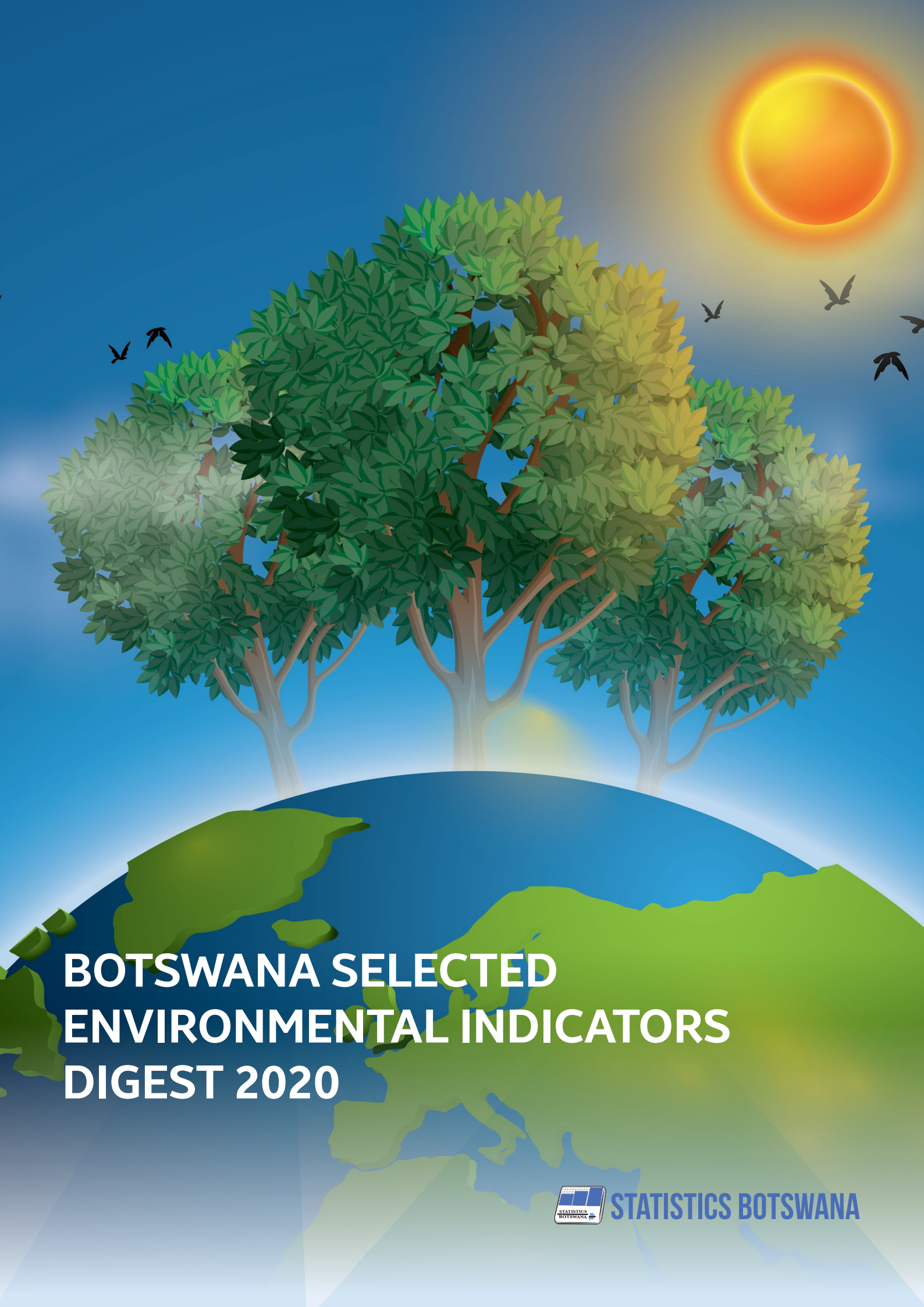

BOTSWANA SELECTED ENVIRONMENTAL INDICATORS DIGEST 2020

STATISTICS BOTSWANA

Published by

STATISTICS BOTSWANA
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ISBN: 978-99968-907-8-9 (PAPER BACK)

June 2021

BOTSWANA SELECTED ENVIRONMENTAL INDICATORS DIGEST 2020

PREFACE

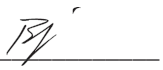
This report is the second edition in a series of the Selected Environmental Indicators Digests of Botswana. It presents the latest available statistics and trends on environmental resource availability; resource use; waste resulting from resource use; as well as associated disasters that may occur as a result of the use. The United Nations Framework for Development of Environment Statistics guided the production of this Report.

The report covers Energy; Water; Forestry; Wildlife; and Waste. Information presented in this report is vital for evidence based environmental planning and management. It also provides a basis for monitoring progress towards the attainment of Vision 2036 and the Sustainable Development Goals.

Secondary data was used in the production of the Report, most notably from the Department of Primary Health; Department of Water and Sanitation; Water Utilities Corporation; Department of Energy; Department of Forestry and Range Resources; and Department of Wildlife and National Parks. I wish to recognise these stakeholders for the collaboration and the immense input they made.

I remain grateful for the invaluable contributions towards the preparation of this Report.

For more information and further enquiries, contact the Directorate of Stakeholder Relations at 3671300. All Statistics Botswana outputs are available on the website at www.statsbots.org.bw, and at Statistics Botswana Information Resource Centre (Head Office, Gaborone).



Dr Burton S. Mguni
Statistician General
June 2021

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

List of Abbreviations

Abbreviation	Description
BWP	Botswana Pula
CSO	Central Statistics Office
DFRR	Department of Forestry & Range Resources
DPH	Department of Primary Health
GDP	Gross Domestic Product
IEA	International Energy Agency
IRES	International Recommendation for Energy Statistics
kL	Kilolitre
Ktoe	Kilotonne of Oil Equivalent
MCs	Management Centres
Mm3	Million Cubic Metre
MSW	Municipal Solid Waste
MWh	Mega Watt hour
OECD	Organisation for Economic Co-operation and Development
Pj	Petajoule
SDGs	Sustainable Development Goals
TFEC	Total Final Energy Consumption
TPES	Total Primary Energy Supply
UNECE	United Nations Economic Commission for Europe
UNFDES	United Nations Framework for the Development of Environment Statistics

Executive Summary

The main purpose of the Report is to present and discuss current status and trends in the following environmental issues: Energy; Water; Forestry; Wildlife; and Waste.

Energy

According to the report, the final energy consumption was dominated by electricity as an energy source during the period 2010 – 2018, followed by coal, diesel and petrol. The highest electricity consumption was recorded in 2014 with 14.04 Pj. In terms of energy intensity, water and electricity sector recorded the highest energy consumption measured by energy intensity during the period 2010 – 2017. The results show that during the years 2010 – 2018 about 92 percent of total electricity was generated from coal, while about 8 percent was from diesel. The year 2017 registered the highest total energy supply of 28.37 Pj. The annual final electricity consumption decreased from 2,310,662 MWh in 2010 to 2,275,409 MWh in 2017. The coal summary statistics show that both production and consumption saw a significant increase from 2010 to 2018.

Water

Dam levels generally improved slightly between 2019 and 2020. Overall water production for the whole country recorded an increase from 2017/18 to 2018/19 and from 2018/19 to 2019/20. The capital (Gaborone) and the second city (Francistown) continue to have the highest water production due to their population sizes and economic activities. Billed water consumption increased from 2017/18 to 2018/19. Most of the MCs recorded a reduction in their non-revenue water.
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.

Forestry

In 2019, forests and woodlands covered about 27 percent of the land area of the country. The total forest area increased from 11,448,903 ha in 2010 to 15,727,900 ha in 2019. The report shows that there was a significant decrease in the areal extent of fires over Botswana between the years 2017 and 2018, which then increased slightly in 2019. Ngamiland District accounted for a large share of the total area burnt during the review period. Similarly the number of fires experienced in the period under review was highest in Ngamiland.

Wildlife

It is evident from the report that species with the highest incidences of poaching during the years 2013 – 2019 were elephant, kudu, impala, vulture, gemsbok, and eland, in that order. Data on rhino poaching was not available for use in this report. In 2015 poaching incidents were the highest compared to the other years. During the period 2010 to 2019 Central and Ngamiland Districts constituted the majority of the incidents of problem animals. The species most involved were elephant, lion, leopard, and wild dog. In terms of population estimates by species, elephant had the highest population estimates in 2018.

Waste

A total of 195,071.51 tonnes of solid waste was collected and disposed of at various landfills in 2017; of which 1,277.69 tonnes was salvaged. General waste constituted the majority of total waste collected. Commercial waste came second after general waste, in terms of the total waste collected in 2017. On average, about 16,255.96 tonnes of solid waste is collected annually. Francistown and Gamodubu landfills constitute the majority of national solid waste collected. The following waste types were salvaged in 2017: paper/plastic; scrap metals; cans/tins; wood; tyres; used oil; and grass.

1.0 ENERGY STATISTICS

The vital role energy plays in socio-economic development cannot be overemphasized, and the availability of high-quality energy statistics has always been a matter of concern for the statistical community (IRES, 2018). The adoption of the new United Nations Sustainable Development Goals (SDGs) in 2015 marked a new level of political recognition of the importance of energy to development (IEA, 2020). For the first time, this included a goal to "ensure access to affordable, reliable, sustainable and modern energy for all" – collectively known as Sustainable Development Goal 7. In order to realise goals such as the aforesaid, there is a need to monitor progress on their attainment through statistical trends overtime and that is where energy statistics is required. Energy statistics is a specialized field of statistics whose scope has been evolving over time and broadly covers (i) extraction, production, transformation, distribution, storage, trade and final consumption of energy products and (ii) the main characteristics and activities of the energy industries (IRES, 2018). This chapter presents annual figures on energy consumption, intensity, production and supply in Botswana for the years 2010 – 2019.

1.1. Total Final Energy Consumption (TFEC)

Trends in total final energy consumption by source for the period 2010 – 2019 are presented in this sub-section. The energy sources mainly include solid, liquid and gaseous fuels. Final energy consumption is calculated as the sum of final energy consumption from different economic sectors and households. TFEC is equivalent to total final consumption excluding non-energy use (World Bank, 2020). According to UNECE, non-energy use covers those fuels that are used as raw materials in the different sectors and are not consumed as a fuel or transformed into another fuel such as white spirit, paraffin waxes, lubricants, bitumen and other products.

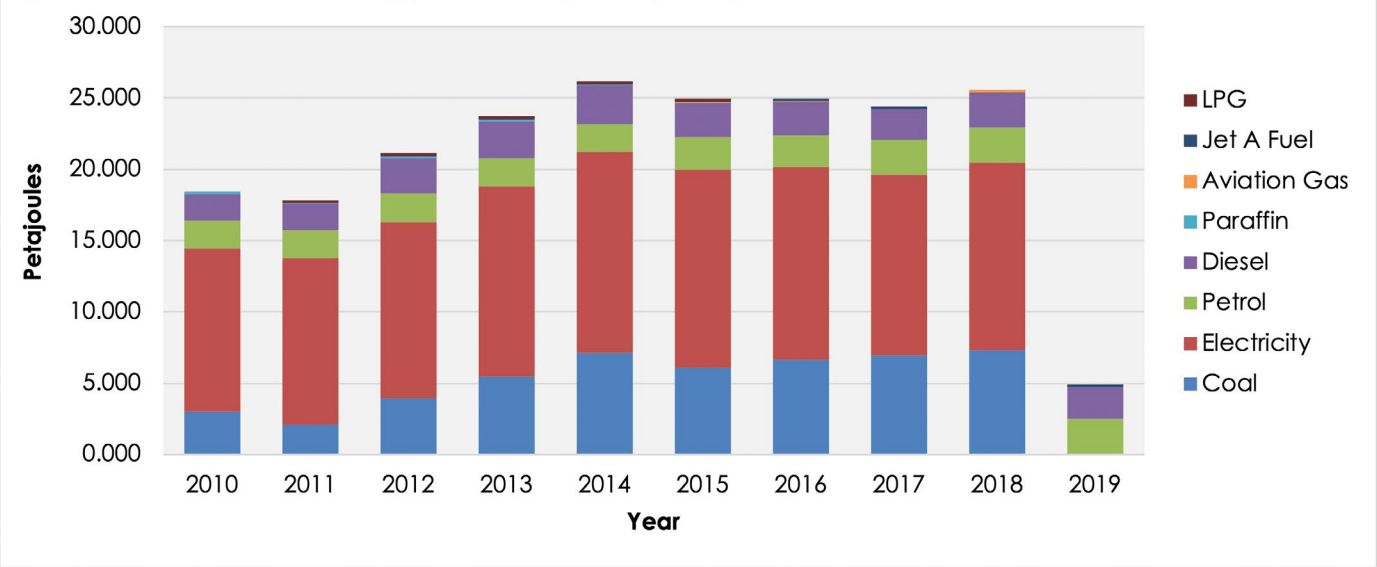
Table 1.1 shows the total final energy consumption by energy source during the years 2010 – 2019, though figures on coal, electricity, and LPG were not available for the year 2019. The table depicts that the highest final energy consumption was from electricity as an energy source during the 2010 – 2018 period. Electricity consumption as final energy, increased from 11.46 Pj in 2010 to 14.04 Pj in 2014, and then dropped to 12.63 Pj in 2017. The highest consumption was recorded in 2014 (14.04 Pj). The second highest final energy consumed was from coal, with the year 2018 recording the highest value of 7.30 Pj. Generally, coal as a source of final energy consumption saw an increasing trend during the period, except for a slight drop between 2014 and 2015. The third largest final energy consumption was from both diesel and petrol.

Table 1.1: Total Final Energy Consumption (TFEC) in Pj, 2010 -2019

Energy Source	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Coal	2.978	2.098	3.947	5.441	7.141	6.103	6.654	6.960	7.300	-
Electricity	11.461	11.666	12.369	13.372	14.037	13.859	13.493	12.628	13.140	-
Petrol	2.002	1.967	2.032	1.964	2.011	2.289	2.252	2.454	2.520	2.520
Diesel	1.828	1.836	2.434	2.611	2.670	2.399	2.319	2.163	2.436	2.210
Paraffin	0.079	0.084	0.111	0.086	0.101	0.034	0.020	0.020	0.017	0.013
Aviation Gas	-	-	0.010	0.010	0.011	0.014	0.011	0.011	0.011	0.008
Jet A Fuel	-	-	0.062	0.063	0.054	0.056	0.058	0.059	-	0.085
LPG	-	0.018	0.022	0.059	0.061	0.067	-	-	-	-

Source: Department of Energy
(-) Data not available

Figure 1.1: Total Final Energy Consumption (TFEC), 2010 – 2019



Note: LPG, Jet A fuel, Aviation & Paraffin are not visible because their figures are too small.

1.2. Energy Intensity by Economic Sector

Statistics on energy intensity by economic sector in Kilotonne of Oil Equivalent (Ktoe)/BWP for the years 2010 – 2017 are presented here. Energy intensity is a measure of how much energy is used compared to a relevant economic activity measure, for instance GDP (Statistics Norway, 2011).

High energy intensities indicate a high price or cost of converting energy into GDP. Low energy intensity indicates a lower price or cost of converting energy into GDP. Low energy intensity is the desired goal because it represents an efficient allocation of energy resources to generate wealth and high quality of life (Martinez et al. 2019).

In this report, Energy Intensity was determined on the basis of following fundamental parameters, constant price GDP and electricity consumption, expressed in Ktoe. Energy intensity is equal to energy consumption per GDP. Due to data challenges electricity is the only energy source used to calculate the energy intensity.

Generally, the results show a reduction in the level of energy consumption measured through energy intensity (Table 1.2 & Figure 1.2b). There was a small increase noted between 2011 with 311.48 Ktoe per GDP unit (BWP) and 2014 with 332.07 Ktoe per GDP unit (BWP), and then it started to drop. The highest level of energy per GDP unit was recorded in 2014 – 332.07 Ktoe per GDP unit, while the lowest level was recorded in 2017 with 236.53 Ktoe per GDP unit.

Table 1.2 also shows the total electricity being used to support economic and social activity, and this is shown by the ratio of energy use to GDP by sector. It is evident from the table that water and electricity sector recorded the highest energy consumption measured by energy intensity during the period 2010 – 2017, followed by the mining sector and social and personal sector, in that order. The construction sector recorded the lowest energy intensity during the period, with an annual average of 28.09 Ktoe per GDP unit.

Table 1.2: Energy Intensity by Economic Sector (Ktoe/GDP), 2010 -2017

Energy Source	2010	2011	2012	2013	2014	2015	2016	2017
Water & Electricity	1,489.83	2,188.90	4,892.75	6,110.08	18,687.22	9,599.28	9,045.75	2,458.42
Mining	770.31	798.22	862.04	738.84	737.94	983.75	866.83	784.80
Manufacturing	253.61	236.17	246.64	249.64	249.94	216.04	242.51	284.23
Social & Personal Services	408.23	377.81	322.97	302.88	309.58	275.76	260.71	258.11
General Government	231.57	214.76	208.06	196.11	197.85	164.33	174.15	159.06
Agriculture	101.75	135.05	152.06	152.02	150.96	217.76	144.94	149.78
Finance & Business Service	144.59	156.49	149.12	166.06	159.99	182.73	138.02	143.27
Transport & Communication	172.78	135.41	155.00	141.84	135.72	124.08	119.20	124.65
Trade, Hotels &Restaurants	160.10	165.34	149.14	151.01	140.80	125.87	105.93	107.93
Construction	31.95	44.95	35.53	24.44	27.13	22.45	18.89	19.36
TOTAL	**322.69**	**311.48**	**316.79**	**322.44**	**332.07**	**323.80**	**291.79**	**236.53**

Source: Department of Energy

Figure 1.2a Energy intensity by economic sector, Ktoe/BWP (2010-2017)

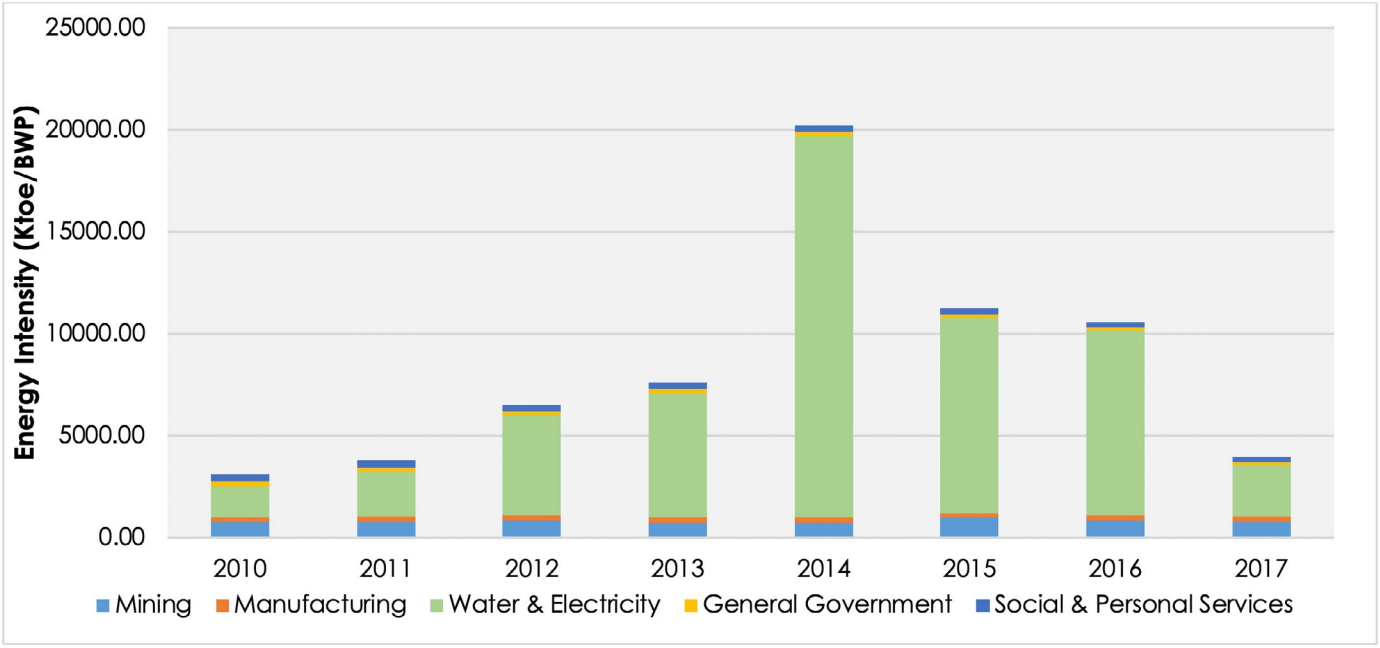
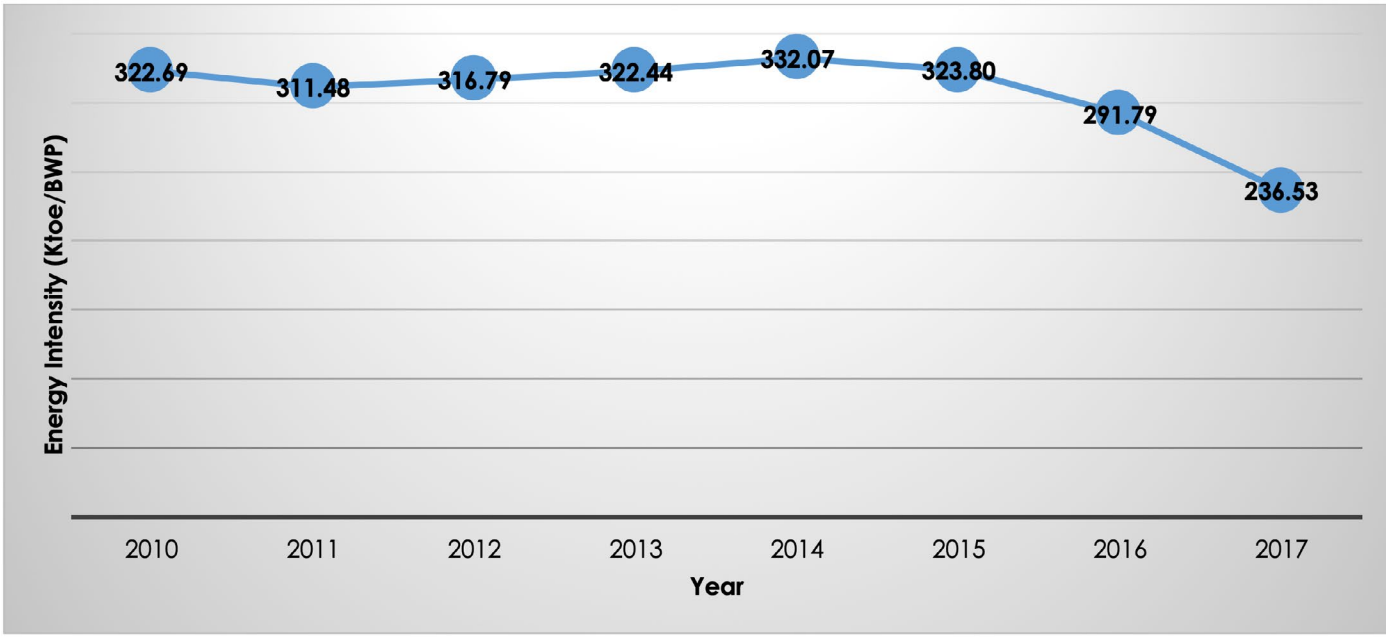


Figure 1.2b Total Energy intensity, Ktoe/BWP (2010-2017)



1.3. Energy Production

This subsection presents trends in total energy production by components of production (solid, liquid, and gaseous fossil fuels) during the years 2010 - 2018. Total energy production refers to the total production of primary energy by all energy producing enterprises in the country in a given period of time. The production of primary energy includes that of coal, crude oil, natural gas, hydro-power and electricity generated by nuclear energy and other means such as wind power and geothermal power. This report focuses on electricity generation, as one of the three components that make up total energy production. The other two are transport and heating. Electricity generation is defined as electricity generated from fossil fuels, nuclear power plants, hydro power plants (excluding pumped storage), geothermal systems, solar panels, biofuels, wind, etc. (OECD, 2020).

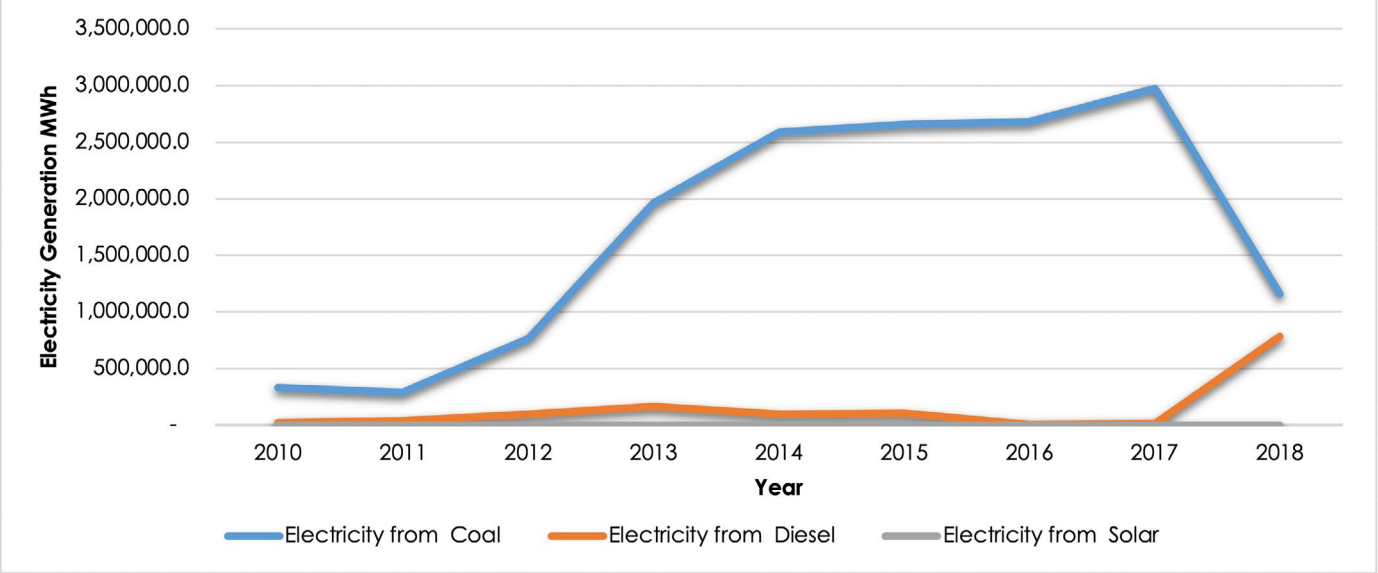
Table 1.3 shows that during the review period, 92.0 percent of the total electricity generation was from coal, and 7.9 percent from diesel. Electricity from solar contributed less than one percent of the total electricity generated. The year 2017 recorded the highest electricity generated from coal (2,976,019.2 MWh).

Table 1.3: Total electricity production by components of production (MWh), 2010 -2018

Energy Source	2010	2011	2012	2013	2014	2015	2016	2017	2018
Electricity from Coal	335,761	293,200	767,274	1,959,889	2,588,002	2,652,924	2,680,225	2,976,019	1,160,055
Electricity from Diesel	25,155	40,263	99,796	162,354	99,358	106,639	9,595	12,227	784,843
Electricity from Solar	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3

Source: Department of Energy

Figure 1.3: Total electricity production by components of production (MWh) 2010-2018



1.4. Total Primary Energy Supply (TPES)

Presented in this subsection are statistics on total primary energy supply by components of supply, that is, solid, liquid, and gaseous fuels for the period 2010 - 2019. However, data on electricity as the highest contributor to TPES was not available in 2019 hence the analysis focused on the period 2010 - 2018. Primary energy refers to total energy available for gross inland use before any transformation takes place (CSO, 2004). Total primary energy supply is the total amount of primary energy a country has at a given time period. This includes domestic energy production plus energy imports, minus energy exports, then plus or minus stock changes.

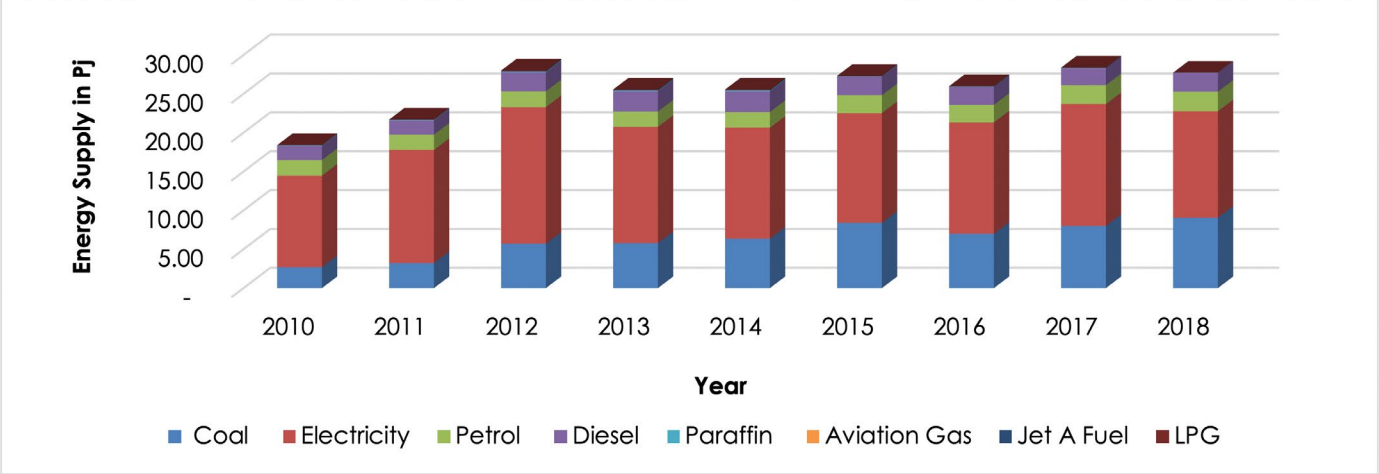
Table 1.4 and Figure 1.4 depict the total energy supply by components of supply (solid, liquid and gaseous fossil fuels) in Botswana. In general, the total energy supply saw a fluctuating trend during the 2010 - 2018 period, with the highest supply recorded in 2017 (28.37 Pj) and the lowest in 2010 (18.39 Pj). The commonly consumed energy sources were electricity, coal, diesel, and petrol, in that order. In 2010 and 2018 the total PES in Petajoules amounted to 18.39 and 27.72 respectively.

Table 1.4: Total Primary energy supply by components of supply (solid, liquid and gaseous fossil fuels), in Petajoules (Pj), 2010 – 2019

Source	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Coal	2.68	3.21	5.70	5.78	6.36	8.41	6.98	7.99	9.06	7.59
Electricity	11.78	14.56	17.58	14.97	14.28	14.12	14.34	15.68	13.69	-
Petrol	2.00	1.97	2.03	1.96	2.01	2.29	2.25	2.45	2.52	2.52
Diesel	1.83	1.84	2.43	2.61	2.67	2.40	2.32	2.16	2.44	2.21
Paraffin	0.08	0.08	0.11	0.09	0.10	0.03	0.02	0.02	0.02	0.01
Aviation Gas	-	-	0.01	0.01	0.01	0.01	0.01	0.01	-	0.01
Jet A Fuel	-	-	0.06	0.06	0.05	0.06	0.06	0.06	-	0.09
LPG	0.02	0.02	0.06	0.06	0.07	-	-	-	-	-
Total	**18.39**	**21.68**	**28.00**	**25.55**	**25.55**	**27.31**	**25.98**	**28.37**	**27.72**	**12.42**

Source: Department of Energy
(-) Data not available

Figure 1.4: Total Primary energy supply by components of supply, in Petajoules (Pj), 2010 – 2018



1.5. Final Electricity Consumption

Final electricity consumption is the total electricity consumed by end users, such as households, industry and agriculture (Eurostat, 2018). It excludes the electricity which is used by energy sector itself. Table 1.5 and Figure 1.5a depict the final electricity consumption by sector for the years 2010 – 2017. The annual final electricity consumption decreased from 2,310,662 MWh in 2010 to 2,275,409 MWh in 2017. The sectoral differentials show that mining (42.53 percent) recorded the highest share of final electricity consumption over the review period followed by water & electricity (12.81 percent), general government (9.24 percent), and trade, hotels & restaurants (9.21 percent). The construction sector recorded the least share of final electricity consumption with about 0.73 percent (See Table 1.5 & Figure 1.5b). According to the Department of Energy, the high variation on the annual figures for water and electricity sector between 2016 and 2017 in particular, was attributed to the fact that the year 2017 included only electricity consumption for core activities- water pumping, transportation and storage. However, the consumption for the year 2016 backwards included all activities even those outside the core ones (e.g. administration and administrative support).

Table 1.5: Final electricity consumption by sector, MWh (2010-2017)

Source	2010	2011	2012	2013	2014	2015	2016	2017	TOTAL	% share
Mining	1,117,100	1,085,700	1,127,600	1,197,000	1,194,000	1,252,339	991,785	895,076	8,860,600	42.53
Trade, Hotels &Restaurants	213,381	238,419	233,344	253,055	252,749	241,413	237,540	248,170	1,918,071	9.21
Finance & Business Service	161,532	186,842	197,971	230,888	229,399	276,441	215,701	235,245	1,734,019	8.32
General Government	246,230	250,435	247,255	245,242	255,488	219,268	238,119	223,082	1,925,119	9.24
Social & Personal Services	207,786	210,999	200,130	199,475	212,723	195,870	191,017	195,053	1,613,053	7.74
Manufacturing	126,874	130,705	138,000	148,527	151,391	133,562	152,663	184,161	1,165,883	5.60
Water & Electricity	131,391	146,278	249,089	397,663	543,088	448,036	583,878	169,296	2,668,719	12.81
Transport & Communication	71,905	60,003	74,909	72,626	74,232	74,348	75,764	83,355	587,142	2.82
Agriculture	18,406	24,783	24,950	25,623	25,289	36,382	24,706	26,094	206,233	0.99
Construction	**16,056**	**27,633**	**24,174**	**17,322**	**19,908**	**17,065**	**14,988**	**15,878**	**153,024**	**0.73**
TOTAL	**2,310,662**	**2,361,797**	**2,517,422**	**2,787,421**	**2,958,268**	**2,894,724**	**2,726,163**	**2,275,409**	**20,831,866**	**100.00**

Source: Department of Energy

Figure 1.5a: Final electricity consumption by sector, MWh (2010-2017)

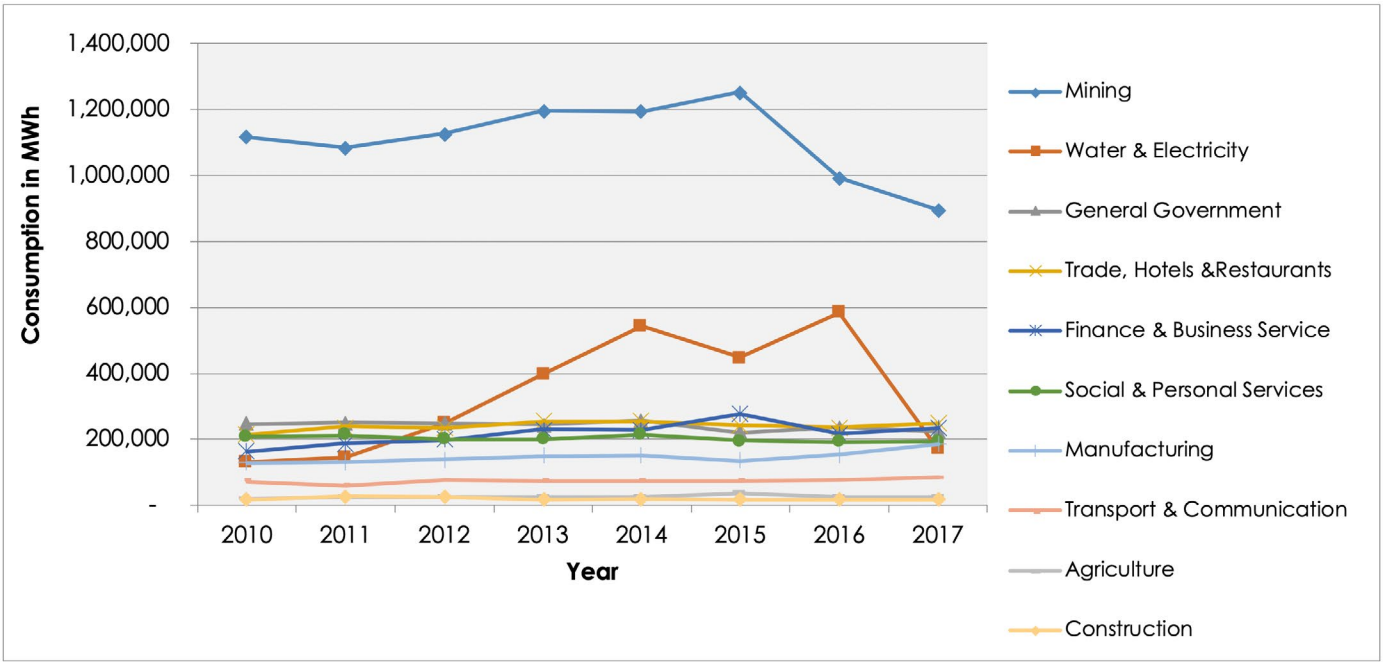
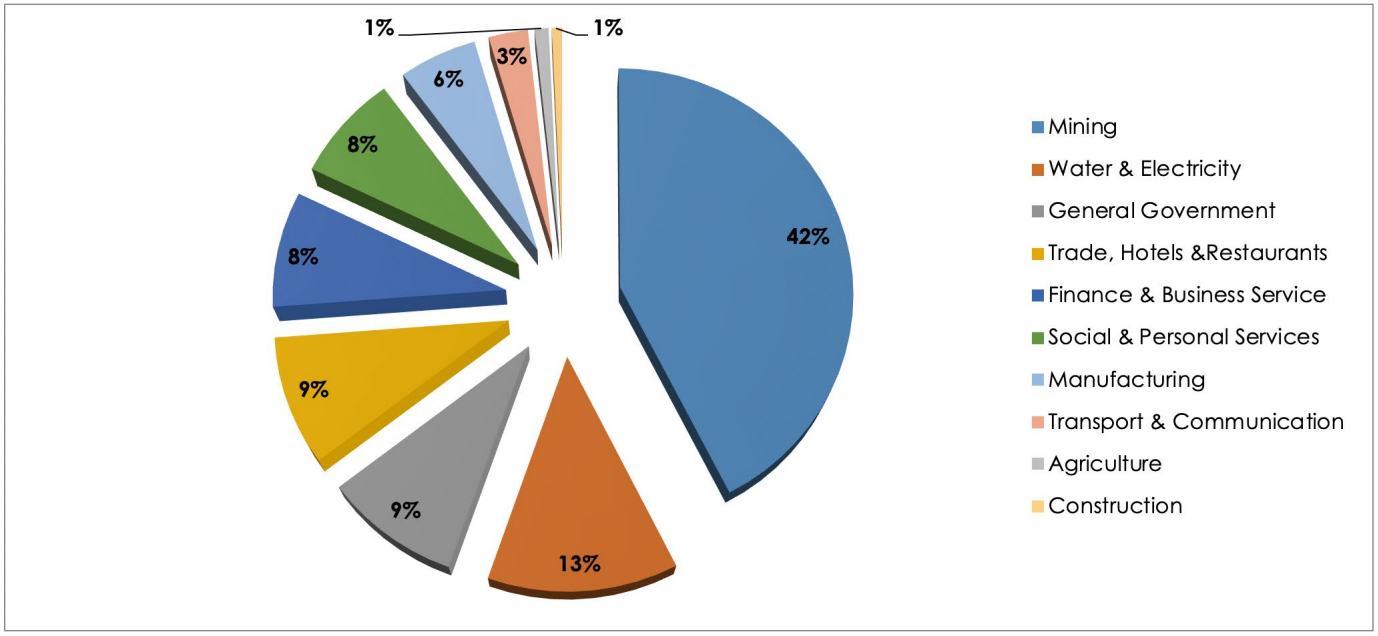


Figure 1.5b: Proportion of Final electricity consumption by sector, MWh (2010-2017)



1.6. Coal Statistics

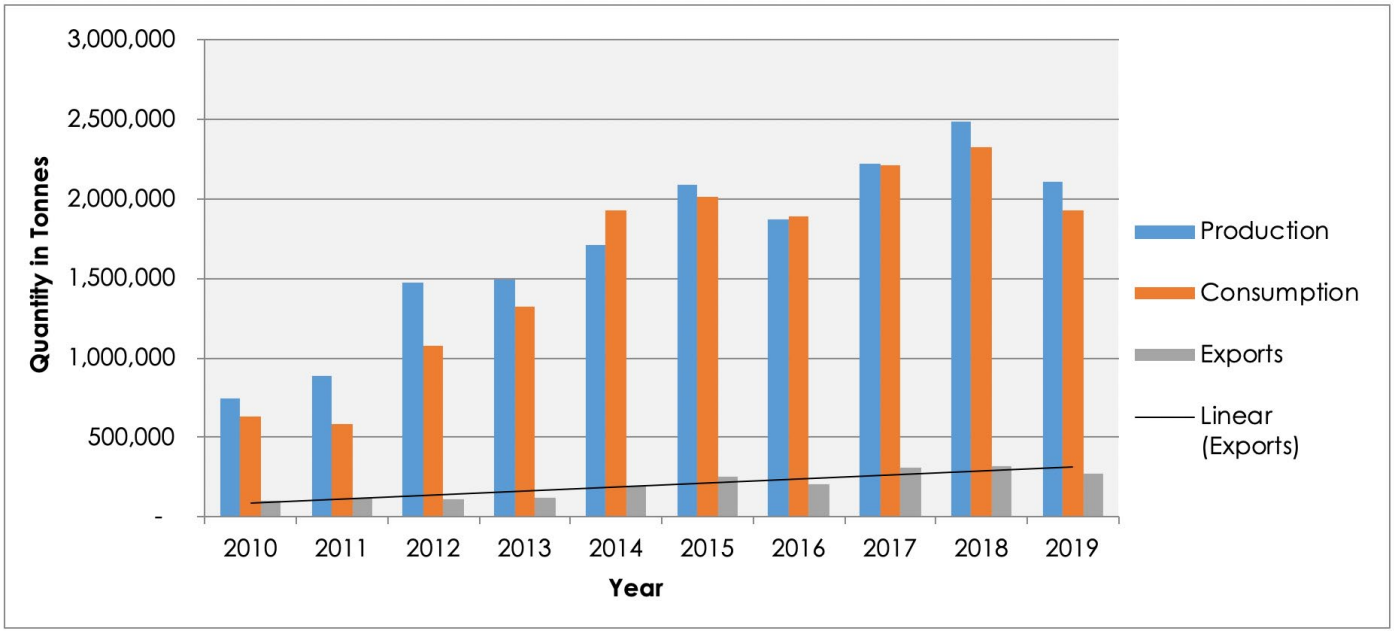
Table 1.6 presents coal summary statistics in Botswana from 2010 to 2019. A total of 17,077,088 tonnes of coal was produced during the review period; of which 15,906,622 tonnes was consumed and 1,994,349 tonnes was exported. Generally, coal production, consumption and exports experienced a significant increase from 2010 to 2019. The highest production and consumption of coal was recorded in 2018, at 2,482,312 tonnes and 2,328,814 tonnes respectively.

Table 1.6: Botswana coal summary statistics, Tonnes (2010-2019)

Year	Production	Consumption	Exports
2010	741,180	635,495	99,801
2011	886,324	584,680	119,274
2012	1,471,420	1,072,340	107,965
2013	1,495,653	1,318,741	118,681
2014	1,711,555	1,923,848	192,146
2015	2,084,571	2,011,779	248,700
2016	1,873,546	1,891,275	204,920
2017	2,219,638	2,215,068	309,726
2018	2,482,312	2,328,814	317,287
2019	2,110,891	1,924,582	275,848
Total	**17,077,088**	**15,906,622**	**1,994,349**

Source: Department of Energy

Figure 1.6: Botswana coal summary statistics, Tonnes (2010-2019)



2.0 WATER STATISTICS

This chapter covers the period 2017/18 to 2019/20 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).

2.1. 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 2.1: Dam Capacities

Dam	Capacity (Mm3)
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 2.1 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 2.2 shows the mid-month percentage dam levels for the years 2019 and 2020. Regarding annual averages, the year 2020 had slightly higher average dam levels than 2019. Dam levels peaked in February and March in 2020, and in April in 2019. The dam levels were at their lowest in October and November 2019, over the two-year period.

Gaborone dam serves the Greater Gaborone area which includes neighbouring settlements, and thus has remained below 70 percent throughout this period. National dam levels (inclusive of Molatedi of South Africa) improved by one percent from 67.2 percent to 68.2 percent from 2019 to 2020.

Table 2.2: Percentage Dam Levels 2019 - 2020

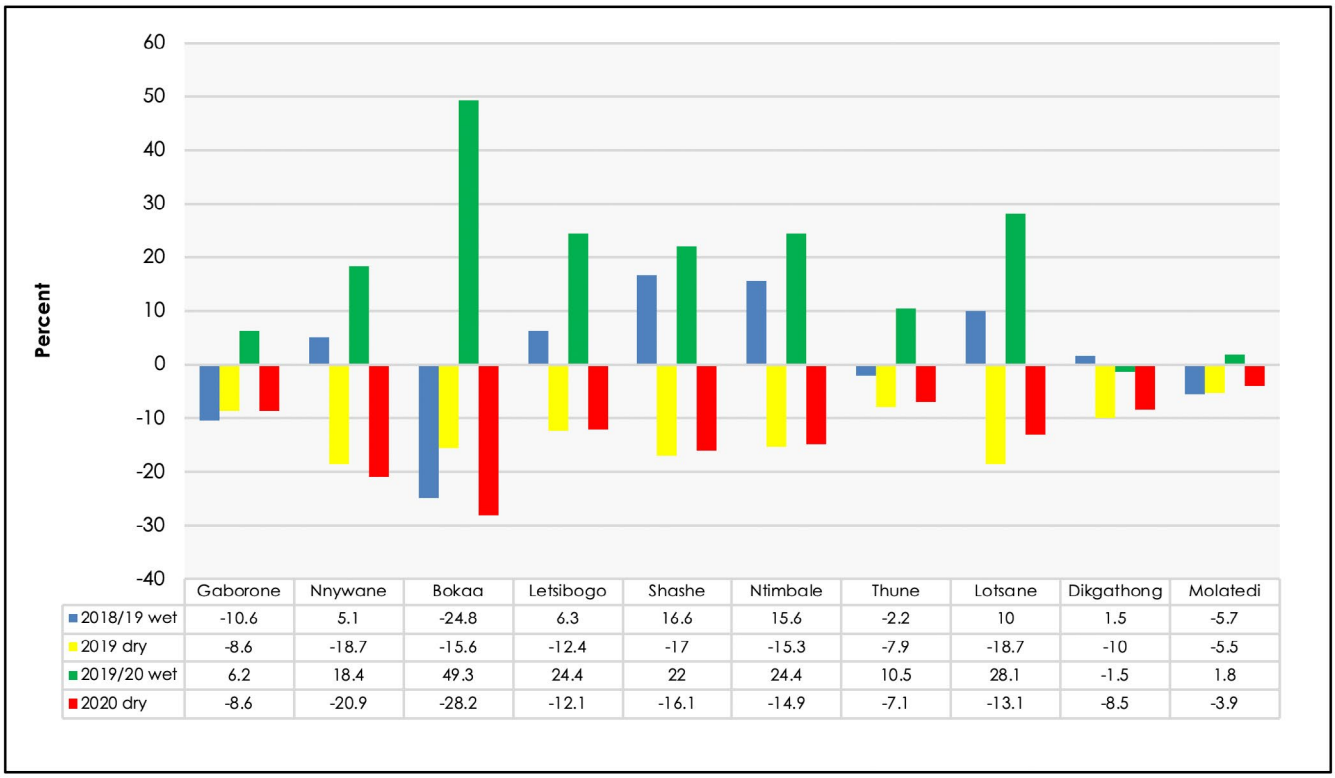
Year:	Date	Gaborone	Nnywane	Bokaa	Letsibogo	Shashe	Ntimbale	Thune	Lotsane	Dikgathong	Molatedi	Monthly Average
2019	**Jan 16th**	60.6	87.9	44	78.5	83.2	100	58.3	68.7	85.8	25	69.2
	Feb 13th	58	84	36.8	80.2	97.3	100	57.4	66.1	86.3	23	68.9
	Mar 15th	57.9	83.8	35.1	88	99.1	99.1	57.5	65.2	90	23	69.9
	Apr 12th	69.6	100.9	66.8	85.4	96.2	95.6	57.6	62.4	87.3	23.5	74.5
	May 15th	68.7	99	64.8	82	92.8	92.2	55.5	58.1	85.1	22.8	72.1
	Jun 14th	66.9	95.1	61.3	79.9	90.4	89.6	54	56.1	83.2	21.4	69.8
	Jul 17th	64.9	91.9	58.4	77.2	87.2	87.3	52.9	53.9	81.4	20.6	67.6
	Aug 15th	63.4	87.2	55.1	75.6	82.3	84.6	51.8	51.7	79.4	19.1	65
	Sep 16th	61	82.2	51.2	73	79.2	80.3	49.7	43.7	77.3	18	61.6
	Oct 15th	58.8	76.8	45.6	71.2	77.1	75.7	48.1	42.8	75	15.6	58.7
	Nov 15th	59	75	62.7	69.7	74.5	72.9	46.1	41.4	73	14.6	58.9
	Dec 16th	62.8	100.6	100	82	76.2	83.9	46.8	55.2	72.7	17.4	69.8
	Annual Average	**62.6**	**88.7**	**56.8**	**78.6**	**86.3**	**88.4**	**53**	**55.4**	**81.4**	**20.3**	**67.2**
2020	**Jan 15th**	62.6	100	100	79.3	73.1	81.7	46.7	60.4	70.1	17.7	69.2
	Feb 14th	67.7	98.6	99.4	93.5	92.4	96.2	60.3	72.2	70.9	19.5	77.1
	Mar 16th	65	95.2	94.9	95.6	99.1	100.1	58.6	70.9	73.5	17.4	77
	Apr 12th	63.2	93	86.1	92.3	95.6	96.2	55.9	66.1	71.5	16.1	73.6
	May 15th	62.1	88.4	87.3	89.6	92.2	93.1	54.6	62.6	69.5	15.6	71.5
	Jun 15th	59.8	81.8	78.9	86.6	88.5	86.7	52.5	58.2	67.5	14.7	67.5
	Jul 15th	58.3	78.8	72.7	84.8	85.5	86.1	51.3	57.6	65.9	13.8	65.5
	Aug 14th	51.1	75.9	67.3	82	82.1	83.9	50.1	56.1	64.3	13	62.6
	Sep 15th	54.6	72.1	57.9	80.2	79.5	81.3	48.8	53	63	12.2	60.3
	Oct 15th	52.5	82	52.5	83.2	89.6	96.9	47.5	51.7	62.2	11.9	63
	Nov 16th	52	88.6	71.1	80.5	85.9	91.7	46	48.7	60.6	13.9	63.9
	Dec 14th	52	101.5	70.5	79	96.4	101.6	46.3	48.2	61.4	14.1	67.1
	Annual Average	**58.4**	**88**	**78.2**	**85.6**	**88.3**	**91.3**	**51.6**	**58.8**	**66.7**	**15**	**68.2**

2.1.1. 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 2.1 below shows the wet and dry seasonal changes in the dam levels for the 2018/19 and 2019/20 meteorological years.

Figure 2.1: Percentage Change in Dam Levels by Wet and Dry Season 2018/19 to 2019/20



	Gaborone	Nnywane	Bokaa	Letsibogo	Shashe	Ntimbale	Thune	Lotsane	Dikgathong	Molatedi
2018/19 wet	-10.6	5.1	-24.8	6.3	16.6	15.6	-2.2	10	1.5	-5.7
2019 dry	-8.6	-18.7	-15.6	-12.4	-17	-15.3	-7.9	-18.7	-10	-5.5
2019/20 wet	6.2	18.4	49.3	24.4	22	24.4	10.5	28.1	-1.5	1.8
2020 dry	-8.6	-20.9	-28.2	-12.1	-16.1	-14.9	-7.1	-13.1	-8.5	-3.9

The highest gain in dam levels during the 2018/19 season was recorded for Shashe dam followed by Ntimbale dam and Lotsane dam, while the highest gain during the 2019/20 season was for Bokaa dam, followed by Lotsane dam and Letsibogo and Ntimbale dams.

The highest loss during the 2018/19 seasons was recorded for Bokaa dam (-24.8 percent), followed by Nnywane dam (-18.7 percent) and Lotsane dam (-18.7 percent), while the highest loss during the 2019/20 seasons was recorded for Bokaa dam (-28.2 percent), followed by Nnywane dam (-20.9 percent) and Shashe dam (-16.1 percent).

Bokaa, Letsibogo, Shashe and Ntimbale dams recorded gains over the two seasons 2018/19 to 2019/20, while Gaborone, Nnywane, Thune, Dikgathong and Molatedi (supplying Botswana from South Africa) recorded losses.

2.2. 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 2.3.

Table 2.3: 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	Letlhakane
	12	Mahalapye
	13	Kasane
	14	Masunga
	15	Francistown
	16	Maun

Source: Water Utilities Corporation

2.2.1. Water Production by Management Centres

Water Utilities Corporation's 16 Management 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) in the north (Table 2.3). 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 2.4: Southern Water Production by Management Centres 2018/19 – 2019/20 (Kilolitres)

Southern		Gaborone	Mochudi	Molepolole	Lobatse	Kanye	Tsabong	Ghanzi	Southern MCs Total
2018-19	**Apr**	2,306,946.00	397,625.30	493,965.50	866,797.00	499,207.00	126,399.00	116,441.00	**4,807,380.80**
	May	2,492,433.00	398,183.00	488,489.10	795,424.00	495,180.20	140,788.40	122,609.00	**4,933,106.70**
	Jun	2,533,796.00	386,618.50	485,714.40	802,400.00	549,731.90	133,377.00	117,578.00	**5,009,215.80**
	Jul	2,345,260.00	364,763.40	469,513.70	807,875.60	495,472.00	137,581.00	114,261.00	**4,734,726.60**
	Aug	2,157,612.00	362,252.20	481,637.80	841,387.30	517,994.00	138,162.10	118,249.00	**4,617,294.30**
	Sep	2,295,746.00	382,656.00	492,150.30	699,414.80	455,863.00	145,681.90	127,577.00	**4,599,089.00**
	Oct	2,084,201.00	382,094.30	473,547.70	875,898.00	447,722.00	153,893.60	133,368.00	**4,550,724.50**
	Nov	2,511,370.00	418,541.20	465,767.70	826,241.00	450,373.00	150,513.40	127,026.00	**4,949,832.30**
	Dec	2,488,662.00	415,252.90	443,028.40	835,405.30	413,526.00	147,576.80	118,898.00	**4,862,349.40**
	Jan	3,184,491.00	370,170.70	424,240.00	818,694.00	410,024.00	151,051.20	122,657.00	**5,481,327.90**
	Feb	2,170,807.00	382,695.00	457,514.00	784,928.00	402,692.00	149,242.80	112,425.00	**4,460,303.80**
	Mar	2,339,044.00	351,706.00	403,484.00	837,678.00	446,731.00	137,335.00	127,330.00	**4,643,308.00**
		28,910,368.00	**4,612,558.40**	**5,579,052.50**	**9,792,143.00**	**5,584,516.00**	**1,711,602.20**	**1,458,419.00**	**57,648,659.10**
2019-20	**Apr**	2,873,222.00	346,898.00	488,001.50	814,607.00	479,836.00	143,494.60	139,017.00	**5,285,076.10**
	May	2,603,133.00	330,377.00	492,806.00	698,856.00	491,525.00	144,388.00	122,661.00	**4,883,746.00**
	Jun	2,750,248.00	320,327.00	533,669.10	783,312.00	528,292.00	142,978.00	128,911.00	**5,187,737.10**
	Jul	2,434,330.00	396,440.60	519,660.10	773,641.00	484,607.00	148,970.00	125,062.00	**4,882,710.70**
	Aug	2,479,231.00	400,966.90	559,046.50	852,740.00	431,649.00	167,374.30	125,096.00	**5,016,103.70**
	Sep	2,249,896.00	397,771.50	588,303.80	848,349.20	462,604.00	146,120.00	120,394.00	**4,813,438.50**
	Oct	2,660,055.40	421,349.60	584,856.80	870,303.00	585,873.60	154,803.00	131,425.70	**5,408,667.10**
	Nov	2,284,664.90	384,840.00	497,167.70	801,897.00	569,791.00	155,435.00	121,414.50	**4,815,210.20**
	Dec	2,395,798.90	436,158.00	561,161.80	872,338.00	660,494.00	144,660.00	118,113.60	**5,188,724.30**
	Jan	2,935,886.00	445,623.00	541,449.00	776,045.00	800,401.00	148,908.00	114,314.30	**5,762,626.30**
	Feb	2,747,105.40	411,611.00	534,743.60	733,137.00	765,118.50	152,896.00	113,560.20	**5,458,171.70**
	Mar	2,860,008.40	458,132.00	512,350.80	765,772.00	615,032.00	144,062.00	118,837.60	**5,474,194.80**
		31,273,579.00	**4,750,494.60**	**6,413,216.80**	**9,590,997.20**	**6,875,223.10**	**1,794,088.90**	**1,478,806.90**	**62,176,406.50**

Source: Water Utilities Corporation

Table 2.5: Northern Water Production by Management Centres 2018/19 – 2019/20 (Kilolitres)

Northern		Francistown	Selibe Phikwe	Palapye	Serowe	Mahalapye	Kasane	Masunga	Letlhakane	Maun
2018-19	**Apr**	1,238,797.0	516,762.0	475,586.0	339,006.5	500,707.0	228,562.0	365,617.8	152,934.0	285,441.0
	May	1,316,263.0	531,536.0	402,469.0	353,656.0	570,129.0	246,680.0	368,185.0	152,813.0	379,723.0
	Jun	1,161,839.0	564,171.0	440,797.0	243,126.0	470,371.0	237,836.0	395,653.6	155,575.0	338,199.0
	Jul	1,206,282.0	808,099.0	544,448.0	248,019.0	503,496.0	114,862.0	379,114.7	147,376.0	323,917.0
	Aug	1,236,860.0	602,586.0	585,964.0	296,615.0	460,087.0	126,753.0	398,791.9	153,409.0	405,005.0
	Sep	1,085,221.0	479,401.0	471,751.0	295,373.0	426,740.0	122,160.0	388,445.1	158,677.0	375,832.0
	Oct	1,296,958.0	542,320.0	602,862.0	303,872.0	424,691.0	153,801.0	396,660.4	134,526.0	406,444.0
	Nov	1,275,820.0	547,669.0	527,134.0	269,081.0	411,986.0	152,138.0	385,637.3	144,409.0	426,280.0
	Dec	1,279,649.0	534,516.0	579,160.0	285,842.0	417,038.0	130,226.0	353,457.7	153,332.0	352,716.0
	Jan	1,366,788.0	532,025.0	581,158.3	290,527.0	402,061.3	141,545.0	384,865.7	143,035.0	421,285.0
	Feb	1,190,853.0	483,718.0	497,296.5	265,847.0	363,016.3	124,314.0	324,540.1	141,161.0	392,583.0
	Mar	1,330,044.0	559,898.0	620,007.8	256,918.0	374,684.2	132,128.0	341,945.2	152,572.0	433,926.0
		14,985,374.0	**6,702,701.0**	**6,328,633.7**	**3,447,882.5**	**5,325,006.9**	**1,911,005.0**	**4,482,914.7**	**1,789,819.0**	**4,541,351.0**
2019-20	**Apr**	1,245,427.0	587,867.0	433,047.0	350,221.0	354,774.0	81,397.0	453,492.7	**191,983.0**	**353,378.0**
	May	1,206,864.0	647,736.0	365,649.0	277,154.0	352,147.0	84,128.0	366,595.7	**161,662.0**	**343,583.0**
	Jun	1,194,059.0	605,874.0	351,154.0	268,498.0	325,115.0	142,195.0	320,221.4	**160,005.0**	**338,925.0**
	Jul	1,187,850.0	540,858.0	341,652.0	310,703.0	425,594.0	147,278.0	431,458.7	**159,622.6**	**383,858.0**
	Aug	1,215,807.0	554,805.0	404,416.0	258,941.0	405,413.0	134,919.0	389,581.0	**167,155.6**	**387,135.0**
	Sep	1,217,328.0	522,994.0	434,224.0	281,100.0	361,896.5	133,599.0	341,477.7	**157,566.8**	**387,671.0**
	Oct	1,249,424.0	554,580.0	498,721.5	330,503.0	408,387.0	138,654.0	399,954.1	**180,004.0**	**395,851.0**
	Nov	1,278,392.0	543,166.0	505,054.2	262,415.0	389,952.0	138,654.0	377,723.5	**192,288.0**	**358,767.0**
	Dec	1,270,393.0	573,795.0	516,843.6	381,069.0	428,703.0	145,294.0	393,452.3	**176,762.0**	**351,079.0**
	Jan	1,345,481.0	628,969.0	441,302.3	257,875.0	385,991.0	130,569.0	312,218.8	**186,966.0**	**340,708.0**
	Feb	1,221,752.0	571,650.0	472,023.3	325,073.0	415,855.0	123,811.0	300,035.4	**178,010.0**	**358,847.0**
	Mar	1,280,033.0	582,514.0	496,394.7	321,571.0	503,193.0	133,174.0	287,735.8	**206,482.0**	**409,616.0**
		14,912,810.0	**6,914,808.0**	**5,260,481.6**	**3,625,123.0**	**4,757,020.5**	**1,533,672.0**	**4,373,947.3**	**2,118,507.0**	**4,409,418.0**

Source: Water Utilities Corporation

Tables 2.4 and 2.5 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 are the capital and second cities of the country, and they have the highest populations; they are also centres of economic activity in the country.

Table 2.6 shows total water production for the years 2017/18 to 2019/20. Gaborone and Francistown MCs have the highest water production for the period.

The highest increase in water production between 2017/18 and 2018/19 was for Kasane MC at 37.3 percent, followed by Palapye MC at 36.3 percent and Maun MC at 16.0 percent, while for the period 2018/19 to 2019/20 the highest increase in water production was for Kanye at 23.1 percent followed by Letlhakane at 18.4 percent and Molepolole at 15.0 percent.

The greatest reduction in water production from 2017/18 to 2018/19 was for Letlhakane MC at 13.2 percent followed by Kanye at 7.9 percent and Serowe MC at 6.5 percent, while for 2018/19 to 2019/20 the greatest reduction in water production was for Kasane MC at 19.7 percent followed by Palapye MC at 16.9 percent.

Overall water production for the whole country recorded an increase from 2017/18 to 2018/19 (2.8 percent) and from 2018/19 to 2019/20 (2.7 percent).

Table 2.6: Total production 2017/18 to 2019/2020 (Kilolitres)

				Percentage change	
Southern	**2017-18**	**2018-19**	**2019-20**	**2017-18 to 2018-19**	**2018-19 to 2019-20**
Gaborone	29,622,880.50	28,910,368.00	31,273,579.00	-2.40%	8.20%
Mochudi	4,393,738.50	4,612,558.40	4,750,494.60	5.00%	3.00%
Molepolole	5,454,927.70	5,579,052.50	6,413,216.80	2.30%	15.00%
Lobatse	9,346,157.70	9,792,143.00	9,590,997.20	4.80%	-2.10%
Kanye	6,065,800.50	5,584,516.00	6,875,223.10	-7.90%	23.10%
Tsabong	1,688,512.80	1,711,602.20	1,794,088.90	1.40%	4.80%
Ghanzi	1,459,513.60	1,458,419.00	1,478,806.90	-0.10%	1.40%
Southern MCs Total	**58,031,531.20**	**57,648,659.10**	**62,176,406.50**	**-0.70%**	**7.90%**
Northern	**2017-18**	**2018-19**	**2019-20**	**2017-18 to 2018-19**	**2018-19 to 2019-20**
Francistown	15,071,802.00	14,985,374.00	14,912,810.00	-0.60%	-0.50%
Selibe Phikwe	6,191,111.00	6,702,701.00	6,914,808.00	8.30%	3.20%
Palapye	4,643,392.50	6,328,633.70	5,260,481.60	36.30%	-16.90%
Serowe	3,686,750.00	3,447,882.50	3,625,123.00	-6.50%	5.10%
Mahalapye	5,263,932.80	5,325,006.90	4,757,020.50	1.20%	-10.70%
Kasane	1,392,296.00	1,911,005.00	1,533,672.00	37.30%	-19.70%
Masunga	3,994,539.40	4,482,914.70	4,373,947.30	12.20%	-2.40%
Letlhakane	2,063,155.00	1,789,819.00	2,118,507.00	-13.20%	18.40%
Maun	3,914,077.50	4,541,351.00	4,409,418.00	16.00%	-2.90%
Northern MCs Total	**46,221,056.20**	**49,514,687.80**	**47,905,787.40**	**7.13%**	**-3.25%**
National	**104,252,587.40**	**107,163,346.90**	**110,082,193.90**	**2.80%**	**2.70%**

Source: Water Utilities Corporation

2.2.2. Water Production by Settlements

Table 2.7 below shows the top ten monthly water production for settlements for the year 2019/20.

Table 2.7: Top ten total production by settlements (kilolitres) 2019/20

	19-Apr	19-May	19-Jun	19-Jul	19-Aug	19-Sep	19-Oct	19-Nov	19-Dec	20-Jan	20-Feb	20-Mar	TOTAL
Gaborone	2,230,247.0	1,894,508.0	1,998,737.0	1,719,377.0	1,882,622.0	1,482,108.0	2,007,162.4	1,557,430.9	1,706,729.9	2,250,458.0	2,095,295.0	2,106,820.0	22,931,495.2
Francistown	1,019,010.0	977,064.0	972,519.0	947,082.0	995,277.0	986,768.0	992,665.0	1,037,772.0	1,021,753.0	1,101,421.0	996,522.0	1,094,666.0	12,142,519.0
Palapye	433,047.0	365,649.0	351,154.0	341,652.0	404,416.0	434,224.0	498,721.5	505,054.2	516,843.6	441,302.3	472,023.3	496,394.7	5,260,481.6
Lobatse	301,489.0	262,209.0	310,575.0	296,878.0	319,146.0	328,278.0	329,350.0	306,868.0	353,352.0	267,267.0	264,801.0	278,828.0	3,619,041.0
Mogoditshane	179,752.0	316,828.0	294,110.0	294,582.0	204,152.0	369,278.0	135,968.0	309,182.0	227,600.0	236,750.0	184,810.0	321,106.0	3,074,118.0
Phikwe	271,191.0	266,562.0	262,415.0	258,982.0	270,134.0	255,927.0	272,974.0	264,991.0	269,430.0	304,719.0	265,393.0	275,981.0	2,962,718.0
Tlokweng	246,830.0	207,650.0	226,530.0	226,490.0	226,790.0	220,500.0	296,210.0	240,180.0	259,860.0	265,260.0	261,170.0	263,150.0	2,940,620.0
Kanye	233,637.0	233,390.0	232,658.0	224,722.0	127,080.0	136,788.0	230,434.0	217,751.0	268,208.0	369,022.0	339,775.5	323,470.0	2,936,935.5
Mahalapye	215,808.0	192,996.0	176,525.0	261,352.0	243,250.0	229,496.0	246,772.0	249,479.0	280,580.0	209,334.0	267,930.0	306,440.0	2,879,962.0
Molepolole	176,597.0	173,925.0	190,137.0	181,379.0	180,715.0	267,842.0	250,402.0	224,682.0	239,723.0	248,270.0	249,948.0	225,043.0	2,608,663.0

Source: Water Utilities Corporation

Table 2.8 below compares the total annual water production for the towns and cities for the years 2017/18 and 2019/20. (No data available for 2018/19).

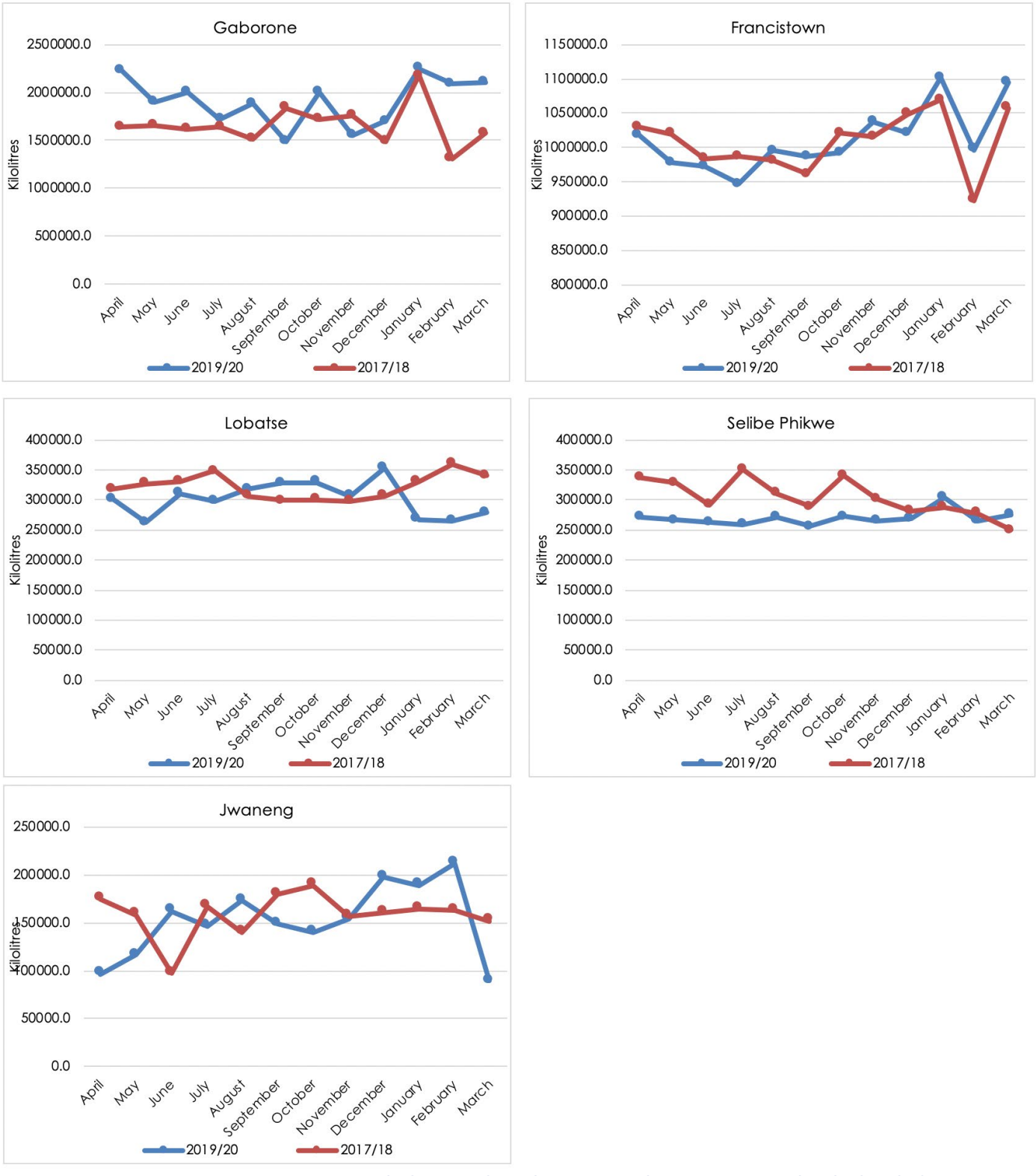
Table 2.8: Change in total water production for towns and cities (kilolitres) 2017/18 to 2019/20

Settlement	2017-18	2019-20	Change	Percentage Change
Gaborone	19,926,489.0	22,931,495.2	3,005,006.2	13.1%
Francistown	12,098,020.0	12,142,519.0	44,499.0	0.4%
Lobatse	3,865,084.0	3,619,041.0	-246,043.0	-6.8%
Phikwe	3,645,365.0	3,238,699.0	-406,666.0	-12.6%
Jwaneng	1,901,371.0	1,821,553.0	-79,818.0	-4.4%

Source: Water Utilities Corporation

Figure 2.2 shows the trends in monthly water production for towns and cities.

Figure 2.2 Monthly water production for towns and cities



2.3. 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 2.9 and 2.10 show the billed water consumption by management centre for the 2017/18 and 2018/19 years.

Table 2.9: Southern Billed Water consumption by Management Centres 2017/18 to 2018/19 (Kilolitres)

Southern		Gaborone	Mochudi	Molepolole	Lobatse	Kanye	Tsabong	Ghanzi	Southern MCs Total
2017-18	**Apr**	1,478,621.0	69,266.0	64,037.0	184,753.0	175,898.0	15,365.0	25,157.0	2,013,097.0
	May	2,139,217.0	180,566.0	184,458.0	249,390.0	229,581.0	49,190.0	69,723.0	3,102,125.0
	Jun	2,134,848.0	213,887.0	226,164.0	213,708.0	194,300.0	55,758.0	65,520.0	3,104,185.0
	Jul	2,358,826.0	218,478.0	214,129.0	219,525.0	261,562.0	66,012.0	78,207.0	3,416,739.0
	Aug	1,530,744.0	389,145.0	236,488.0	216,649.0	242,117.0	59,391.0	29,295.0	2,703,829.0
	Sep	1,196,148.0	187,815.0	270,959.0	191,300.0	151,175.0	68,428.0	75,072.0	2,140,897.0
	Oct	2,651,238.0	75,904.0	219,729.0	290,775.0	220,188.0	63,840.0	75,805.0	3,597,479.0
	Nov	2,155,719.0	170,234.0	219,729.0	250,185.0	241,202.0	68,999.0	70,896.0	3,176,964.0
	Dec	2,190,419.0	259,903.0	222,676.0	259,997.0	198,210.0	65,035.0	78,039.0	3,274,279.0
	Jan	2,498,864.0	245,934.0	281,197.0	279,277.0	237,107.0	60,101.0	67,702.0	3,670,182.0
	Feb	2,368,415.0	234,832.0	213,240.0	262,748.0	105,008.0	48,619.0	69,206.0	3,302,068.0
	Mar	2,273,987.0	221,686.0	205,012.0	250,252.0	195,178.0	75,210.0	59,712.0	3,281,037.0
Total		**24,977,046.0**	**2,467,650.0**	**2,557,818.0**	**2,868,559.0**	**2,451,526.0**	**695,948.0**	**764,334.0**	**36,782,881.0**
2018-19	**Apr**	1,639,659.0	151,962.0	270,630.0	303,273.0	499,207.0	126,399.0	116,441.0	**3,107,571.0**
	May	2,105,603.3	336,681.0	301,277.0	595,349.0	495,180.2	140,788.4	122,609.0	**4,097,487.9**
	Jun	2,143,977.8	195,605.0	346,282.0	303,658.9	549,731.9	133,377.0	117,578.0	**3,790,210.6**
	Jul	2,226,221.0	339,027.0	383,885.0	563,688.1	495,472.0	137,581.0	114,261.0	**4,260,135.1**
	Aug	2,073,053.0	241,751.0	319,420.0	493,272.6	517,994.0	138,162.1	118,249.0	**3,901,901.7**
	Sep	2,149,637.0	219,349.0	335,874.0	398,602.4	455,863.0	145,681.9	127,577.0	**3,832,584.3**
	Oct	2,079,498.8	317,350.0	420,589.0	511,305.5	447,722.0	153,893.6	133,368.0	**4,063,726.9**
	Nov	2,086,332.0	185,688.0	322,021.0	296,513.2	450,373.0	150,513.4	127,026.0	**3,618,466.6**
	Dec	2,129,543.0	254,500.7	292,789.0	408,811.8	413,526.0	147,576.8	118,898.0	**3,765,645.3**
	Jan	2,266,683.0	255,850.5	304,720.0	411,592.0	410,024.0	151,051.2	122,657.0	**3,922,577.7**
	Feb	2,129,543.0	275,868.0	262,028.0	382,414.0	402,692.0	149,242.8	112,425.0	**3,714,212.8**
	Mar	2,155,289.8	373,680.0	312,013.6	418,001.0	446,731.0	137,335.0	127,330.0	**3,970,380.4**
Total		**25,185,040.7**	**3,147,312.2**	**3,871,528.6**	**5,086,481.5**	**5,584,516.1**	**1,711,602.2**	**1,458,419.0**	**46,044,900.3**

Source: Water Utilities Corporation

Table 2.10: Northern billed water consumption by Management Centres (Kilolitres) 2017/18 to 2018/19

Southern		Francistown	Selibe Phikwe	Palapye	Serowe	Mahalapye	Kasane	Masunga	Letlhakane	Maun	Northern MCs Total
2017-18	**Apr**	404,843.0	189,753.0	151,361.0	80,222.0	58,585.0	60,936.0	63,127.0	49,425.0	76,744.0	1,134,996.0
	May	811,722.0	243,909.0	228,873.0	233,874.0	145,290.0	75,124.0	227,315.0	96,465.0	179,356.0	2,241,928.0
	Jun	777,316.0	245,732.0	264,723.0	80,377.0	164,417.0	96,592.0	180,419.0	71,489.0	184,855.0	2,065,920.0
	Jul	879,715.0	291,511.0	263,821.0	169,260.0	143,229.0	146,753.0	186,959.0	79,670.0	180,627.0	2,341,545.0
	Aug	566,097.0	292,018.0	237,353.0	35,063.0	103,164.0	83,530.0	176,701.0	41,952.0	154,584.0	1,690,462.0
	Sep	1,021,072.0	142,232.0	284,182.0	170,032.0	174,455.0	67,431.0	184,235.0	80,440.0	148,803.0	2,272,882.0
	Oct	641,849.0	313,619.0	316,140.0	177,416.0	168,814.0	114,993.0	202,030.0	83,802.0	159,315.0	2,177,978.0
	Nov	805,870.0	279,309.0	281,945.0	111,474.0	177,697.0	84,271.0	210,862.0	99,382.0	156,300.0	2,207,110.0
	Dec	636,833.0	315,694.0	328,997.0	143,674.0	138,793.0	77,941.0	198,784.0	85,280.0	158,889.0	2,084,885.0
	Jan	988,163.0	389,562.0	372,930.0	156,023.0	209,387.0	93,231.0	307,868.0	98,432.0	154,659.0	2,770,255.0
	Feb	913,191.0	319,446.0	269,012.0	170,156.0	171,230.0	80,996.0	202,727.0	85,620.0	145,525.0	2,357,903.0
	Mar	746,452.0	284,839.0	266,835.0	161,142.0	131,191.0	64,266.0	157,839.0	79,848.0	128,194.0	2,020,606.0
Total		**9,193,123.0**	**3,307,624.0**	**3,266,172.0**	**1,688,713.0**	**1,786,252.0**	**1,046,064.0**	**2,298,866.0**	**951,805.0**	**1,827,851.0**	**25,366,470.0**
2018-19	**Apr**	996,344.7	288,015.0	342,053.0	211,163.0	195,505.0	82,447.0	298,187.0	**102,550.0**	**168,020.0**	**2,684,284.7**
	May	702,211.0	500,218.0	317,998.0	281,114.0	269,408.0	102,901.0	263,274.0	**102,065.0**	**224,293.8**	**2,763,482.7**
	Jun	599,970.2	322,131.0	385,130.0	224,166.0	216,868.0	94,480.0	244,468.0	**117,157.0**	**205,762.0**	**2,410,132.2**
	Jul	842,158.0	418,071.0	366,738.0	232,221.0	203,563.0	98,357.0	226,655.0	**113,907.0**	**230,388.0**	**2,732,058.0**
	Aug	756,658.5	345,205.0	330,915.0	253,254.0	231,282.0	101,869.0	206,295.0	**115,321.0**	**248,680.0**	**2,589,479.5**
	Sep	766,105.0	432,111.0	238,445.0	239,495.0	223,772.0	83,219.0	274,783.0	**93,208.0**	**275,556.0**	**2,626,694.0**
	Oct	1,091,172.0	352,097.0	439,350.0	223,511.0	224,764.9	106,016.0	231,854.0	**126,977.0**	**317,767.0**	**3,113,508.9**
	Nov	862,273.4	396,201.0	348,456.0	252,990.0	235,907.0	94,803.0	238,577.0	**103,618.0**	**238,250.0**	**2,771,075.4**
	Dec	864,844.1	312,469.0	440,187.0	226,994.0	229,610.0	122,921.0	221,444.0	**93,989.0**	**270,740.0**	**2,783,198.1**
	Jan	820,843.0	353,294.0	425,109.0	199,070.0	259,465.0	99,197.0	296,713.0	**100,493.0**	**259,465.0**	**2,813,649.0**
	Feb	948,795.1	391,404.0	339,944.0	238,206.0	232,386.0	85,592.0	212,237.0	**123,598.0**	**297,211.6**	**2,869,373.6**
	Mar	976,193.3	366,296.8	450,893.0	250,034.0	244,165.0	101,978.6	339,755.0	**85,788.0**	**306,906.0**	**3,122,009.7**
Total		**10,227,568.3**	**4,477,512.8**	**4,425,218.0**	**2,832,218.0**	**2,766,695.9**	**1,173,780.6**	**3,054,242.0**	**1,278,671.0**	**3,043,039.4**	**33,278,945.8**

Source: Water Utilities Corporation

Gaborone MC followed by Francistown MC then Selibe Phikwe MC recorded the highest billed water consumption for the year 2017/18 and for the year 2018/19 it was Gaborone MC, Francistown MC and Kanye MC in that order.

Table 2.11: Total billed Water consumption by Management Centres 2017/18 and 2018/19 (Kilolitres)

Southern	2017-18	2018-19	2019-20
Gaborone	24,977,046.0	25,185,040.7	0.8%
Mochudi	2,467,650.0	3,147,312.2	27.5%
Molepolole	2,557,818.0	3,871,528.6	51.4%
Lobatse	2,868,559.0	5,086,481.5	77.3%
Kanye	2,451,526.0	5,584,516.0	127.8%
Tsabong	695,948.0	1,711,602.2	145.9%
Ghanzi	764,334.0	1,458,419.0	90.8%
Southern MCs Total	**36,782,881.0**	**46,044,900.3**	**25.2%**

Northern MCs	2017-18	2018-19	Percentage change
Francistown	9,193,123.0	10,227,568.2	11.3%
Selibe Phikwe	3,307,624.0	4,477,512.8	35.4%
Palapye	3,266,172.0	4,425,218.0	35.5%
Serowe	1,688,713.0	2,832,218.0	67.7%
Mahalapye	1,786,252.0	2,766,695.9	54.9%
Kasane	1,046,064.0	1,173,780.6	12.2%
Masunga	2,298,866.0	3,054,242.0	32.9%
Letlhakane	951,805.0	1,278,671.0	34.3%
Maun	1,827,851.0	3,043,039.3	66.5%
Northern MCs Total	**25,366,470.0**	**33,278,945.8**	**31.2%**

Table 2.11 above compares the 2017/18 and 2018/19 total billed water consumption for the management centres.

Total billed water consumption was higher in 2018/19 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.

All of the MCs recorded increases in their billed water consumption. Tsabong recorded the highest increase in billed water consumption at 145.9 percent, followed by Kanye at 127.8 percent and Ghanzi at 90.8 percent.

2.4. Non-Revenue Water

Table 2.12 shows percentage non-revenue water (NRW) for 2017/18 and 2018/19 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 2018/19 Lobatse MC recorded the highest non-revenue water at 48.1 percent followed by Mahalapye at 41.5 percent, Tsabong MC at 35.8 percent and Kasane MC at 35.5 percent. Except for Kasane and Palapye, all the MCs recorded reductions in Non-Revenue Water between 2017/18 and 2018/19.

The highest percentage change in Non-Revenue Water between the two periods was recorded for Kanye MC at 42.6 percentage points followed by Serowe MC at 36.1 percentage points and Letlhakane MC at 25.4 percentage points.

Table 2.12: Non Revenue Water (NRW) 2016/17 to 2018/19 (Percent)

	MCs	2017/18	2018/19
Southern MCs	Gaborone	16%	12.9%
	Mochudi	44%	31.8%
	Molepolole	53%	30.6%
	Lobatse	69%	48.1%
	Kanye	60%	17.4%
	Tsabong	59%	35.8%
	Ghanzi	48%	26.9%
Northern MCs	Francistown	**39%**	**20.2%**
	Selibe-Phikwe	47%	33.2%
	Palapye	**30%**	**30.1%**
	Serowe	54%	17.9%
	Mahalapye	66%	41.5%
	Kasane	25%	35.5%
	Masunga	42%	31.9%
	Maun	53%	33.0%
	Letlhakane	54%	28.6%
	TOTAL	**40%**	**25.8%**

Source: Water Utilities Corporation

2.5. Water to Mines

WUC supplies some of the water used by Botswana's key industry; mining. Table 2.13 shows the monthly supply of raw (untreated) water to the mines for the 2017/18 and 2019/20 years. Data is not available for the year 2018/19 and for the diamond mines.

Table 2.13: Raw water to mines 2017/18 and 2019/20 (Kilolitres)

		Botash	Morupule Colliery Mine	BCL	Tati Nickel	Mupane
2017/18	April	8,938.0	56,419.0	66	11,981.0	97,650.0
	May	7,485.0	58,083.0	60	4,535.0	64,240.0
	June	22,557.0	71,382.0	115	0	63,900.0
	July	33,661.0	90,541.0	184	5,795.0	106,140.0
	August	25,284.0	72,527.0	254	5,188.0	95,830.0
	September	18,728.0	59,553.0	89	0	93,600.0
	October	25,076.0	88,180.0	118	5,465.0	89,840.0
	November	**25,224.0**	**72,524.0**	**119**	**4,134.0**	**100,010.0**
	December	26,241.0	122,836.0	120	0	80,750.0
	January	**25,954.0**	**117,798.0**	**797**	**5,129.0**	**99,160.0**
	February	25,344.0	66,487.0	798	10,755.0	96,440.0
	March	33,651.0	77,338.0	799	3,610.0	79,790.0
	Total	**278,143.0**	**953,668.0**	**3,519.0**	**56,592.0**	**1,067,350.0**
2019/20	April	42,979.0	114,155.0		5,547.0	63,360.0
	May	21,120.0	114,114.0		-	63,000.0
	June	11,637.0	78,927.0		-	66,690.0
	July	**36,581.0**	**70,048.0**		**11,918.0**	**74,120.0**
	August	**28,681.0**	**99,079.0**		**-**	**64,720.0**
	September	**29,292.0**	**114,034.0**		**-**	**76,460.0**
	October	**32,133.0**	**118,979.0**		**4,799.0**	**83,810.0**
	November	**25,920.0**	**158,708.0**		**-**	**76,170.0**
	December	**40,236.0**	**135,422.0**		**-**	**81,140.0**
	January	**19,235.0**	**102,836.0**		**-**	**76,240.0**
	February	**30,719.0**	**149,459.0**		**-**	**64,750.0**
	March	**26,775.0**	**97,917.0**		**7,987.0**	**8,870.0**
	Total	**345,308.0**	**1,353,678.0**		**30,251.0**	**799,330.0**

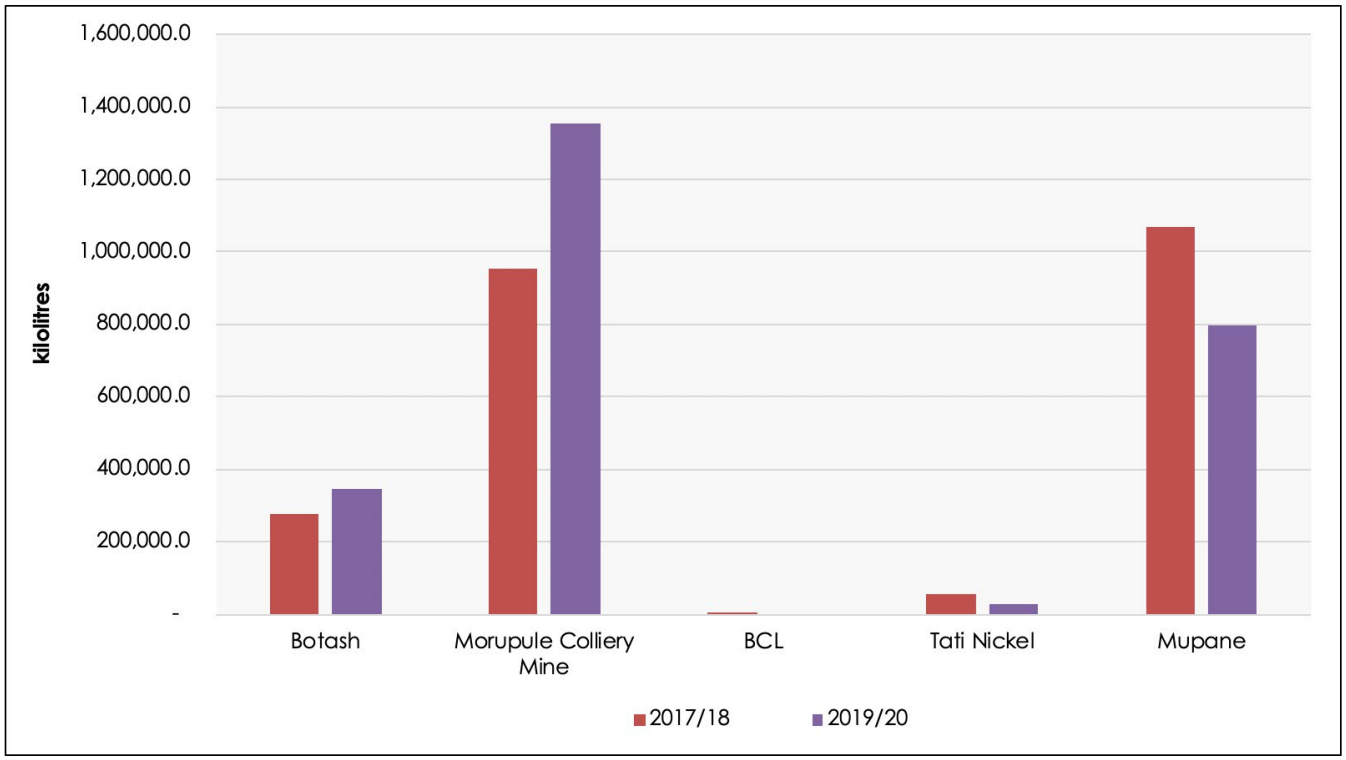
Dashes (-) shows no data available
Source: Water Utilities Corporation

For the year 2017/18, Mupane mine received the largest amount of raw water followed by Morupule Colliery and Botash mines. For 2019/20 Morupule Colliery mine received the largest amount of raw water followed by Mupane and Botash mines.

Morupule Colliery and Botash mines recorded an increase in the raw water it received from WUC between 2017/18 and 2019/20. Reductions in raw water received from WUC were recorded by Tati Nickel and Mupane mines. The BCL mine is no longer operational.

Figure 2.3 graphically shows the total annual raw water supplied to the mines by WUC for the years 2017/18 and 2019/20.

Figure 1.3: WUC Raw water to mines



3.0 FORESTRY

This chapter presents trends and current statistics on Botswana's forest cover and pressures on forests, particularly wild fire incidences and area burnt by district. Food and Agricultural Organisation (FAO) defines forest as "land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 percent, or trees able to reach these thresholds in situ. It does not include land that is predominantly under agricultural or urban land use". Statistics on forest area as a proportion of the total land area is an indicator that is used to monitor the extent to which the forests in a country are being conserved or restored, but it is only partly a measure of the extent to which they are sustainably managed (FAO, 2020). Forests satisfy numerous functions that are vital for humanity, including the provision of goods (wood and non-wood forest products) and services such as habitats for biodiversity, carbon sequestration, and soil and water conservation, amongst others. According to the Department of Forestry and Range Resources (DFRR), there are four (4) forest cover classes in Botswana: riparian forest, typical forest, woodland and savanna. National forest reserves are mainly located in the northern part of the country.

3.1. Trends in Forest Cover in Botswana

Table 3.1 shows that the forest cover was on the increase between 2010 and 2016, and then remained constant from the year 2017 forth. The total forest area increased from 19.67 percent of total land area in 2010 to 27.02 percent in 2019. The trend in forest cover is also shown graphically in Figure 3.1.

Table 3.1: Botswana Forest Cover (ha), 2010 - 2019

Year	2010	2016	2017	2018	2019
Total Forest Area (ha)	11,448,903	15,831,300	15,727,900	15,727,900	15,727,900
Total Area (ha)	58,200,000	58,200,000	58,200,000	58,200,000	58,200,000
% of Total Land Area	19.67	27.20	27.02	27.02	27.02

Source: Department of Forestry & Range Resources

Figure 3.1: Forest Cover as a Proportion of Total Land Area, 2010 – 2019

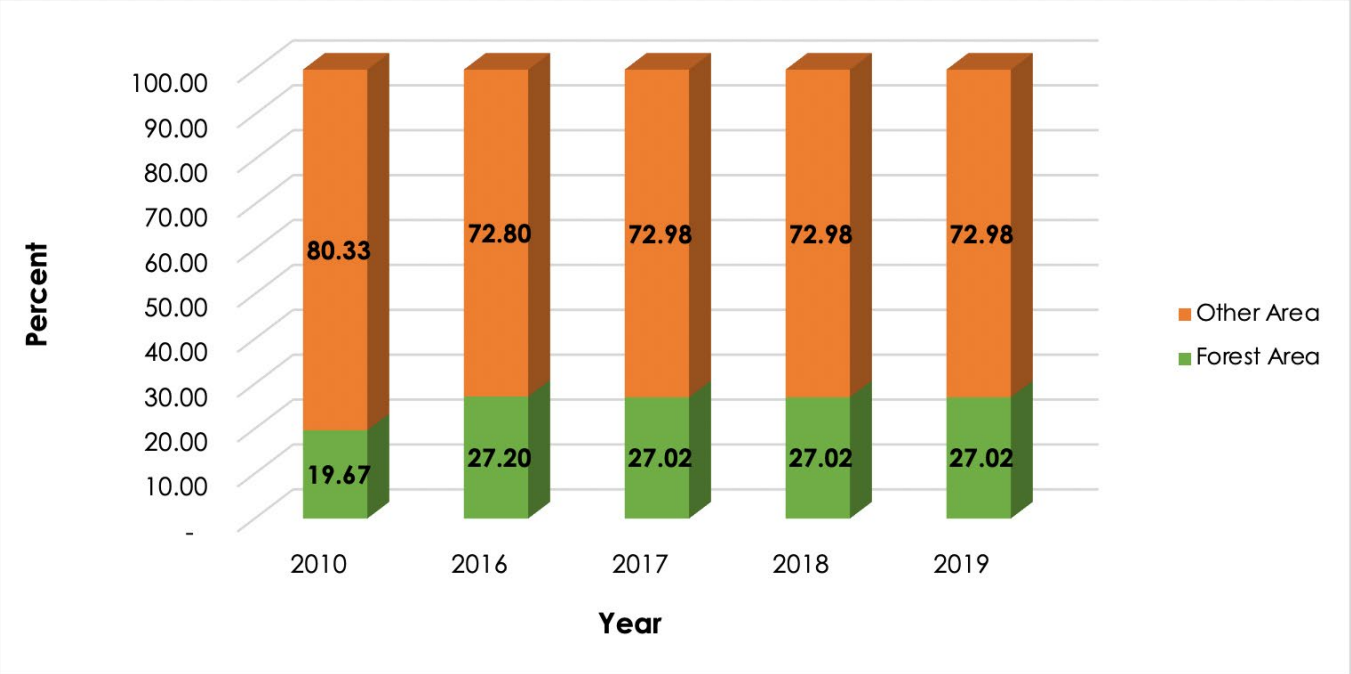
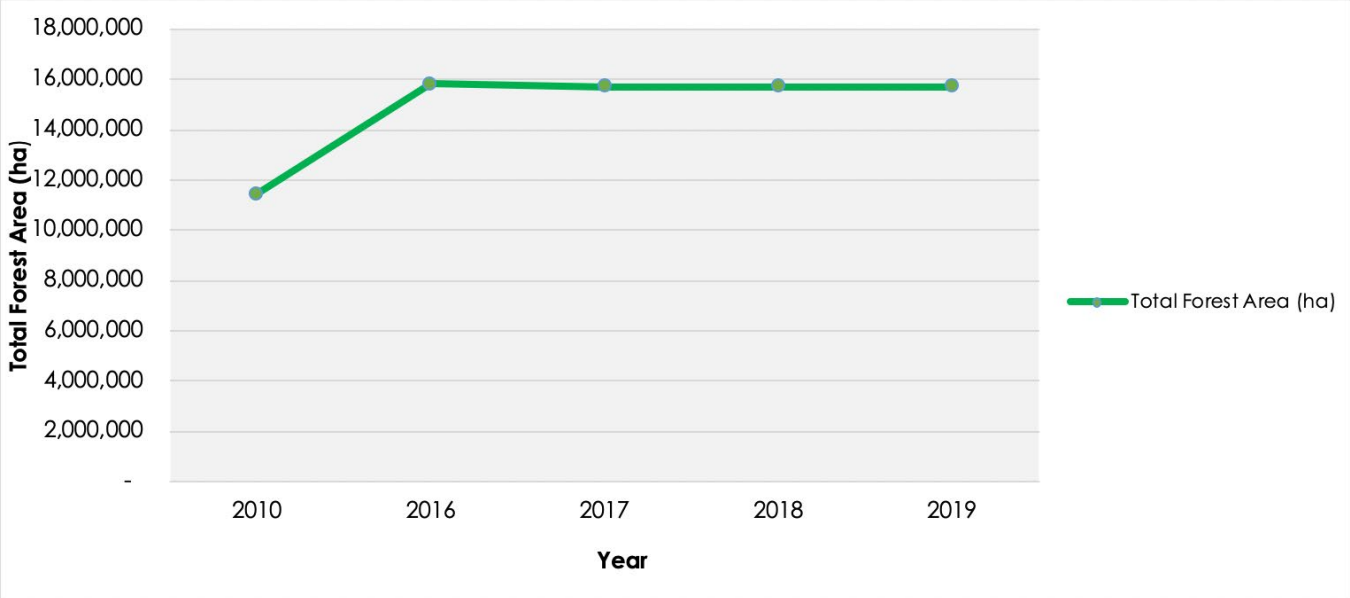


Figure 3.2: Botswana Forest Cover (ha), 2010 – 2019



3.2. Pressures on Forests

This sub-section presents pressures that are exerted on forests by humans and other natural forces, wild fires in particular.

3.2.1 Fire Incidences

Wild fires are destructive by nature. They have the potential to destroy ecosystems and natural habitat, resulting in the extinction of wildlife and increased air pollution. In Botswana major threat to forest resources are by wild fires (Statistics Botswana, 2015).

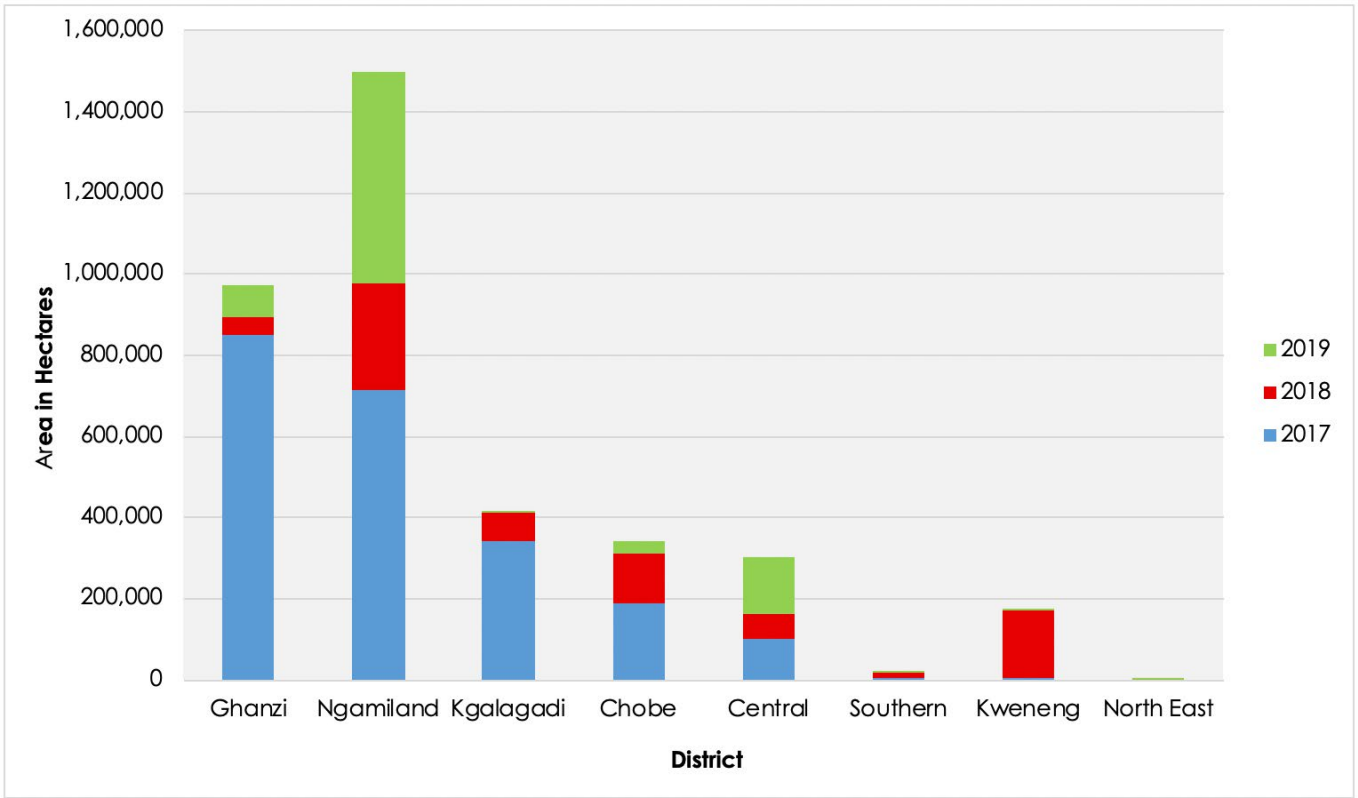
Table 3.2 displays the extent of the area affected by wild fires by district for the period 2017 to 2019. It is evident from the table that there was a substantial decrease in the areal extent of fires between the years 2017 (2,208,735 ha) and 2018 (735, 254 ha), and then increased slightly to 784,377 ha in 2019. Figure 3.3 shows that Ngamiland district had the largest area burnt by wild fires during the period under review, followed by Ghanzi, Kgalagadi and Chobe districts, in that order. Figure 3.4 depicts the area burnt by district in 2019.

Table 3.2: Area Burnt by District, 2017 – 2019

District	2017	2018	2019	District Size (Hectares)
Ngamiland	712,056	262,832	525,474	11,134,421
Central	102,154	60,106	141,062	14,637,419
Ghanzi	851,715	40,734	78,413	11,472,587
Chobe	190,327	119,092	31,674	2,101,920
Kgalagadi	342,441	71,460	4,323	10,491,604
Kweneng	3,654	168,982	1,866	3,696,345
Southern	4,560	11,199	1,150	2,723,320
North East	1,646	620	357	514,619
South East	28	229	42	85,800
Kgatleng	154	0	16	761,943
Grand Total	**2,208,735**	**735,254**	**784,377**	**57,619,978**

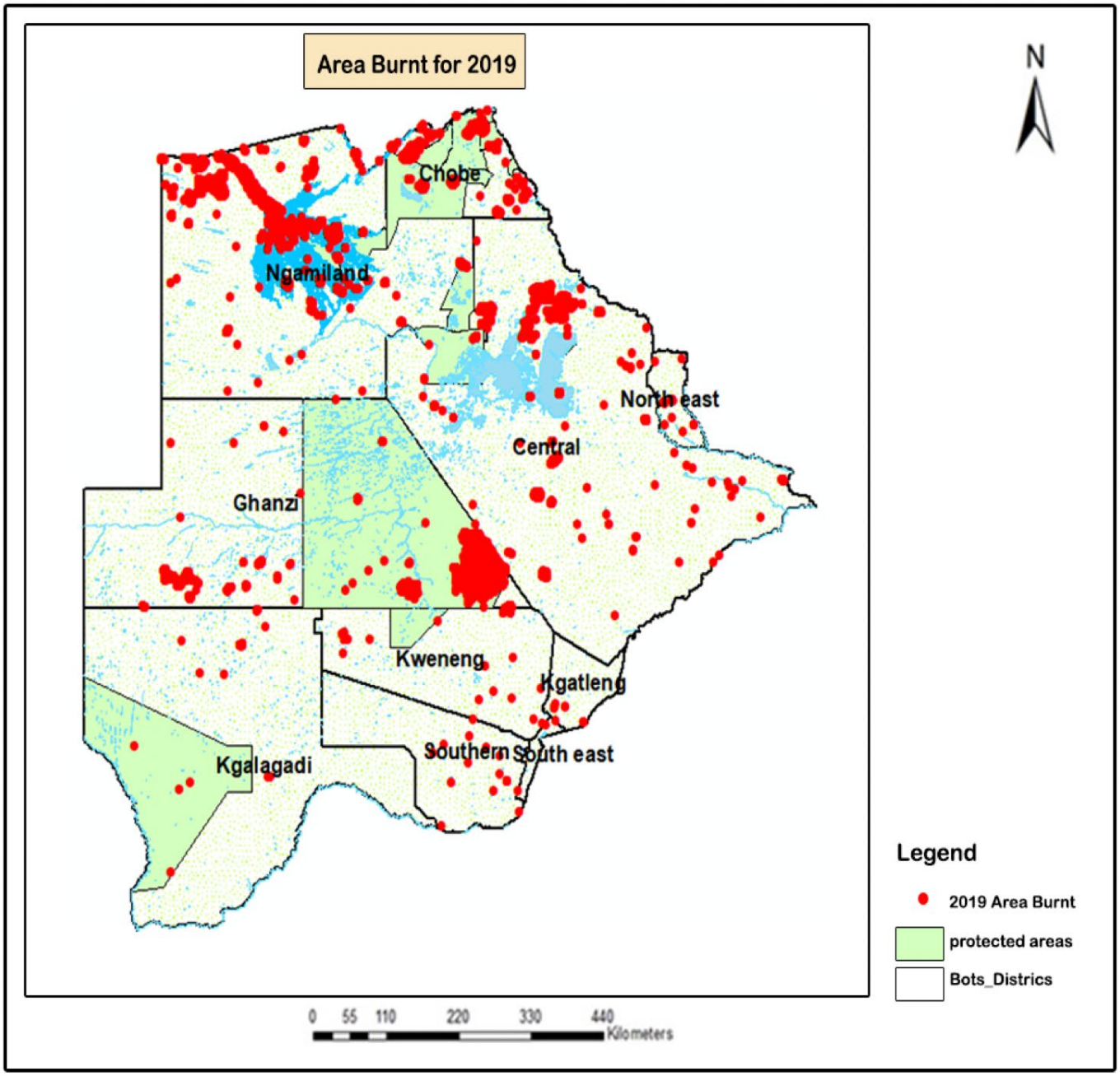
Source: Department of Forestry & Range Resources

Figure 3.3: Area Burnt by Selected District, –2017 – 2019



Source: Department of Forestry & Range Resources

Figure 3.4: Burnt Scars by District, 2019



Source: Department of Forestry & Range Resources

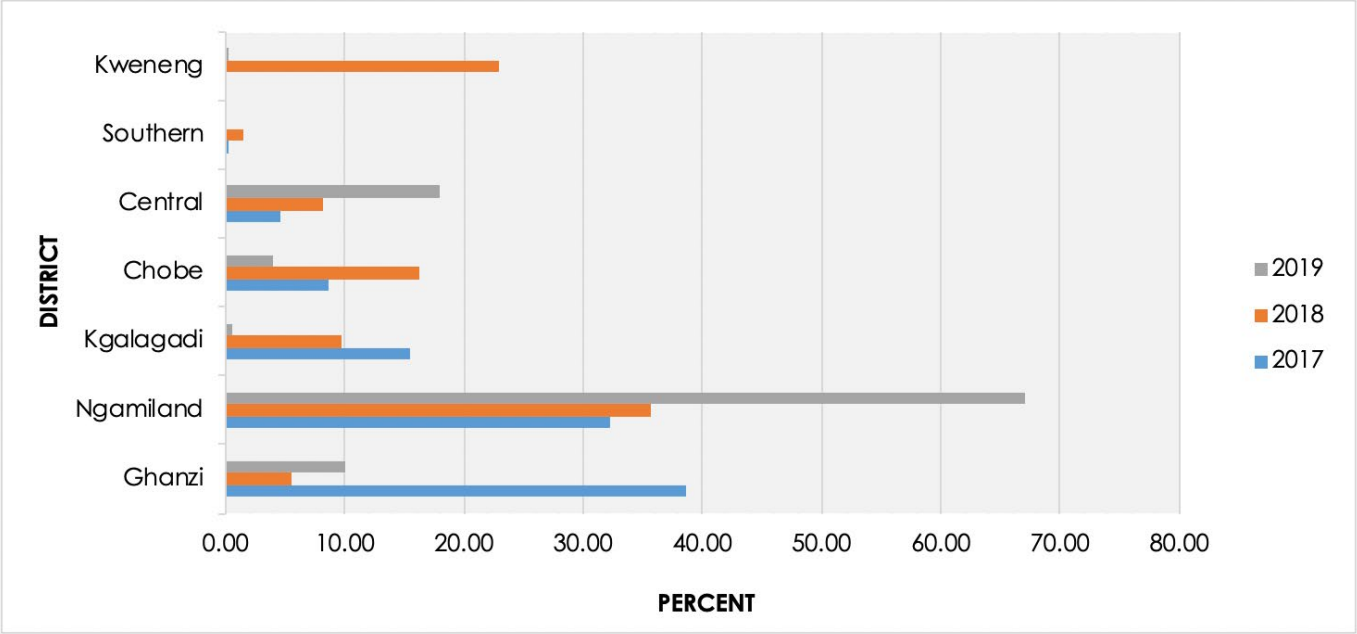
Table 3.3 presents the proportion of areas burnt by district during the years 2017 to 2019. Proportionately, Ngamiland District, Ghanzi District, Central District, and Chobe District show more burnt areas. The highest proportion of area burnt recorded during the review period was in Ngamiland in 2019 with 66.99 percent. By contrast, the Kgatleng, South East, and North East Districts had lower proportionate burnt areas compared to other districts. Figure 3.5 graphically show the areas burnt in proportion to the district size.

Table 3.3: Proportion of Areas Burnt by District, 2017 – 2019

District	2017	2018	2019	District Size (Hectares)
Ngamiland	32.24	35.75	66.99	11,134,421
Central	4.63	8.17	17.98	14,637,419
Ghanzi	38.56	5.54	10.00	11,472,587
Chobe	8.62	16.20	4.04	2,101,920
Kgalagadi	15.50	9.72	0.55	10,491,604
Kweneng	0.17	22.98	0.24	3,696,345
Southern	0.21	1.52	0.15	2,723,320
North East	0.07	0.08	0.05	514,619
South East	0.00	0.03	0.01	85,800
Kgatleng	0.01	0.00	0.00	761,943
Grand Total	**2,208,735**	**735,254**	**784,377**	**57,619,978***
% of Total Land Area	**3.83**	**1.28**	**1.36**	

Source: Department of Forestry & Range Resources
Note: (*) Total Land Area of Botswana.

Figure 3.5: Proportion of Areas Burnt by Selected District, 2017 – 2019



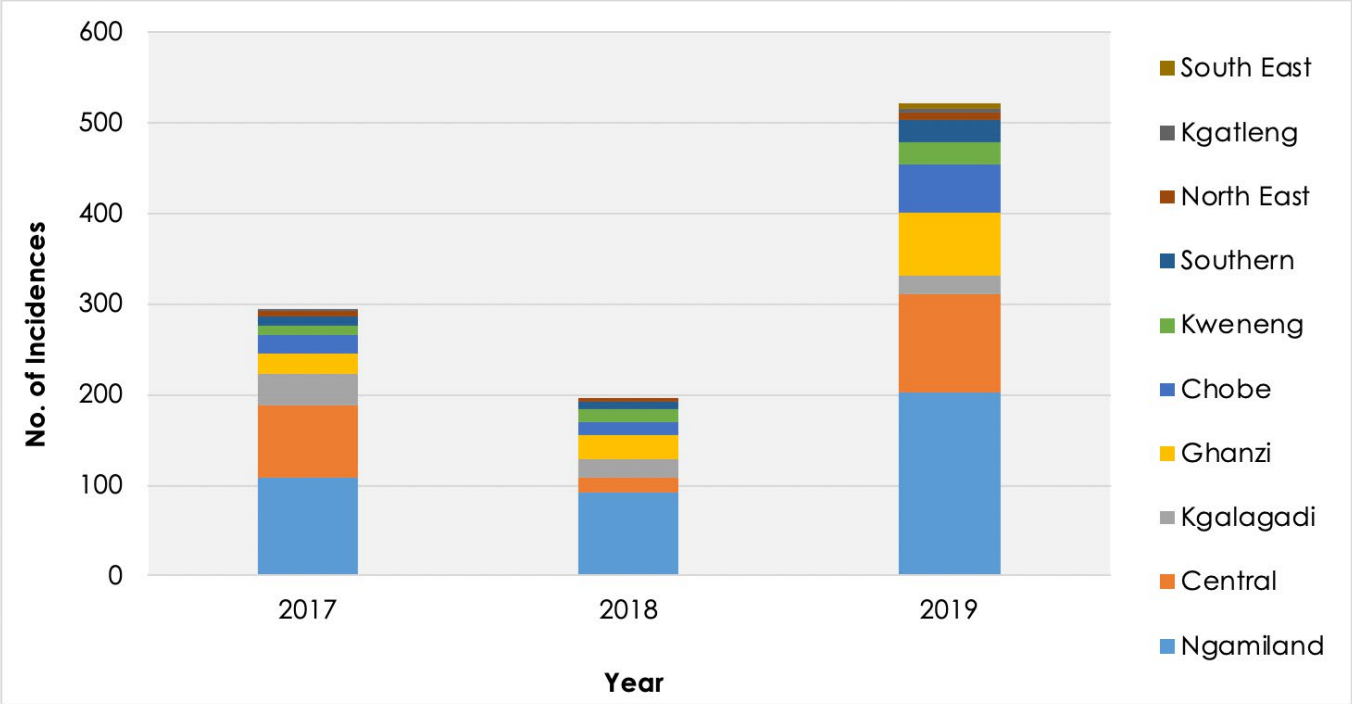
Presented in Table 3.4 are the incidences of fire by district for the years 2017 - 2019. It is evident from the table that Ngamiland, Central, Ghanzi, and Chobe districts recorded the highest incidences during the review period, while Kgatleng and South East recorded the least incidences. In general, the national incidence of fires followed a fluctuating trend, with the highest incidences noted in 2019.

Table 3.4: Incidence of Fires by District, 2017 – 2019

District	2017	2018	2019	Total
Ngamiland	109	91	203	403
Central	79	17	108	204
Kgalagadi	34	20	20	74
Ghanzi	23	27	69	119
Chobe	21	14	54	89
Kweneng	11	16	25	52
Southern	9	8	25	42
North East	7	3	7	17
Kgatleng	2	0	4	6
South East	0	0	6	6
Grand Total	**295**	**196**	**521**	**1,012**

Source: Department of Forestry & Range Resources

Figure 3.6: Number of fire incidences by District, 2017 – 2019



4.0 WILDLIFE STATISTICS

This chapter provides and discusses statistics on animal life; mammals and birds in particular. The incidences of poaching, problem animal control incidences, and population estimates for the years 2013 – 2019 are presented here.

4.1. Poaching

Poaching is the illegal killing of wildlife. It's usually performed without a hunting license and/or outside the regulated killing season. In order to track progress on the SDGs, particularly Goal 15, Target 15.c: "enhance global support for efforts to combat poaching and trafficking of protected species, including by increasing the capacity of local communities to pursue sustainable livelihood opportunities," there is need to collect and document poaching-related statistics.
The purpose of this section is to present levels and trends of national poaching incidences by species for the years 2013 to 2019. The data on poaching incidences by district were not available.

4.1.1 Poaching Incidences

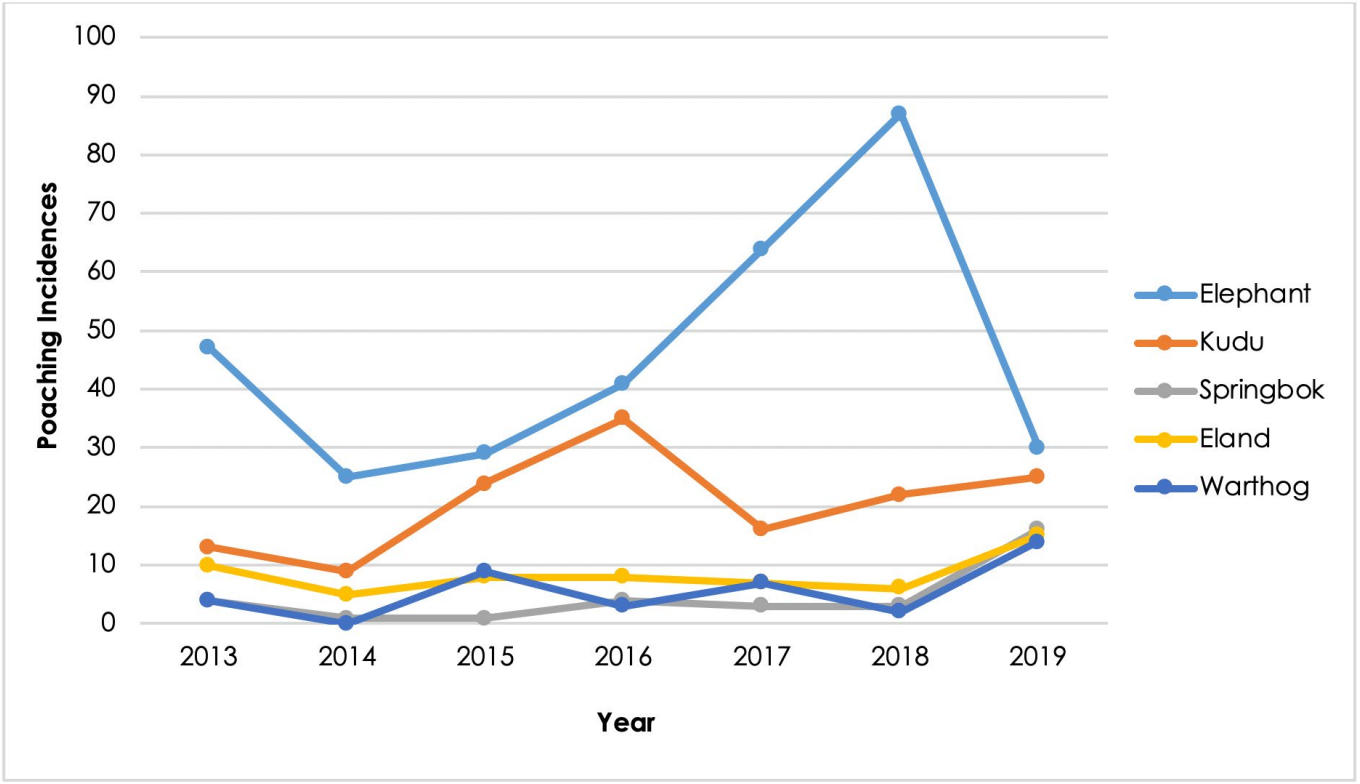
Table 4.1 presents incidences of poaching at national level in the period 2013 to 2019. The table shows that the highest numbers of poaching incidences were incurred by the following species, in the order given: elephant (27.5 percent), kudu (12.3 percent), impala (10.4 percent), vulture (9.4 percent), gemsbok (5.6 percent), and eland (5.0 percent). The national poaching incidences saw a fluctuating trend during the review period, with the highest incidences recorded in 2015, 2019, 2013 and 2016, in that order. Data on rhino poaching was not available for use in this report.

Table 4.1: National Poaching Statistics (2013 - 2019)

Species	2013	2014	2015	2016	2017	2018	2019	TOTAL
Elephant	47	25	29	41	64	87	30	**323**
Kudu	13	9	24	35	16	22	25	**144**
Springbok	4	1	1	4	3	3	16	**32**
Eland	10	5	8	8	7	6	15	**59**
Warthog	4	0	9	3	7	2	14	**39**
Impala	23	12	24	13	17	20	13	**122**
Steenbok	2	4	15	2	5	13	13	**54**
Gemsbok	13	5	15	11	7	5	10	**66**
Buffalo	1	4	3	2	1	2	9	**22**
Lion	2	0	7	3	3	0	9	**24**
Wildebeest	0	1	10	1	3	5	6	**26**
Duiker	2	4	4	6	3	7	4	**30**
Hartebeest	6	0	1	0	0	0	3	**10**
Porcupine	0	0	2	1		0	2	**5**
Python	1	0	1	2	1	0	2	**7**
Civet	0	0	0	0	0	2	2	**4**
Cheetah	1	0	2	0	0	0	1	**4**
Giraffe	1	2	3	4	1	2	1	**14**
Leopard	1	0	0	0	0	0	1	**2**
Ostrich	1	1	2	5	1	1	1	**12**
Wilddog	0	0	8	0	0	0	1	**9**
Zebra	4	1	2	0	3	1	1	**12**
Ant Bear	0	0	0	0	1	1	1	**3**
Bushbuck	0	2	0	0	0	0	0	**2**
Chobe Bush Buck	2	0	0	0	0	0	0	**2**
Crocodile	1	0	0	0	0	0	0	**1**
Guinea Fowl	0	2	2	1	1	2	0	**8**
Hyena	1	0	0		1	0	0	**2**
Kori Bustard	0	0	1	0	0	0	0	**1**
Sitatunga	1	0	0	0	0	0	0	**1**
Tortoise	0	0	1	3	3	0	0	**7**
Vultures	20	0	91	0	0	0	0	**111**
Reedbuck	0	0	0	0	0	1	0	**1**
Waterbuck	2	0	3	0	0	1	0	**6**
Spring Hare	0	0	0	0	4	2	0	**6**
Bat Eared Fox	0	0	0	0	0	1	0	**1**
Red Billed Francolin	0	0	0	0	0	3	0	**3**
TOTAL	**163**	**78**	**268**	**145**	**152**	**189**	**180**	**1,175**

Source: Department of Wildlife & National Parks

Figure 4.1: National Poaching Statistics of Selected Species (2013 - 2019)



4.2. Problem Animal Control (PAC) Incidences

The ever increasing competition between the human population and wildlife for the same diminishing habitat and natural resources is the main driver of problem animal incidences. An increase in contact between people and wildlife causes conflict which comes in different forms including animals damaging people's property, and as a response people then kill animals in order to protect themselves and their belongings. The animals involved in such conflicts are termed problem animals.

The purpose of this section is to present trends of problem animal incidences by species and district for the years 2015 to 2019.

4.2.1 Trends in Problem Animal Incidences

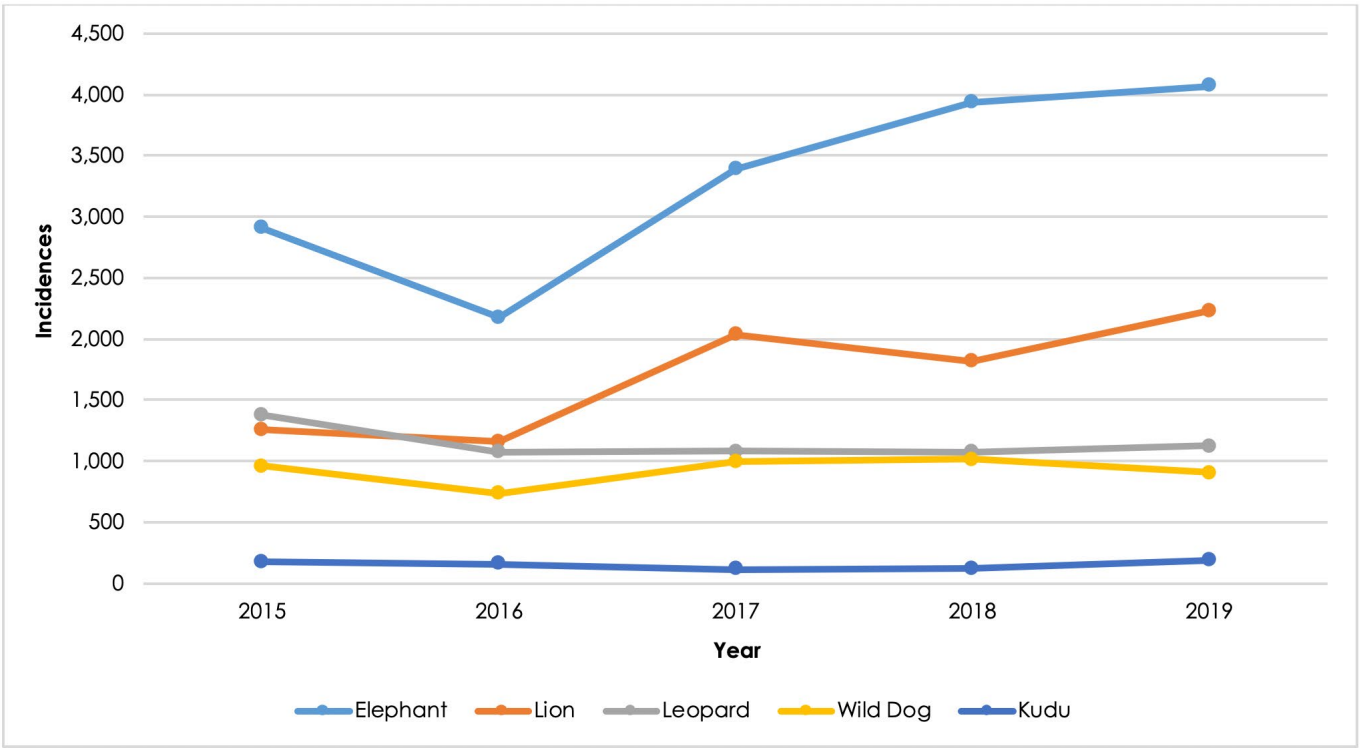
It is evident from Table 4.2 that the estimated national number of problem animal incidents was highest during the years 2018 and 2019 with 8,464 and 9,013, respectively. Generally, the total number of problem animal incidents observed an increasing trend during the period under review. They increased by about 23 percent between 2015 and 2019. The species frequently implicated in the incidents are Elephant, Lion, Leopard and Wild Dog in that descending order. (Table 4.2 & Figure 4.2)

Table 4.2: National Problem Animal Incidents by Species (2015-2019)

Species	2015	2016	2017	2018	2019
Elephant	2,908	2,174	3,387	3,940	4,073
Lion	1,262	1,164	2,032	1,818	2,234
Leopard	1,381	1,075	1,083	1,075	1,125
Wild Dog	961	736	992	1,013	904
Kudu	178	155	114	119	187
Crocodile	177	86	144	136	135
Cheetah	90	70	113	77	96
Python	57	90	30	46	57
Baboon	76	69	40	42	53
Hippopotamus	60	35	47	54	52
Hyaena	75	57	68	72	37
Black Backed Jackal	28	28	19	29	20
Buffalo	2	3	12	9	7
Steenbok	11	9	1	2	7
Porcupine	10	9	5	5	7
Monkey	10	3	6	6	4
Eland	3	11	17	6	5
Warthog	8	13	9	7	4
Zebra	3	8	3	1	2
Tsessebe	0	3	3	5	2
Vulture	0	0	0	2	1
Giraffe	0	0	3	0	1
Roan	1	1	0	0	0
Ostrich	1	0	0	0	0
Gemsbok	0	0	1	0	0
Duiker	1	0	0	0	0
Total	**7,303**	**5,799**	**8,129**	**8,464**	**9,013**

Source: Department of Wildlife & National Parks

Figure 4.2: Estimated Number of Problem Animal Incidents for Selected Species, 2015 – 2019



The latest figures on Problem Animals Incidents by species and district for the year 2019 are presented in Table 4.3. It is evident from the table that the species with the highest incidents in 2019 was the elephant (4,073), followed by lion (2,234), and leopard (1,125). The problem animal incidents involving elephant were most prevalent in Central and Ngamiland districts with 2,327 and 1,574 respectively.

Central and Ngamiland districts, accounted for the majority of the incidents during the year. Refer to the appendix for trend per district.

Table 4.3: Problem Animals Incidents by Species and District for 2019

Species	Chobe	Ghanzi	Kgalagadi	Kgatleng	Kweneng	Ngamiland	Southern	Central	Total
Elephant	149	12	0	0	10	1,574	1	2,327	**4,073**
Lion	120	18	66	0	75	1,103	0	852	**2,234**
Leopard	8	57	102	52	121	172	45	568	**1,125**
Wild dog	5	108	218	2	163	133	53	222	**904**
Kudu	1	0	2	34	42	0	62	46	**187**
Crocodile	1	0	0	6	0	97	0	31	**135**
Cheetah	1	7	33	0	12	9	10	24	**96**
Python	1	0	0	3	9	0	34	10	**57**
Baboon	4	0	0	9	14	1	12	13	**53**
Hippopotamus	6	0	0	5	10	31	0	0	**52**
Hyaena	3	1	3	5	5	12	8	0	**37**
Black Backed Jackal	0	0	11	1	4	0	1	3	**20**
Buffalo	2	0	0	0	0	5	0	0	**7**
Porcupine	0	0	1	1	1	2	2	0	**7**
Steenbok	0	0	0	0	0	0	5	2	**7**
Eland	4	0	1	0	0	0	0	0	**5**
Monkey	1	0	0	0	0	0	1	2	**4**
Warthog	3	0	0	0	0	0	1	0	**4**
Tsessebe	2	0	0	0	0	0	0	0	**2**
Southern	0	0	0	0	0	0	2	0	**2**
Giraffe	0	0	0	0	0	0	0	1	**1**
Vulture	0	0	0	0	0	0	1	0	**1**
Total	**311**	**203**	**437**	**118**	**466**	**3,139**	**238**	**4,101**	**9,013**

Source: Department of Wildlife & National Parks

4.3. Wildlife Population Estimates

The purpose of this section is to present population estimates of wild animals counted in Botswana's administrative districts through aerial surveys of 2013 and 2015, as well as the aerial census of 2018. The aerial surveys of animals conducted during the aforementioned period were not countrywide; they covered selected districts as shown in Table 4.4.

4.3.1 Trends in Countrywide Population Estimates by Selected Species

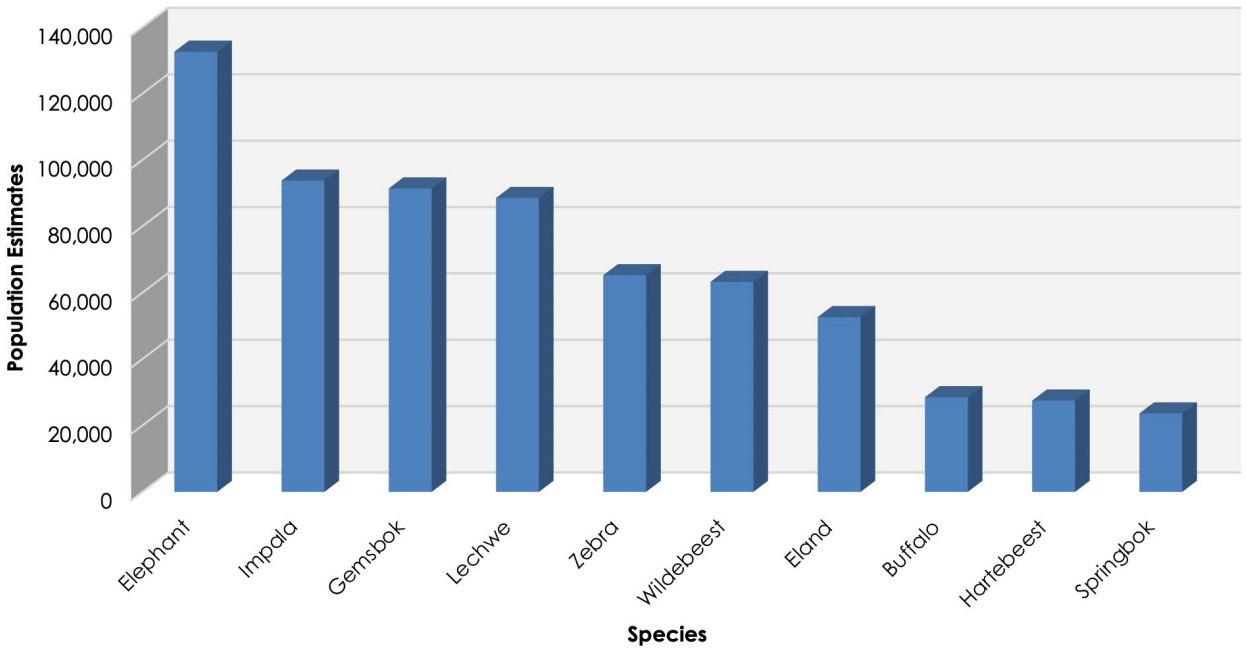
Displayed in Table 4.4 are statistics on the aerial surveys of animals conducted in selected districts (2013 and 2015) and the aerial census of 2018. The analysis focused on the latest estimates (2018 aerial census). In general, the elephant population (132,674) recorded the highest estimates during the year. Impala' population estimates were the second highest after elephant with a count of 93, 816. Trailing behind all animal species during the year 2018 was Roan with only 833 sighted. Figure 4.3 displays the selected species with high population count.

Table 4.4: Wildlife Population Estimates of Selected Species- National Level, 2013 – 2018

	Population Estimates		
Species	**2013 (Ngamiland; Chobe & Central)**	**2015 (Kgalagadi; Ghanzi; Kweneng; & Southern)**	**2018 (Whole Country)**
Elephant	156,401	789	132,674
Impala	55,283	408	93,816
Gemsbok	6,329	121,449	91,462
Lechwe	51,979	-	88,584
Zebra	59,463	3,615	65,300
Wildebeest	9,689	20,180	63,286
Eland	1,345	74,790	52,695
Buffalo	38,616	-	28,534
Hartebeest	492	43,526	27,515
Springbok	3,437	-	23,650
Kudu	4,109	14,243	21,163
Steenbok	2,993	28,467	15,468
Hippo	5,743	-	13,232
Giraffe	5,440	1,924	11,613
Warthog	2,578	2,144	7,626
Duiker	322	10,920	6,151
Tsessebe	1,478	-	3,650
Sable	2,439	-	2,872
Reedbuck	-	-	2,620
Waterbuck	-	399	1,245
Sitatunga	261	-	875
Roan	425	-	833

Source: DWNP
(-) Not covered by the survey

Figure 4.3: Wildlife Population Estimates of Selected Species- National Level, 2018



5.0 WASTE STATISTICS

Waste refers to materials that are not prime products (that is, products produced for the market) for which the generator has no further use in terms of his/her own purposes of production, transformation or consumption, and of which he/she wants to dispose of (Glossary of Environment Statistics, 1997). Waste may be generated during the extraction of raw materials, the processing of raw materials into intermediate and final products, the consumption of final products, and other human activities. Waste statistics is important in monitoring the implementation of waste policies and related programmes. In complying with the principles of recovery and safe disposal, reliable statistics on the production and management of waste from businesses and private households are required (Eurostat, 2020). The management and disposal of waste can have serious environmental impacts, therefore there is a need to collect waste-related statistics for monitoring purpose. Landfill, for example, takes up land space and may cause air, water and soil pollution (Eurostat, 2020). Furthermore, the United Nations Framework for Development of Environment Statistics (UNFDES) has developed indicators that are used internationally to monitor the management and disposal of waste, including among others; FDES Waste Statistics Generation of waste (Topic 3.3.1): Amount of waste generated by source (FDES 3.3.1.a), and Amount of waste generated by waste category (FDES 3.3.1.b).

The focus of the statistics presented in this chapter is on the amount of Municipal Solid Waste (MSW) collected and disposed at landfills, which is defined as the MSW removed from the generator and disposed of at disposal sites (e.g. landfills). Solid waste in general refers to all the waste that is generated from household, commercial, industrial and agricultural sectors. The major instruments used for solid waste management in Botswana are the Waste Management Act and the Botswana Strategy for Waste Management of 1998.

5.1. Statistics on Municipal Solid Waste (MSW) collected

Table 5.1a presents statistics on the amount of waste collected by type in the year 2017. About 224,320.91 tonnes of solid waste was collected and disposed of at various landfills in the country of which 1,516.04 tonnes was salvaged (refer to Table 5.2 of Section 5.2). Table 5.1a further reveals that general waste (117,191.356 tonnes) constituted the majority of the total waste followed by commercial (48,476.76 tonnes), and building rubble (39,411.07 tonnes) in that order. General waste is a mix of various types of waste, and it is driven by the fact that waste is not separated at the source (e.g. at households). It is lumped together in waste bins. Proportionately, general waste constituted about 52.26 percent of the amount of waste collected in 2017. On average the monthly national waste collected stood at 18,693.41 tonnes.

Francistown (83,160.26 tonnes) collected the highest quantities of waste compared to all other landfills. Gamodubu landfill came second with a total of 76,314.15 tonnes of waste collected in 2017 (Table 5.1b & Appendices 9 to 21).

Table 5.1a: Municipal Solid Waste Collected by Type of Waste and Month, 2017 (Tonnes

Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
General Waste	**10,047.40**	**10,027.26**	**10,682.89**	**9,685.24**	**10,249.29**	**9,785.77**	**4,049.51**	**8,678.48**	**9,679.02**	**12,998.98**	**12,116.82**	**9,190.70**	**117,191.36**
Commercial	888.06	2,179.20	1,123.82	997.30	891.64	721.16	925.32	1,047.36	601.28	13,977.76	12,916.96	12,206.90	**48,476.76**
Building Rubble	965.64	1,174.77	1,351.09	944.09	2,162.19	3,702.49	1,635.60	2,378.73	1,694.59	2,312.83	10,583.35	10,505.74	**39,411.07**
Garden Waste	517.92	515.71	440.99	550.27	592.47	480.50	603.27	801.76	566.10	1,087.36	1,123.79	889.66	**8,169.82**
Carcasses	160.40	335.82	406.21	397.54	499.82	465.72	513.19	587.82	499.60	116.97	354.41	383.15	**4,720.69**
Poultry Waste	270.99	179.78	258.94	280.86	314.18	238.06	244.88	66.76	257.17	179.84	108.97	95.55	**2,495.94**
Tyres	120.40	88.87	53.22	30.03	52.39	62.42	104.48	56.87	79.90	228.78	224.34	274.21	**1,375.93**
Clinical Waste	65.55	42.26	50.80	70.47	101.32	80.61	71.64	77.99	154.52	162.02	51.60	132.77	**1,061.54**
Stones/rocks/soil	82.57	12.20	10.84	50.67	59.77	2.06	116.06	71.89	5.10	10.42	72.51	56.65	**550.74**
Sludge	34.28	24.74	14.90	32.43	40.48	33.10	38.32	37.50	74.12	50.98	37.12	22.24	**440.21**
Scrap Metals	39.61	45.32	27.47	7.98	13.86	35.70	29.67	45.85	22.14	24.28	35.09	23.15	**350.12**
Paper	-	-	19.24	-	-	-	0.38	0.22	-	0.22	-	46.28	**66.34**
Used oil	1.09	0.90	2.78	0.44	-	1.32	0.36	1.28	1.56	0.37	0.08	0.22	**10.40**
Total	13,193.91	14,626.83	14,443.19	13,047.31	14,977.41	15,608.91	8,332.68	13,852.51	13,635.10	31,150.81	37,625.04	33,827.22	**224,320.91**

Source: Department of Primary Health
(-) Data not available

Figure 5.1: Municipal Solid Waste Collected by Type of Waste and Month, 2017

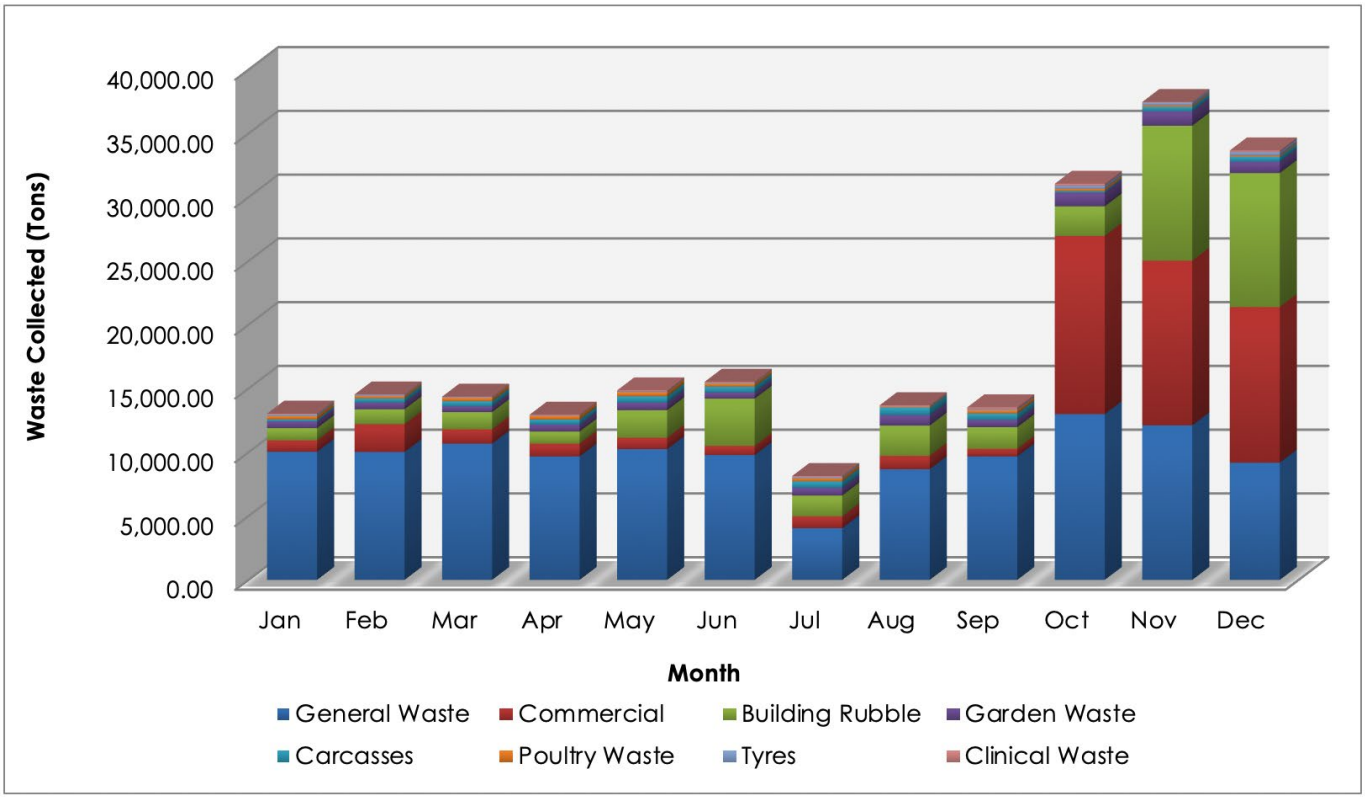


Figure 5.2: Proportion of Municipal Solid Waste Collected by Type of Waste, 2017

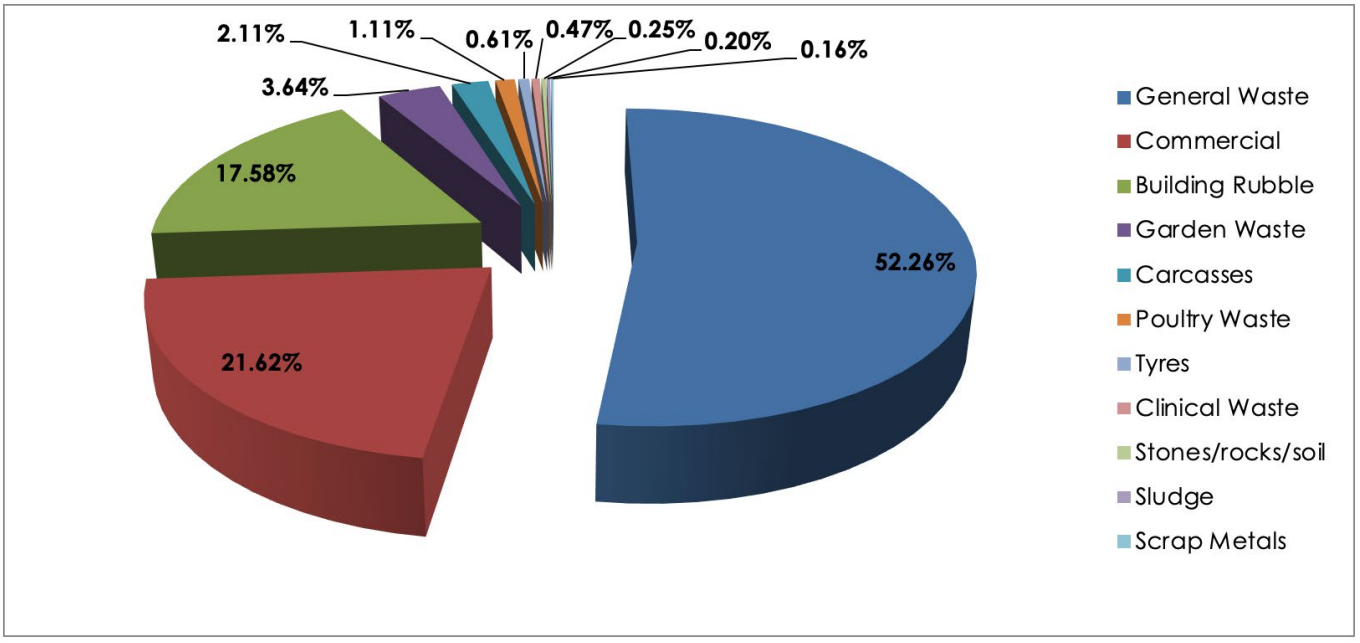


Table 5.1b: Total Municipal Solid Waste Collected by Landfill and Month, 2017 (Tonnes)

Landfill	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Francistown	**1,123.54**	**2,767.40**	**1,438.22**	**1,348.84**	**2,518.92**	**2,178.78**	**1,941.30**	**2,311.52**	**1,623.50**	**18,719.44**	**25,373.58**	**21,815.22**	**83,160.26**
Gamodubu	7,981.60	5,880.28	6,121.87	5,943.81	6,685.61	6,464.48	1,140.20	6,545.96	6,428.78	7,938.84	7,412.74	7,769.98	**76,314.15**
Ramotswa	697.38	2,461.20	3,141.86	2,468.50	2,404.06	2,384.04	1,925.60	640.92	1,949.72	978.18	738.7	667.44	**20,457.60**
Maun	821.495	1310.617	1473.853	1009.966	1083.22	2231.48	1071.7	1177.84	1151.06	750.26	790.36	324.88	**13,196.73**
Kasane	770.06	762.91	875.77	419.96	408.26	662.42	396.04	1016.08	572.78	972.22	1468.49	1632.22	**9,957.21**
Serowe	579.64	460	313.04	552.84	444.98	546.2	580.38	558.42	603.48	537.24	537.84	381.4	**6,095.46**
Lobatse	328.3	357.58	475.967	414.98	501.14	543.37	328.7	636.34	588.23	598.46	536.56	499.3	**5,808.93**
Jwaneng	425.64	290.9	289.72	254.537	312.112	181.471	298.32	386.036	137.81	127.94	73.677	93.9	**2,872.06**
Masunga	216.35	0	0	296.55	247.57	94.49	212.3	247.57	199.72	216.85	411.87	459.22	**2,602.49**
Kanye	137.8	143.22	213.76	212.37	236.98	204.44	264.14	173.48	238.42	213.92	203.02	74.06	**2,315.61**
Ghanzi	112.1	192.72	99.13	124.96	134.56	117.74	174	158.34	141.6	97.46	78.2	109.6	**1,540.41**
Total	**13,193.91**	**14,626.83**	**14,443.19**	**13,047.31**	**14,977.41**	**15,608.91**	**8,332.68**	**13,852.51**	**13,635.10**	**31,150.81**	**37,625.04**	**33,827.22**	**224,320.91**

Source: Department of Primary Health

5.2. Solid Waste salvaged

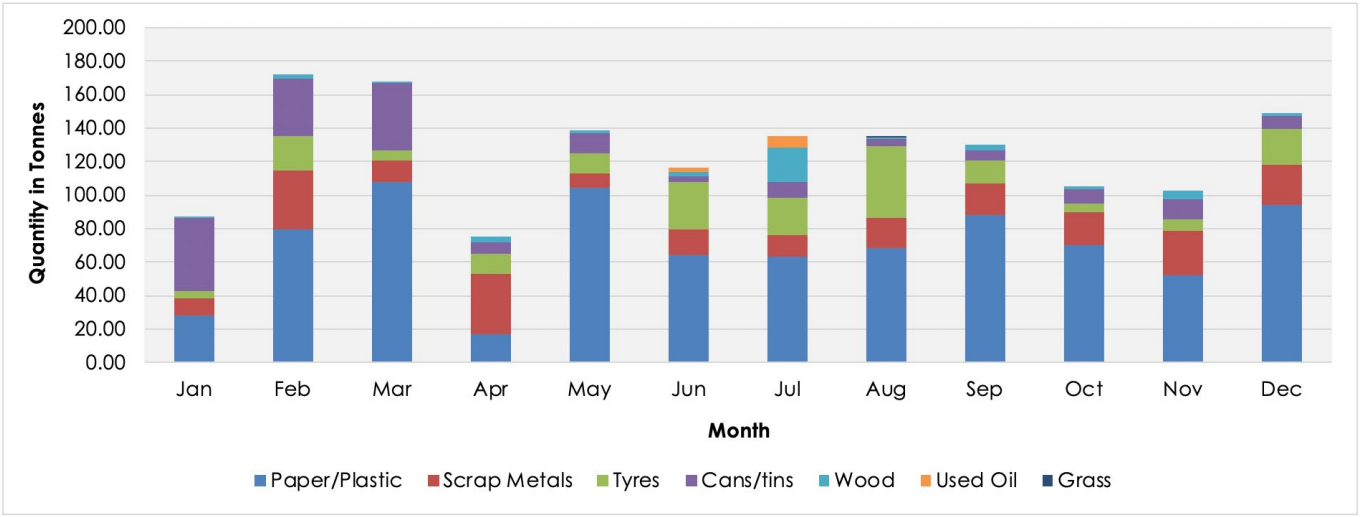
Waste salvaging refers to a controlled removal of waste materials from a solid waste management facility for the purpose of reuse or storage for later reuse (Integrated Waste Management Board, 2007). A total of 1,516.04 tonnes of waste was salvaged in 2017. The following waste types were salvaged: paper/plastic; scrap metals; cans/tins; wood; tyres; used oil; and grass. It is evident from Table 5.2 that paper/plastic constituted about 55.29 percent (838.27 tonnes) of the total waste salvaged, followed by scrap metals, and tyres with 15.68 percent (237.74 tonnes) and 12.78 percent (193.77 tonnes), respectively. The highest monthly figure was recorded in February with 171.81 tonnes. (See Table 5.2).

Table 5.2: Solid Waste salvaged by Type of Waste and Month, 2017 (Tonnes)

Landfill	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Paper/Plastic	**27.97**	**79.69**	**108.18**	**16.61**	**104.34**	**64.20**	**63.72**	**68.18**	**88.50**	**70.28**	**52.32**	**94.28**	**838.27**
Scrap Metals	10.30	35.32	12.43	36.69	8.96	15.44	12.42	18.67	18.20	19.42	26.12	23.77	**237.74**
Tyres	4.12	20.12	5.75	11.58	11.51	28.53	22.40	42.30	13.72	5.25	7.11	21.38	**193.77**
Cans/tins	44.06	34.52	40.78	7.39	11.98	3.51	9.63	4.14	6.22	8.25	12.33	7.50	**190.31**
Wood	0.92	2.16	0.62	2.98	1.96	2.34	20.64	1.02	3.90	2.16	5.01	2.10	**45.81**
Used Oil	0.00	0.00	0.00	0.00	0.00	2.80	6.90	0.00	0.00	0.00	0.00	0.00	**9.72**
Grass	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.00	0.00	0.00	0.00	**0.42**
Total	**87.37**	**171.81**	**167.76**	**75.25**	**138.75**	**116.82**	**135.71**	**134.71**	**130.54**	**105.36**	**102.89**	**149.03**	**1,516.04**

Source: Department of Primary Health

Figure 5.3: Solid Waste salvaged by Type of Waste and Month, 2017



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APPENDICES

Appendix 1: Problem Animal Incidents by District (2015-2019) – Chobe

Species	2015	2016	2017	2018	2019
Elephant	85	303	115	180	149
Lion	24	87	100	125	120
Leopard	4	25	12	5	8
Hippo	1	14	8	12	6
Wild dog	0	3	3	6	5
Baboon	0	17	11	1	4
Eland	3	11	17	6	4
Hyaena	6	5	2	4	3
Warthog	0	3	2	4	3
Buffalo	0	2	9	9	2
Tsessebe	0	3	3	5	2
Crocodile	0	5	2	2	1
Python	1	0	0	0	1
Cheetah	0	0	0	0	1
Monkey	0	0	0	0	1
Kudu	3	2	1	3	1
Zebra	1	7	1	0	0
Roan	**1**	**1**	**0**	**0**	**0**
Giraffe	**0**	**0**	**3**	**0**	**0**
Total	**129**	**488**	**289**	**362**	**311**

Source: Department of Wildlife & National Parks

Appendix 2: Problem Animal Incidents by District (2015-2019) – Ngamiland

Species	2015	2016	2017	2018	2019
Elephant	1,256	556	1,090	1,137	1,574
Lion	601	297	738	842	1,103
Leopard	222	91	149	158	172
Wild Dog	248	108	131	169	133
Crocodile	153	50	119	122	97
Hippopotamus	57	19	29	35	31
Hyaena	13	11	16	12	12
Cheetah	7	4	12	6	9
Buffalo	1	1	3	0	5
Porcupine	0	0	0	0	2
Baboon	0	0	0	0	1
Python	1	1	2	2	0
Black Backed Jackal	0	0	0	4	0
Warthog	0	0	1	0	0
Kudu	5	0	0	0	0
Total	**2,564**	**1,138**	**2,290**	**2,487**	**3,139**

Source: Department of Wildlife & National Parks

Appendix 3: Problem Animal Incidents by District (2015-2019) – Kweneng

Species	2015	2016	2017	2018	2019
Wild Dog	204	189	182	171	163
Leopard	166	145	120	143	121
Lion	28	42	25	31	75
Kudu	52	45	39	29	42
Baboon	10	2	4	6	14
Cheetah	21	15	18	13	12
Elephant	34	24	92	190	10
Python	3	9	6	5	9
Hyaena	15	14	13	9	5
Black Backed Jackal	5	6	4	3	4
Porcupine	2	1	1	1	1
Warthog	0	0	1	1	0
Steenbok	1	3	0	0	0
Total	**541**	**495**	**505**	**602**	**456**

Source: Department of Wildlife & National Parks

Appendix 4: Problem Animal Incidents by District (2015-2019) – Kgatleng

Species	2015	2016	2017	2018	2019
Leopard	46	46	36	54	52
Kudu	25	15	12	9	34
Baboon	8	4	3	15	9
Crocodile	5	7	7	6	6
Hippopotamus	0	0	1	0	5
Hyaena	12	8	14	12	5
Python	1	6	2	1	3
Wild Dog	15	14	14	4	2
Black Backed Jackal	10	6	1	1	1
Porcupine	0	2	2	0	1
Cheetah	2	0	0	1	0
Elephant	0	0	25	10	0
Total	**124**	**108**	**117**	**113**	**118**

Source: Department of Wildlife & National Parks

Appendix 5: Problem Animal Incidents by District (2015-2019) – Southern

Species	2015	2016	2017	2018	2019
Kudu	66	42	41	46	62
Wild Dog	26	14	38	77	53
Leopard	62	57	48	66	45
Python	33	59	12	37	34
Baboon	42	23	12	11	12
Cheetah	14	11	9	6	10
Hyaena	23	17	11	28	8
Steenbok	8	4	0	2	5
Zebra	1	0	0	1	2
Porcupine	1	3	0	2	2
Black Backed Jackal	5	5	6	3	1
Elephant	1	0	0	2	1
Warthog	3	0	1	1	1
Vulture	0	0	0	2	1
Monkey	1	3	0	2	1
Giraffe	0	0	0	0	1
Lion	0	7	1	0	0
Ostrich	1	0	0	0	0
Total	**287**	**245**	**179**	**286**	**239**

Source: Department of Wildlife & National Parks

Appendix 6: Problem Animal Incidents by District (2015-2019) – Ghanzi

Species	2015	2016	2017	2018	2019
Wild Dog	89	69	109	186	108
Leopard	77	42	30	75	57
Black Backed Jackal	2	1	0	3	0
Lion	62	20	20	29	18
Elephant	27	3	13	24	12
Python	0	0	1	0	0
Hyaena	2	0	0	2	1
Cheetah	18	5	7	18	7
Zebra	0	0	1	0	0
Warthog	0	0	1	0	0
Porcupine	0	0	1	0	0
Kudu	1	0	2	0	0
Gemsbok	0	0	1	0	0
Total	**278**	**140**	**186**	**337**	**203**

Source: Department of Wildlife & National Parks

Appendix 7: Problem Animal Incidents by District (2015-2019) – Kgalagadi

Species	2015	2016	2017	2018	2019
Wild Dog	137	136	361	235	218
Leopard	133	76	157	130	102
Lion	85	80	199	115	66
Cheetah	15	13	48	16	33
Elephant	20	14	5	2	0
Black Backed Jackal	3	2	7	6	11
Hyaena	4	2	12	5	3
Porcupine	1	0	0	0	1
Kudu	4	0	2	2	2
Eland	0	0	0	0	1
Duiker	1	0	0	0	0
Total	**403**	**323**	**791**	**511**	**437**

Source: Department of Wildlife & National Parks

Appendix 8: Problem Animal Incidents by District (2015-2019) – Central

Species	2015	2016	2017	2018	2019
Elephant	1,485	1,274	2,047	2,395	2,327
Lion	462	631	949	676	852
Leopard	671	593	531	444	568
Wild Dog	242	203	154	165	222
Kudu	22	51	17	30	46
Crocodile	19	24	16	6	31
Cheetah	13	22	19	17	24
Baboon	16	23	10	9	13
Python	18	15	7	1	10
Hippopotamus	2	2	9	7	10
Black Backed Jackal	3	8	1	9	3
Steenbok	2	2	1	0	2
Monkey	6	0	4	2	2
Buffalo	1	0	0	0	0
Zebra	1	1	1	0	0
Warthog	5	10	3	1	0
Porcupine	6	3	1	2	0
Total	**2,974**	**2,862**	**3,770**	**3,764**	**4,110**

Source: Department of Wildlife & National Parks

Appendix 9: General Waste by Month, 2017 (Tonnes)

Landfill	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Gamodubu	7,530.28	5,333.88	5,605.29	5,450.52	5,784.59	5,563.60	538.66	5,673.30	5,728.74	7,235.30	6,781.94	7,126.38	**68,352.48**
Ramotswa	210.26	1,990.34	2,649.16	1,774.56	1,858.82	1,758.68	1,399.78	184.86	1,494.24	613.62	451.02	536.16	**14,921.50**
Francistown	170.64	463.46	234.96	262.02	288.72	262.22	255.90	261.54	99.92	2,819.60	2,630.74	258.32	**8,008.04**
Maun	662.32	800.40	654.90	655.83	675.36	666.82	631.64	661.78	740.82	679.86	608.52	40.94	**7,479.19**
Serowe	451.22	389.46	258.98	379.03	335.90	427.48	406.70	435.36	435.02	417.24	428.00	328.12	**4,692.51**
Lobatse	250.68	327.94	422.48	339.72	398.04	339.62	246.04	518.16	385.27	421.80	422.46	326.60	**4,398.81**
Kasane	302.16	279.86	303.91	268.91	301.60	329.06	134.66	482.98	371.37	361.02	374.49	264.60	**3,774.62**
Jwaneng	193.20	219.10	278.90	236.60	260.14	137.06	142.66	158.46	131.45	119.98	72.75	89.50	**2,039.80**
Kanye	123.30	122.56	192.48	133.85	166.73	173.12	129.88	150.02	136.42	157.60	180.58	72.22	**1,738.76**
Ghanzi	80.22	100.26	81.83	70.00	106.77	64.58	92.70	79.40	80.08	69.58	36.84	54.00	**916.26**
Masunga	73.12	-	-	114.20	72.62	63.53	70.89	72.62	75.69	103.38	129.48	93.86	**869.39**
Total	**10,047.40**	**10,027.26**	**10,682.89**	**9,685.24**	**10,249.29**	**9,785.77**	**4,049.51**	**8,678.48**	**9,679.02**	**12,998.98**	**12,116.82**	**9,190.70**	**117,191.36**

Source: Department of Primary Health

Appendix 10: Clinical Waste by Month, 2017 (Tonnes)

Landfill	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Gamodubu	22.24	15.26	18.74	18.72	50.22	24.56	22.68	21.98	22.28	19.96	20.34	16.38	**273.36**
Ramotswa	3.94	1.56	2.48	6.58	0.86	7.54	6.28	7.38	0.46	93.18	3.90	81.60	**215.76**
Francistown	3.16	2.84	2.84	9.62	6.86	2.86	5.12	8.66	90.82	11.96	2.56	16.26	**163.56**
Maun	9.60	4.26	8.53	5.02	6.76	8.67	5.99	9.05	6.30	9.02	5.91	4.05	**83.16**
Serowe	6.92	5.00	7.88	2.70	10.60	6.02	8.70	4.00	10.00	8.34	3.16	1.36	**74.68**
Lobatse	5.68	4.30	1.60	8.32	8.20	12.30	6.36	8.06	6.84	6.82	4.26	1.48	**74.22**
Kasane	3.34	3.30	2.91	3.56	3.46	5.90	3.58	5.84	5.22	4.00	2.38	2.14	**45.63**
Jwaneng	3.44	3.40	2.30	3.98	3.30	3.62	2.40	4.12	3.98	3.60	3.12	2.34	**39.60**
Kanye	2.36	-	1.68	6.40	5.05	2.75	4.84	4.40	3.97	2.40	0.81	4.12	**38.77**
Ghanzi	2.66	2.34	1.84	3.00	3.69	3.82	2.24	2.18	1.80	1.24	1.20	0.80	**26.81**
Masunga	2.21	-	-	2.57	2.32	2.57	3.45	2.32	2.85	1.50	3.96	2.24	**25.99**
Total	**65.55**	**42.26**	**50.80**	**70.47**	**101.32**	**80.61**	**71.64**	**77.99**	**154.52**	**162.02**	**51.60**	**132.77**	**1,061.54**

Source: Department of Primary Health

Appendix 11: Garden Waste by Month, 2017 (Tonnes)

Landfill	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Francistown	36.50	95.06	56.28	80.80	57.10	36.00	58.84	85.88	20.24	663.10	643.40	605.26	**2,438.46**
Gamodubu	140.26	138.68	133.44	115.69	218.18	137.16	123.10	177.78	114.78	150.64	170.50	97.18	**1,717.39**
Kasane	54.62	54.01	66.87	53.13	31.11	67.51	31.37	60.31	43.10	37.97	54.44	33.28	**587.72**
Ramotswa	55.30	55.54	38.12	29.04	38.38	41.64	30.48	75.94	71.82	36.98	16.58	24.66	**514.50**
Kanye	7.58	15.66	12.10	73.62	59.65	25.30	125.56	19.46	92.00	47.98	17.86	0.48	**497.25**
Serowe	68.88	34.24	19.68	22.22	39.56	62.72	43.38	45.34	64.38	29.52	34.42	29.00	**493.34**
Ghanzi	18.48	70.30	13.54	42.96	17.52	39.26	70.90	67.64	51.28	22.72	30.66	45.70	**490.96**
Jwaneng	113.82	32.08	5.94	6.26	45.12	40.86	38.22	165.46	0.64	0.20	0	0.16	**448.76**
Masunga	1.90	0	0	74.27	53.69	12.28	47.40	53.69	27.68	27.81	43.47	44.60	**386.79**
Lobatse	17.94	16.16	16.16	40.94	24.32	3.61	23.24	41.44	77.34	34.22	35.88	0.42	**331.67**
Maun	2.64	3.98	78.86	11.34	7.84	14.16	10.78	8.82	2.84	36.22	76.58	8.92	**262.98**
Total	**517.92**	**515.71**	**440.99**	**550.27**	**592.47**	**480.50**	**603.27**	**801.76**	**566.10**	**1,087.36**	**1,123.79**	**889.66**	**8,169.82**

Source: Department of Primary Health

Appendix 12: Building Rubble Waste by Month, 2017 (Tonnes)

Landfill	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Francistown	7.52	7.52	0	0	1,249.34	1,127.52	642.32	886.84	888.84	949.64	8,805.68	8,302.72	**22,867.94**
Kasane	400.36	419.81	491.71	91.41	66.71	255.42	221.17	459.57	147.92	562.16	1,027.74	1,325.33	**5,469.31**
Gamodubu	176.04	294.22	267.46	282.52	531.42	692.08	328.36	535.28	422.36	440.36	326.60	364.46	**4,661.16**
Ramotswa	206.74	231.10	190.78	457.68	237.18	332.50	298.50	360.94	187.28	197.98	235.06	75.50	**3,011.20**
Maun	32.72	218.60	383.22	6.36	0	1,133.34	0	28.02	7.10	28.50	25.40	101.92	**1,965.18**
Lobatse	43.00	0	0	14.18	61.40	150.16	42.70	38.90	3.88	87.72	50.02	142.64	**634.60**
Masunga	2.42	0	0	16.24	2.48	6.99	23.87	2.48	20.03	17.31	81.05	190.11	**362.98**
Serowe	17.06	3.52	17.78	71.58	13.38	4.48	78.68	23.50	15.46	29.16	31.80	3.06	**309.46**
Jwaneng	79.78	0	0.14	4.12	0	0	0	42.86	0	0	0	0	**126.90**
Ghanzi	0w	0	0	0	0.28	0	0	0.34	1.72	0	0	0	**2.34**
Total	**965.64**	**1,174.77**	**1,351.09**	**944.09**	**2,162.19**	**3,702.49**	**1,635.60**	**2,378.73**	**1,694.59**	**2,312.83**	**10,583.35**	**10,505.74**	**39,411.07**

Source: Department of Primary Health

Appendix 13: Scrap Metals Waste by Month, 2017 (Tonnes)

Landfill	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Francistown	16.88	20.6	20.68	2.14	1.14	21.3	17.16	6.64	0.56	14.24	14.24	14.22	**149.8**
Gamodubu	10.28	9	2.06	3.5	4.64	4.98	5.2	26.04	10.4	4.66	5.68	0.68	**87.12**
Maun	5.46	3.98	1.98	0	0	1.44	0	0	2.44	0	7.42	2.16	**24.88**
Ghanzi	0.12	6.8	0.94	1	1.6	5.88	1.4	4.24	0.42	0	0	1.7	**24.1**
Serowe	2.16	0.36	0	0.18	3.38	1.42	3.14	4.86	3.92	2.12	0.92	0.66	**23.12**
Kasane	1.2	2.76	0.85	0	0.69	0	1.29	3.28	2.53	0.66	5.81	3.67	**22.74**
Jwaneng	0	1.82	0.14	1.16	1.8	0.68	1.48	0	1.75	2.48	0	0.06	**11.37**
Ramotswa	2.96	0	0.82	0	0.6	0	0	0.78	0	0.12	1.02	0	**6.3**
Masunga	0.55	0	0	0	0.01	0	0	0.01	0	0	0	0	**0.57**
Lobatse	0	0	0	0	0	0	0	0	0.12	0	0	0	**0.12**
Kanye	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total	**39.61**	**45.32**	**27.47**	**7.98**	**13.86**	**35.7**	**29.67**	**45.85**	**22.14**	**24.28**	**35.09**	**23.15**	**350.12**

Source: Department of Primary Health

Appendix 14: Waste Tyres by Month, 2017 (Tonnes)

Landfill	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Gamodubu	69.62	41.10	42.50	24.76	41.58	42.10	81.74	39.26	70.32	25.64	44.62	96.88	**620.12**
Francistown	0	0	0	0	2.56	1.14	11.62	12.32	2.20	182.36	173.34	169.14	**554.68**
Jwaneng	36.48	37.90	2.92	0	0	0	0.12	0.38	0	2.88	0.12	0.06	**80.86**
Ramotswa	4.64	1.04	0	0	4.24	9.04	2.90	0	0	2.70	2.92	0	**27.50**
Ghanzi	2.82	0.44	0.78	2.00	1.26	2.14	3.82	2.18	1.20	0.48	0.28	5.00	**22.40**
Lobatse	2.20	0	0	0	0	2.20	1.50	0.28	0	11.96	0.94	2.06	**21.14**
Maun	2.92	3.32	4.60	0	0	1.72	0	0	6.18	1.68	0.70	0	**21.12**
Kasane	1.60	1.85	1.12	1.07	1.39	0.56	1.56	0.81	0	1.08	0	1.07	**12.11**
Serowe	0.12	3.22	0	0	1.36	3.52	1.22	1.64	0	0	0	0	**11.08**
Kanye	0	0	1.30	2.20	0	0	0	0	0	0	1.42	0	**4.92**
Masunga	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total	**120.40**	**88.87**	**53.22**	**30.03**	**52.39**	**62.42**	**104.48**	**56.87**	**79.90**	**228.78**	**224.34**	**274.21**	**1,375.93**

Source: Department of Primary Health

Appendix 15: Poultry Waste by Month, 2017 (Tonnes)

Landfill	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Ramotswa	213.80	179.78	258.94	203.24	260.12	237.26	190.88	13.98	192.40	122.98	28.98	28.78	**1,931.10**
Masunga	57.19	0	0	38.34	51.34	-	52.00	51.34	61.05	55.00	78.67	65.89	**510.82**
Serowe	0	0	0	39.28	2.72	0.80	2.00	1.44	3.72	1.86	1.32	0.88	**54.02**
Ghanzi	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Gamodubu	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Kasane	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Maun	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total	**270.99**	**179.78**	**258.94**	**280.86**	**314.18**	**238.06**	**244.88**	**66.76**	**257.17**	**179.84**	**108.97**	**95.55**	**2,495.94**

Source: Department of Primary Health

Appendix 16: Waste Sludge by Month, 2017 (Tonnes)

Landfill	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Gamodubu	69.62	41.10	42.50	24.76	41.58	42.10	81.74	39.26	70.32	25.64	44.62	96.88	**620.12**
Francistown	0	0	0	0	2.56	1.14	11.62	12.32	2.20	182.36	173.34	169.14	**554.68**
Jwaneng	36.48	37.90	2.92	0	0	0	0.12	0.38	0	2.88	0.12	0.06	**80.86**
Ramotswa	4.64	1.04	0	0	4.24	9.04	2.90	0	0	2.70	2.92	0	**27.50**
Ghanzi	2.82	0.44	0.78	2.00	1.26	2.14	3.82	2.18	1.20	0.48	0.28	5.00	**22.40**
Lobatse	2.20	0	0	0	0	2.20	1.50	0.28	0	11.96	0.94	2.06	**21.14**
Maun	2.92	3.32	4.60	0	0	1.72	0	0	6.18	1.68	0.70	0	**21.12**
Kasane	1.60	1.85	1.12	1.07	1.39	0.56	1.56	0.81	0	1.08	0	1.07	**12.11**
Serowe	0.12	3.22	0	0	1.36	3.52	1.22	1.64	0	0	0	0	**11.08**
Kanye	0	0	1.30	2.20	0	0	0	0	0	0	1.42	0	**4.92**
Total	**120.40**	**88.87**	**53.22**	**30.03**	**52.39**	**62.42**	**104.48**	**56.87**	**79.90**	**228.78**	**224.34**	**274.21**	**1,375.93**

Source: Department of Primary Health

Appendix 17: Carcasses Waste by Month, 2017 (Tonnes)

Landfill	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Ramotswa	213.80	179.78	258.94	203.24	260.12	237.26	190.88	13.98	192.40	122.98	28.98	28.78	**1,931.10**
Masunga	57.19	0	0	38.34	51.34	-	52.00	51.34	61.05	55.00	78.67	65.89	**510.82**
Serowe	0	0	0	39.28	2.72	0.80	2.00	1.44	3.72	1.86	1.32	0.88	**54.02**
Total	**270.99**	**179.78**	**258.94**	**280.86**	**314.18**	**238.06**	**244.88**	**66.76**	**257.17**	**179.84**	**108.97**	**95.55**	**2,495.94**

Source: Department of Primary Health

Appendix 18: Stones/rocks/soil Waste by Month, 2017 (Tonnes)

Landfill	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Serowe	34.28	24.74	14.9	32.21	40.48	33.1	38.32	37.5	74.12	49.96	37.12	18.2	**434.93**
Gamodubu	0	0	0	0	0	0	0	0	0	1.02	0	4.04	**5.06**
Masunga	0	0	0	0.22	0	0	0	0	0	0	0	0	**0.22**
Total	**34.28**	**24.74**	**14.9**	**32.43**	**40.48**	**33.1**	**38.32**	**37.5**	**74.12**	**50.98**	**37.12**	**22.24**	**440.21**

Source: Department of Primary Health

Appendix 19: Used oil Waste by Month, 2017 (Tonnes)

Landfill	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Maun	112.04	277.04	347.38	332.88	396.56	408.10	425.70	473.38	386.46	0	69.36	122.52	**3,351.42**
Gamodubu	32.88	48.14	52.38	48.10	54.98	0	40.46	72.32	59.90	61.26	63.06	63.98	**597.46**
Francistown	0	0	0	0	27.56	1.90	23.86	3.56	10.00	19.56	185.32	177.06	**448.82**
Lobatse	11.32	10.64	4.61	10.52	10.52	44.92	10.10	28.90	30.80	30.80	24.70	11.32	**229.15**
Masunga	3.74	0	0	5.85	8.70	9.12	12.14	8.70	12.24	4.66	11.93	7.56	**84.64**
Ramotswa	0.24	0	1.74	0	1.42	1.30	0.66	0.30	0	0.20	0	0	**5.90**
Serowe	0.18	0	0.10	0.02	0	0.38	0.20	0.50	0.02	0.34	0	0	**1.74**
Masunga	0	0	0	0.17	0.08	-	0.05	0.08	0.18	0.11	0	0.71	**1.38**
Ghanzi	0	0	0	0	0	0	0.02	0.08	0	0.04	0.02	0	**0.16**
Kasane	0	0	0	0	0	0	0	0	0	0	0.02	0	**0.02**
Total	**160.40**	**335.82**	**406.21**	**397.54**	**499.82**	**465.72**	**513.19**	**587.82**	**499.60**	**116.97**	**354.41**	**383.15**	**4,720.69**

Source: Department of Primary Health

Appendix 20: Commercial Waste by Month, 2017 (Tonnes)

Landfill	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Francistown	888.06	2,179.2	1,123.82	997.3	891.64	721.16	925.32	1047.36	601.28	13,977.76	12,916.96	12,206.9	**48,476.76**

Source: Department of Primary Health

Appendix 21: Paper Waste by Month, 2017 (Tonnes)

Landfill	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Maun	0	0	0	0	0	0	0	0	0	0	0	46.28	**46.28**
Lobatse	0	0	19.24	0	0	0	0	0	0	0	0	0	**19.24**
Serowe	0	0	0	0	0	0	0.38	0.22	0	0.22	0	0	**0.82**
Total	**0**	**0**	**19.24**	**0**	**0**	**0**	**0.38**	**0.22**	**0**	**0.22**	**0**	**46.28**	**66.34**

Source: Department of Primary Health

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ISBN: 978-99968-907-8-9 (PAPER BACK)