Botswana Environment Statistics Water Digest 2018



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PREFACE

This is Statistics Botswana's annual Botswana Environment Statistics: Water Digest. It is the first solely water statistics annual digest.

This Digest will provide data for use by decision-makers in water management and development and provide tools for the monitoring of trends in water statistics. The indicators in this report cover data on dam levels, water production, billed water consumption, non-revenue water, and water supplied to mines. It is envisaged that coverage of indicators will be expanded as more data becomes available.

International standards and guidelines were followed in the compilation of this report. The United Nations Framework for the Development of Environment Statistics (UNFDES) and the United Nations International Recommendations for Water Statistics were particularly useful guidelines.

The data collected herein 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 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 and the Department of Water Affairs for availing the water 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 Resource Centre (Head-Office, Gaborone).

Dr. Burton S. Mguni Statistician General July 2020

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DEFINITIONS

The following are terms and concepts as used in this report.

Billed consumption This water consumption based on the payments for water over a specific period of time. The water may not necessarily have been consumed during that period. It is used as a proxy for water consumed over the period of time because such water is currently not recorded and provided as data.

Dam levels The proportion of water in a dam, to its capacity, herein expressed as a percentage.

Dry season The dry period that extends from April to September in Botswana's meteorological year.

Management Centre (MC) The centre of water management for a group of settlements gazetted by the Water Utilities Corporation (WUC). A MC may fall amongst those that are Southern or those that are Northern.

Non-Revenue Water (NRW) Water that is not accounted for in revenue from water sales. This includes loss in transmission and water that is provided without payment for it, and is a proxy for water losses.

Percentage change The difference between the new value and the old value divided by the old value expressed as a percentage. (x100).

Potable water Treated water that is treated to safe drinking water standards.

Raw water Untreated water supplied as drawn from source.

Settlements Cities, towns and villages of all sizes are designated as settlements by the provider of the data.

Water production Treated water that is pumped into the system of water provision.

Wet season The wet or rainy period that extends from October to March in Botswana's meteorological year.

EXECUTIVE SUMMARY

This report covers the period 2016/17 to 2017/18 and provides statistics on dam levels, water production, billed water consumption, non-revenue water and water provided to mines by the Water Utilities Corporation (WUC).

Dam Levels

The highest gains in dam levels during the 2016/17 wet season were recorded for Gaborone dam followed by Molatedi dam (RSA) and Letsibogo dam. The highest gains during the 2017/18 wet season were recorded for Shashe dam followed by Ntimbale dam and Letsibogo dam. Only Gaborone dam recorded a gain during the 2017 dry season. All the dams recorded overall losses in their levels during the 2018 dry season.

Water Production

Gaborone and Francistown cities have the highest water production in the year 2017/18. Water production increased for Palapye, Gaborone, Lobatse and Francistown and reduced for Selibe Phikwe, Jwaneng and Serowe between 2016/17 and 2017/18. Gaborone and Francistown Management Centres (MCs) had the highest water production for both 2016/17 and 2017/18. Overall water production for the whole country recorded an increase between 2016/17 and 2017/18.

Billed Water Consumption

Gaborone MC recorded the highest billed water consumption followed by Francistown MC and Selibe Phikwe MC for the 2016/17 and 2017/18 years. Gaborone MC and Palapye MC recorded increased billed water consumption between 2016/17 and 2017/18, while the rest of the MCs recorded reductions in their billed water consumption. There was a reduction in the national billed water consumption between 2016/17 and 2017/18.

Non-Revenue Water

For the year 2016/17 Lobatse MC recorded the highest non-revenue water followed by Maun MC and Mahalapye MC. For the year 2017/18 Lobatse MC recorded the highest non-revenue water followed by Mahalapye MC and Tsabong MC. All the MCs recorded increased Non-Revenue Water between 2016/17 and 2017/18.

Water Supplied To Mines

Mupane mine received the largest amount of raw water from Water Utilities Corporation for both 2016/17 and 2017/18. Morupule Colliery mine recorded an increase in the raw water it received between 2016/17 and 2017/18.

1. INTRODUCTION

This report covers the period 2016/17 to 2017/18 and provides statistics on dam levels, water production, billed water consumption, non-revenue water and water provided to mines by the Water Utilities Corporation (WUC).

1.1. Dam Levels

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

Table 1.1: Dam Capacifies	
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: Water Utilities Cooperation

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

Table 1.1 shows the dam capacities. 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.

The dam levels depend on 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.

Table 1.2 below shows the mid-month percentage dam levels for the years 2016, 2017 and 2018. Looking at annual averages, the year 2016 had the lowest dam levels while 2017 had the highest dam levels. Dam levels peaked in April in the year 2016, and in March for the year 2017 while they peaked in June in the year 2018.

Table 1.2: Percentage Dam Levels 2016 - 2018

Year	Date	Gaborone	Nnywane	Bokaa	Letsibogo	Shashe	Ntimbale	Thune	Lotsane	Dikgathong	Molatedi	Monthly Average
2016	Jan 18th	1.7	100.0	51.7	35.6	83.8	82.7	36.5	46.5	70.4	7.3	51.6
	Feb 15th	1.7	93.3	49.4	36.5	80.7	91.0	37.0	44.4	70.0	7.0	51.1
	Mar 17th	9.0	102.6	73.5	68.7	100.8	101.6	37.3	98.0	88.0	8.9	68.8
	Apr 20th	18.8	94.6	99.0	75.9	98.1	97.8	39.9	96.9	97.9	39.3	75.8
	May 19th	18.6	88.2	91.5	72.9	95.4	95.4	37.0	93.2	95.9	36.0	72.4
	Jun 6th	17.2	80.1	88.5	71.1	93.7	93.8	37.0	91.0	94.5	35.0	70.2
	Jul 21st	16.1	77.3	82.5	67.9	89.4	90.6	36.2	87.8	92.1	33.7	67.4
	Aug 8th	15.5	74.1	80.0	66.0	87.2	88.0	-	-	91.0	-	71.7
	Sep 12th	14.4	68.0	75.7	63.3	83.6	88.5	-	-	-	29.7	60.5
	Oct 10th	13.2	61.5	71.4	60.6	80.5	87.0	-	-	-	-	62.4
	Nov 18th	13.7	54.0	71.8	57.3	77.8	79.8	29.9	91.5	84.2	24.7	58.5
	Dec 8th	14.6	74.5	99.8	56.3	76.3	78.7	29.9	92.6	83.2	24.9	63.1
	Annual Average	12.9	80.7	77.9	61.0	87.3	89.6	35.6	82.4	86.7	24.7	64.4
2017	Jan 16th	22.2	100.0	100.0	67.9	100.8	100.9	47.2	100.9	101.8	30.4	77.2
	Feb 13th	35.8	100.0	100.8	100.0	100.0	103.6	72.4	100.9	104.0	37.6	85.5
	Mar 15th	99.6	99.7	100.0	100.0	100.4	100.2	87.4	100.8	101.8	65.9	95.6
	Apr 12th	97.0	91.9	95.8	97.2	97.7	99.0	85.4	96.4	99.3	64.4	92.4
	May 15th	94.7	91.9	90.8	95.0	94.3	92.7	80.9	94.2	96.9	61.9	89.3
	Jun 15th	91.6	91.9	85.1	92.4	91.1	95.5	80.5	89.1	95.1	59.0	87.1
	Jul 19th	89.6	91.2	80.5	89.6	87.2	91.8	78.4	88.8	93.2	57.2	84.8
	Aug 15th	87.7	89.4	75.4	88.0	84.5	90.6	76.0	86.1	91.8	54.9	82.4
	Sep 15th	85.7	86.5	70.0	85.4	81.5	85.1	74.8	82.9	89.7	52.5	79.4
	Oct 16th	83.7	79.0	64.9	83.8	79.3	82.9	72.9	81.3	88.2	49.7	76.6
	Nov 15th	80.7	/3.9	58.4	80.8	76.8	80.2	/2.1	77.5	86.1	46.4	/3.3
	Dec I Ifn	/9.4	/2.3	55.8	85.1	/4.8	80.0	6/.8	/4.8	84.9	44.1	/1.9
2019	Annual Average	74.0	67.0 47.3	51.4	00.0	72.4	77.4	/4./	67.5	94.4	30.5	49.2
2010	Feb 13th	75.8	81.0	67.5	81.2	70.2	82.6	63.7	67.4	80.4	39.4	70.6
	Mar 15th	74.0	80.4	64.3	96.9	99.8	99.9	70.4	72 1	100.4	38.2	79.7
	Apr 12th	81.5	100.4	87.7	96.3	100.0	100.0	69.9	71.7	100.0	39.8	84.8
	May 15th	79.5	97.5	84.8	93.5	97.5	97.1	67.7	62.4	98.8	39.8	81.9
	Jun 15th	91.6	91.9	85.1	92.4	91.1	95.5	80.5	89.1	95.1	59.0	87.1
	Jul 19th	75.3	90.5	74.1	86.3	91.5	91.2	65.1	62.0	94.0	37.1	76.7
	Aug 15th	73.5	87.7	70.5	86.2	88.7	89.1	63.5	61.3	92.6	34.3	74.7
	Sep 15th	70.8	83.1	65.9	84.8	85.5	85.8	61.9	57.8	90.6	31.5	71.8
	Oct 16th	68.5	78.7	59.9	81.7	82.5	83.5	59.7	55.2	88.5	28.7	68.7
	Nov 15th	65.8	73.7	55.1	78.4	79.5	79.9	57.5	49.3	85.6	26.0	65.1
	Dec 11th	62.8	68.4	49.7	74.4	77.2	78.2	56.5	49.1	84.6	22.5	62.3
	Annual Average	74.6	83.4	68.0	86.2	86.3	88.4	65.2	63.4	91.2	36.3	74.3

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

1.1.1. Dry And Wet Season Dam Levels Percentage Change

The dry season in Botswana is from April to September while the wet season is from October to March. The recharge for the dams is mainly from rivers and streams that are seasonal. **Figure 1.1** below shows the wet and dry seasonal changes in the dam levels for 2016/17 and the 2017/18 meteorological years.



Figure 1.1: Percentage Change In Dam Levels By Wet And Dry Season

The highest gain in dam levels during the 2016/17 wet season was recorded for Gaborone dam followed by Molatedi dam (supplying from South Africa) and Letsibogo dam. During the 2017 dry season only Gaborone dam registered a gain in its levels, while the rest registered losses. The highest loss during the 2017 dry season was registered for Bokaa dam, followed by Shashe dam and Ntimbale dam. The highest gain during the 2017/18 wet season was recorded for Shashe dam followed by Ntimbale dam and Letsibogo dam. Gaborone, Bokaa, Thune, Lotsane and Molatedi (RSA) dams recorded overall losses in their levels during the 2017/18 wet season. All the dams recorded overall losses in their levels during the dry season of 2018. The highest loss was recorded for Bokaa dam followed by Nnywane dam and Shashe dam.

1.2. Water Production

There are sixteen (16) Management Centres (MCs) throughout the country through which Water Utilities Corporation (WUC) provides potable 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**.

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	Letlhakane
	12	Mahalapye
	13	Kasane
	14	Masunga
	15	Francistown
	16	Maun

Table 1.3: List Of Water Management Centres (MCs)

1.2.1. Water Production By Management Centers

Water Utilities Corporation's 16 Managements Centres (MCs) are designated as northern MCs and southern MCs. Each MC serves a number of settlements. The MCs are named after one of the settlements they serve. There are seven (7) MCs in the south and nine (9) MCs in the north. (See appendix). 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 1.4: Southern Water Production By Management Centres 2017/18 (Kilolitres)

		Gaborone	Molepolole	Lobatse	Mochudi	Kanye	Tsabong	Ghanzi
2017/18	Apr	2,406,950.0	524,998.5	763,716.0	369,813.4	519,835.0	150,475.2	110,673.0
	May	2,507,869.3	516,116.7	777,482.0	364,951.7	514,627.0	159,953.4	118,097.0
	Jun	2,413,546.7	514,908.6	773,770.0	363,691.4	425,106.7	158,265.4	114,267.0
	Jul	2,485,982.0	543,966.8	788,978.7	351,186.0	544,179.5	115,115.6	127,034.0
	Aug	2,250,148.0	569,166.3	746,704.0	337,240.0	472,044.6	139,866.2	127,149.0
	Sep	2,651,381.0	571,047.3	723,959.0	349,642.0	511,055.7	133,727.0	119,229.0
	Oct	2,568,104.5	506,971.8	766,171.0	339,749.0	551,574.0	138,823.0	124,182.6
	Nov	2,524,864.0	541,487.8	753,963.0	388,523.0	573,927.0	136,202.0	129,149.0
	Dec	2,310,357.1	519,125.1	785,173.0	384,999.0	482,828.0	144,972.0	119,806.0
	Jan	3,164,008.9	508,777.0	817,175.0	404,127.0	512,243.0	145,228.0	130,078.0
	Feb	2,009,839.0	386,759.0	834,687.0	382,327.0	484,943.0	134,582.0	116,758.0
	Mar	2,329,830.0	619,932.0	814,379.0	357,489.0	473,437.0	131,303.0	123,091.0
	Total	29,622,880.5	6,323,256.7	9,346,157.7	4,393,738.5	6,065,800.5	1,688,512.8	1,459,513.6

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Table 1.5: Northern water production by Management Centres 2017/18 (Kilolitres)

		Selibe Phikwe	Palapye	Serowe	Letlhakane	Mahalapye	Kasane	Masunga	Francistown	Maun
2017/18	Apr	535,591.0	362,232.0	297,666.0	153,012.0	423,970.0	160,802.0	309,315.5	1,287,955.0	353,191.0
	May	506,653.0	382,806.0	321,426.0	159,809.0	406,068.0	164,966.0	317,239.1	1,241,392.0	350,910.0
	Jun	472,419.0	375,243.0	316,473.0	162,145.0	371,025.0	163,351.0	310,636.4	1,192,337.0	342,695.0
	Jul	564,082.0	358,656.0	298,389.0	178,804.0	415,018.0	147,353.0	337,998.6	1,246,624.0	334,582.8
	Aug	516,457.0	379,167.0	300,166.0	181,329.0	367,732.0	166,192.0	354,096.0	1,234,291.0	333,095.0
	Sep	489,299.0	354,496.0	303,240.0	176,742.0	442,287.0	173,411.0	297,038.7	1,208,841.0	358,477.5
	Oct	568,964.0	451,888.7	298,197.0	177,686.0	432,031.0	158,820.0	361,173.8	1,271,045.0	307,326.0
	Nov	524,160.0	364,075.3	267,496.0	173,870.0	427,877.0	123,180.0	352,947.9	1,272,963.0	316,408.0
	Dec	501,974.0	488,269.0	295,527.0	171,248.0	445,808.0	89,406.0	341,906.9	1,293,814.0	328,295.0
	Jan	533,487.0	456,304.0	368,876.0	192,867.0	515,943.7	143,764.0	317,602.5	1,348,960.0	313,505.8
	Feb	489,826.0	370,566.7	307,633.0	156,310.0	475,381.7	106,580.0	308,471.9	1,172,226.0	270,502.3
	Mar	480,417.0	318,246.1	311,661.0	179,333.0	540,791.4	111,866.0	386,111.0	1,301,354.0	309,777.6
	Total	6,183,329.0	4,661,949.8	3,686,750.0	2,063,155.0	5,263,932.8	1,709,691.0	3,994,538.4	15,071,802.0	3,918,766.1

Source: Water Utilities Corporation

Tables 1.4 and **1.5** show the monthly water production trends for the southern and the northern management centres. Water production is higher for the southern MCs than the northern MCs. Gaborone MC has the highest water demand, followed by Francistown MC. The two MCs encompass the capital and second city respectively, and they have the highest populations; they are also centres of economic activity in the country.

Table 1.6 shows total water production for the years 2016/17 and 2017/18. Gaborone and Francistown MCs have the highest water production in both years. The MCs recorded an increase in total water production from 2016/17 to 2017/18.

The highest increase in water production from 2016/17 to 2017/18 was for Mochudi MC at 53 percent, followed by Kanye MC at 51 percent and Letlhakane MC at 29 percent. The greatest reduction in water production from 2016/17 to 2017/18 was for Lobatse MC at 26 percent followed by Molepolole MC at 20 percent and Selibe Phikwe MC at 19 percent.

Overall water production for the whole country recorded an increase between 2016/17 and 2017/18.

Table 1.6: Total production 2016/17 - 2017/18 (Kilolitres)

Southern MCs	Total 2016/17	Total 2017/18	Percentage Change
Gaborone	27,497,322.1	29,622,880.5	8%
Lobatse	8,521,162.6	6,323,256.7	-26%
Kanye	6,198,738.0	9,346,157.7	51%
Molepolole	5,502,564.9	4,393,738.5	-20%
Mochudi	3,967,349.8	6,065,800.5	53%
Tsabong	1,647,467.6	1,688,512.8	2%
Ghantsi	1,381,467.7	1,459,513.6	6%
Total	54,716,072.7	58,899,860.3	8%
Northern MCs			
Francistown	15,430,049.0	15,071,802.0	-2%
Selibe Phikwe	7,660,847.0	6,183,329.0	-19%
Mahalapye	4,714,478.1	5,263,932.8	12%
Maun	3,900,116.0	3,918,766.1	0%
Serowe	3,766,357.0	3,686,750.0	-2%
Palapye	3,750,466.3	4,661,949.8	24%
Masunga	3,528,989.4	3,994,538.4	13%
Letlhakane	1,600,943.3	2,063,155.0	29%
Kasane	1,467,904.0	1,709,691.0	16%
Total	45,820,150.1	46,553,914.0	2%

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1.2.2. Water Production By Settlements

Table 1.7 below shows monthly water production for selected settlements for the year 2017/18. The relatively highly populated capital city and second city of Gaborone and Francistown had the highest water production to supply the population and industries.

	Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18	Total
Gaborone	1,642,408	1,652,750	1,611,054	1,639,604	1,517,654	1,833,225	1,721,774	1,761,880	1,493,250	2,176,900	1,303,186	1,572,804	19,926,489
Francistown	1,029,804	1,019,887	983,687	986,809	981,173	961,661	1,020,730	1,016,229	1,048,724	1,069,051	922,481	1,057,784	12,098,020
Mogoditshane	383,281	429,206	408,655	433,672	409,480	427,615	426,403	365,215	426,302	493,944	363,035	374,254	4,941,062
Lobatse	317,968	326,178	330,225	348,415	306,944	299,281	300,649	297,536	306,805	330,959	358,863	341,261	3,865,084
Mahalapye	248,610	230,928	225,454	292,436	247,713	312,509	313,476	317,082	328,937	384,703	351,933	417,356	3,671,137
Phikwe	336,134	328,186	292,371	350,957	309,635	288,974	340,514	302,224	281,140	287,590	277,350	250,290	3,645,365
Serowe	268,034	275,714	275,110	258,803	258,033	265,123	267,770	229,643	250,272	315,326	271,759	265,752	3,201,339
Kanye	197,811	241,604	209,418	247,982	196,159	199,214	243,505	275,936	196,130	228,229	223,478	218,587	2,678,052
Tlokweng	202,970	229,280	207,580	234,730	195,060	228,140	225,370	223,560	222,320	282,070	196,880	215,560	2,663,520
Palapye	249,604	188,590	214,299	184,038	211,758	194,367	269,738	197,672	280,948	222,491	226,598	181,595	2,621,698
Molepolole	218,591	222,767	218,016	224,525	239,749	234,390	210,436	176,143	187,712	187,452	113,317	314,081	2,547,179
Maun	188,111	196,534	189,497	183,509	183,169	212,041	190,014	184,620	202,844	180,341	142,740	147,788	2,201,208
Jwaneng	174,615	158,266	97,247	166,154	140,273	180,001	188,887	156,152	160,828	164,566	162,786	151,596	1,901,371
Kasane	99,368	103,168	105,031	91,635	103,400	107,698	90,647	61,291	29,488	81,325	62,810	64,377	1,000,238

Table 1.7: Monthly Water Production For Selected Settlements (Kilolitres) 2017/18





Figure 1.2: Water Production For Towns/Cities (2016/17 And 2017/18)

Table 1.8 below compares the total annual water production for the towns and cities (with available data) for the years 2016/17 and 2017/18.

In comparing the two years 2016/17 and 2017/18, indications are that water production increased for Gaborone, Lobatse and Francistown, while there was significant reduction for Selibe Phikwe and Jwaneng. The reduction in Selibe Phikwe is largely a result of the reduction and cessation in mining activities in the town.

				<u> </u>
Settlement	2016/17	2017/18	Change	Percentage Change (%)
Gaborone	17,795,730.0	19,926,489.0	2,130,759.0	10.7
Francistown	11,789,013.0	12,098,020.0	309,007.0	2.6
Selibe Phikwe	5,024,177.0	3,645,365.0	-1,378,812.0	-27.4
Lobatse	3,676,965.0	3,865,084.0	188,119.0	5.1
Jwaneng	2,110,799.0	1,901,371.0	-209,428.0	-9.9

Table 1.8: Change In Total Annual Water Production For Towns And Cities 2016/17 To 2017/18

1.3. Water Consumption

Water Utilities Corporation (WUC) bills consumers for the consumption of water based on meter readings and estimations. "Billed water" consumption is resultant from these readings and estimations. Data is available by Management Centre (MC). **Tables 1.9** and **1.10** show the billed water consumption by management centre for the 2016/17 and 2017/18 years.

Southern	Month	Gaborone	Mochudi	Molepolole	Lobatse	Kanye	Tsabong	Ghanzi	Southern MCs Total
2016/17	Apr	1,924,379	210,987	281,594	305,361	282,419	95,918	82,449	3,183,107
	May	1,982,618	196,068	288,450	278,790	305,667	73,535	87,948	3,213,076
	Jun	1,966,604	219,982	246,860	372,621	291,819	75,809	74,927	3,248,622
	Jul	1,872,089	169,453	278,357	364,815	359,112	71,294	85,098	3,200,218
	Aug	1,682,964	189,988	279,692	278,719	274,190	60,898	77,028	2,843,479
	Sep	2,017,545	258,881	297,170	295,971	304,406	75,841	174,451	3,424,265
	Oct	2,014,165	211,531	328,381	319,177	304,654	84,653	85,396	3,347,957
	Νον	2,012,771	223,488	262,361	292,881	393,975	72,836	89,727	3,348,039
	Dec	1,812,055	223,201	264,414	256,149	243,077	72,098	88,236	2,959,230
	Jan	2,049,710	211,976	268,876	302,583	312,613	86,594	83,967	3,316,319
	Feb	1,857,038	200,576	253,405	235,248	223,933	55,048	69,416	2,894,664
	Mar	2,788,652	172,690	209,303	245,031	260,074	80,199	69,994	3,825,943
2017/18	Apr	1,478,621	69,266	64,037	184,753	175,898	15,365	25,157	2,013,097
	May	2,139,217	180,566	184,458	249,390	229,581	49,190	69,723	3,102,125
	Jun	2,134,848	213,887	226,164	213,708	194,300	55,758	65,520	3,104,185
	Jul	2,358,826	218,478	214,129	219,525	261,562	66,012	78,207	3,416,739
	Aug	1,530,744	389,145	236,488	216,649	242,117	59,391	29,295	2,703,829
	Sep	1,196,148	187,815	270,959	191,300	151,175	68,428	75,072	2,140,897
	Oct	2,651,238	75,904	219,729	290,775	220,188	63,840	75,805	3,597,479
	Νον	2,155,719	170,234	219,729	250,185	241,202	68,999	70,896	3,176,964
	Dec	2,190,419	259,903	222,676	259,997	198,210	65,035	78,039	3,274,279
	Jan	2,498,864	245,934	281,197	279,277	237,107	60,101	67,702	3,670,182
	Feb	2,368,415	234,832	213,240	262,748	105,008	48,619	69,206	3,302,068
	Mar	2,273,987	221,686	205,012	250,252	195,178	75,210	59,712	3,281,037

Table 1.9: Southern Billed Water Consumption By Management Centres (Kilolitres)

Northern	Month	Francistown	Selibe Phikwe	Palapye	Serowe	Mahalapye	Kasane	Masunga	Letihakane	Maun	Northern MCs Total
2016/17	Apr	826,231	652,439	208,992	1,190,252	212,552	88,174	194,469	109,098	169,964	3,652,171
	May	885,031	800,149	218,987	190,904	198,438	77,986	200,999	110,275	178,301	2,861,070
	Jun	947,711	596,703	236,806	225,452	191,722	88,160	215,236	131,442	157,788	2,791,020
	Jul	813,562	619,355	190,475	177,210	179,995	100,715	225,372	70,502	175,068	2,552,254
	Aug	941,128	568,182	247,596	183,414	180,777	121,274	234,707	96,648	174,311	2,748,037
	Sep	1,014,344	628,169	211,468	193,444	206,496	101,861	259,834	139,116	179,207	2,933,939
	Oct	884,215	544,326	193,354	205,035	250,786	106,907	251,735	222,178	177,607	2,836,143
	Νον	797,660	460,703	367,050	199,981	397,051	159,022	307,167	214,295	174,917	3,077,846
	Dec	754,356	381,839	391,450	192,324	177,423	97,691	206,068	95,016	174,518	2,470,685
	Jan	862,154	404,309	260,855	239,358	214,060	83,511	183,142	108,166	176,356	2,531,911
	Feb	680,878	385,978	341,979	158,602	160,660	150,861	199,604	101,068	154,780	2,334,410
	Mar	741,563	343,854	286,967	152,388	165,698	86,996	248,229	67,072	146,851	2,239,618
2017/18	Apr	404,843	189,753	151,361	80,222	58,585	60,936	63,127	49,425	76,744	1,134,996
	May	811,722	243,909	228,873	233,874	145,290	75,124	227,315	96,465	179,356	2,241,928
	Jun	777,316	245,732	264,723	80,377	164,417	96,592	180,419	71,489	184,855	2,065,920
	Jul	879,715	291,511	263,821	169,260	143,229	146,753	186,959	79,670	180,627	2,341,545
	Aug	566,097	292,018	237,353	35,063	103,164	83,530	176,701	41,952	154,584	1,690,462
	Sep	1,021,072	142,232	284,182	170,032	174,455	67,431	184,235	80,440	148,803	2,272,882
	Oct	641,849	313,619	316,140	177,416	168,814	114,993	202,030	83,802	159,315	2,177,978
	Νον	805,870	279,309	281,945	111,474	177,697	84,271	210,862	99,382	156,300	2,207,110
	Dec	636,833	315,694	328,997	143,674	138,793	77,941	198,784	85,280	158,889	2,084,885
	Jan	988,163	389,562	372,930	156,023	209,387	93,231	307,868	98,432	154,659	2,770,255
	Feb	913,191	319,446	269,012	170,156	171,230	80,996	202,727	85,620	145,525	2,357,903
	Mar	746,452	284,839	266,835	161,142	131,191	64,266	157,839	79,848	128,194	2,020,606

Table 1.10: Northern Billed Water Consumption By Management Centres (Kilolitres)

Source: Water Utilities Corporation

Gaborone MC, Francistown MC and Selibe Phikwe MC recorded the highest billed water consumption for the 2016/17 and 2017/18 years.

Southern MCs	2016/17	2017/18	Percentage Change	
Gaborone	23,980,590.0	24,977,046.0	4.2	
Kanye	3,555,939.0	2,451,526.0	-31	
Lobatse	3,547,346.0	2,868,559.0	-19	
Molepolole	3,258,863.0	2,557,818.0	-21.4	
Mochudi	2,488,821.0	2,467,650.0	-0.9	
Ghanzi	1,068,637.0	764,334.0	-28.5	
Tsabong	904,723.0	695,948.0	-23.1	
Southern MCs Total	38,804,919.0	36,782,881.0	-5.2	
Northern MCs	2016/17	2017/18		
Francistown	10,148,833.0	9,193,123.0	-9.4	
Selibe Phikwe	6,386,006.0	3,307,624.0	-48.2	
Serowe	3,308,364.0	1,688,713.0	-49.0	
Palapye	3,155,979.0	3,266,172.0	3.5	
Masunga	2,726,562.0	2,298,866.0	-15.7	
Mahalapye	2,535,658.0	1,786,252.0	-29.6	
Maun	2,039,668.0	1,827,851.0	-10.4	
Letlhakane	1,464,876.0	951,805.0	-35.0	
Kasane	1,263,158.0	1,046,064.0	-17.2	
Northern MCs Total	33,029,104.0	25,366,470.0	-23.2	

Table 1.11: Total Billed Water Consumption 2016/17 And 2017/18 (Kilolitres)

Source: Water Utilities Corporation

Table 1.11 above compares the 2016/17 and 2017/18 total billed water for the management centres. Total billed water consumption was higher in 2016/17 than in 2017/18 for both the southern and the northern MCs. Southern MCs recorded higher billed water consumption than northern MCs for both years. Within the MCs, Gaborone MC (Southern) recorded the highest percentage increase of 4.2 percent while Palapye (northern) recorded a 3.5 percent increase in the northern MCs during the same period. The rest of the MCs recorded reductions in their billed water consumption. The greatest reduction was for Serowe MC at 49.0 percent, followed by Selibe Phikwe MC at 48.2 percent and Letlhakane MC at 35.0 percent.

1.4. Non-Revenue Water

Table 1.12 shows non-revenue water (NRW) for 2016 /17 and 2017/18 by MCs. Non- revenue water refers to water that is not accounted for in billing or revenue to WUC, including water losses during distribution.

For the year 2017/18 Lobatse MC recorded the highest non-revenue water at 69 percent followed by Mahalapye MC at 66 percent and Kanye MC at 60 percent. All the MCs recorded increased Non-Revenue Water between 2016/17 and 2017/18. The highest percentage change in Non-Revenue Water was recorded for Letlhakane MC at 46 percent followed by Serowe MC at 42 percent and Selibe Phikwe MC at 30 percent.

MCs	2016/	17 2017/18	Percentage Change
Southern MCs Gaborone	1:	3% 16%	3%
Mochudi	3	7% 44%	7%
Molepolole	4	1% 53%	12%
Lobatse	5	3% 69%	11%
Kanye	4	3% 60%	17%
Tsabong	4.	5% 59%	14%
Ghanzi	2	3% 48%	25%
Northern MCs Francistown	3.	4% 39%	5%
Selibe-Phiky	ve 1	7% 47%	30%
Palapye	1.	30%	14%
Serowe	1:	2% 54%	42%
Mahalapye	4	5% 66%	20%
Kasane	1.	4% 25%	11%
Masunga	2	3% 42%	19%
Maun	44	3% 53%	5%
Letlhakane		3% 54%	46%
Total	29	9% 40%	11%

Table 1.12: Non Revenue Water (NRW) 2016/17 And 2017/18 (Percent)

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** shows the monthly supply of raw (untreated) water to the mines for the 2016/17 and 2017/18 years. Available data only applies to the mines listed in the table as data is not available for the diamond mines.

		Botash	Morupule Colliery Mine	BCL	Tati Nickel	Mupane
2016/17	April	35,380.0	13,893.0	15,492.0	30,761.0	99,370.0
	Мау	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	1,208,160.0
2017/18	April	8,938.0	56,419.0	66.0	11,981.0	97,650.0
	Мау	7,485.0	58,083.0	60.0	4,535.0	64,240.0
	June	22,557.0	71,382.0	115.0	0.0	63,900.0
	July	33,661.0	90,541.0	184.0	5,795.0	106,140.0
	August	25,284.0	72,527.0	254.0	5,188.0	95,830.0
	September	18,728.0	59,553.0	89.0	0.0	93,600.0
	October	25,076.0	88,180.0	118.0	5,465.0	89,840.0
	November	25,224.0	72,524.0	119.0	4,134.0	100,010.0
	December	26,241.0	122,836.0	120.0	0.0	80,750.0
	January	25,954.0	117,798.0	797.0	5,129.0	99,160.0
	February	25,344.0	66,487.0	798.0	10,755.0	96,440.0
	March	33,651.0	77,338.0	799.0	3,610.0	79,790.0
	Total	278,143.0	953,668.0	3,519.0	56,592.0	1,067,350.0

Table 1.13: Raw Water Supply To Mines 2016/17 And 2017/18 (Kilolitres)

Source: Water Utilities Corporation

For the year 2016/17, Mupane mine received the largest amount of raw water followed by Tati Nickel mine and Morupule Colliery mine. For 2017/18 Mupane mine received the largest amount of raw water followed by Morupule Colliery mine and Botash mine.

Morupule Colliery mine recorded an increase in the raw water it received from WUC between 2016/17 and 2017/18. The highest reductions in raw water received from WUC were recorded by BCL mine and Tati Nickel mine followed by Botash mine and Mupane mine. The reductions recorded for BCL mine and Tati Nickel mine are largely due to mine closures that started in 2016. **Figure 1.3** graphically shows the total annual raw water supplied to the mines by WUC for the years 2016/17 and 2017/18.



Figure 1.3: WUC Water To Mines

1.6. Conclusion

Dikgathong dam is the largest in the country and also feeds greater Gaborone area; the dam presented high annual average dam levels of over 80 percent in 2016 and over 90 percent in 2017 and 2018.

Water production increased between the years 2017 and 2018. Billed water consumption on the other hand declined in the same period. It should be noted that billed water consumption for a year is not dependent on the water production for that year. It is rather based on the amount in monetary terms paid for consumption that year and not necessarily that the water was consumed in the year. The amount is then converted to volumes in kilolitres.

1.7. Appendix: Settlements under Water Utilities Corporation (WUC) Management Centres (MCs)

The following is an indication of the settlements that fall under each of the Water Utilities Corporation (WUC) Management Centres.

Southern Management Centres

Gaborone Management Centre

Gaborone Tlokweng Mogoditshane Kumakwane Mmopane MetsimotIhabe Gakutlo Mmatseta Gabane Mokolodi Village Tloaneng Traquair (Mokolodi)

Molepolole Management Centre

Molepolole Gamodubu>>> Mmanoko & Gakgatla Ramaphate>>> Thamaga Kubuna Kotolaname>>> Losilakgokong Sasakwe Wellfield >>> Kopong, Lentsweletau, Kweneng & Medie Kgope Ditshukudu>>> Mahetlwe Mogonono Hatsalatladi Sojwe >>> Boatlaname Lephephe Shadishadi Loologane Bothapatlou Diphuduhudu Kaudwane Kudumelapye Letlhakeng >>> Sesung, Ditshegwane & Metsibotlhoko Ngware>>> Malwelwe Seringne>>>Mantshwabisi Monwane Moshaweng Salajwe Sorilatholo Maboane>>>Takatokwane & Dutlwe Tshwaane>>>Khona Khekheng Motokwe Tsetseng

Lobatse Management Centre

Lobatse, Sunny Side & Police College Ramotswa, Taung & Boatle Otse Mogobane Mmankgodi Manyana Mogonye Bikwe Ntlhantlhe Lekgolobotlo Magotlhwane Borobadilepe Digawana & Lorwana Ditlharapa & Molete Dikhukhung Kgoro, Lejwana & Gathwane Goodhope Sub (Gamajaalela, Pitsane, Goodhope, Malokaganyane, Dinatshana, Bethel, Pitsane-Photlokwe) Molapowabojang Gopong Mogojogojo Mmathethe & Magoreapitse Mosi Kanngwe Leporung & Phitshane-Molopo Sekhutlane & Mabule Pihetshwane, Hebron, Logaganeng & Marojane Metlobo Metlojane & Tswanyaneng Mmakgori Gamokoto & Mogwalale Papatlo, Ramatlabama, Makokwe & Matasalalo Rakhuna & Nawatsau Tshidilamolomo Tswaaneng Tswagare & Sekokwane Mokakato Sedibeng Mokgomane Madingwane Sheep Farm Motsentshe Tlhareseleele Kgomokasitwa

Mochudi Management Centre

Mochudi, Morwa, Pilane, Rasesa, Bokaa Oodi Cluster (Oodi, Matebele & Mokatse) River Villages (Mabalane, Malolwane, Ramonaka, Mmathubudukwane &Sikwane) - (Mabalane Plant + BH9119) Dikwididi Ramotlabaki Dikgonnye Malotwane Khurutshe Leshibitse Kgomodiatshaba Artesia Olifants Drifts

Kanye Management Centre

Kanye Moshupa Jwaneng Ranaka Moshana Lorolwane Lotlhakane West Pitseng Lotlhakane East Gasegwagwa Seherelela Selokolela Gasita Sesung Ralekgetho Sese Mabutsane, Morwamosu, Kokong and Kanaku Mahotswane Kutuku Lefhoko, Maokane & Mokhomma Samane & Thankane Tsonyane Sekoma Khonkhwa & Keng Khakhea>>>Itholoke

Tsabong Management Centre

Tsabong, Maubelo, Logaganeng & Maleshe Werda Makopong Omaweneno Hereford (Bray) Kokotsha (Tsoong) Draihoek Maralaleng McCathy's Rust Hukuntsi, Lokgwabe, Lehututu, Tshane & Make Kang Hunhukwe, Monong & Ncaang Inalegolo Ngwatle & Zutshwa Middlepits, Gakhibana, Bogogobo, Khuis & Kolokwane Khisa Bokspits, Struizendam, Vaalhoek & Rapplespan Khawa Ukhwi

Phuduhudu

Ghanzi Management Centre

Ghanzi Bere Charleshill (Makunda Interconnected) Chobokwane D'Kar East Hanahai (West Hanahai Interconnected) Kacgae Kalkfontein/Tsootsha Karakubis Kole Kuke Metsimantsho Ncojane New Xade New Xanagas Qabo (Grootlaagte Interconnected) Xanagas

Northern Management Centres

Selibe Phikwe Management Centre

Phikwe Mmadinare Sefhophe Tobane Damochojenaa Serule, Gojwane, Moreomabele & Topisi Bobonong Molalatau Matlhathane Tsetsebjwe Moletemane Lephokole Robelela/Tshokwe Lentswelemoriti Mabolwe/Gobojango/Semolale Motlhabaneng

Palapye Management Centre

Palapye Patikwane Wellfield Lecheng ,Matlhakola,Mokungwana,Goo-Tau,Goo-Sekgweng,Manaledi Kgagodi,Diloro,Mogapi,Mogapinyana,Tamasane Maunatlala Moremi & Matolwane Seolwana, Matolwane Seolwana, Mokokwana, Mosweu Lerala, Majwaneng & Martin's Drift Ratholo Malaka Radisele Mogome Mokgware Tamasane

Serowe Management Centre

Serowe from Palapye Treatment Plant Groundwater supply to Serowe from wellfield Groundwater supply from BPC wellfield Paje & Mabeleapodi Sanakoma Wellfield (Motshegaletau,Sehunong,Mabuo,Motshegaletau) Thabala Tshimoyapula Majwanaadipitse Dimajwe Malatswae Mmashoro Mogorosi

Letlhakane Management Centre

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Letlhakane Rakops/Xere Khumaga/ Mmadikola/Toromoja Mokoboxane Khwee Mmatshumo Motopi/Moreomaoto Mopipi Mosu/Mokubilo Xhumo Kedia

Mahalapye Management Centre

Mahalapye Shoshong Scheme Taupye Palla Road Tobela Mosolotshane/Moralane Ikongwe Kodibeleng Otse Mokgenene Poloka Dibete Mookane Mmaphashalala Dovedale **Kudumatse** Mokoswane Shakwe Makwate Matlhako-Leteoreng Moshopha Sefhare, Machaneng, Chadibe-Borotsi Mokobeng/ Ngwapa Ramokgonami/Maape/Seleka Pilikwe/ Mhalapitsa Ga-Setsile Tewane

Kasane Management Centre

Kasane Ngoma Kazungula Kavimba Kachikau Lesoma Parakarungu Satau Pandamatenga Chobe Enclave

Masunga Management Centre

Masingwaneng Gulubane Matenge Makaleng Totena Botalaote Mambo Sechele Kalakamati Sekakangwe Goshwe Mbalambi Gungwe Gambule Zwenshambe Mulambakwena Masunga Letsholathebe Vukwi Nlaphkwane Mapoka Moroka Ramokgwebana Jackalas # 1 **Butale** Senyawe Kgari Masukwane Pole Mosojane Tshesebe Themashanga Mowana Tsamaya Siviya Jackalas 2

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Mabudzane Maitengwe Dagwi Changate Nkange Senete Tutume Matobo Nswazwi Makuta Nshakashoawe Sebina Marobela Hubona Marapong Semitwe Sowa Township Botash Nata Dukwi village Dukwi refugee camp Manxotai Maposa Mosetse Gweta Sepako Zoroga Lepashe Tsokotshaa

Francistown Management Centre

Francistown Mathangwane Scheme (Mathangwane, Borolong, Chadibe, Shashe Mooke, Jamakata, Natale, Makobo) Matshelagabedi Matsiloje Tonota, Foley , Dithadi Tati-siding

Maun Management Centre

Maun, Sexaxa, Matsaudi, Disaneng, Matlapana Shorobe Sankuyo Mababe Chanoga Phuduhudu Makalamabedi Komana Khwai Somelo Sehithwa Botlhatlogo Bodibeng Toteng Legotlhwana Kareng Semboyo/Makakung Tsau Gumare Xoshe Qangwa Sepopa Ikoga, Mowana, Kajaja, Tamacha- (kl) Nokaneng Habu, Xhwee, Kamukaku, Boajankwe Tubu Xaxana Etsha 1 & 6, Xurube Etsha 13 Nxaunxau Chukumuchu Xaixai Shakawe,Samochima,Xhaoga,Ukusi,Nxamasere,Mohembo West Shaikarawe Mohembo East, Xakao,Kauzhwi,Gowa,Kaputura,Sekondomoro,Sechenge Tobera Ngarange Mogotho Eretsha Seronga/Xao/Teekae/Gonutsuga Beetsha Gudigwa Ghani

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