7	1.5	1.4	-	1.1	1.5	1.3	1.6	1.5	1.3	1.3
Mahalapye	1.9	2.2	2.9	-	2.7	2.6	2.6	2.6	1.6	1.8	1.4	1.6
Tshane	1.9	2.4	2.5	2.1	2.1	1.9	1.9	1.8	1.7	1.6	1.8	1.8
Sua pan	1.9	2.2	2.2	2.5	2.2	-	2.0	1.9	2.1	1.8	1.4	1.8
Tsabong	1.8	2.4	2.3	2.1	-	2.5	2.2	2.5	1.6	1.7	1.6	1.7
Werda	1.8	2.5	2.3	2.0	2.3	1.9	1.8	2.0	1.7	1.6	1.6	1.7
Pandamatenga	2.1	2.2	2.4	2.7	2.1	1.5	1.7	1.9	1.9	-	1.7	1.9
Lephephe	1.8	2.4	2.8	2.8	2.8	2.5	2.6	2.3	1.8	1.6	-	1.4
Goodhope	2.3	3.0	3.9	3.3	3.6	3.0	2.8	2.9	2.0	2.0	1.9	2.7

Nb. (-) Dashes show no data

Source: Department of Meteorological Services

2.3.2. Wind speed Daily Averages

Table 2.10 shows the maximum daily average wind speeds recorded for each month, by location. Goodhope recorded the highest daily average wind speeds for ten (10) of the twelve (12) months

Table 2.10: Maximum recorded daily average wind speeds by month

Month	Max	Station
July	6.2	Mahalapye
August	7.8	Goodhope
September	8.6	Goodhope
October	6.3	Goodhope/ Lephephe
November	7.1	Goodhope
December	5.6	Goodhope
January	5.9	Goodhope
February	5.8	Goodhope
March	4.2	Sua Pan
April	4.9	Goodhope
May	4.7	Goodhope
June	5.6	Goodhope

Nb. (-) Dashes show no data

Source: Department of Meteorological Services

2.3.3. Wind direction

The Department of Meteorological Services (DMS) monitors wind direction at its meteorological stations and provides the data herein. Wind direction is expressed in degrees, that is, the direction that the wind is blowing from.

Table 2.11 shows the predominant wind direction by number of days for the year 2016/17 for those stations with data. The winds predominantly blew from easterly directions.

Mahalapye recorded winds blowing from the northeast on 34 percent of the days recorded during the 2016/17 year, and Pandamatenga had winds from the east on 33 percent of the days recorded during the same period. Sua Pan had 31 percent of its daily predominant winds blowing from the east southeast while Lephephe recorded 28 percent of its winds predominantly from the east and Goodhope 27 percent of its daily wind direction predominantly from the northeast. Shakawe had 24 percent of its daily predominant winds from the southeast, Tsabong 23 percent from the northeast and Ghanzi 20 percent from the east southeast. Werda and Tshane recorded 18 and 17 percent respectively, both predominantly from the north northeast.

Table 2.11: Dominant wind direction by number of days and location 2016/17

	GHANZI	SHAKAWE	MAHALAPYE	TSHANE	SUA PAN	TSABONG	WERDA	PANDAMATENGA	LEPHEPE	GOODHOPE
N	10	40	27	36	8	15	32	10	15	28
NNE	15	13	46	59	13	55	65	12	13	89
NE	29	20	114	57	25	76	56	45	36	100
ENE	38	23	56	39	53	29	43	99	72	32
E	43	23	16	23	60	10	29	120	94	10
ESE	73	50	3	14	102	9	15	34	33	10
SE	63	87	0	11	33	9	9	9	5	5
SSE	20	69	1	24	10	15	16	15	4	10
S	18	19	2	22	5	10	16	6	9	10
SSW	16	4	6	12	7	24	17	1	4	7
SW	13	2	5	10	2	30	14	0	3	4
WSW	8	0	2	8	4	16	4	1	4	7
W	6	3	9	8	1	7	7	0	10	8
WNW	2	1	14	10	2	9	12	2	12	13
NW	3	1	14	7	4	7	12	3	14	14
NNW	8	5	19	17	5	12	18	8	6	18
Total	365	360	334	357	334	333	365	365	334	365

Source: Department of Meteorological Services

Figure 2.1 shows the predominant daily wind direction by location, for the year 2016/17.

Figure 2.1: Dominant wind direction by location

