

BOTSWANA ENVIRONMENT STATISTICS: HUMAN SETTLEMENTS REPORT 2013

STATISTICS BOTSWANA

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PREFACE

Statistics Botswana, through the Environment Statistics Unit, presents the first edition of the *Botswana Environment Statistics: Human Settlements Report*. The report provides the latest available statistics and trends analysis on the environment in which people live and work, with particular reference to living conditions and environmental health. Data used in this report are secondary and were drawn from previous Population and Housing Censuses as well as reports from various Government departments and other organisations.

The Framework for Development of Environmental Statistics (FDES) developed by the United Nations Statistical Division was used in preparing this report. The statistical information provided in this report is intended for use by decision-makers in Government, the private sector and civic society for the management and improvement of conditions related to human settlements, shelter conditions, safe water, sanitation and health. The management of these conditions is important, particularly in light of the rapid urbanization, increasing pollution, environmental degradation and the likely effects of climate change on Botswana, which when put together, can set the country back in the journey towards the attainment of Vision 2016 and the UN Millennium Development Goals.

I would like to thank all data providers that worked cooperatively with Statistics Botswana's Environment Statistics Unit in the production of this report, and encourage their continued support in the future.



.....
Anna Majelantle
Statistician General
April 2014

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1.0 INTRODUCTION

1.1 The concept of human settlements

According to the United Nations (1988), human settlements are a main component of the Action Plan for the Human Environment. The Action Plan informs planning and management of human settlements for environmental quality. The United Nations Conference on Human Settlements (Habitat) described the concept of human settlements as thus;

"The fabric of human settlements consists of physical elements and services to which these elements provide the material support. The physical components comprise shelter, i.e. the superstructures of different shape, size, type and materials erected by mankind for security, privacy and protection from the elements and for his singularity within a community: and infrastructure, i.e. the complex networks designed to deliver to or remove from the shelter people, goods, energy or information. Services cover those required by a community for the fulfilment of its functions as a social body, such as education, health, culture, welfare, recreation and nutrition (UN, 1988)."

Human settlements and environmental health constitute component five (5) of the United Nations Framework for Development of Environment Statistics (UNFDES).

'It comprises statistics on the environment in which humans live and work, particularly with regard to living conditions and environmental health. These statistics are important for the management and improvement of conditions related to human settlements, shelter conditions, safe water, sanitation, and health, particularly in the context of rapid urbanization, increasing pollution, environmental degradation, disasters, extreme events, and climate change,' (UNSD, 2013).

The sub-component on human settlements includes relevant statistics on basic services and infrastructure of human settlements. Human settlements refer to the totality of the human community, including people living in large cities, towns or villages. They refer to the human population that resides in a settlement, the physical elements (e.g., shelter and infrastructure), services (e.g., water, sanitation, waste removal, energy and transport), and the exposure of humans to potentially deleterious environmental conditions (UNSD, 2013).

United Nations Statistical Division (UNSD) further states that Environmental health which is the second sub-component on human settlement is defined by the World Health Organisation (WHO) as "those aspects of the human health and disease that are determined by factors in the environment. It also refers to the theory and practice of assessing and controlling factors in the environment that can potentially affect health" (WHO, 2012; cited in UNSD, 2013). According to UNSD (2013), the full scope of environmental health as defined by the WHO goes beyond the scope of the FDES. The FDES excludes indoor air pollution and the associated impacts on human health.

The purpose of this report is to provide available statistics and trends analysis on the environment in which people live and work, zeroing into both the living conditions and environmental health.

HUMAN SETTLEMENTS

This section of the human settlement report presents sub-component on human settlement. The topics discussed under the sub-component on human settlement are as follows; (i) Urban and rural population; (ii) Access to water, sanitation and energy; (iii) Housing conditions; (iv) Environmental concerns specific to urban settlements.

2.1 Population

Total population of Botswana by census district, urban and rural areas are provided in this sub-section. Moreover, the breakdown of this sub-section is as thus; population size by sex, annual growth, intercensal increase, and population density by district.

2.1.1 Population Size and Growth

The population of the Republic of Botswana experienced an intercensal increase of 26.7 percent between 1991(1,326,796) and 2001(1,680,863) censuses (Table 2.1a). During the same period, Botswana's annual average growth rate stood at 2.37 percent. Furthermore, Gaborone district had a high intercensal increase of 39.4 percent followed by Kweneng East district with 34.0 percent. Barolong district on the other hand had an exceptionally high intercensal increase most probably as a result of reclassification of some settlements between districts. However, the only district which experienced a negative intercensal increase was Ngwaketsi South/Kanye/Moshupa with -11.8 percent.

Table 2.1a further shows that during the 2001 and 2011 censuses; the population of Botswana experienced an intercensal increase of 20.5 percent (annual average growth rate of 1.86 percent). The results clearly show that the annual growth rate of Botswana has been declining during the past twenty years and this might be influenced by the go-slow in natural increase and net migration. For example, Letamo, et al (2013: 14) adds that "previous censuses show that fertility has been declining since the 1980s. Total Fertility Rate (TFR) was 6.6 children per woman in 1981 and decreased to 4.2 in 1991, 3.3 in 2001 and 2.8 in 2011." Mortality rate on the other hand fluctuated during the past forty years. Even though the Crude Death Rate (CDR) is not the best mortality measure, it declined from 13.7 in 1971 to 11.5 in 1991 and increased to 12.4 in 2001 then declined to 6.35 in 2011 (Majelantle, 2013). According to Gwebu, et al (2013: 22), "one of the dangers to industrialization and economic diversification is the small and shrinking population size. Gwebu and colleagues further argued that a decline in fertility and low life expectancy are a threat to the realisation of a critical population mass for sustained industrialization and economic growth".

Population intercensal increase by district reveals that South East had the highest increase of 40.2 percent followed by Kweneng East district with 35.3 percent between 2001 and 2011. This might be attributable to the fact that most of the people who cannot afford to buy or rent houses in Gaborone opt to reside in the outskirts of the capital city where rentals and house prices are reasonable. Furthermore, Gaborone already has one of the highest population densities in the country and as a result the population spills into the catchment areas. Among the towns Sowa and Gaborone had the highest increases.

In spite of the fact that the country experienced a positive (low) intercensal population increase (between 2001 and 2011 censuses), Lobatse and Selibe Phikwe districts experienced a negative increase at -2.3 percent and -0.9 percent respectively (Table 2.1a). Selibe Phikwe in particular has been affected by the gloomy prospects of the BCL mines, as a result residents and investors relocated to places where their businesses can be sustained. On realising the likely impacts of the closure of BCL mines, the government of Botswana came up with Selebi Phikwe Economic Diversification Unit (SPEDU) Regional Development Agency in order to diversify the regional economy from mining. 'SPEDU was set up to ensure a long term survival of Selebi Phikwe and the surrounding regions beyond the closure of the BCL mine and smelter through initiatives which may bring sustainable new employment and investment to the region and hence an improved economic and social base.'

http://www.finance.gov.bw/index.php?option=com_content1&parent_id=216&pparent=264&id=266

The population growth has implications on density and its consequences (See Section 2.1.3) particularly on areas with high population like Gaborone.

2.1.2 Sex Ratio

Sex Ratio, which is the degree of balance between females and males, is also presented in this sub-section. It is given by the ratio of males to females in the population per 100. Generally the Sex Ratio in Botswana is low though it has been experiencing a slight increase during the 1991, 2001 and 2011 censuses, with 91.6, 93.8 and 95.5 males per 100 females respectively (Figure 2.1a). Results reveal that in most districts males are fewer than females.

Table 2.1a Population by Census District and Sex between the 1991, 2001 and 2011 Censuses

District:	1991 Census			2001 Census			Intercensal Increase		Annual Average Growth Rate (%)
	Both Sexes	Male	Female	Both Sexes	Male	Female	Number	Percent	
Urban Cities/Towns									
Gaborone	133,468	68,248	65,220	186,007	91,851	94,156	52,539	39.4	3.32
Francistown	65,244	31,665	33,579	83,023	40,147	42,876	17,779	27.3	2.41
Lobatse	26,052	12,541	13,511	29,689	14,205	15,484	3,637	14	1.31
Selibe Phikwe	39,772	20,343	19,429	49,849	24,336	25,513	10,077	25.3	2.26
Orapa	8,827	4,713	4,114	9,151	4,837	4,314	324	3.7	0.36
Jwaneng	11,188	5,895	5,293	15,179	7,616	7,563	3,991	35.7	3.05
Sowa Town	2,228	1,462	766	2,879	1,571	1,308	651	29.2	2.56
Total City/Town:	286,779	144,867	141,912	375,777	184,563	191,214	88,998	31	2.7
Urban & Rural Districts									
Southern:									
Ngwaketsi South/Kanye/Moshupa	128,989	59,628	69,361	113,704	53,812	59,892	-15,285	-11.8	-1.26
Barolong	18,400	8,749	9,651	47,477	23,397	24,080	29,077	158	9.48
Ngwaketsi West	-	-	-	10,471	5,159	5,312	10,471	-	-
South East	43,584	20,591	22,993	60,623	29,129	31,494	17,039	39.1	3.3
Kweneng:									
Kweneng East	141,611	66,817	74,794	189,773	91,067	98,706	48,162	34	2.93
Kweneng West	28,826	13,511	15,315	40,562	20,480	20,082	11,736	40.7	3.42
Kgatleng	57,770	27,348	30,422	73,507	35,734	37,773	15,737	27.2	2.41
Central:									
Serowe-Palapye	128,471	59,988	68,483	153,035	73,294	79,741	24,564	19.1	1.75
Mahalapye	95,433	45,442	49,991	109,811	53,322	56,489	14,378	15.1	1.4
Central Bobonong	53,558	25,303	28,255	66,964	32,067	34,897	13,406	25	2.23
Central Boteti	35,459	16,834	18,625	48,057	23,482	24,575	12,598	35.5	3.04
Central Tutume	100,049	45,978	54,071	123,514	57,835	65,679	23,465	23.5	2.11
North East	43,354	19,920	23,434	49,399	23,164	26,235	6,045	13.9	1.31
North West:									
Ngamiland East	55,469	27,960	29,851	72,382	35,276	37,106	16,913	30.5	2.66
Ngamiland West	39,065	16,350	20,373	52,330	24,385	27,945	13,265	34	2.92
Chobe	14,126	7,649	6,477	18,258	9,395	8,863	4,132	29.3	2.57
Ghanzi:									
Ghanzi	24,719	12,401	12,318	33,170	16,916	16,254	8,451	34.2	2.94
Kgalagadi:									
Kgalagadi South	19,794	9,622	10,172	25,938	13,037	12,901	6,144	31	2.7
Kgalagadi North	11,340	5,442	5,898	16,111	8,111	8,000	4,771	42.1	3.51
Total Urban & Rural Districts:	1,040,017	489,533	550,484	1,305,086	629,062	676,024	265,069	25.5	2.27
Total	1,326,796	634,400	692,396	1,680,863	813,625	867,238	354,067	26.7	2.37

Note: **Annual Average Growth Rate**= $(1/t * \text{LN} (Pt/P0)) * 100$, where (t) is number of years between censuses, (LN) is the Natural Log, (Pt) is population at time t, (P0) is population at base year

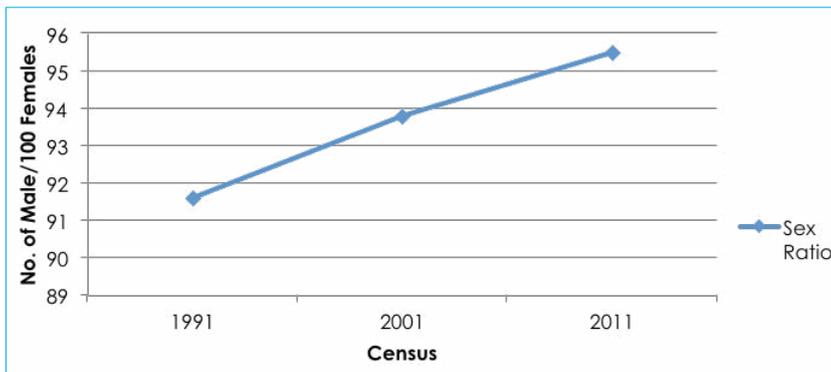
Note: (-) Not available

Table 2.1a Population by Census District and Sex between the 1991, 2001 and 2011 Censuses Continued...

District:	2001 Census			2011 Census			Intercensal Increase		Annual Average Growth Rate (%)
	Both Sexes	Male	Female	Both Sexes	Male	Female	Number	Percent	
Urban Cities/Towns									
Gaborone	186,007	91,851	94,156	231,592	113,544	118,048	45,585	24.5	2.19
Francistown	83,023	40,147	42,876	98,961	48,106	50,855	15,938	19.2	1.76
Lobatse	29,689	14,205	15,484	29,007	14,145	14,862	-682	-2.3	-0.23
Selibe Phikwe	49,849	24,336	25,513	49,411	24,733	24,678	-438	-0.9	-0.09
Orapa	9,151	4,837	4,314	9,531	4,730	4,801	380	4.2	0.41
Jwaneng	15,179	7,616	7,563	18,008	9,820	8,188	2,829	18.6	1.71
Sowa Town	2,879	1,571	1,308	3,598	1,960	1,638	719	25	2.23
Total City/Town:	375,777	184,563	191,214	440,108	217,038	223,070	64,331	17.1	1.58
Urban & Rural Districts									
Southern:									
Ngwaketse South/Kanye/Moshupa	113,704	53,812	59,892	129,247	62,262	66,985	15,543	13.7	1.28
Barolong	47,477	23,397	24,080	54,831	26,681	28,150	7,354	15.5	1.44
Ngwaketse West	10,471	5,159	5,312	13,689	6,874	6,815	3,218	30.7	2.68
South East	60,623	29,129	31,494	85,014	40,699	44,315	24,391	40.2	3.38
Kweneng:									
Kweneng East	189,773	91,067	98,706	256,752	125,214	131,538	66,979	35.3	3.02
Kweneng West	40,562	20,480	20,082	47,797	24,402	23,395	7,235	17.8	1.64
Kgatleng	73,507	35,734	37,773	91,660	44,572	47,088	18,153	24.7	2.21
Central:									
Serowe-Palapye	153,035	73,294	79,741	180,500	88,889	91,611	27,465	17.9	1.65
Mahalapye	109,811	53,322	56,489	118,875	57,548	61,327	9,064	8.3	0.79
Central Bobonong	66,964	32,067	34,897	71,936	34,249	37,687	4,972	7.4	0.72
Central Boteti	48,057	23,482	24,575	57,376	28,147	29,229	9,319	19.4	1.77
Central Tutume	123,514	57,835	65,679	147,377	70,340	77,037	23,863	19.3	1.77
North East	49,399	23,164	26,235	60,264	28,595	31,669	10,865	22	1.99
North West:									
Ngamiland East	72,382	35,276	37,106	90,334	44,410	45,924	17,952	24.8	2.22
Ngamiland West	52,330	24,385	27,945	61,950	29,201	32,749	9,620	18.4	1.69
Chobe	18,258	9,395	8,863	23,347	12,023	11,324	5,089	27.9	2.46
Ghanzi:									
Ghanzi	33,170	16,916	16,254	43,355	22,461	20,894	10,185	30.7	2.68
Kgalagadi:									
Kgalagadi South	25,938	13,037	12,901	30,016	15,119	14,897	4,078	15.7	1.46
Kgalagadi North	16,111	8,111	8,000	20,476	10,347	10,129	4,365	27.1	2.4
Total Urban & Rural Districts:	1,305,086	629,062	676,024	1,584,796	772,033	812,763	279,710	21.4	1.94
Total	1,680,863	813,625	867,238	2,024,904	989,071	1,035,833	344,041	20.5	1.86

Note: **Annual Average Growth Rate**=(1/t*LN (Pt/P0))*100, where (t) is number of years between censuses, (LN) is the Natural Log, (Pt) is population at time t, (P0) is population at base year

Figure 2.1a Sex Ratio during 1991, 2001 & 2011 Censuses



2.1.3 Population Density

The measure of population by area occupied (in square kilometre) is referred to as population density. It is one important indicator which shows the proximity of people living together. Generally, the population density of Botswana was on the increase during the 1991, 2001 and 2011 censuses (Table 2.1b). The density increased from 2.50 people per square kilometre in 1991 to 3.19 people per square kilometre in 2001, and 3.85 per square kilometre in 2011.

District differentials reveal that among town districts Francistown had the highest density (825.87 per square kilometre) in 1991, followed by Selebi Phikwe (795.44 per square kilometre), then Gaborone (789.75 per square kilometre) during the same year. However, the pattern changed both in 2001 and 2011 censuses; Gaborone topped the list with 1,100.63 and 1,345.17 per square kilometres, respectively (Table 2.1b and Figure 2.1b). At the same time the population of Gaborone increased from 186,007 in 2001 to 231,592 in 2011. This finding is supported by the fact that Gaborone is the capital city of Botswana; hence a lot of people are attracted to its modern infrastructure and affluence of better goods and services. Among urban and rural districts South East and Kweneng East had the highest density in all the years because they serve as dormitory areas for the greater population working in Gaborone.

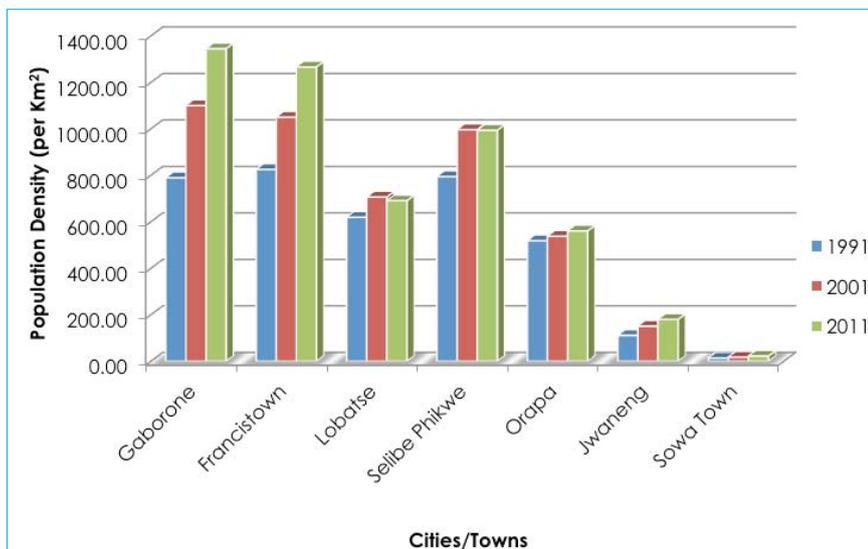
Increased population density implies extra demand for social services, land, infrastructure and employment. Furthermore, high population density is often associated with poor sanitation (access to unimproved sanitation facilities) more especially for people living in poverty. Drainage systems in most cases are not properly maintained, as a result waste water is not just a concern but also an eyesore. This situation creates a breeding place for disease vectors like mosquitoes, but also is a source of water-borne diseases.

Table 2.1b Population Density by Census District between the 1991, 2001 and 2011 Censuses

District:	Area (Km ²)	1991 Census		2001 Census		2011 Census	
		Population	Density (per Km ²)	Population	Density (per Km ²)	Population	Density (per Km ²)
Urban Cities & Towns							
Gaborone	169	133,468	789.75	186,007	1,100.63	227,333	1,345.17
Francistown	79	65,244	825.87	83,023	1,050.92	100,079	1,266.82
Lobatse	42	26,052	620.29	29,689	706.88	29,032	691.24
Selibe Phikwe	50	39,772	795.44	49,849	996.98	49,724	994.48
Orapa	17	8,827	519.24	9,151	538.29	9,544	561.41
Jwaneng	100	11,188	111.88	15,179	151.79	18,063	180.63
Sowa Town	159	2,228	14.01	2,879	18.11	3,599	22.64
Urban & Rural Districts							
Southern:	28,470	128,989	4.53	171,652	6.03	197,767	6.95
Ngwaketsi South	-	128,989	-	113,704	-	129,462	-
Barolong	-	18,400	-	47,477	-	55,103	-
Ngwaketsi West	9,171	-	0	10,471	1.14	13,697	1.49
South East	1,800	43,584	24.21	60,623	33.68	92,843	51.58
Kweneng:							
Kweneng East	7,901	170,437	21.57	189,773	24.02	256,833	32.51
Kweneng West	24,841	-	0	40,562	1.63	47,841	1.93
Kgatleng	7,960	57,770	7.26	73,507	9.23	92,247	11.59
Central:							
Serowe-Palapye	31,381	128,471	4.09	153,035	4.88	188,174	6
Mahalapye	16,876	95,433	5.65	109,811	6.51	117,492	6.96
Central Bobonong	14,242	53,558	3.76	66,964	4.7	70,806	4.97
Central Boteti	33,806	35,459	1.05	48,057	1.42	56,209	1.66
Central Tutume	46,140	100,049	2.17	123,514	2.68	144,895	3.14
North East	5,120	43,354	8.47	49,399	9.65	59,829	11.69
North West:							
Ngamiland East	86,400	55,469	0.64	75,070	0.87	96,356	1.12
Ngamiland West	22,730	39,065	1.72	49,642	2.18	61,748	2.72
Chobe	20,800	14,126	0.68	18,258	0.88	23,449	1.13
Ghanzi:							
Ghanzi	117,910	24,719	0.21	33,170	0.28	43,370	0.37
Kgalagadi:							
Kgalagadi South	32,800	19,794	0.6	25,938	0.79	30,016	0.92
Kgalagadi North	72,400	11,340	0.16	16,111	0.22	20,484	0.28
Total	581,364	1,455,785	2.5	1,852,515	3.19	2,235,995	3.85

Source: CSO (2003); 2011 Population & Housing Census Data
 (-) Data Not Available

Figure 2.1b Population Density by Cities/Towns between the 1991, 2001 and 2011 Censuses



2.2 Access to Water, Sanitation and Energy

Discussions under this sub-item includes information on population using improved drinking water sources, improved sanitation, and access to sustainable and clean energy (electricity) in urban and rural areas. Having access to these basic services leads to an improved standard of living, this in turn leads to sustainable use of the environment. For example, increased use of electricity and reduced consumption of fuel-wood implies that fewer trees are cut for energy, and this paves the way for the attainment of Millennium Development Goal 7 on environmental sustainability.

2.2.1 Energy Sources

Access to energy sources used for cooking, heating and lighting by urban and rural areas during the 2001 and 2011 censuses and where possible 1991 census is presented in Tables 2.2a – 2.2b. More emphasis is given to the use of electricity as it is regarded as sustainable and clean energy. It is clear from Tables 2.2 (both a and b) that the dominant source of energy for household lighting in Botswana during the 1991 and 2001 censuses was paraffin, both in urban and rural areas. In spite of the dominance of paraffin as a principal source of energy for lighting, the proportion of households using the same source was on the decrease. For example, in urban areas the proportion decreased from 65.7 percent in 1991 to 49.2 percent in 2001 and further down to 21.26 percent in 2011. The drop in paraffin usage in 2011 might be attributable to the interventions on electrifications of villages and other settlements by government, for example, “The Renewable Energy Rural Electrification Programme for Botswana.” The aim of the project was to increase the use of solar energy for cooking and lighting through the provision of solar home systems. The project was started in 2005 and was supposed to be functional till December 2013. The national implementing partners were the Department of Energy Affairs, Botswana Power Corporation (BPC Lesedi) and United Nations Development Programme (UNDP).

During the 1991, 2001 and 2011 censuses rural areas also experienced a decrease in the use of paraffin as a principal source of energy for lighting, from 63.1 percent in 1991 to 59.2 percent in 2001, then 46.2 percent in 2011. However, the situation changed in 2011 for urban areas when electricity became the dominant source of energy for lighting with 69.13 percent. As for the rural areas, the use of paraffin as a dominant source persisted during the 2011 census.

Tables 2.2c – 2.2d provide information on the proportion of all households in urban and rural areas by principal energy source for cooking during the 1991, 2001 and 2011 censuses. The tables show that wood/charcoal were mostly used during the three censuses, that is, both in urban and rural areas, followed by gas (LPG). The use of wood/charcoal in rural areas was over 77 percent during the review period; however overall use of wood for cooking was gradually declining. The use of electricity experienced a significant increase for both urban and rural areas. In urban areas the use of electricity as a principal source of energy for cooking increased from 4.80 percent in 1991 to 7.60 percent in 2001 then to 23.56 percent in 2011. This is a good development because a significant increase in the use of electricity over other sources which emit a lot of carbon contributes to the reduction on the emission of greenhouse gases (GHGs).

Regarding the principal source of energy for space heating during the 2001 and 2011 censuses, the use of wood was extensive though it experienced a slight decrease during the period. For example the use of wood as principal source of energy for space heating in urban areas reduced from 39.86 percent in 2001 to 31.21 percent in 2011, while in rural areas the use of wood also reduced from 82.67 percent in 2001 to 78.08 percent in 2011. The reason why the use of wood is dominant in rural areas is the fact that firewood is more abundant and therefore there is easy access to it compared to urban areas. Moreover, firewood is cheaper than electricity and as a result the majority of rural dwellers would afford to use firewood than electricity. The table further reveals that the use of electricity as a principal source of energy for space heating was slightly on the increase for both urban and rural areas. About 33.60 percent of the total households did not do any space heating in 2011 (Tables 2.2e - 2.2f and Figure 2.2c).

An indicator on the use of solar power as a principal source of energy for lighting was introduced in the census questionnaire in 2001; this intended to help assess the uptake of solar energy as a clean and renewable energy source with a low carbon footprint. The use of solar energy in Botswana increased from 0.20 percent in 2001 to 0.51 percent in 2011. Generally, households in rural areas used more solar energy for lighting as compared to those in urban areas.

The use of solar power as a principal source of energy for cooking in Botswana decreased from 0.19 percent in 2001 to 0.08 percent in 2011. The same scenario was experienced for both urban and rural areas during the 2001 and 2011 censuses. There was no difference in the use of solar power as a principal source of energy for heating in Botswana, that is, 0.14 percent of the households used solar power as a principal source of energy for heating both in 2001 and 2011 census (Tables 2.2c - d).

The percentage of households using diesel as an energy source for lighting was 0.77 percent in 2011. During the same year the use of petrol stood at 0.15 percent nationally. The same situation persisted with regard to the use of both diesel and petrol as principal sources of energy for cooking. As for the use of diesel and petrol as principal sources of energy for heating, 0.09 percent of the households used petrol while only 0.03 percent used diesel (Tables 2.2a - c). Petrol and diesel are used to power generators and they are also known emitters of greenhouse gases.

Table 2.2a Proportions of Households in Urban and Rural by Principal Energy Source for Lighting in 1991, 2001 & 2011 Censuses

Principal Fuel-Lighting	1991			2001			2011		
	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural
Electricity	10.1	17.5	2	24.8	37	8.1	53.24	69.13	23.87
Petrol	-	-	-	-	-	-	0.15	0.12	0.21
Diesel	-	-	-	-	-	-	0.77	0.04	2.12
Solar power	-	-	-	0.2	0.1	0.4	0.51	0.17	1.12
Gas (LPG)	0.8	1.2	0.3	0.5	0.7	0.4	0.28	0.33	0.19
Bio gas	-	-	-	0.1	0.1	0.1	0.02	0.02	0.02
Wood	11.4	0.8	23.1	5.6	0.6	12.5	3.56	0.57	9.09
Paraffin	64.5	65.7	63.1	53.4	49.2	59.2	30.02	21.26	46.21
Candle	11.8	14.1	9.3	8.6	7	10.9	11.01	8.18	16.25
Paraffin/Candle	-	-	-	6	5.2	7.1	-	-	-
Other	1.4	0.7	2.1	0.6	0.1	1.3	0.44	0.18	0.92
Not Stated	-	-	-	0.1	0.1	0.2	-	-	-
No. of Households	276,209	145,106	131,103	404,706	234,757	169,949	550,918	357,542	193,376
Percentage of Households	100.0	52.50.	47.5	100.0	58.00	42.00	100.0	64.90	35.10

Source: CSO (2003); 2011 Population & Housing Census Data
 Note (- : not available)

Table 2.2b Distribution of Households in Urban and Rural by Principal Energy Source for Lighting in 1991, 2001 & 2011 Censuses

Principal Fuel-Lighting	1991			2001			2011		
	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural
Electricity	27,897	25,394	2,622	100,367	86,860	13,766	293,309	247,169	46,159
Petrol	-	-	-	-	-	-	826	429	406
Diesel	-	-	-	-	-	-	4,242	143	4,100
Solar power	-	-	-	809	235	680	2,810	608	2,166
Gas (LPG)	2,210	1,741	393	2,024	1,643	680	1,543	1,180	367
Bio gas	0	0	0	405	235	170	110	72	39
Wood	31,488	1,161	30,285	22,664	1,409	21,244	19,613	2,038	17,578
Paraffin	178,155	95,335	82,726	216,113	115,500	100,610	165,386	76,013	89,359
Candle	32,593	20,460	12,193	34,805	16,433	18,524	60,656	29,247	31,424
Paraffin/Candle				24,282	12,207	12,066	-	-	-
Other	3,867	1,016	2,753	2,428	235	2,209	2,424	644	1,779
Not Stated	-	-	-	405	235	340	-	-	-
No. of Households	276,209	145,106	130,972	404,301	234,992	170,289	550,918	357,542	193,376

Source: CSO (2003); 2011 Population & Housing Census Data

Note (- : not available)

Figure 2.2a Households in Urban and Rural by Selected Principal Energy Source for Lighting in 1991, 2001 & 2011 Censuses

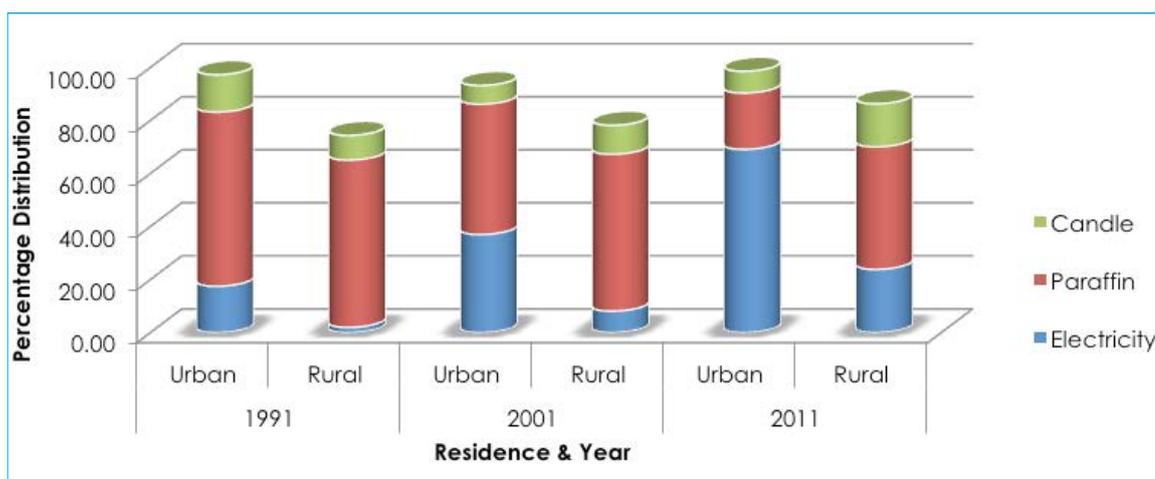


Table 2.2c Proportions of Households in Urban and Rural by Principal Energy Source for Cooking in 1981, 1991, 2001 & 2011 Censuses

Principal Fuel-Cooking	1991			2001			2011		
	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural
Electricity	2.7	4.8	0.3	4.86	7.6	1.08	17.79	23.56	7.12
Petrol	-	-	-	-	-	-	0.06	0.07	0.06
Diesel	-	-	-	-	-	-	0.09	0.08	0.1
Solar power	-	-	-	0.19	0.28	0.08	0.08	0.09	0.06
Gas (LPG)	21.6	35.6	6.3	40.59	57.65	17.01	37.89	50.81	14
Bio gas	-	-	-	0.57	0.66	0.44	0.92	1.17	0.45
Wood/Charcoal	64.3	40.6	90.6	45.72	22.83	77.34	41.19	21.81	77.03
Paraffin	10.7	18.2	2.5	7.53	10.47	3.47	1.67	2.1	0.85
Cow dung	-	-	-	0.11	0.02	0.23	0.07	0.04	0.14
Coal	0.1	0.1	0.5	0.12	0.12	0.11	0.04	0.04	0.03
Crop Waste	-	-	-	0.08	0.1	0.06	0.02	0.02	0.01
Charcoal	-	-	-	-	-	-	0.13	0.16	0.08
Other	0.5	0.6	-	0.11	0.12	0.09	0.05	0.05	0.06
Not Stated	-	-	-	0.12	0.14	0.1	-	-	-
No. of Households	276 209	145 106	131 103	404 706	234 757	169 949	550 945	357 542	193 376
Percentage of Households	100.000	52.53	79.50	100.00	52.50	47.50	100.00	58.00	42.00

Source: CSO (2003); 2011 Population & Housing Census Data

Note (- : not available)

Table 2.2d Distribution of Households in Urban and Rural by Principal Energy Source for Cooking in 1981, 1991, 2001 & 2011 Censuses

Principal Fuel-Cooking	1991			2001			2011		
	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural
Electricity	7,458	6,965	393	19,669	17,842	1,835	98,013	84,237	13,768
Petrol	-	-	-	-	-	-	331	250	116
Diesel	-	-	-	-	-	-	496	286	193
Solar power	-	-	-	769	657	136	441	322	116
Gas (LPG)	59,661	51,658	8,259	164,270	135,337	28,908	208,753	181,667	27,073
Bio gas	0	0	0	2,307	1,549	748	5,069	4,183	870
Wood/Charcoal	177,602	58,913	118,779	185,032	53,595	131,439	226,934	77,980	148,958
Paraffin	29,554	26,409	3,278	30,474	24,579	5,897	9,201	7,508	1,644
Cow dung	0	0	0	445	47	391	386	143	271
Coal	276	145	656	486	282	187	220	143	58
Crop Waste	-	-	-	324	235	102	110	72	19
Charcoal	-	-	-	-	-	-	716	572	155
Other	1,381	871	-	445	282	153	275	179	116
Not Stated	-	-	-	486	329	170	-	-	-
No. of Households	276,209	145,106	131,103	404,706	234,757	169,949	550,945	357,542	193,376

Source: CSO (2003); 2011 Population & Housing Census Data

Note (- : not available)

Figure 2.2b Households in Urban and Rural by Principal Energy Source for Cooking in 1981, 1991, 2001 & 2011 Censuses

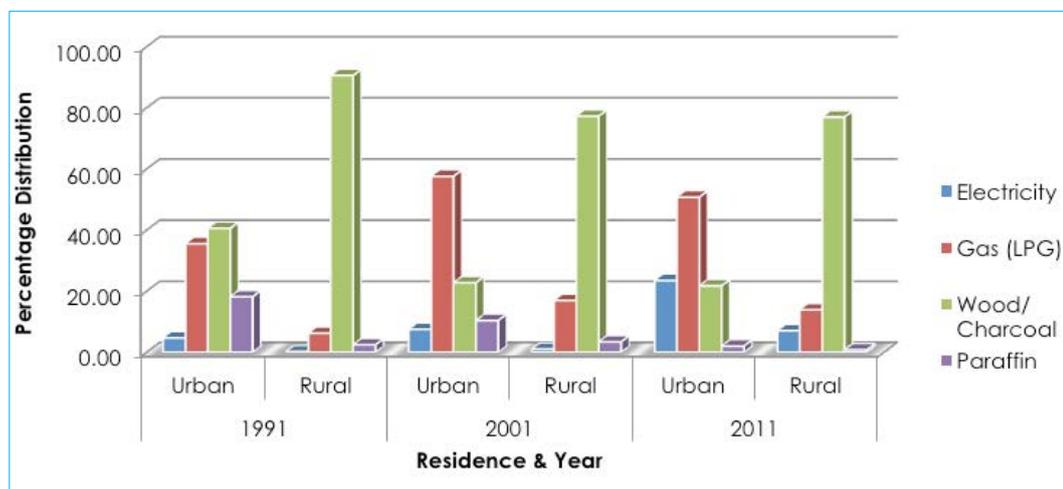


Table 2.2e Proportions of Households in Urban and Rural by Principal Energy Source for Heating in 2001 & 2011 Censuses

Principal Fuel-Heating	Residence Type				Total	
	Urban		Rural		2011	2001
	2011	2001	2011	2001		
Electricity	22.47	12.54	6.18	2.44	16.75	8.3
Petrol	0.1	-	0.07	-	0.09	-
Diesel	0.02	-	0.04	-	0.03	-
Solar power	0.13	0.15	0.14	0.14	0.14	0.14
Gas (LPG)	1.37	3.35	0.38	0.98	1.02	2.36
Bio gas	0.06	-	0.05	-	0.06	-
Wood	31.21	39.86	78.08	82.67	47.66	57.84
Paraffin	0.24	1.97	0.3	1.29	0.26	1.69
Cow dung	0.02	0.06	0.1	0.29	0.05	0.16
Coal	0.15	0.17	0.11	0.08	0.13	0.13
Charcoal	0.19	0.16	0.08	0.13	0.15	0.15
None	43.97	40.7	14.43	11.51	33.6	28.44
Other (NEC)	0.07	1.03	0.03	0.47	0.06	0.79
No. of Households	357 542	234 757	193 375	169 949	550 917	404 706

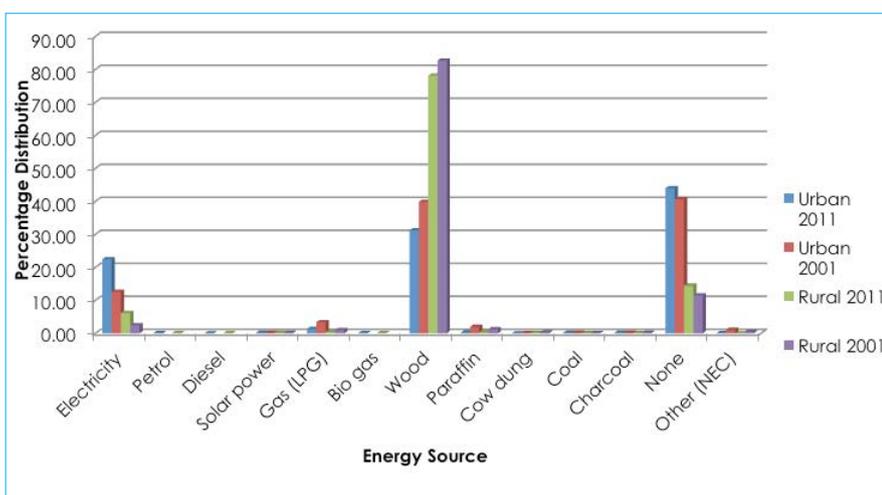
Source: CSO (2003); 2011 Population & Housing Census Data

Note: (-) not available

Table 2.2f Distribution of Households in Urban and Rural by Principal Energy Source for Space Heating in 2001 & 2011 Censuses

Principal Fuel-Heating	Residence Type				Total	
	Urban		Rural		2011	2001
	2011	2001	2011	2001		
Electricity	80,340	29,439	11,951	4,147	92,279	33,591
Petrol	358	-	135	-	496	-
Diesel	72	-	77	-	165	-
Solar power	465	352	271	238	771	567
Gas (LPG)	4,898	7,864	735	1,666	5,619	9,551
Bio gas	215	-	97	-	331	-
Wood	111,589	93,574	150,987	140,497	262,567	234,082
Paraffin	858	4,625	580	2,192	1,432	6,840
Cow dung	72	141	193	493	275	648
Coal	536	399	213	136	716	526
Charcoal	679	376	155	221	826	607

Figure 2.2c Households in Urban and Rural by Principal Energy Source for Heating in 2001 & 2011 Censuses



2.2.2 Water Sources

Like many other sub-Saharan African countries, Botswana is faced with the challenge of water scarcity and hence a decision to incorporate water and related issues in the Vision 2016 (harnessing the scarce water resources in a way that ensures an adequate supply of safe drinking water that is affordable and accessible to all the citizens). Vision 2016 targets are consistent with the Millennium Development Goals, for example, MDG 7 on ensuring environmental sustainability has a target that stipulates that by 2015 the proportion of people without sustainable access to safe drinking water and basic sanitation should be halved.

This sub-section of the human settlement report presents a descriptive analysis of household access to improved water sources by residence during the 1991, 2001 and 2011 censuses. Tables 2.2g– 2.2i and Figures 2.2d – 2.2e show that out of the 276,209 households in 1991, the percentage of households with access to improved water through piped/tapped-water stood at about 53 percent in towns and urban villages, about 23 percent in rural villages and only 2 percent in localities. Out of the 404,706 households in 2001, the proportion of households with access to improved water source (taped/piped) was on the increase in towns and urban villages, rural, and localities, with 57 percent, 25 percent and 6 percent, respectively. However, in 2011, households with access to taped/piped water experienced an increase only in towns and urban villages (from 56.0 percent in 2001 to 64.4 percent in 2011), while a percentage decrease was observed both in rural villages (from 25.0 percent in 2001 to 21.6 percent in 2011) and localities (from 5.8 percent in 2001 to 4.5 percent in 2011). Gwebu, et al (2013) asserts that the just mentioned finding might be attributed to a large

extent by the growth in household numbers that were located in rural villages in 2001, like Mmopane, but were then converted into urban villages. Generally, the proportion of households with access to improved water source through tapped/piped water increased from 77 percent in 1991 to 88 percent in 2001 then to 91 percent in 2011.

Lastly, the results on households with access to improved water through piped/tapped water by district show that during the 2001 and 2011 censuses Gaborone had the highest number of households with 58,359 and 74,456 respectively, followed by Francistown (with 22,981 in 2001 and 31,199 in 2011) then Selibe Phikwe (with 14,994 in 2001 and 16,023 in 2011).

Table 2.2g: Household Using Piped/Tapped, Bowser/Tanker & Borehole as Water Sources by Residence and District between the 2001 and 2011 Censuses

Residence & District:	2001			2011		
	Piped/Tapped	Bowser/tanker	Borehole	Piped/Tapped	Bowser/tanker	Borehole
Cities & Towns						
Gaborone	58,378	0	0	74,456	364	37
Francistown	22,981	0	0	31,199	13	31
Lobatse	8,511	0	0	9,202	0	5
Selibe Phikwe	14,994	6	0	16,023	1	18
Orapa	2,578	0	0	3,288	0	0
Jwaneng	4,658	0	0	5,438	7	0
Sowa Town	979	0	0	1,183	2	5
Urban & Rural Districts						
Southern:	19,778	347	2,247	42,909	829	3,115
Ngwaketse South/Kanye/Moshupa	8,409	125	1,602	27,458	388	2,043
Barolong	9,393	61	456	12,500	122	799
Central:	45,464	1,295	10,098	124,474	2,077	12,950
Serowe-Palapye	11,983	372	3,237	39,863	579	3,955
Mahalapye	10,068	231	1,899	25,916	235	2,660
Central Bobonong	5,364	208	1,237	15,125	237	2,101
Central Boteti	3,993	331	1,431	11,258	232	1,525
Central Tutume	14,056	153	2,294	32,312	794	2,709
North East	9,631	427	146	14,817	386	217
North West:	9,336	939	4,569	29,599	524	1,752
Ngamiland East	3,019	234	1,363	18,086	299	1,232
Ngamiland West	6,317	236	484	11,513	159	376
Chobe	2,002	64	235	6,590	66	144
Ghanzi:	3,440	178	1,108	2,570	189	1,623
Kgalagadi:	6,521	136	813	11,792	623	1,014
Kgalagadi South	3,116	36	624	6,794	324	724
Kgalagadi North	3,405	100	189	49,98	297	290
Total:	354,925	3,685	20,804	498,729	6,283	27,037

Source: Central Statistics Office (2003) and 2011 Population & Housing Census Data

Table 2.2h: Number of Households by Water Supply & Region during the 1991, 2001 & 2011 Censuses

Water Source	Towns & Urban Villages			Rural Villages			Localities			Total		
	1991	2001	2011	1991	2001	2011	1991	2001	2011	1991	2001	2011
Piped/Tapped	145,106	230,273	354,876	63,249	100,997	119,108	4,378	23,655	24,745	212,733	354,925	498,729
Bowser/Tanker	0.0	194	976	0.0	962	1,053	0.0	2,529	4,254	0.0	3,685	6,283
Well	0.0	93	44	0.0	271	150	11,487	6,874	4,906	11,487	7,238	5,100
Borehole	0.0	128	328	0.0	474	613	20,759	20,202	26,096	20,759	20,804	27,037
Other	0.0	4,069	1,352	0.0	2,695	844	31,230	11,290	10,967	31,230	18,054	13,797
Total	145,106	234,757	357,576	63,249	105,399	121,768	67,854	64,550	70,968	276,209	404,706	550,946

Table 2.2i: Proportions of Households by Water Supply & Region during the 1991, 2001 & 2011 Censuses

Water Source	Towns & Urban Villages			Rural Villages			Localities			Total		
	1991	2001	2011	1991	2001	2011	1991	2001	2011	1991	2001	2011
Piped/Tapped	52.5	56.9	64.4	22.9	25.0	21.6	1.6	5.8	4.5	77	87.7	90.5
Bowser/Tanker	0.0	0.0	0.2	0.0	0.2	0.2	0.0	0.6	0.8	0.0	0.9	1.1
Well	0.0	0.0	0.0	0.0	0.1	0.0	4.2	1.7	0.9	4.2	1.8	0.9
Borehole	0.0	0.0	0.1	0.0	0.1	0.1	7.5	5.0	4.7	7.5	5.1	4.9
Other	0.0	1.0	0.2	0.0	0.7	0.2	11.3	2.8	2.0	11.3	4.5	2.5
Total	52.5	58.0	64.9	22.9	26.0	22.1	24.6	15.9	12.9	100.0	100.0	100.0

Figure 2.2d: Households by Water Supply (Piped, Bowser & Borehole) & Region during the 1991, 2001 & 2011 Censuses

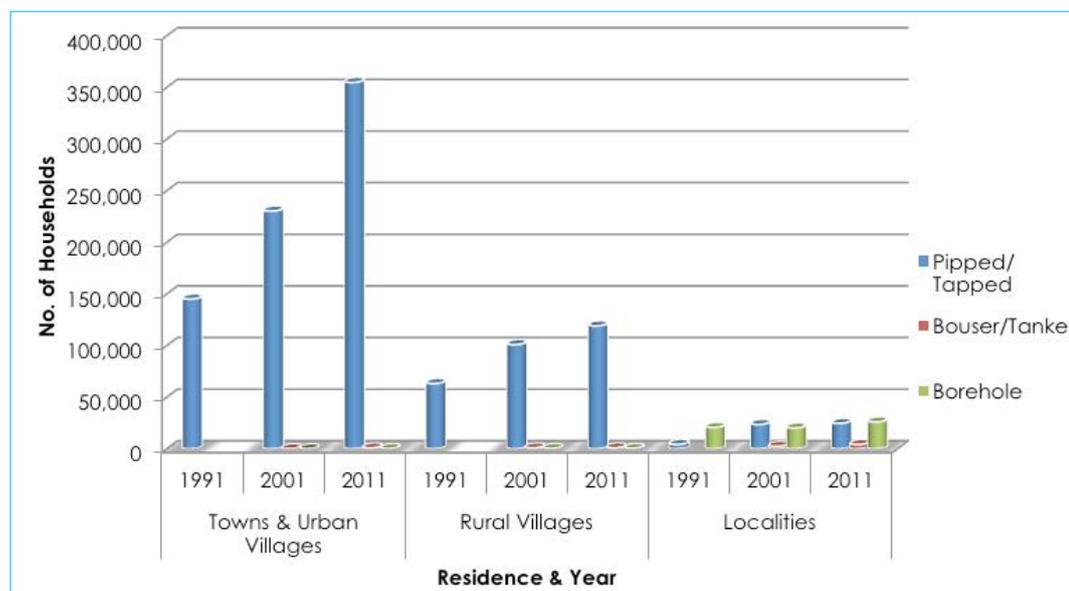
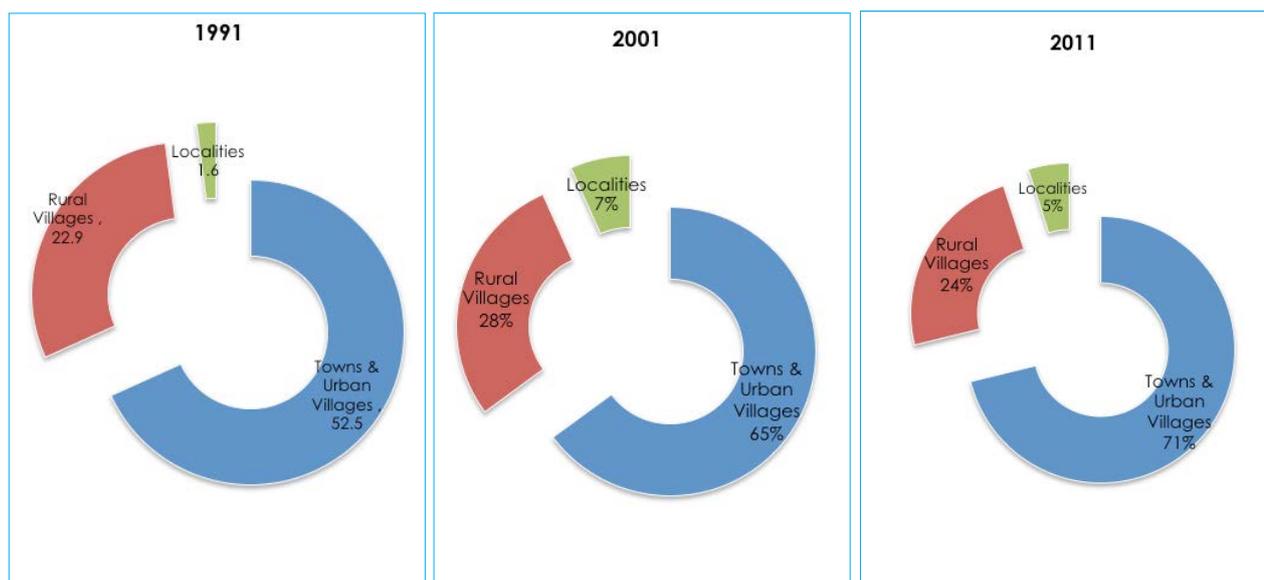


Figure 2.2e: Proportion of Households with Access to Improved Water through Piped/tapped Water by District, 1991, 2001 & 2011 Censuses



2.2.3 Access to Sanitation

This sub-section provides information on households using improved sanitation facility and having access to waste removal services. World Health Organization (WHO) defines access to improved sanitation as “the proportion of population or households with at least excreta disposal facilities that can effectively prevent human, animal, and insect contact with excreta.” WHO further states that improved facilities include ordinary protected pit latrines and flush toilets with sewerage connection, and all these have to be properly maintained.

Both sanitation facility and waste removal services are very important for environmental quality and human health, more especially in densely populated areas. Lack of proper disposal of waste water for example, can lead to ground water contamination, which can result in the spread of diarrhoea, cholera and other water-borne diseases. In Botswana, the issue of access to improved sanitation is emphasised in one of the Vision 2016 Pillars of A compassionate, Just and Caring Nation, which states that by 2016 Botswana citizens should have access to adequate nutrition, quality sanitation and adequate supply of clean drinking water, among other things. To meet some of the Vision 2016 targets, the Government of Botswana has given the Department of Waste Management and Pollution Control the responsibility of overseeing the implementation of the Waste Management Act of 1998. The department helps in the development of waste management facilities through the provision of technical support and budgetary assistance to the local authorities. This support enables the local authorities to provide sustainable waste management services to citizens.

2.2.3.1 Toilet Facility

Table 2.2j shows that the percentage of households with access to improved sanitation facilities increased from 76.9 percent (311,164) in 2001 to 92.7 percent (514,952) in 2011. The remaining proportions, that is, during the 2001 (23.1 percent) and 2011 (7.3 percent) censuses, had no access to any form of toilet facility.

Table 2.2j further reveals that flush toilets were common in cities and towns during the review period as compared to the urban and rural districts combined. For example, the number of households with access to flush toilets in Cities and Towns increased from 49.9 percent in 2001 to 64.8 percent in 2011, whereas in urban and rural districts combined the proportion increased from 16.7 percent in 2001 to 26.8 percent in 2011. During the same period, pit latrine facilities were dominant in urban and rural districts combined as compared to cities and towns. The use of pit latrine facility was slightly on the increase in urban and rural districts, that is, from 55.5 percent in 2001 to 57 percent in 2011. In urban and rural districts, Central district had the highest number of households with access to flush toilets both in 2001 (10,477) and 2011 (28,830) followed by Kweneng district with 6,046 in 2001 and 21,529 in 2011. Generally, access to improved sanitation facilities by households in Botswana shows a positive trend which implies that households with access to unimproved sources of sanitation facilities are getting fewer (Tables 2.2j – 2.2k & Figures 2.2f – 2.2h).

Table 2.2j: Household Using Improved Sanitation Facility by District between the 2001 and 2011 Censuses

District	Total Households	2001				Total Households	2011			
		Flush Toilet	Ventilated Improved Pit Latrine	Pit Latrine	Dry-Compost		Flush Toilet	Ventilated Improved Pit Latrine	Pit Latrine	Dry-Compost
Urban Cities/Towns										
Gaborone	58,476	29,881	12,923	15,555	88	73,834	48,170	2,852	23,678	68
Francistown	23,124	7,677	3,607	11,146	211	31,778	18,977	1,186	10,968	44
Lobatse	8,523	3,264	2,710	2,514	6	9,219	4,383	406	4,392	9
Selibe Phikwe	15,258	6,164	3,799	5,081	63	16,121	10,242	252	5,525	6
Orapa	2,578	2,573	4	3	0	3,291	3,286	3	3	0
Jwaneng	4,681	3,487	179	768	1	5,943	5,123	81	216	6
Sowa Town	979	975	0	0	4	1,199	1,158	2	3	0
Urban & Rural Districts										
Southern:	37,202	2,716	8,482	15,067	8	48,828	7,875	2,160	28,861	430
Ngwaketsi South/ Kanye/Moshupa	-	-	-	-	-	31,525	5,400	1,172	18,341	263
Barolong	-	-	-	-	-	13,743	1,992	897	8,714	145
Ngwaketsi West	-	-	-	-	-	3,560	483	91	1,806	22
South East	14,780	4,331	3,798	5,498	59	26,564	11,940	1,018	10,073	103
Kweneng	52,578	6,046	8,886	24,869	18	80,633	21,529	4,391	42,676	384
Kweneng East	-	-	-	-	-	68,399	19,751	4,251	37,632	320
Ngwaketsi West	-	-	-	-	-	12,234	1,778	140	5,044	64
Kgatleng	17,054	2,132	6,856	5,167	10	24,823	6,592	947	14,312	267
Central:	110,287	10,477	20,734	39,924	50	148,712	28,830	4,199	80,723	905
Serowe-Palapye	-	-	-	-	-	48,387	10,990	1,478	24,566	301
Mahalapye	-	-	-	-	-	29,583	5,865	1,070	17,222	191
Central Bobonong	-	-	-	-	-	19,171	3,538	225	10,379	88
Central Boteti	-	-	-	-	-	13,827	2,446	771	6,339	31
Central Tutume	-	-	-	-	-	37,744	5,991	655	22,217	294
North East	10,834	1,224	217	6,630	10	15,775	4,228	322	10,067	54
North West:	30,913	3,957	3,246	8,068	31	43,786	13,186	628	15,674	43,926
Ngamiland East	-	-	-	-	-	23,279	7,324	426	10,044	23,385
Ngamiland West	-	-	-	-	-	13,661	2,504	84	3,226	13,687
Chobe	-	-	-	-	-	6,846	3,358	118	2,404	6,854
Ghanzi:	7,776	1,081	622	1,858	1	11,378	3,300	219	3,283	10
Kgalagadi:	9,663	1,237	2,020	3,131	18	13,511	2,907	547	7,325	22
Kgalagadi South	-	-	-	-	-	7,950	1,717	289	4,163	17
Kgalagadi North	-	-	-	-	-	5,561	1,190	258	3,162	5
Total	404,706	87,223	78,083	145,280	578	555,395	191,726	19,213	257,779	46,234

Source: CSO (2003); 2011 Population & Housing Census Data

Note: (-) Data not available and the total numbers of the major districts were used instead

Figure 2.2f: Household Using Improved Sanitation Facility in Urban Cities & Towns between the 2001 and 2011 Censuses

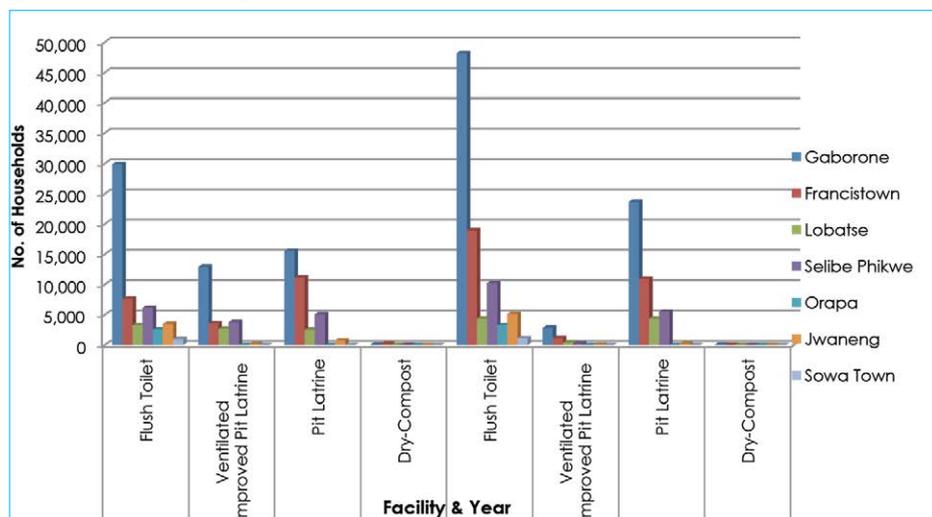


Table 2.2k: Distribution of Households by Improved Sanitation Facility & Region between the 2001 and 2011 Censuses

Sanitation Facility & Region	Number		Percent	
	2001	2011	2001	2011
Urban Cities/Towns:				
Flush Toilet	54,022	91,339	47.9	64.8
Ventilated Improved Pit Latrine	23,223	4,782	20.6	3.4
Pit Latrine	35,066	44,785	31.1	31.8
Dry-Compost	373	133	0.3	0.1
Total:	112,684	141,039	100.0	100.0
Urban & Rural Districts:				
Flush Toilet	33,201	100,387	16.7	26.8
Ventilated Improved Pit Latrine	54,860	14,431	27.6	3.9
Pit Latrine	110,214	212,994	55.5	57.0
Dry-Compost	205	46,101	0.1	12.3
Total:	198,480	373,913	100.0	100.0
Grand Total:	311,164	514,952	76.9	92.7
Total Number of Households:	404,706	555,395		

Source: CSO (2003); 2011 Population & Housing Census Data

Figure 2.2g: Proportion of Households by Improved Sanitation Facility for Urban Cities & Towns Region between the 2001 & 2011 Censuses

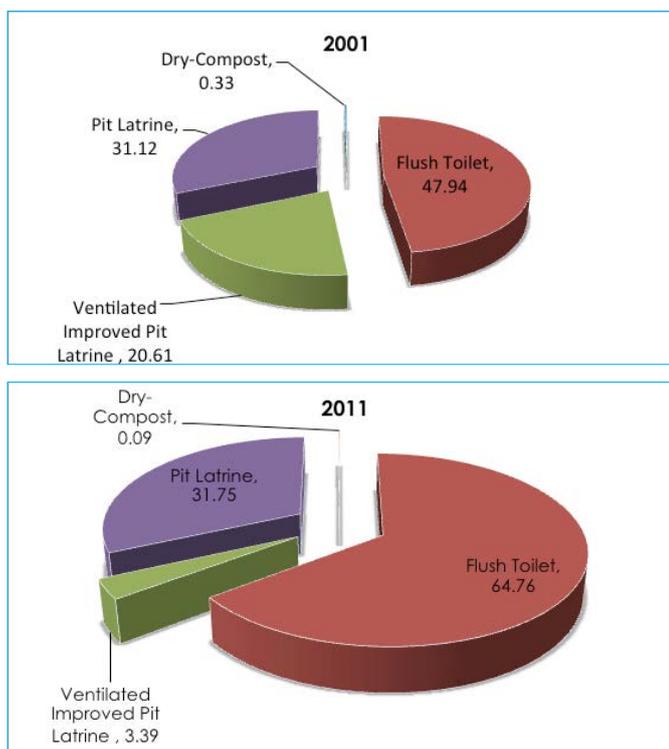
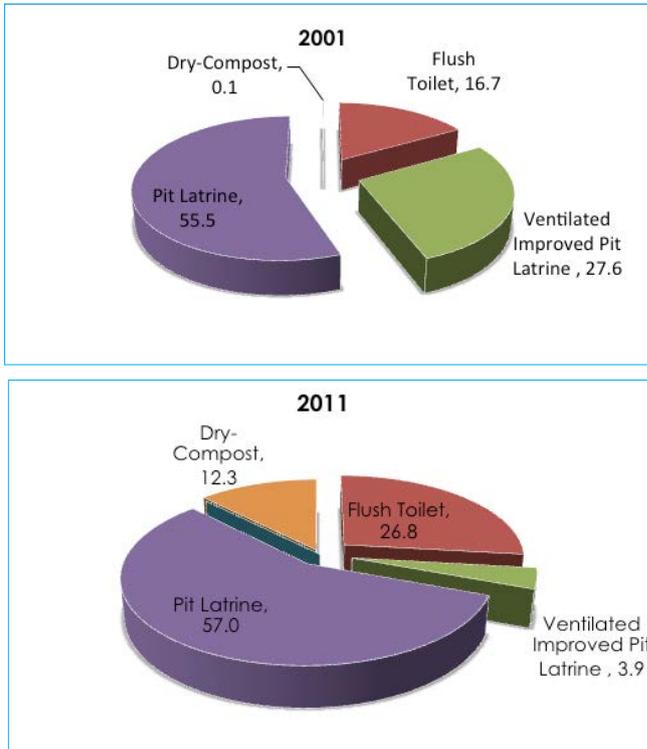


Figure 2.2h: Proportion of Households by Improved Sanitation Facility for Urban & Rural Districts between the 2001 & 2011 Censuses



2.2.1.1 Waste Collection and Disposal

Anything that has no purpose or that is no longer useful is regarded as waste and therefore it should be disposed-off. For example, domestic waste from household activities like cooking, refrigeration (preservation) should be safely disposed-off because they attract bacteria and germs which are not good for human health. Wastes from industrial processes are considered hazardous and can be toxic in most cases. The Government of Botswana has put measures in place to encourage safe disposal of waste and these include the development of sanitary landfills, among others.

Tables 2.2i – 2.2s and Figures 2.2i – 2.2n show the comparison of waste disposal by households in urban and rural districts during the 2001 and 2011 censuses. Waste collection in Cities and Towns during the 2011 census was such that about 76 percent of the households received regular collection compared to about 81 percent during the 2001 census (a decline of about of 5 percent). The need to reverse this trend cannot be overemphasised, for the health and well-being of the people, particularly that Government has established sanitary landfills with the view to improving the waste management system.

During the 2011 census, households in Orapa and Selibe Phikwe enjoyed the highest regular collection of waste service of about 95 percent each; followed by Jwaneng with about 92 percent, Gaborone had the lowest regular collection. Sowa Town experienced a steep decline in regular waste collection from 99 percent in 2001 to 75 percent in 2011. On the other hand, households in Selibe Phikwe experienced an increase in regular waste collection from about 80 percent in 2001 to about 95 percent in 2011 (Table 2.2q and Figure 2.2m).

In 2011, burning as a form of refuse disposal amongst the main administrative districts was highest in Kgatleng district followed by Central district with 32 percent and 26 percent respectively. However among the sub-districts Okavango had the highest regular waste collection with about 47 percent followed by Central Boteti with about 38 percent. During the same year Central district had about 38 percent of the households disposing their refuse through rubbish pit followed by Southern district with about 35 percent. Of all the urban parts of the census districts, Chobe had the highest regular collection service with 86 percent followed by South East with 64 percent.

Regular collection of waste in rural areas increased from about 6 percent in 2001 to about 14 percent in 2011. Furthermore, rubbish pit method of waste disposal reduced from 57.86 percent in 2001 to 36.44 percent in 2011. This is a good sign because burning of waste, rubbish pit, roadside collection and illegal dumping as means of disposing off waste pose a health risk. Modukanele (2013: 6) adds that “an increased illegal dumping of waste in public areas and drainage systems, which can end up blocking the systems and contributing to flooding during rainy season and become a breeding ground for insects and rodent disease causing vector.”

It is evident from Table 2.2s and Figure 2.2n that the most dominant methods of waste disposal in rural areas during the 2001 census was rubbish pit followed by roadside collection and then burning with 57.86 percent, 15.33 percent and 9.87 percent respectively. During the 2011 census, rubbish pit method of disposing waste dominated in the rural areas constituting 36.44 percent of the entire households, followed by burning with 32.39 percent, then regular collection with 13.49 percent.

Table 2.2I: Distribution of Households by Mode of Waste Disposal and Urban District during 2011 Census

Urban District:	Refuse Disposal						Household No.
	Regularly Collected	Irregularly Collected	Burning	Roadside Collection	Rubbish Pit	Other (NEC)	
Cities/Towns	108,085	24,431	1,050	6,076	2,257	57	141,956
Gaborone	49,633	19,078	337	4,528	1,357	30	74,963
Francistown	25,729	3,774	498	676	588	28	31,297
Lobatse	8,034	817	17	283	63	0	9,214
Selibe Phikwe	15,221	324	32	405	74	3	16,059
Orapa	3,114	138	0	31	9	0	3,292
Jwaneng	5,463	58	151	106	161	1	5,940
Sowa Town	890	236	19	42	4	0	1,191
Southern:	3,166	2,370	3,024	6,715	8,160	189	23,626
Ngwaketsi South/Kanye/Moshupa	2,213	1,807	2,323	5,379	6,331	149	18,202
Barolong	385	212	289	709	1,008	39	2,642
Ngwaketsi West	566	350	414	627	823	2	2,782
South East	12,750	3,978	844	1,674	580	34	19,860
Kweneng:	15,351	7,695	10,159	8,896	13,699	575	56,376
Kweneng East	14,857	7,576	10,065	8,605	13,025	574	54,702
Kweneng West	493	118	93	291	675	4	1,674
Kgatleng	3,366	1,258	4,315	1,603	2,694	188	13,425
Central:	11,762	4,220	17,477	7,595	25,539	1,035	67,634
Serowe-Palapye	5,575	1,771	4,751	4,083	7,804	405	24,389
Mahalapye	2,059	749	3,429	635	5,712	183	12,768
Central Bobonong	1,115	567	2,258	1,114	3,286	290	8,630
Central Boteti	1,494	446	2,677	467	1,919	54	7,057
Central Tutume	1,519	691	4,362	1,299	6,815	105	14,790
North East	2,004	514	432	367	496	10	3,823
North West:	6,006	954	4,370	2,648	6,639	70	20,690
Ngamiland East	3,068	529	3,085	2,329	5,047	49	14,107
Ngamiland West	363	152	1,186	225	1,496	12	3,434
Chobe	2,572	265	23	72	46	10	2,988
Okavango Delta	3	8	76	23	51	0	161
Ghanzi:	1,498	321	124	1,796	176	59	3,974
Kgalagadi:	986	564	498	2,079	1,990	79	6,196
Kgalagadi South	448	353	241	882	684	64	2,672
Kgalagadi North	538	211	257	1,197	1,306	15	3,524
Total- 2011 Census	164,978	46,304	42,299	39,439	62,251	2,288	357,560
Total- 2001 Census	107,894	24,086	12,888	14,508	68,385	6,996	234,757

Source: CSO (2003); 2011 Population & Housing Census Data

Table 2.2m: Proportion of Households by Mode of Waste Disposal and Urban District during 2011 Census

Urban District:	Refuse Disposal						Total	Household No.
	Regularly Collected	Irregularly Collected	Burning	Roadside Collection	Rubbish Pit	Other (NEC)		
Cities/Towns	76.14	17.21	0.74	4.28	1.59	0.04	100.00	141956
Gaborone	66.21	25.45	0.45	6.04	1.81	0.04	100.00	74963
Francistown	82.21	12.06	1.59	2.16	1.88	0.09	100.00	31297
Lobatse	87.19	8.87	0.18	3.07	0.68	0.00	100.00	9214
Selibe Phikwe	94.78	2.02	0.2	2.52	0.46	0.02	100.00	16059
Orapa	94.59	4.19	0	0.94	0.27	0.00	100.00	3292
Jwaneng	91.97	0.98	2.54	1.78	2.71	0.02	100.00	5940
Sowa Town	74.73	19.82	1.6	3.53	0.34	0.00	100.00	1191
Southern:	13.4	10.03	12.8	28.42	34.54	0.80	100.00	23626
Ngwaketsi South/Kanye/Moshupa	12.16	9.93	12.76	29.55	34.78	0.82	100.00	18202
Barolong	14.57	8.02	10.94	26.84	38.15	1.48	100.00	2642
Ngwaketsi West	20.35	12.58	14.88	22.54	29.58	0.07	100.00	2782
South East	64.2	20.03	4.25	8.43	2.92	0.17	100.00	19860
Kweneng:	27.23	13.65	18.02	15.78	24.30	1.02	100.00	56376
Kweneng East	27.16	13.85	18.40	15.73	23.81	1.05	100.00	54702
Kweneng West	29.45	7.05	5.56	17.38	40.32	0.24	100.00	1674
Kgatleng	25.07	9.37	32.14	11.94	20.07	1.40	100.00	13425
Central:	17.39	6.24	25.84	11.23	37.76	1.53	100.00	67634
Serowe-Palapye	22.86	7.26	19.48	16.74	32.00	1.66	100.00	24389
Mahalapye	16.13	5.87	26.86	4.97	44.74	1.43	100.00	12768
Central Bobonong	12.92	6.57	26.16	12.91	38.08	3.36	100.00	8630
Central Boteti	21.17	6.32	37.93	6.62	27.19	0.77	100.00	7057
Central Tutume	10.27	4.67	29.49	8.78	46.08	0.71	100.00	14790
North East	52.42	13.44	11.3	9.6	12.97	0.26	100.00	3823
North West:	29.03	4.61	21.12	12.8	32.09	0.34	100.00	20690
Ngamiland East	21.75	3.75	21.87	16.51	35.78	0.35	100.00	14107
Ngamiland West	10.57	4.43	34.54	6.55	43.56	0.35	100.00	3434
Chobe	86.08	8.87	0.77	2.41	1.54	0.33	100.00	2988
Okavango Delta	1.86	4.97	47.2	14.29	31.68	0.00	100.00	161
Ghanzi:	37.7	8.08	3.12	45.19	4.43	1.48	100.00	3974
Kgalagadi:	15.91	9.1	8.04	33.55	32.12	1.28	100.00	6196
Kgalagadi South	16.77	13.21	9.02	33.01	25.6	2.40	100.00	2672
Kgalagadi North	15.27	5.99	7.29	33.97	37.06	0.43	100.00	3524
Total- 2011 Census	46.14	12.95	11.83	11.03	17.41	0.64	100.00	357560
Total- 2001 Census	45.96	10.26	5.49	6.18	29.13	2.98	100.00	234757

Figure 2.2i: Proportion of Households by Mode of Waste Disposal and Urban District during 2001 & 2011 Censuses

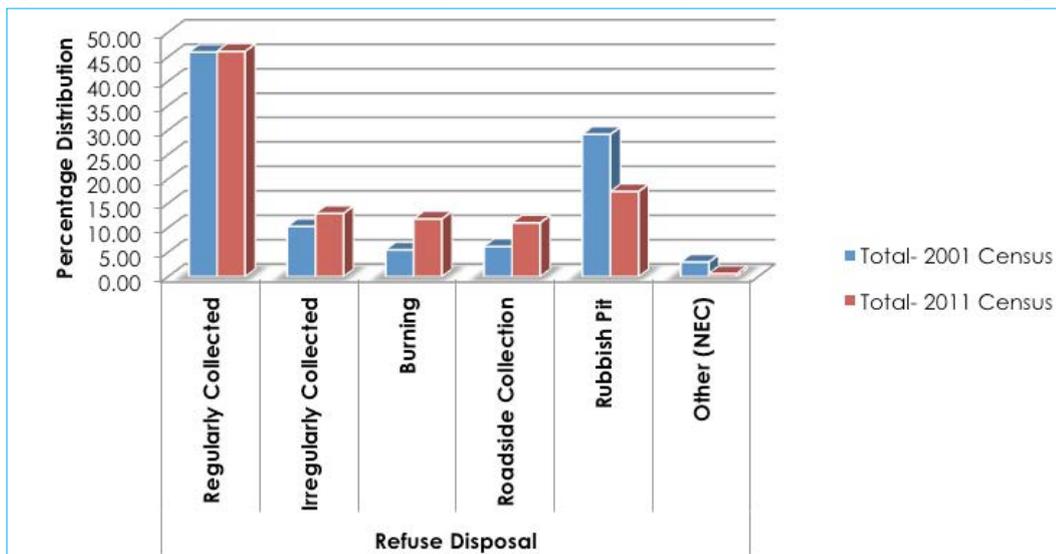


Figure 2.2j: Proportion of Households by Mode of Waste Disposal in Cities & Towns during 2011 Census



Table 2.2n: Distribution of Households by Mode of Waste Disposal and Rural District during 2011 Census

Rural District:	Refuse Disposal						Household No.
	Regularly Collected	Irregularly Collected	Burning	Roadside Collection	Rubbish Pit	Other (NEC)	
Southern:	2,018	1,002	6,105	5,169	10,617	254	25,165
Ngwaketse South/Kanye/Moshupa	818	514	3,777	1,706	6,232	230	13,277
Barolong	1,196	473	1,947	3,453	4,024	21	11,115
Ngwaketse West	3	14	382	11	361	2	773
South East	1,835	253	714	717	588	24	4,131
Kweneng:	4,145	1,407	8,776	1,586	8,106	160	24,183
Kweneng East	2,002	794	5,393	850	4,471	117	13,626
Kweneng West	2,144	614	3,384	736	3,636	43	10,557
Kgatleng	1,657	752	4,844	1,145	2,902	186	11,488
Central:	7,197	3,103	30,298	5,677	32,984	712	79,962
Serowe-Palapye	2,428	804	8,766	1,966	7,679	150	21,796
Mahalapye	1,045	827	5,634	819	8,600	100	17,026
Central Bobonong	1,495	334	3,519	484	4,609	84	10,525
Central Boteti	696	377	3,324	387	2,215	54	7,053
Central Tutume	1,529	761	9,053	2,019	9,877	323	23,562
North East	2,717	1,397	1,916	3,425	2,526	60	12,042
North West:	3,571	1,167	7,922	1,870	7,061	102	21,693
Ngamiland East	1,223	171	3,214	793	2,204	24	7,629
Ngamiland West	683	473	4,098	757	3,692	27	9,730
Chobe	1,308	462	542	321	1,157	50	3,840
Okavango Delta	356	60	69	0	9	0	494
Ghanzi:	1,768	354	902	1,545	2,787	44	7,400
Kgalagadi:	1,184	561	1,144	1,466	2,895	52	7,302
Kgalagadi South	938	492	686	833	2,296	39	5,284
Kgalagadi North	246	69	458	633	599	13	2,018
Total- 2011 Census	26,085	9,997	62,631	22,604	70,463	1,586	193,366
Total- 2001 Census	10,656	4,759	16,774	26,053	98,332	13,375	169,949

Source: CSO (2003); 2011 Population & Housing Census Data

Table 2.2o: Proportion of Households by Mode of Waste Disposal and Rural District during 2011 Census

Rural District:	Refuse Disposal						Total	Household No.
	Regularly Collected	Irregularly Collected	Burning	Roadside Collection	Rubbish Pit	Other (NEC)		
Southern:	8.02	3.98	24.26	20.54	42.19	1.01	100.00	25165
Ngwaketse South/Kanye/Moshupa	6.16	3.87	28.45	12.85	46.94	1.73	100.00	13277
Barolong	10.76	4.26	17.52	31.07	36.2	0.19	100.00	11115
Ngwaketse West	0.39	1.81	49.42	1.42	46.7	0.26	100.00	773
South East	44.42	6.12	17.28	17.36	14.23	0.58	100.00	4131
Kweneng:	17.14	5.82	36.29	6.56	33.52	0.66	100.00	24183
Kweneng East	14.69	5.83	39.58	6.24	32.81	0.86	100.00	13626
Kweneng West	20.31	5.82	32.05	6.97	34.44	0.41	100.00	10557
Kgatleng	14.42	6.55	42.17	9.97	25.26	1.62	100.00	11488
Central:	9	3.88	37.89	7.1	41.25	0.89	100.00	79962
Serowe-Palapye	11.14	3.69	40.22	9.02	35.23	0.69	100.00	21796
Mahalapye	6.14	4.86	33.09	4.81	50.51	0.59	100.00	17026
Central Bobonong	14.20	3.17	33.43	4.60	43.79	0.80	100.00	10525
Central Boteti	9.87	5.35	47.13	5.49	31.41	0.77	100.00	7053
Central Tutume	6.49	3.23	38.42	8.57	41.92	1.37	100.00	23562
North East	22.56	11.60	15.91	28.44	20.98	0.50	100.00	12042
North West:	16.46	5.38	36.52	8.62	32.55	0.47	100.00	21693
Ngamiland East	16.03	2.24	42.13	10.39	28.89	0.31	100.00	7629
Ngamiland West	7.02	4.86	42.12	7.78	37.94	0.28	100.00	9730
Chobe	34.06	12.03	14.11	8.36	30.13	1.30	100.00	3840
Okavango Delta	72.06	12.15	13.97	0.00	1.82	0.00	100.00	494
Ghanzi:	23.89	4.78	12.19	20.88	37.66	0.59	100.00	7400
Kgalagadi:	16.21	7.68	15.67	20.08	39.65	0.71	100.00	7302
Kgalagadi South	17.75	9.31	12.98	15.76	43.45	0.74	100.00	5284
Kgalagadi North	12.19	3.42	22.7	31.37	29.68	0.64	100.00	2018
Total- 2011 Census	13.49	5.17	32.39	11.69	36.44	0.82	100.00	193366
Total- 2001 Census	6.27	2.8	9.87	15.33	57.86	7.87	100.00	169949

Figure 2.2k: Proportion of Households by Mode of Waste Disposal in Rural Administrative Districts during 2011 Census

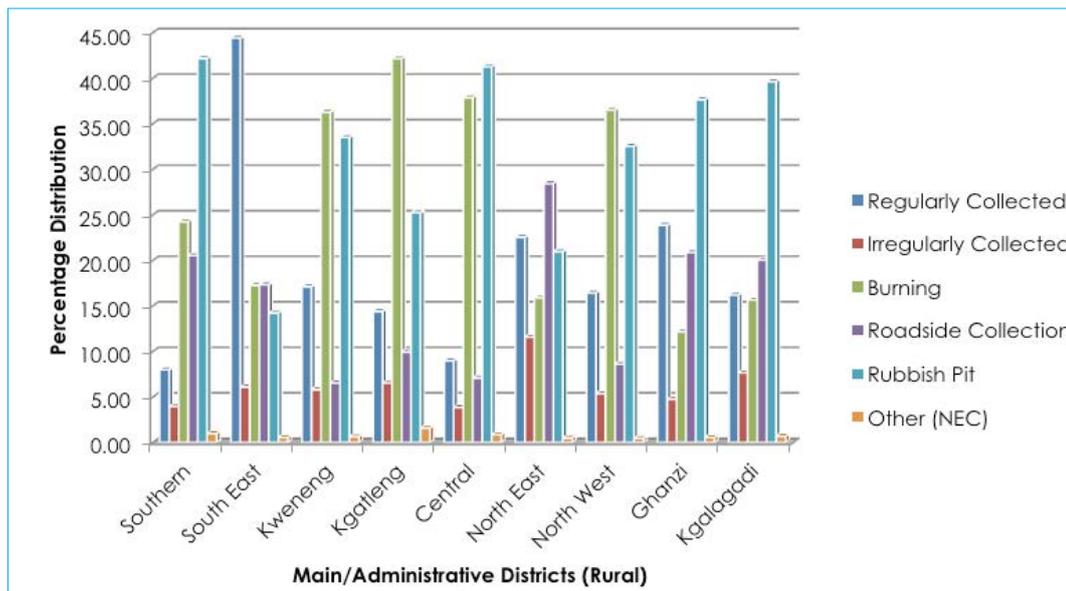


Table 2.2p: Distribution of Households by Mode of Waste Disposal and Urban District during 2001 Census

Urban District:	Refuse Disposal						Household No.
	Regularly Collected	Irregularly Collected	Burning	Roadside Collection	Rubbish Pit	Other (NEC)	
Cities/Towns							
Gaborone	44,524	9,725	363	766	1,053	2,041	58,476
Francistown	20,307	1,348	92	534	666	173	23,124
Lobatse	6,416	1,704	44	186	119	55	8,523
Selibe Phikwe	12,196	2,539	49	98	290	87	15,258
Orapa	2,567	1	1	6	0	3	2,578
Jwaneng	4,448	10	1	37	173	12	4,681
Sowa Town	969	3	0	0	2	5	979
Ngwaketsi South	1,523	1,008	1,044	1,543	6,634	520	12,272
South East	2,892	948	601	1,652	3,325	398	9,816
Kweneng:	2,478	1,477	3,361	3,004	18,379	1,013	29,715
Kweneng East	2,069	1,373	3,308	2,873	17,798	997	28,418
Kweneng West	407	105	54	130	582	19	1,297
Kgatleng	1,131	449	1,243	498	4,220	320	7,861
Central:	544	322	531	563	2,571	206	4,734
Serowe-Palapye	2,090	782	1,766	1,556	9,705	701	16,601
Mahalapye	795	684	1,354	664	6,364	288	10,149
Central Bobonong	576	658	709	1,278	2,278	321	5,820
Central Boteti	851	414	428	429	1,362	121	3,605
Central Tutume	712	438	608	1,279	4,044	478	7,559
North West:	2,413	1,175	820	663	8,061	272	13,403
Ngamiland East	1,021	665	768	381	6,823	196	9,854
Ngamiland West	57	21	45	139	1,104	12	1,378
Chobe	1,335	489	7	143	133	64	2,171
Ghanzi:	823	503	266	278	619	175	2,664
Kgalagadi South	171	209	130	43	1,100	20	1,673
Total- 2001 Census	107,894	24,086	12,888	14,508	68,385	6,996	234,757
Total- 2011 Census	164,978	46,304	42,299	39,439	62,251	2,288	357,560

Source: CSO (2003); 2011 Population & Housing Census Data

Table 2.2q: Proportion of Households by Mode of Waste Disposal and Urban District during 2001 Census

Urban District:	Refuse Disposal						Total	Household No.
	Regularly Collected	Irregularly Collected	Burning	Roadside Collection	Rubbish Pit	Other (NEC)		
Cities/Towns								
Gaborone	76.14	16.63	0.62	1.31	1.8	3.49	100.00	58,476
Francistown	87.82	5.83	0.4	2.31	2.88	0.75	100.00	23,124
Lobatse	75.28	19.99	0.52	2.18	1.40	0.64	100.00	8,523
Selibe Phikwe	79.93	16.64	0.32	0.64	1.90	0.57	100.00	15,258
Orapa	99.57	0.04	0.04	0.23		0.12	100.00	2,578
Jwaneng	95.02	0.21	0.02	0.79	3.70	0.26	100.00	4,681
Sowa Town	98.98	0.31			0.20	0.51	100.00	979
Ngwaketse South	12.41	8.21	8.51	12.57	54.06	4.24	100.00	12,272
South East	29.46	9.66	6.12	16.83	33.87	4.05	100.00	9,816
Kweneng:	8.34	4.97	11.31	10.11	61.85	3.41	100.00	29,715
Kweneng East	7.28	4.83	11.64	10.11	62.63	3.51	100.00	28,418
Kweneng West	31.38	8.1	4.16	10.02	44.87	1.47	100.00	1,297
Kgatleng	14.39	5.71	15.81	6.34	53.68	4.07	100.00	7,861
Central:	11.49	6.80	11.22	11.90	54.31	4.36	100.00	4,734
Serowe-Palapye	12.59	4.71	10.64	9.37	58.46	4.22	100.00	16,601
Mahalapye	7.83	6.74	13.34	6.54	62.71	2.84	100.00	10,149
Central Bobonong	9.90	11.31	12.18	21.96	39.14	5.51	100.00	5,820
Central Boteti	23.61	11.48	11.87	11.90	37.78	3.35	100.00	3,605
Central Tutume	9.42	5.79	8.04	16.92	53.5	6.32	100.00	7,559
North West:	18.00	8.77	6.12	4.95	60.14	2.03	100.00	13,403
Ngamiland East	10.36	6.75	7.79	3.87	69.24	1.99	100.00	9,854
Ngamiland West	4.14	1.52	3.27	10.09	80.12	0.87	100.00	1,378
Chobe	61.49	22.52	0.32	6.59	6.13	2.95	100.00	2,171
Ghanzi:	30.89	18.88	9.98	10.44	23.24	6.57	100.00	2,664
Kgalagadi South	10.22	12.49	7.77	2.57	65.75	1.20	100.00	1,673
Total- 2001 Census	45.96	10.26	5.49	6.18	29.13	2.98	100.00	234,757
Total- 2011 Census	46.14	12.95	11.83	11.03	17.41	0.64	100.00	357,560

Figure 2.2i: Proportion of Households by Mode of Waste Disposal in All Urban Districts during 2001 & 2011 Censuses

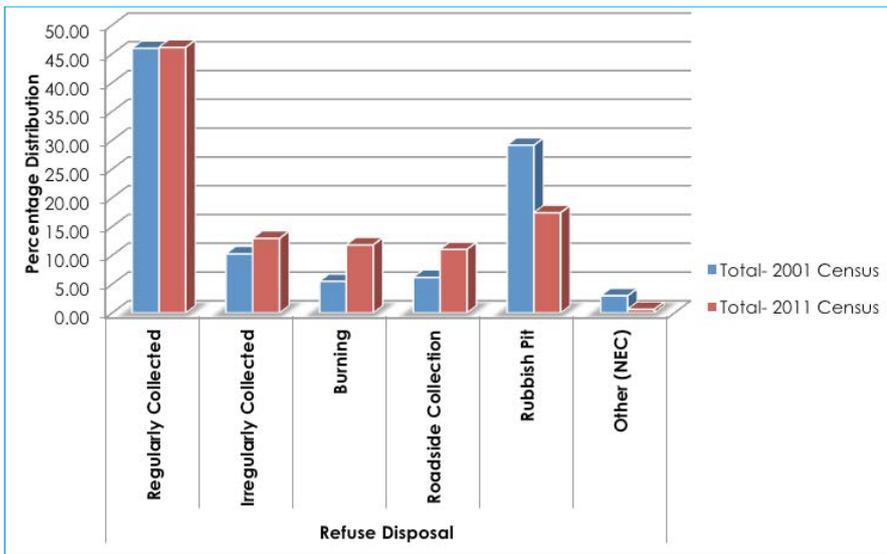


Figure 2.2m: Proportion of Households by Mode of Waste Disposal in Cities & Towns during 2001 Census

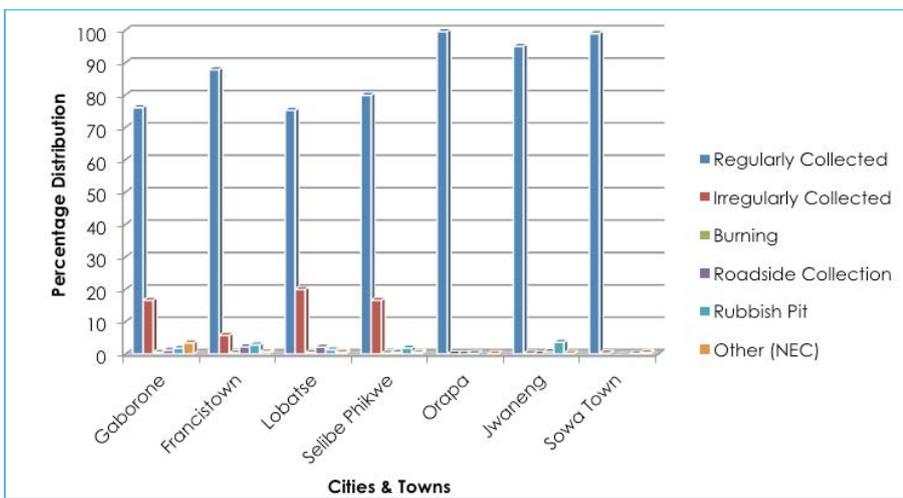


Table 2.2r: Distribution of Households by Mode of Waste Disposal and Rural District during 2011 Census

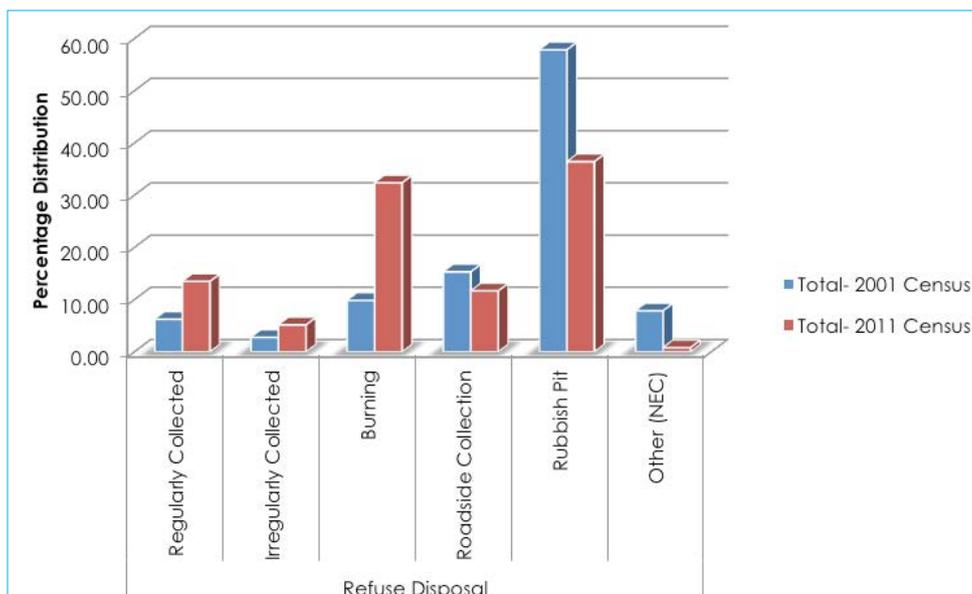
Rural District:	Refuse Disposal						Household No.
	Regularly Collected	Irregularly Collected	Burning	Roadside Collection	Rubbish Pit	Other (NEC)	
Southern:	636	481	1,768	2,914	17,289	1,842	24,930
Ngwaketsi South/Kanye/Moshupa	152	160	1,172	1,546	7,750	1,412	12,191
Barolong	341	191	460	1,100	7,878	378	10,348
Ngwaketsi West	142	131	135	268	1,661	54	2,391
South East	1,400	73	362	999	1,769	361	4,964
Kweneng:	1,836	503	1,957	4,310	12,239	2,021	22,863
Kweneng East	911	333	1,598	2,877	8,553	1,122	15,394
Kweneng West	925	170	358	1,432	3,686	899	7,469
Kgatleng	813	327	2,034	1,351	4,232	436	9,193
Central:	2,569	1,883	7,873	12,791	35,373	6,070	66,553
Serowe-Palapye	545	250	2,341	3,467	9,658	1,106	17,368
Mahalapye	346	171	1,446	1,901	8,800	915	13,581
Central Bobonong	394	182	1,433	1,939	4,276	1,013	9,237
Central Boteti	319	625	1,258	1,016	2,872	668	6,758
Central Tutume	965	657	1,390	4,469	9,761	2,367	19,609
North East	1,609	626	683	888	6,551	477	10,834
North West:	972	343	1,310	1,849	11,401	1,635	17,510
Ngamiland East	346	70	533	883	3,318	611	5,761
Ngamiland West	98	87	683	491	6,482	965	8,806
Chobe	382	180	71	468	1,312	16	2,429
Okavango Delta	145	7	23	7	289	43	514
Ghanzi:	2,198	1,232	2,510	4,790	36,702	3,691	51,124
Ghanzi	220	123	197	479	3,655	328	5,002
CKGR	0	0	54	0	15	41	110
Kgalagadi:	602	390	546	464	5,804	184	7,990
Kgalagadi South	148	186	159	224	3,167	122	4,006
Kgalagadi North	454	204	387	240	2,637	62	3,984
Total- 2001 Census	10,656	4,759	16,774	26,053	98,332	13,392	169,949
Total- 2011 Census	26,085	9,997	62,631	22,604	70,463	1,586	193,366

Source: CSO (2003); 2011 Population & Housing Census Data

Table 2.2s: Proportion of Households by Mode of Waste Disposal and Rural District during 2011 Census

Rural District:	Refuse Disposal						Total	Household No.
	Regularly Collected	Irregularly Collected	Burning	Roadside Collection	Rubbish Pit	Other (NEC)		
Southern:	2.55	1.93	7.09	11.69	69.35	7.39	100.00	24,930
Ngwaketsi South/Kanye/Moshupa	1.25	1.31	9.61	12.68	63.57	11.58	100.00	12,191
Barolong	3.3	1.85	4.45	10.63	76.13	3.65	100.00	10,348
Ngwaketsi West	5.94	5.48	5.65	11.21	69.47	2.26	100.00	2,391
South East	28.2	1.47	7.29	20.12	35.64	7.27	100.00	4,964
Kweneng:	8.03	2.2	8.56	18.85	53.53	8.84	100.00	22,863
Kweneng East	5.92	2.16	10.38	18.69	55.56	7.29	100.00	15,394
Kweneng West	12.38	2.28	4.79	19.17	49.35	12.04	100.00	7,469
Kgatleng	8.84	3.56	22.13	14.7	46.04	4.74	100.00	9,193
Central:	3.86	2.83	11.83	19.22	53.15	9.12	100.00	66,553
Serowe-Palapye	3.14	1.44	13.48	19.96	55.61	6.37	100.00	17,368
Mahalapye	2.55	1.26	10.65	14	64.8	6.74	100.00	13,581
Central Bobonong	4.27	1.97	15.51	20.99	46.29	10.97	100.00	9,237
Central Botefi	4.72	9.25	18.61	15.03	42.5	9.88	100.00	6,758
Central Tutume	4.92	3.35	7.09	22.79	49.78	12.07	100.00	19,609
North East	14.85	5.78	6.3	8.2	60.47	4.4	100.00	10,834
North West:	5.55	1.96	7.48	10.56	65.11	9.34	100.00	17,510
Ngamiland East	6.01	1.22	9.25	15.33	57.59	10.61	100.00	5,761
Ngamiland West	1.11	0.99	7.76	5.58	73.61	10.96	100.00	8,806
Chobe	15.73	7.41	2.92	19.27	54.01	0.66	100.00	2,429
Okavango Delta	28.21	1.36	4.47	1.36	56.23	8.37	100.00	514
Ghanzi:	4.3	2.41	4.91	9.37	71.79	7.22	100.00	51,124
Ghanzi	4.4	2.46	3.94	9.58	73.07	6.56	100.00	5,002
CKGR	0	0	49.09	0	13.64	37.27	100.00	110
Kgalagadi:	7.53	4.88	6.83	5.81	72.64	2.3	100.00	7,990
Kgalagadi South	3.69	4.64	3.97	5.59	79.06	3.05	100.00	4,006
Kgalagadi North	11.4	5.12	9.71	6.02	66.19	1.56	100.00	3,984
Total- 2001 Census	6.27	2.8	9.87	15.33	57.86	7.88	100.00	169,949
Total- 2011 Census	13.49	5.17	32.39	11.69	36.44	0.82	100.00	193,366

Figure 2.2n: Proportion of Households by Mode of Waste Disposal and Rural District during 2001 & 2011 Censuses



2.2 Housing Conditions

This sub-component of the human settlements report captures data on the sufficiency of housing with regards to the following features: access to adequate housing, which encompass the characteristics of houses in both rural and urban settings, including the quality of the houses (e.g., modern and traditional housing) and their location in zones vulnerable to natural extreme events (floods in particular). Housing sufficiency statistics can include, but are not restricted to, the number and proportion of individuals or families that do not have access to an adequate dwelling or live in a precarious dwelling (UNSD, 2013: 121). In the case of Botswana, this includes population or households living in shacks.

Housing access and conditions are important for the well-being and health of a population. For example, overcrowding increases the risk of being infected with air-borne diseases like tuberculosis, influenza and meningitis, just to mention a few. The poorest in the population because of their low economic status often reside in unsafe and poorly built housing units and as a result lack access to improved sanitation facilities and are more vulnerable to natural extreme events/disasters.

'The Government of Botswana commits itself to addressing housing needs of the population at large through the National Housing Policy 2000. The policy is established to provide decent and affordable housing for all with a safe and sanitary environment' (Singh & Dwivedi, 2013).

2.3.1 Housing Units by Type

Table 2.3a and Figure 2.3a present proportions of housing units in Botswana during the 1991, 2001 and 2011 population censuses according to the following classes; traditional, detached, semi-detached, town house, mixed house, flat, commercial building, shack, moveable and room. As mentioned in the introduction, the focus here is on households living in shacks because it shows some level of deprivation.

The proportion of households living in shacks increased steadily from 1.12 percent in 1991 to 1.70 percent in 2001. During the 2011 census the proportion of households living in shacks stood at 1.7 percent, showing a zero increase from the 2001 figure. Households occupying traditional housing units were on the decrease during the 1991, 2001 and 2011 censuses. The proportion dropped from 64.04 percent in 1991 to 22.17 percent in 2001, then to 13.2 percent in 2011. During the same period the proportion of households occupying detached and semi-detached, flats, and rooms were on the increase. This shows a transformation from the traditional to the modern way of living. In spite of the transformation, rural areas experienced an increase in the proportion of households living in shacks while a slight decrease was experienced in urban areas. Households occupying shacks in rural areas increased from 1.0 percent in 1991 to 2.3 percent in 2001, then 3.1 percent in 2011. In urban areas households living in shacks decreased from 1.4 percent in 1991 to 1.3 percent in 2001, then it further dropped to 0.7 percent in 2011 (Tables 2.3c & 2.3d).

**Table 2.3a: Distribution of Housing Units by Housing Type
1991, 2001 & 2011 Censuses**

Type of Housing	1991	2001	2011
Traditional	176,881	89,713	72,725
Mixed	-	75,462	55,095
Detached	55,409	137,924	239,111
Semi-detached	7,464	16,312	25,344
Town House	2,805	11,475	10,468
Flats	1,288	3,449	8,264
Part of Commercial building	203	811	551
Moveable	4,222	5,019	3,857
Shack	3,348	6,884	9,366
Rooms	20,825	55,895	126,167
Shared	-	806	-
other	3,764	21	-
Not stated	-	935	-
Total	276,209	404,706	550,946
Number of housing units	276,209	404,706	550,946

Source: CSO (2003); 2011 Population & Housing Census Data
Note: (-) Data Unavailable

**Table 2.3b: Percent distribution of housing units by
housing type 1991, 2001 & 2011 Censuses**

Type of Housing	1991	2001	2011
Traditional	64.04	22.17	13.2
Mixed	-	18.65	10
Detached	20.06	34.08	43.4
Semi-detached	2.7	4.43	4.6
Town House	1.02	2.84	1.9
Flats	0.47	0.85	1.5
Part of Commercial building	0.07	0.2	0.1
Moveable	1.53	1.24	0.7
Shack	1.12	1.7	1.7
Rooms	7.54	13.81	22.9
Shared	-	0.2	-
other	0.93	0.01	-
Not stated	-	0.23	-
Total	100	100	100
Number of housing units	276,209	404,706	550,946

Source: Singh & Dwivedi (2013: 6)
Note: (-) Data Unavailable

Figure 2.3a: Distribution of housing units by housing type 1991, 2001 and 2011 Censuses

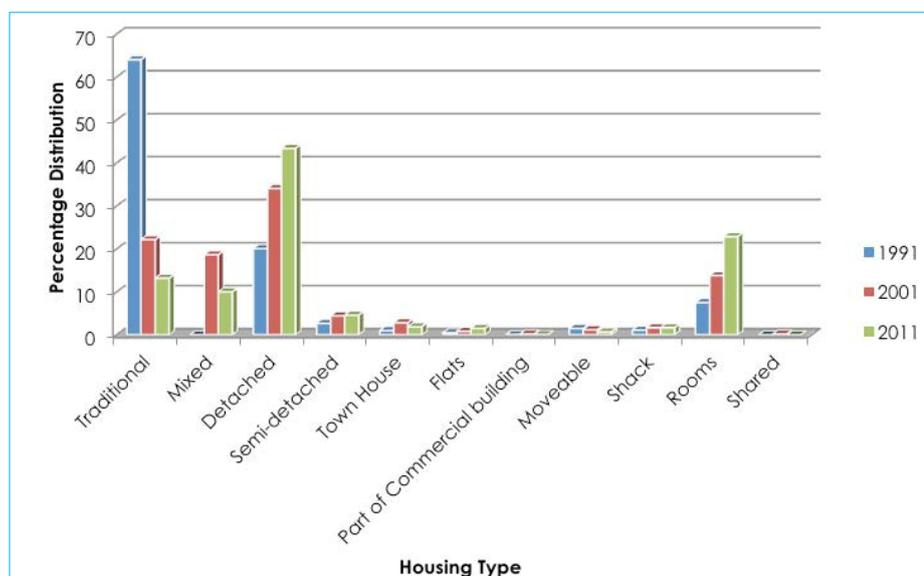


Table 2.3c: Distribution of housing in rural and urban areas by housing type, 1991, 2001 and 2011 Censuses

Type of Housing	Rural			Urban		
	1991	2001	2011	1991	2001	2011
Traditional	118,073	84,084	35,544	58,808	28,124	37,111
Mixed	0	43,453	10,341	0	73,076	44,784
Detached	9,870	45,736	22,733	45,539	210,236	216,353
Semi-detached	1,275	6,219	2,168	6,189	25,344	23,026
Town House	249	3,485	439	2,556	18,122	10,188
Flats	78	259	275	1,210	6,632	8,170
Part of Commercial building	97	497	319	106	1,046	473
Moveable	2,535	7,213	2,479	1,687	2,406	1,390
Shack	1,361	5,113	6,063	1,987	6,032	3,140
Rooms	863	12,304	12,406	19,962	96,338	113,541
Shared	0	515	0	0	1,024	0
other	925	23	0	2,839	8	0
Not stated	0	573	0	0	1,260	0
Total	135,326	209,474	92,767	140,883	469,648	458,176
Number of housing units	135,326	209,474	92,767	140,883	469,648	458,176

Source: CSO (2003); 2011 Population & Housing Census Data

Table 2.3d: Percent Distribution of housing in rural and urban areas by housing type, 1991, 2001 and 2011 Censuses

Type of Housing	Rural			Urban		
	1991	2001	2011	1991	2001	2011
Traditional	87	44.5	18.4	41.7	6.0	8.1
Mixed	0.0	22.9	5.3	0.0	15.6	9.8
Detached	7.3	19.3	11.8	32.3	44.8	47.2
Semi-detached	0.9	2.1	1.1	4.4	5.4	5.0
Town House	0.2	1.4	0.2	1.8	3.9	2.2
Flats	0.1	0.1	0.1	0.9	1.4	1.8
Part of Commercial building	0.1	0.2	0.2	0.1	0.2	0.1
Moveable	0.0	2.3	1.3	1.2	0.5	0.3
Shack	1.0	2.3	3.1	1.4	1.3	0.7
Rooms	0.6	4.6	6.4	14.2	20.5	24.8
Shared	0.0	0.2	0.0	0.0	0.2	0.0
other	0.0	0.0	0.0	2.0	0.0	0.0
Not stated	0.0	0.3	0.0	0.0	0.2	0.0
Total	100.0	100.0	100.0	100.0	100.0	100.0
Number of housing units	135,326	209,474	193,379	140,883	195,232	357,567

2.3.1 Household Size

This section provides information on the number of households by type and size of housing, as well as the number of rooms during the 2011 census. It is evident from Table 4e that households occupying one room were the highest followed by those residing in two rooms, numbering 167,126 and 118,979 respectively. Of all the households occupying one room, 85,366 of 167,126 (51.08 percent) lived in shacks. Households occupying mixed and traditional housing units followed with 50,629 (30.29 percent) and 11,119 (6.65 percent) respectively. Nationally, these findings show that there is some degree of congestion in households and this situation as mentioned before, puts people at the risk of contracting airborne diseases, among others. Marshy (1999) adds that congestion presents direct and indirect risks to the entire population, more especially the median aged and people living with disabilities. Marshy cited the following examples, that overcrowding results in poor ventilation, worsening of respiratory-related illness, increased vulnerability to diseases, physically and emotionally overstrained caregivers and worsens health risks related to poor water supply and sanitation.

Distribution of the number of households by size and number of rooms were further looked into, from the urban and rural perspective. Households with five or more persons occupying one room were the main focus here because this would show some high level of overcrowding. In both urban and rural areas, households occupying one room decreased with the enlargement of household size. Out of a total of 162,791 households occupying one room in urban areas, 17,428 households (27.76 percent) had five or more persons occupying one room. About 10.31 percent (4,266) of households in rural areas had five or more persons occupying one room. (Table 2.3f and Figures 2.3b - c).

Table 2.3e: Distribution of Number of Households by Type of Housing Unit and Number of Rooms, 2011

Type of Housing Unit	Number of rooms										Total
	0	1	2	3	4	5	6	7+	Unknown	NA	
Traditional	9	11,119	15,166	12,692	7,799	4,109	2,081	2,121	5	24	55,125
Mixed	61	50,629	64,092	64,835	36,094	12,932	5,656	4,712	18	57	239,086
Detached	4	6,231	8,739	6,233	2,657	673	331	316	3	7	25,194
Semi-detached	7	1,844	2,182	3,441	1,780	735	287	349	0	3	10,628
Town House/Terraced	1	1,100	2,722	3,320	917	206	100	78	0	1	8,445
Flats, Apartment	0	424	138	107	46	27	14	36	0	0	792
Part of Commercial building	1	2,987	478	241	76	37	10	31	0	8	3,869
Movable	3	7,424	1,308	298	75	34	12	43	1	5	9,203
Shack	16	85,366	24,154	8,985	4,039	1,726	793	844	7	17	125,947
Rooms	0	1	0	0	0	0	0	0	0	0	1
Unknown	0	1	0	0	1	0	0	1	5	0	8
NA	0	0	0	0	0	0	0	0	0	0	0
Total	102	167,126	118,979	100,152	53,484	20,479	9,284	8,531	39	122	478,298

Source: 2011 Population & Housing Census Data

Table 2.3f: Distribution of Number of Households by Size of Household and Number of Rooms: Urban and Rural Areas, 2011

No. of People & Residence	Number of rooms										Total Households	Number of rooms	Average Number of Rooms
	0	1	2	3	4	5	6	7+	Unknown	NA			
Urban													
1	29	71,555	22,018	14,386	5,934	1,722	756	816	10	29	117,255	202,766	1.7
2	14	38,801	20,126	13,397	6,271	1,984	823	800	7	8	82,231	166,051	2
3	12	21,987	18,706	14,339	6,884	2,231	953	880	4	10	66,006	154,267	2.3
4	13	13,020	17,149	14,513	7,405	2,352	980	951	4	7	56,394	145,874	2.6
5	11	7,272	13,154	12,116	6,546	2,282	1,025	894	6	7	43,313	120,987	2.8
6	6	4,157	8,932	8,861	5,017	1,978	862	718	0	3	30,534	89,541	2.9
7	5	2,314	5,576	5,963	3,675	1,596	690	617	0	3	20,439	63,111	3.1
8	1	1,338	3,415	3,865	2,658	1,229	630	460	1	2	13,599	44,000	3.2
9	1	806	2,117	2,709	1,937	1,012	465	397	0	1	9,445	31,895	3.4
10+	6	1,541	3,446	4,567	4,135	2,449	1,377	1,376	4	58	18,959	70,230	3.7
Total	98	162,791	94,716	18,835	8,561	7,909	36	128	458,175	1,088,722	2.4		
Rural													
1	8	22,062	8,331	3,562	1,050	346	126	184	2	14	35,685	57,819	1.6
2	2	8,098	5,232	2,428	889	298	134	117	9	6	17,213	32,738	1.9
3	2	4,220	3,448	2,059	820	323	138	132	1	4	11,147	24,192	2.2
4	2	2,725	2,735	1,835	768	350	118	118	0	4	8,655	20,226	2.3
5	3	1,728	2,007	1,464	713	282	95	112	0	1	6,405	15,927	2.5
6	1	1,043	1,396	1,125	528	275	105	89	0	0	4,562	12,044	2.6
7	1	568	829	723	422	227	96	75	0	1	2,942	8,409	2.9
8	0	331	542	506	313	166	82	65	0	0	2,005	6,034	3
9	0	223	336	347	225	132	74	59	0	1	1,397	4,431	3.2
10+	1	373	540	606	526	340	173	195	0	3	2,757	9,646	3.5
Total	20	41,371	25,396	14,655	6,254	2,739	1,141	1,146	12	34	92,768	191,466	2.1

Source: 2011 Population & Housing Census Data

Figure 2.3b: Number of Households by Size of Household and Number of Rooms: Urban Areas, 2011

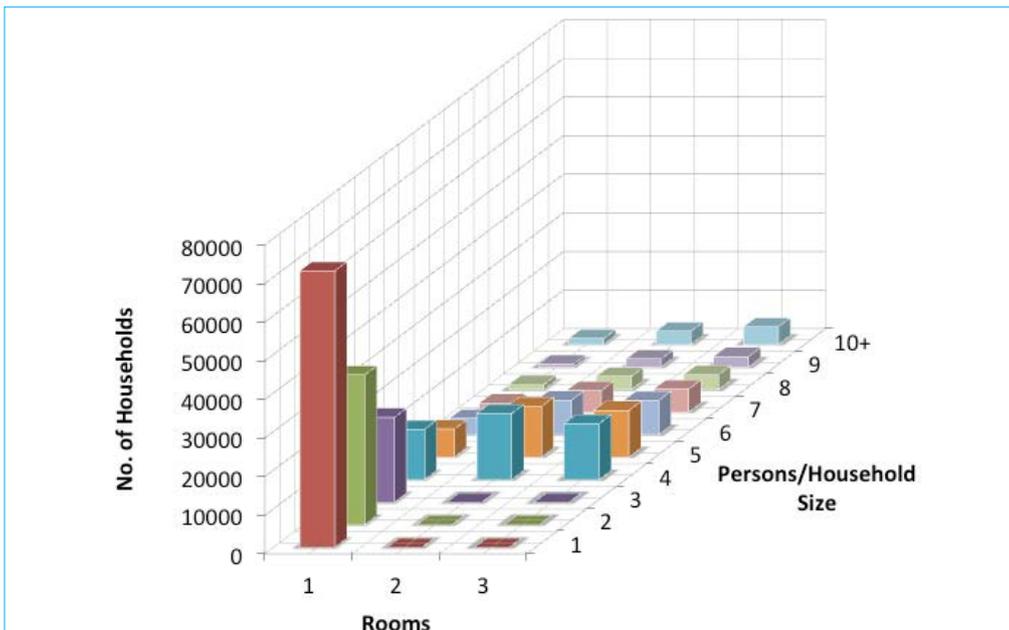
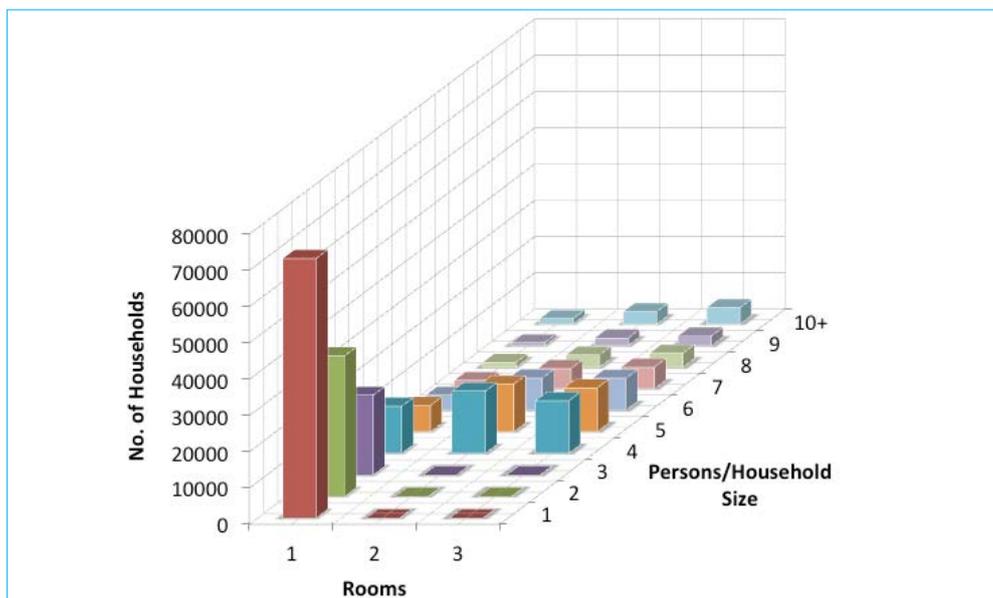


Figure 2.3c: Number of Households by Size of Household and Number of Rooms: Rural Areas, 2011



2.3.1 Population in zones vulnerable to natural extreme events

The purpose of this section is to provide information on population in zones vulnerable to natural extreme events between the 1991, 2001 and 2011 censuses by district. Botswana is prone to a number of disasters, including floods, drought, veldt fires, pests, animal diseases, environmental degradation and hydro-meteorological hazards. The principal ones include floods, drought and veldt fires. An increase in the number and intensity of natural disaster incidents result in loss of life, property and ecological damage.

"A detailed study conducted by the National Disaster Management Office in 2008 identified a number of disasters and risks prevalent in Botswana. These risks include flooding, drought, animal epidemics and wild land fires, motor vehicle accidents, and human epidemics such as HIV/AIDS, Cholera, Diarrhoea, and Malaria" (National Disaster Management Office, 2009; Cited in Environment Statistics Report, 2012: 119). In response to the impacts of natural disasters, the Government of Botswana has developed integrated series of activities including National Policy on Disaster Management, among others.

Table 2.3g depicts population in zones vulnerable to floods, drought, fires, environmental degradation, animal or insect infestation, insect over-population and hydro-meteorological hazards by district in Botswana. This is a crude indicator because it assumes that all persons in a particular district are prone to a hazard which has been identified to be frequently occurring in that area. According to Table 4g there was a 25.49 percent intercensal increase of population living in disaster prone areas from a total of 1,040,017 in 1991 to 1,305,086 in 2001. This gives an annual average growth rate of about 2.27 percent. However, Botswana's annual average growth rate of population living in disaster prone areas increased by 1.94 percent from 1,305,086 in 2001 to 1,584,794 in 2011, which is slightly lower than that the 1991 – 2001 increase.

South East district experienced the highest intercensal increase of population living in disaster prone area with about 39 percent between 1991 to 2001 censuses. Just like during the 1991 and 2001 censuses, South East district experienced the highest intercensal increase of about 40 percent between the 2001 and 2011 censuses. The most common disasters in the South East district were drought and floods-related. Generally the two most common hazards in almost all the districts under review include drought and floods. Lastly, a combination of extreme temperatures and severe storms is common in the North West and Central (Boteti and Tutume) districts. For example, according to Statistics Botswana (2013), a total of 300 households were affected by floods and storm rain on the 10th of April 2010 in the North West district. This shows the extent of vulnerability to natural hazards the population of North West district are faced with.

Table 2.3g: Proportion of population in zones vulnerable to particular health issues, natural extreme events, 1991 & 2001 Censuses

District Area	Highest Disaster Hazards in Area	Hazard Sub Category	Actual / Potential	1991 Census			2001 Census			Intercensal Increase	
				(Both Sexes)	Male	Female	(Both Sexes)	Male	Female	Number	Percent
CENTRAL - Serowe	Floods Hazard, Drought, Fire Hazards & Environmental Degradation	Floods, Drought, Veld Fires & Deforestation, Erosion & Loss of Biodiversity	A	128,471	59,988	68,483	153,035	73,294	79,741	24,564	19.12
CENTRAL - Tutume	Fire Hazard, Drought, Floods, animal & insects infestation & hydro meteorological Hazards	Veld Fires, Drought, Floods, Animal or Insect Overpopulation, Severe Storms & Extreme Temperatures	A	100,049	45,978	54,071	123,514	57,835	65,679	23,465	23.45
CENTRAL - Bobonong	Fire Hazard, Drought, Floods & Environmental Degradation	Urban and Veld Fires, Drought, Floods & Deforestation, Erosion & Loss of Biodiversity	A&P	53,558	25,303	28,255	66,964	32,067	34,897	13,406	25.03
CENTRAL - Boteti	Fire Hazard, Drought, Floods & hydro meteorological Hazards	Urban and Veld Fires, Drought, Floods, Severe Storms & Extreme Temperatures	A&P	35,459	16,834	18,625	48,057	23,482	24,575	12,598	35.53
CENTRAL - Mahalapye	Drought, Fire, Environmental Degradation & animal or insects infestation	Drought, Deforestation, Erosion & Loss of Biodiversity & Animal or Insect Overpopulation	A	95,433	45,442	49,991	109,811	53,322	56,489	14,378	15.07
CHOBÉ	Fire Hazards & animal or insects infestation	Veld Fires & Animal or Insect Overpopulation	A	14,126	7,649	6,477	18,258	9,395	8,863	4,132	29.25
GHANZI	Drought, Fire Hazards	Drought & Urban/Veldt Fires	A	24,719	12,401	12,318	33,170	16,916	16,254	8,451	34.19
KGALAGADI	Drought, Fire Hazards & Environmental Degradation	Drought, Veld Fires & Erosion & Loss of Biodiversity	A	31,134	15,064	16,070	42,049	21,148	20,901	10,915	35.06
KWENENG	Drought, Floods & Fire Hazards	Drought, Floods, Urban & Veldt Fires	A	170,437	80,328	90,109	230,335	111,547	118,788	59,898	35.14
KGATLENG	Fire & Environmental Degradation	Veld Fires & Deforestation, Erosion & Loss of Biodiversity	A	57,770	27,348	30,422	73,507	35,734	37,773	15,737	27.24
NORTH-EAST	Animal & insects infestation & Environmental Degradation	Animal or Insect Overpopulation & Deforestation, Erosion & Loss of Biodiversity	A	43,354	19,920	23,434	49,399	23,164	26,235	6,045	13.94
NORTH-WEST	Drought, Fire Hazards & hydro meteorological Hazards	Drought, Veld Fires & Severe Storms & Extreme Temperatures	A	94,534	44,310	50,224	124,712	59,661	65,051	30,178	31.92
SOUTH EAST	Drought & Floods Hazards	Drought	A	43,584	20,591	22,993	60,623	29,129	31,494	17,039	39.09
SOUTHERN	Drought, Fire, Floods & Animal & insects infestation	Drought, Urban & Veld Fires, Floods & Animal or Insect Overpopulation	A	147,389	68,377	79,012	171,652	82,368	89,284	24,263	16.46
TOTAL				1,040,017	489,533	550,484	1,305,086	629,062	676,024	265,069	25.49

Table2.3g: Proportion of population in zones vulnerable to particular health issues, natural extreme events, 2001& 2011 Censuses Continued...

District Area	Highest Disaster Hazards in Area	Hazard Sub Category	Actual / Potential	2001 Census			2011 Census			Intercensal Increase		Annual Average Growth Rate (%)
				(Both Sexes)	Male	Female	(Both Sexes)	Male	Female	Number	Per-cent	
CENTRAL - Serowe	Floods Hazard, Drought, Fire Hazards & Environmental Degradation	Floods, Drought, Veld Fires & Deforestation, Erosion & Loss of Biodiversity	A	153,035	73,294	79,741	180,500	88,889	91,611	27,465	17.95	1.65
CENTRAL – Tutume	Fire Hazard, Drought, Floods, animal & insects infestation & hydro meteorological Hazards	Veld Fires, Drought, Floods, Animal or Insect Overpopulation, Severe Storms & Extreme Temperatures	A	123,514	57,835	65,679	147,377	70,340	77,037	23,863	19.32	1.77
CENTRAL – Bobonong	Fire Hazard, Drought Floods & Environmental Degradation	Urban and Veld Fires, Drought, Floods & Deforestation, Erosion & Loss of Biodiversity	A&P	66,964	32,067	34,897	71,936	34,249	37,687	4,972	7.42	0.72
CENTRAL – Boteti	Fire Hazard, Drought, Floods & hydro meteorological Hazards	Urban and Veld Fires, Drought, Floods, Severe Storms & Extreme Temperatures	A&P	48,057	23,482	24,575	57,376	28,147	29,229	9,319	19.39	1.77
CENTRAL – Mahalapye	Drought, Fire, Environmental Degradation & animal or insects infestation	Drought, Deforestation, Erosion & Loss of Biodiversity & Animal or Insect Overpopulation	A	109,811	53,322	56,489	118,875	57,548	61,327	9,064	8.25	0.79
CHOBÉ	Fire Hazards & animal or insects infestation	Veld Fires & Animal or Insect Overpopulation	A	18,258	9,395	8,863	23,347	12,023	11,324	5,089	27.87	2.46
GHANZI	Drought, Fire Hazards	Drought & Urban/ Veldt Fires	A	33,170	16,916	16,254	43,355	22,461	20,894	10,185	30.71	2.68
KGALAGADI	Drought, Fire Hazards & Environmental Degradation	Drought, Veld Fires & Erosion & Loss of Biodiversity	A	42,049	21,148	20,901	50,492	25,466	25,026	8,443	20.08	1.83
KWENENG	Drought, Floods & Fire Hazards	Drought, Floods, Urban & Veldt Fires	A	230,335	111,547	118,788	304,549	149,616	154,933	74,214	32.22	2.79
KGATLENG	Fire & Environmental Degradation	Veld Fires & Deforestation, Erosion & Loss of Biodiversity	A	73,507	35,734	37,773	91,660	44,572	47,088	18,153	24.7	2.21
NORTH-EAST	Animal & insects infestation & Environmental Degradation	Animal or Insect Overpopulation & Deforestation, Erosion & Loss of Biodiversity	A	49,399	23,164	26,235	60,264	28,595	31,669	10,865	21.99	1.99
NORTH-WEST	Drought, Fire Hazards & hydro meteorological Hazards	Drought, Veld Fires & Severe Storms & Extreme Temperatures	A	124,712	59,661	65,051	152,284	73,611	78,673	27,572	22.11	2
SOUTH EAST	Drought & Floods Hazards	Drought	A	60,623	29,129	31,494	85,014	40,699	44,315	24,391	40.23	3.38
SOUTHERN	Drought, Fire, Floods & Animal & insects infestation	Drought, Urban & Veld Fires, Floods & Animal or Insect Overpopulation	A	171,652	82,368	89,284	197,767	95,817	101,950	26,115	15.21	1.42
TOTAL				1,305,086	629,062	676,024	1,584,796	772,033	812,763	279,710	21.43	1.94

Source: NDMO; 2011 Population & Housing Census Data

2.3.3 Flood Occurrences

Information on flood and storm occurrence by year, location, number of households and individuals affected, and assistance given is presented in this sub-section. Flooding usually takes place in a situation where water overflows in a dry place or within existing water bodies. On the other hand a "storm" is defined as a violent disturbance of the atmosphere with strong winds, and usually rain, thunder, lightning, or snow (Statistics Botswana, 2013: 119). A combination of both storms and floods occurrence are common in Botswana, and they are destructive by nature.

Table 2.3 and Figures 2.3d – 2.3e show natural disasters incidents during the years 2010 –2013 by district, individuals affected and assistance given. It is evident from the table that Ngamiland district experienced more floods than any other district during the year 2010. The floods affected ten villages, and within those villages 168 households and 800 individuals were victims of the disaster. Furthermore, a total of 235 tents were issued to the victims of the 2010 floods in Ngamiland district to provide temporary shelter. Maun alone had a total of 568 individuals displaced by storm rains in 2010. In 2012, storm rains in Mahalapye sub-district affected 329 households, displacing 1,756 people. As a result, a total of 119 tents and 322 food baskets were issued to the victims. During the year 2010 a total of 212 people in 32 households were affected by a combination of hailstorms and heavy rains in Kgatleng district in 2010. In 2013 alone, the most occurring incident was the hailstorm.

Out of a total of 164 households affected by natural disasters in 2013, 137 (83.54 percent) were hit by hailstorm while the remaining 27 (16.46 percent) were affected by storm rains. Kgatleng district was the hardest hit with 81 households (49.39 percent) and 242 individuals affected, resulting in 32 tents and 27 food baskets provided for relief.

Table 2.3h: Natural Disasters Incidents, 2010 - 2013

Incident	Year	District/Village affected	No. of households affected	Total no. of individual affected / displaced	Assistance given	
					Tents	Food Baskets
Floods	2010	Ngamiland District (Ikoga, Nxamasere, Etsha 13, Mohembo east, Kauxhwi, Jao Flats, Eretsha, Beetsha, Gudigwa, Tubu)	168	800	235	0
Storm rains	2010	North West District (Maun)	132	568	132	69
Hail storm and Heavy rains	2010	Kgatleng District (Ramotlabaki, Malolwane, Kgomodiatshaba)	32	212	32	0
Hailstorm	2010	Ngwaketsi District (Ntlhantlhe, Leggobotlho)	49	0	18	0
Storm winds	2010	North West District (Maun)	37	89	4	5
Storm rains	2012	Mahalapye Sub-District (Mahalapye)	329	1,756	119	322
Storm rains	2013	Palapye Sub-District (Maunatlala, Seolwane, Mogapi, Matolwane, Mogapinyana, Malaka)	27	115	0	0
Hailstorm	2013	Kgatleng District (Morwa, Bokaa, Oodi, Rasesa, Malotwana, Mochudi)	81	242	32	27
	2013	Mahalapye Sub-District (Poloka & Setsile)	19	0	0	0
	2013	North West District (Maun)	5	17	2	2
	2013	Kweneng District (Lethakeng –Salajwe)	32	96	3	19

Source: National Disaster Management Office (NDMO)

Figure 2.3d: Distribution of Individuals & Household Affected by Incident, Year & District 2010 - 2013

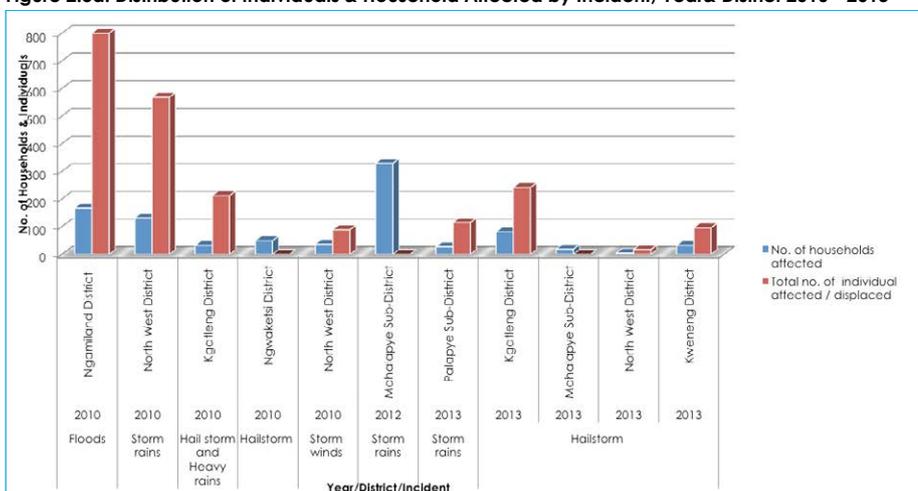
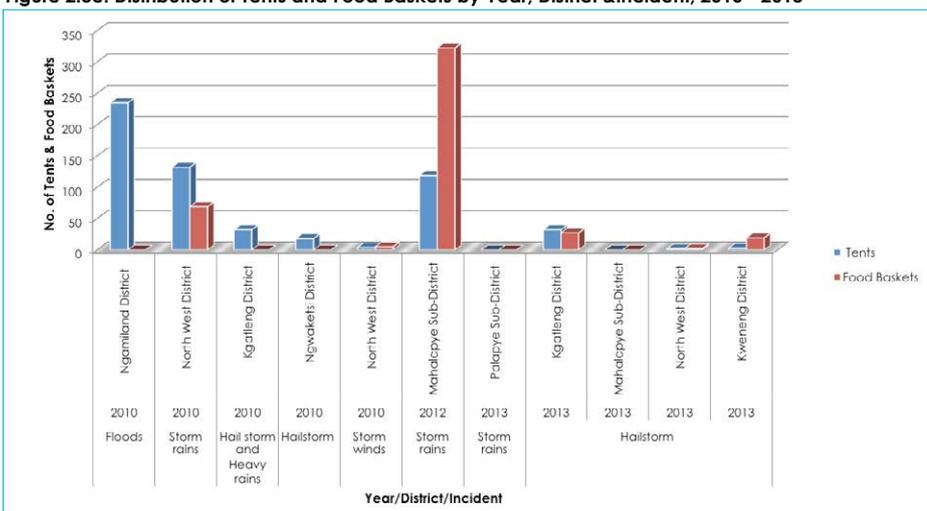


Figure 2.3e: Distribution of Tents and Food Baskets by Year, District & Incident, 2010 - 2013



2.4 Environmental Concerns

This sub-section of the human settlement report discusses the extent of road ways, total registered vehicles (national and privately owned stock), motor vehicle accidents trend, number of road accidents by type of road surface, and road casualties.

2.4.1 Transport

Transport and Communication facilities are a vital infrastructure of a modern economy because it facilitates human movement, as well as delivery of goods and services. Transport system comprises several modes like road, railways, air transport and waterways. Good transport network is very important for Botswana as a landlocked country with an unevenly distributed population (Statistics Botswana, 2013). On the other hand transport sector has been identified as a major contributor to greenhouse gas emissions.

2.4.1.1 Extent of roadways

The extent of roadways which is sometimes referred to as national road network is given by a combination of a set of roads maintained by Local Authorities and those in custody of the Central Government through Department of Roads (Statistics Botswana, 2013). However, the statistics presented in this sub-section are only Central Government-related because the bulk of the roads from Local Government have been handed over to Central Government.

Tables 2.4a – 2.4b and Figure 5a present the extent of roadways maintained by Central Government by type. The tables and figure reveal that bitumen type of road constituted more than half of the roadways from the year 2000 to 2010; however it suddenly dropped to 37 percent during the years 2011, 2012 and 2013. During the same period (2011-2013), gravel roadways dominated the entire roadways maintained by Central Government, constituting an annual percentage of 41, that is, 7,339 kilometres in both 2011 and 2012 and 7,560 kilometres in 2013. Furthermore, the track roadways were introduced under the maintenance of Central Government since 2011 and they contributed 3 percent (629 kilometres) both in 2011 and 2012. Generally, the extent of roadways increased from 9,132 kilometres in 2000 to 18,507 kilometres in 2013 (more than two-fold increase). According to Statistics Botswana (2013), 'this increase was a result of the Local Authorities having handed over some of the roads that were under their care to the Central Government. The bulk of the roads from Local Authorities were gravel, sand and track.'

Table 2.4a: Extent of Roadways Maintained by Central Government (Km) by Type, 2000-2012

Year	Bitumen	Gravel	Sand	Track	Total
2000	5,662	1,999	1,471	..	9,132
2001	5,804	1,800	1,471	..	9,075
2002	5,954	1,637	1,325	..	8,916
2003	6,116	1,501	1,299	..	8,916
2004	6,116	1,501	1,299	..	8,916
2005	6,367	1,250	1,299	..	8,916
2006	6,367	1,250	1,299	..	8,916
2007	6,396	1,221	1,299	..	8,916
2008	6,506	1,111	1,299	..	8,916
2009	6,780	867	1,299	..	8,946
2010	6,780	867	1,299	..	8,946
2011	6,689	7,339	3,385	629	18,042
2012	6,689	7,339	3,385	629	18,042
2013	6,925	7,560	4,022	..	18,507

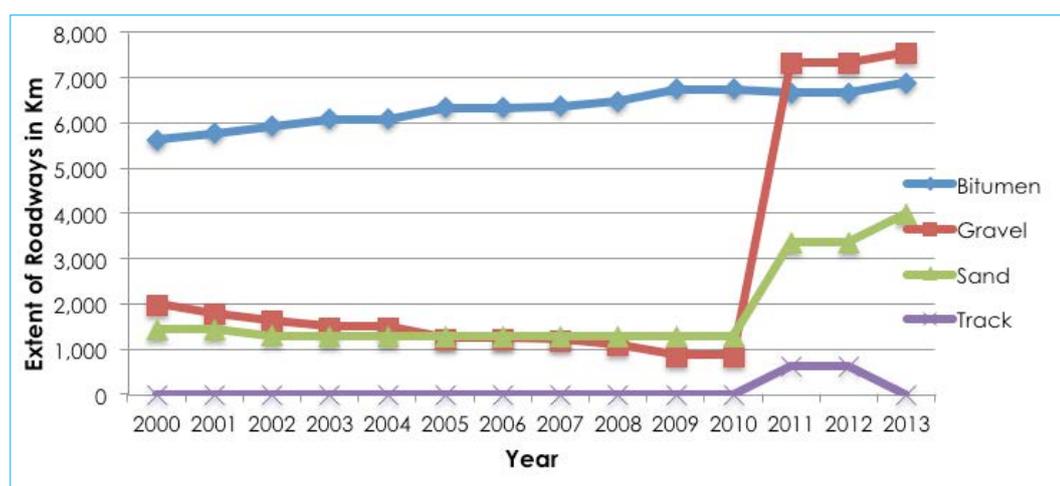
Source: Transport Statistics Unit, 2011
(..) = Not Applicable

Table 2.4b: Percentage (%) Distribution of Extent of Roadways Maintained by Central Government (Km) by Type, 2000-2012

Year	Bitumen	Gravel	Sand	Track	Total
2000	62	22	16	..	100
2001	64	20	16	..	100
2002	67	18	15	..	100
2003	69	17	15	..	100
2004	69	17	15	..	100
2005	71	14	15	..	100
2006	71	14	15	..	100
2007	72	14	15	..	100
2008	73	12	15	..	100
2009	76	10	15	..	100
2010	76	10	15	..	100
2011	37	41	19	3	100
2012	37	41	19	3	100
2013	37	41	22	..	100

Source: Transport Statistics Unit, 2011
 (..) = Not Applicable

Figure 2.4a: Extent of Roadways Maintained by Central Government (Km) by Type, 2000-2012



2.4.1.1 Vehicles Stock

This sub-section of the report presents information on registered vehicles, both national and privately owned vehicles. The information captured was from both registration and renewal of vehicle licenses.

Table 2.4c shows that national vehicle stock was on the increase during the years 2002-2012. The table further reveals that total registered vehicles stood at 162,807 in 2002 and increased to 400,873 vehicles in 2012. An annual average growth rate of 9.01 percent was observed. Generally passenger cars constituted the majority of the total national vehicle stock (Table 2.4c and Figure 2.4b). According to Statistics Botswana (2013) 'the increase in vehicle stock has resulted in the construction of better roads and increase in revenue collected from registration and licensing of vehicles as well as permits issued to goods and passenger carrying vehicles. On the other hand, this development has brought with it some major challenges like an increase in road accidents' (Table 2.4f). The increase also has implications on greenhouse gas emissions as petrol and diesel used to drive the vehicles are a major source.

Table 2.4d and Figure 2.4c present total registration of privately owned vehicles from years 2003 to 2012. Registration of privately owned vehicles experienced a steady growth during the review period. Passenger cars with an annual average registration of 123,203 constituted the majority of total registration followed by Light Duty Vehicles-(vans in particular) (LDVs) with an annual average of 83,078. Motor cycles trailed behind all privately owned vehicles, with an average annual registration of 10,489.

Presented in Table 2.4e and Figure 2.4d are statistics on motor vehicle first registration by type of vehicle between the years 2001 and 2013. During the period under review motor vehicle first registration fluctuated. However, it is worth noting that there was a significant increase between the years 2010, 2011, 2012, and 2013 with 31,929, 36,044, 36,573 and 38,735 respectively, of motor vehicles registered for the first time. This implies that there is an obvious increase of traffic during busy hours of the working days and hence the need for increased resources to control traffic. The latter is also worsened by the fact that passenger cars constitute the majority of the total motor vehicle first registrations during all the years under review.

Table 2.4c: National vehicle Stock- Total Registered Vehicles, 2002-2012

Year	Passenger Cars	*LDVs	Trucks	Buses	Tractors	Motor Cycles	Trailers	Tankers/Horses	Others	Total
2002	59,791	72,134	8,701	6,903	3,133	1,041	7,963	998	2,143	162,807
2003	65,479	75,355	9,394	7,407	2,957	990	8,808	1,219	2,219	173,828
2004	74,465	79,122	9,942	8,749	3,068	1,027	9,336	1,286	2,270	189,265
2005	83,039	79,812	10,349	9,490	2,913	943	9,777	1,406	2,335	200,064
2006	91,874	80,743	11,270	9,660	2,816	947	10,209	1,600	2,413	211,532
2007	104,926	82,916	12,819	10,019	2,835	967	11,297	1,831	2,453	230,063
2008	120,783	88,547	15,324	10,889	3,371	1,109	12,296	1,892	2,287	256,498
2009	135,334	91,826	17,209	11,590	4,057	1,155	13,878	2,101	3,506	280,656
2010	177,131	100,978	22,220	14,155	5,180	1,650	17,648	2,931	2,826	344,719
2011	197,293	100,459	23,413	13,875	5,708	1,716	18,605	3,119	2,967	367,155
2012	225,604	102,982	24,435	14,757	6,020	1,752	19,421	3,208	2,694	400,873

Source: Department of Road Transport & Safety; Transport Statistics Unit, 2011

Note: *LDVs- Light Duty Vehicles- Van

Figure 2.4b: National Vehicle Stock-Total Registered Vehicles, 2003-2012

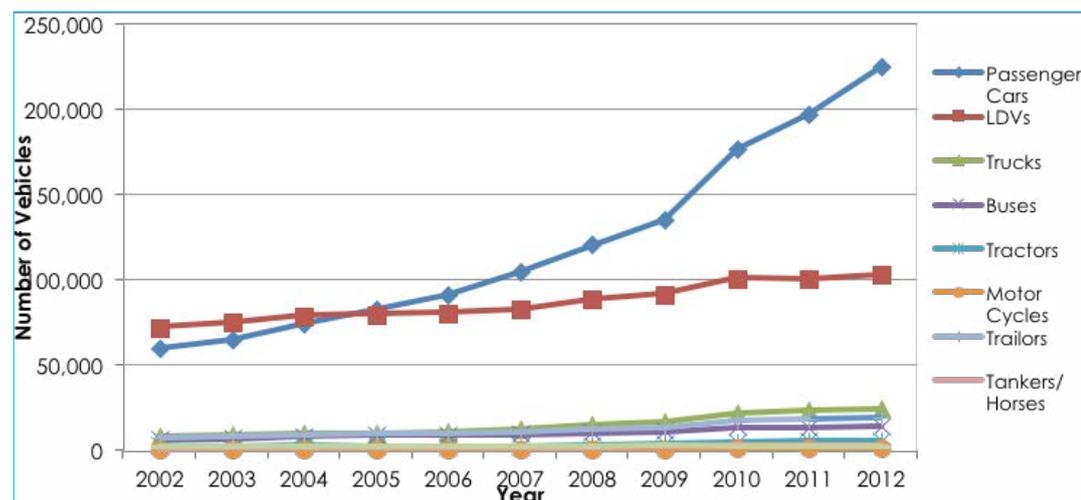


Table 2.4d: Privately Owned Vehicles- Total Registrations by Year & Type, 2003-2012

Year	Passenger Cars	LDVs	Trucks	Buses	Motor Cycles	Tractors	Trailers	Tankers/Horses	Others	Total	Vehicles/1000 people
2003	64,681	70,923	8,173	7,012	804	3,694	7,710	940	1,565	165,502	99
2004	73,587	74,455	8,648	8,228	852	2,812	8,183	1,021	1,590	179,376	106
2005	82,056	74,387	8,992	8,913	772	2,638	8,614	1,121	1,550	189,043	110.7
2006	90,877	75,035	9,928	9,103	750	2,536	9,050	1,328	1,527	200,134	116.4
2007	103,980	77,659	11,537	9,522	788	2,550	10,152	1,568	1,647	219,403	126.3
2008	119,618	82,757	14,104	10,220	968	3,108	11,261	1,805	1,897	245,738	140
2009	133,295	87,231	16,210	10,976	1,042	3,794	12,843	2,000	3,496	270,887	152.5
2010	174,781	95,755	21,233	13,327	1,535	4,833	16,513	2,833	2,651	333,461	185.3
2011	196,031	94,889	22,602	13,383	1,614	5,458	17,505	3,018	2,604	357,104	176.3
2012	223,124	97,691	23,603	14,206	1,632	5,715	18,309	3,106	2,429	389,815	192.5

Source: Transport Statistics Unit

Figure 2.4c: Privately Owned Vehicles- Total Registrations by Year & Type, 2003-2012

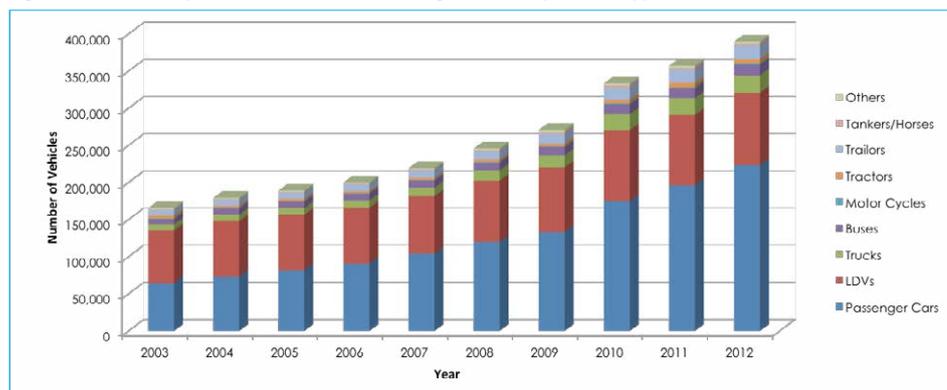
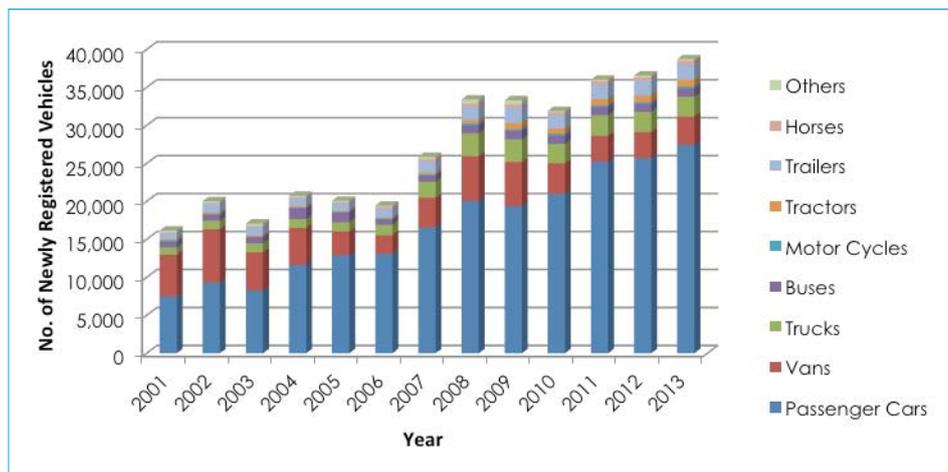


Table 2.4e: Motor Vehicle First Registrations by Type of Vehicle, 2001 - 2013

Year	Passenger Cars	Vans	Trucks	Buses	Motor Cycles	Tractors	Trailers	Horses	Others	Total
2001	7,465	5,492	963	788	137	180	841	37	252	16,155
2002	9,313	7,006	1,136	745	153	218	1,114	80	277	20,042
2003	8,272	5,031	1,170	804	97	170	1,061	162	324	17,091
2004	11,608	4,908	1,146	1,433	109	163	1,023	135	212	20,737
2005	12,905	3,110	1,219	1,298	110	141	960	167	179	20,089
2006	13,073	2,462	1,395	709	104	138	1,123	275	163	19,442
2007	16,538	3,935	2,121	784	164	226	1,457	326	325	25,876
2008	20,037	5,912	3,031	1,031	255	430	1,792	392	533	33,413
2009	19,354	5,831	2,970	1,136	241	801	2,029	396	567	33,325
2010	20,972	4,040	2,581	1,084	249	671	1,825	259	248	31,929
2011	25,204	3,426	2,723	1,058	241	825	1,894	434	239	36,044
2012	25,673	3,453	2,650	1,052	256	847	1,963	440	239	36,573
2013	27,450	3,712	2,616	1,122	242	876	2,022	442	253	38,735

Source: Department of Road Transport and Safety, Ministry of Transport and Communication

Figure 2.4d: Motor Vehicle First Registrations by Type of Vehicle, 2001 – 2013



2.4.1.1 Road Accidents

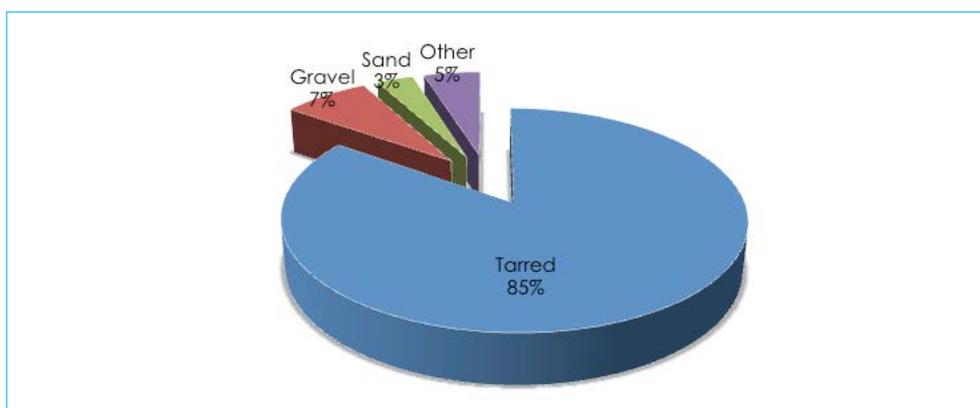
The number of road accidents by type of road surface is presented in this sub-section. During the period 2007-2012, after an initial slight increase between the year 2007 and 2008, the number of road accidents decreased from 20,415 in 2008 to 17,527 in 2012. Tared road accidents contributed the highest percentage (85 percent) to the total number of accidents, followed by gravel road accidents (7percent). This result might be influenced by the fact that all the main roads (e.g. A1) are tared and there is a lot of traffic throughout the year, hence the high likelihood of road accidents occurrence (Table 2.4e and Figure 2.4f).

Table 2.4f: Number of Road Accidents by Type of Road Surface, 2007-2012

Type of Road	2007	2008	2009	2010	2011	2012	% Contribution in 2012
Tarred	16,649	17,893	16,899	16,041	15,513	14,865	84.8
Gravel	1,781	1,616	1,786	1,649	1,419	1,273	7.3
Sand	663	488	690	675	533	551	3.1
Other	394	418	625	613	536	838	4.8
Total	19,487	20,415	20,000	18,978	18,001	17,527	100

Source: Transport Statistics Unit

Figure 2.4e: Percentage Contribution of Road Accidents by Type of Road Surface to the Total Road Accidents, 2007-2012



2.4.1.1 Road Casualties

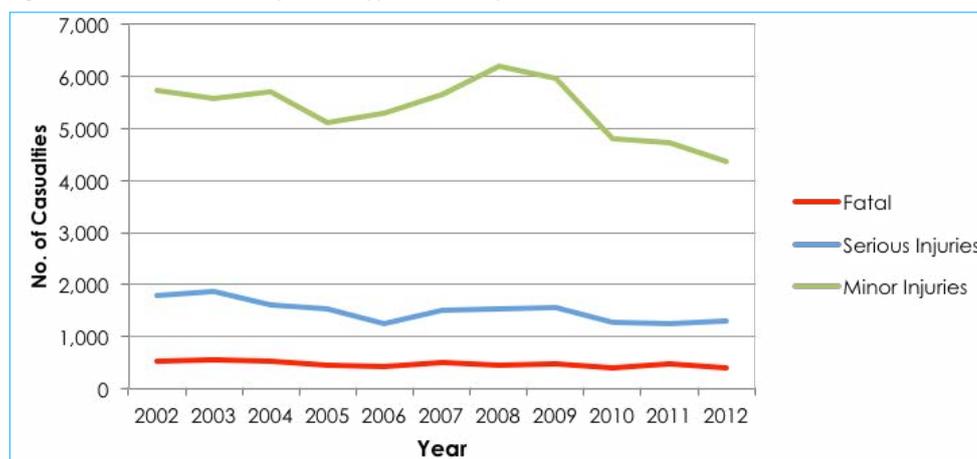
Road casualties are classified into three categories; fatal, serious injuries and minor injuries. Generally the trend of road casualties' occurrence was slightly on the decrease during the 2002 to 2012 period with pockets of increase experienced in the years 2007 and 2008. Road fatalities fluctuated during the period under review, with the highest number recorded in 2003 (557 deaths) (Table 2.4g and Figure 2.4f). According to CSO (2010), the number of deaths due to road accidents is likely to increase after the event (accident) because some road accident victims die months after and may not be recorded at the time of compiling a report.

Table 2.4g: Road Casualties by Year & Type of casualty, 2002-2012

Year	Fatal	Serious Injuries	Minor Injuries	Not Known	Total
2002	520	1,781	5,713	..	8,014
2003	557	1,853	5,553	..	7,963
2004	532	1,602	5,706	..	7,840
2005	450	1,520	5,099	..	7,069
2006	429	1,235	5,274	14	6,952
2007	497	1,494	5,648	..	7,639
2008	455	1,522	6,183	..	8,160
2009	475	1,540	5,955	..	7,970
2010	397	1,252	4,781	..	6,430
2011	483	1,239	4,714	..	6,436
2012	404	1,285	4,346	..	6,035

Source: Botswana Police Service (Road Traffic Accident Unit; Transport Statistics Unit, 2011)

Figure 2.4f: Road Casualties by Year & Type of casualty, 2002-2012



2.4.1.4 Civil Aviation

This sub-section provides information on civil aviation as a mode of transport used in and out of Botswana. Civil Aviation is a non-military category of flying. It can either be private or commercial. Both aircraft movement and air passenger statistics are presented. Aircraft movement entails total number of landings and take-offs, while 'Air Passenger' means person travelling in an airplane. The just mentioned indicators of civil aviation have a bearing on the economy of a country, that is, the higher the statistics the higher the chances of an increased Gross Domestic Product (GDP). "Overall growth in passenger traffic mirrored positive economic growth worldwide. Information Handling Services (IHS) Global Insight, a major global economic forecasting organization, estimates the world's real Gross Domestic Product to have increased by 2.3 percent in 2012" (ICAO, 2013: 1). Furthermore, there is an environmental impact associated with high air plane traffic, for example, an increased landing and take-off of air planes contributes to high emissions of greenhouse gases. According to IPCC (1990) "the total contribution of aircraft emissions to total anthropogenic carbon dioxide (CO₂) emissions was considered to be about 2 percent in 1990. However, air traffic in the world is growing, and will likely continue to grow. Though there is an improvement in fuel efficiency of new aircraft, the long lifetime of aircraft and the expected growth in air traffic imply that this emission source in the future will increase in importance (p.94)."

Table 2.4h shows that total aircraft movement (international and domestic) reduced from 82,799 in 2011 to 80,164 in 2012 then increased to 86,363 in 2013. On the other hand, air passenger movement also followed the same pattern, decreasing from 788,461 in 2011 to 764,972 in 2012 then increasing to 783,651 in 2013 (Table 2.4i). The increase in both air passenger movement and aircraft movement followed the same pattern as that of the country's Real GDP, implying that they also contributed to the growth of the economy.

Table 2.4h: Aircraft Movement by Month and Type of Movement, January -Dec 2011, 2012 & 2013

Quarter	2011			2012			2013		
	International	Domestic	Total	International	Domestic	Total	International	Domestic	Total
Q1	4,136	11,194	15,330	3,718	11,600	15,318	4,193	13,533	17,726
Q2	5,494	15,966	21,460	4,638	16,391	21,029	4,696	17,291	21,987
Q3	5,796	19,592	25,388	5,108	19,318	24,426	5,399	19,482	24,881
Q4	4,538	16,083	20,621	4,421	14,970	19,391	4,536	17,233	21,769
Total	19,964	62,835	82,799	17,885	62,279	80,164	18,824	67,539	86,363

Source: Civil Aviation Authority of Botswana

Table 2.4i: Air Passenger Movement by Month and Type, January -Dec 2011, 2012 & 2013

Quarter	2011			2012			2013		
	International	Domestic	Total	International	Domestic	Total	International	Domestic	Total
Q1	90,447	74,083	164,530	87,164	77,018	164,182	88,220	77,117	165,337
Q2	106,507	94,509	201,016	98,857	94,364	193,221	100,534	91,329	191,863
Q3	113,459	108,299	221,758	109,466	104,075	213,541	112,325	114,206	226,531
Q4	103,147	98,010	201,157	104,156	89,872	194,028	105,359	94,561	199,920
Total	413,560	374,901	788,461	399,643	365,329	764,972	406,438	377,213	783,651

Source: Civil Aviation Authority of Botswana

3.0 ENVIRONMENTAL HEALTH SECTION

The second sub-component of the fifth Component of the Framework for the Development of Environmental Statistics (FDES) is on environmental health. Environmental health refers to aspects of the human health and disease that are determined by factors in the environment (United Nations Statistics Division; 2013). Anthropogenic activity results in changes in environmental conditions which in turn have an impact on human health. The assimilative capacity and the resilience of the environment to impacts caused by human habitation can influence the health of human settlements and that of the natural environment (United Nations Statistics Division; 2013).

This part of the report looks into the human health aspects of environmental health, the effects in the causative relationship between environmental conditions and human health. While it is determined that environmental conditions will have an impact on human health, the causal relationship between the two aspects is not always immediately apparent when cases of human health problems are investigated. This report does not purport that the disease cases observed herein were solely the result of environmental conditions, or that they are to any extent determined by any known environmental conditions. The current data availability of environmental indicators limits such correlation analysis as to confidently determine the causes of the trends in disease cases. This report therefore acts as the first step towards the systematic collection of data on diseases that are identified as largely determined by environmental factors and conditions. This is facilitated by the existence of health data in the health sector. Trends in environmental diseases are herein observed.

3.1 Airborne Diseases and Conditions

This includes all airborne diseases and conditions that are caused or worsened by exposure to unhealthy levels of pollutants in the air, such as particulate matter and sulphur dioxide or trioxide (FDES;2013). Examples given by the FDES are of upper and lower respiratory disease, obstructive pulmonary disease, asthma and allergic rhinitis. In the medical fraternity, airborne diseases are those that spread by droplet infection, when an infected individual sneezes or coughs and releases droplets into the air, which are

breathed in by the potential recipient. Tuberculosis and measles are such diseases. For purposes of this report focus will only be given to diseases caused by environmental factors.

3.1.1 Tuberculosis (TB)

Tuberculosis (TB) is a respiratory disease caused by bacteria called *Mycobacterium tuberculosis* that most often affects the lungs. TB is second only to HIV/AIDS as the greatest killer worldwide due to a single infectious agent (World Health Organisation, 2013). TB is transmitted through the air. When an infected patient coughs, sneezes or spits they expel TB germs that when inhaled can cause another person to become infected.

Environmental factors play a role in the spread of TB. "The WHO agrees that poverty and urbanization create the perfect conditions for TB transmission. Urbanization leads to higher population densities, crowded living conditions, and increased mobility among migrants seeking temporary work" (Schmidt C; 2008). The use of tobacco also greatly increases the risk of TB and death, which is an environmental factor for those that are exposed to secondary tobacco smoke.

Botswana's TB programme was successful in rolling back the disease until 1990, after which the incidence of the disease increased, peaking in 2002. Table 3.1a shows the prevalence of TB in Botswana from 1997 to 2011, using notification rates per 100,000 of the population. The peak was reached in 2002 at 623 cases notified per 100,000 of the population.

Table 3.1a Tuberculosis prevalence in Botswana 1997 to 2011 (notification rates per 100,000)

Year	Prevalence (notification rates per 100,000)
1997	476
1998	506
1999	537
2000	595
2001	620
2002	623
2003	594
2004	566
2005	602
2006	519
2007	470
2008	536
2009	505
2010	419
2011	333

Source: Ministry of Health

Figure 3.1a shows the trend of TB prevalence based on notification rates per 100,000 of the population. Although there was a peak in prevalence in 2002, the trend line indicates a falling prevalence of TB in Botswana.

Figure 3.1a Tuberculosis prevalence in Botswana (Notification rates per 100,000)

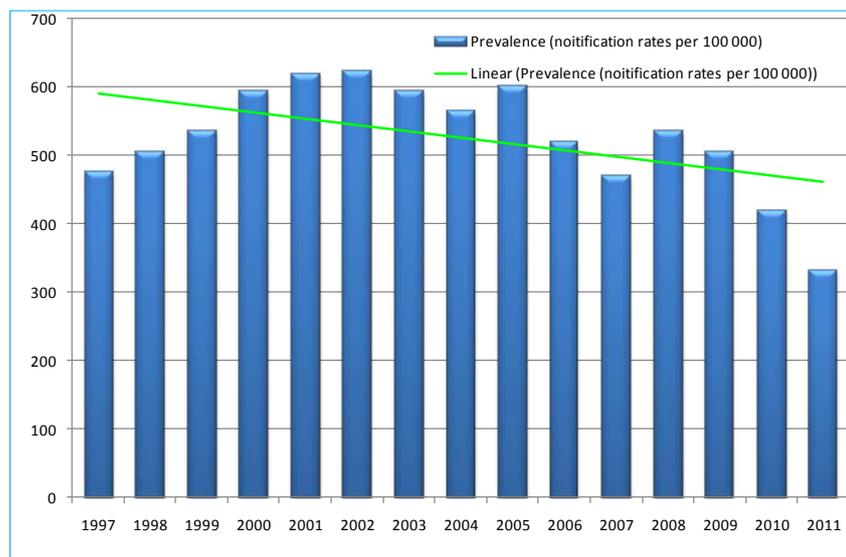


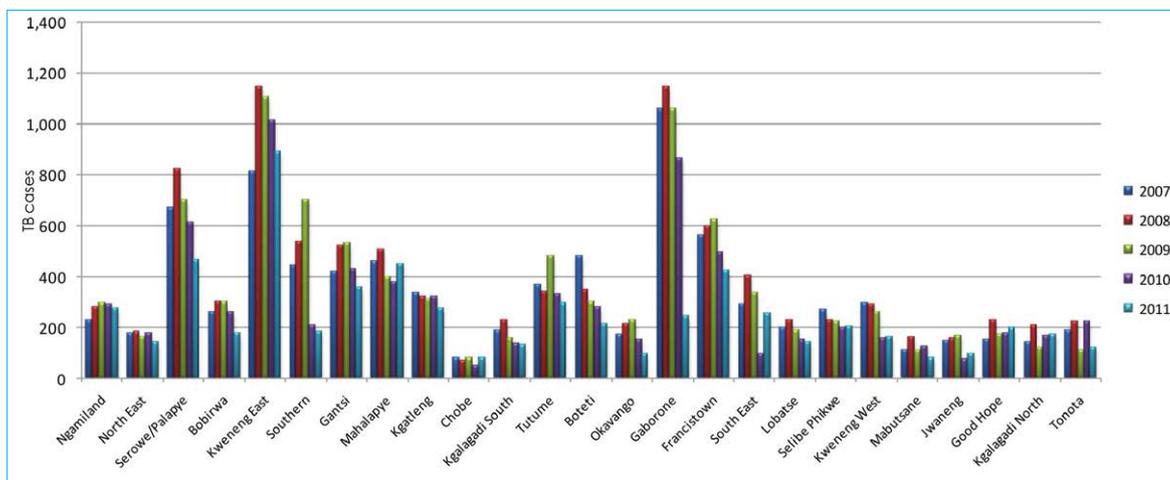
Table 3.1b shows that the highest number of TB cases notified over the five year period from 2007 to 2011 were in Gaborone and Kweneng East in 2008 and 2009. This is possibly a result of higher population sizes. The highest number for a district was recorded for Gaborone with 1,149 cases in 2008 and Kweneng East recording at 1,146 cases. The lowest figures recorded were consistently for Chobe district, possibly as a result of its low population size. Figure 3.1b demonstrates the trends and comparisons among the districts.

Table 3.1b Tuberculosis cases by district and year 2007 – 2011

Year	2007	2008	2009	2010	2011
Ngamiland	226	279	294	287	273
North East	173	178	159	174	141
Serowe/Palapye	670	822	697	613	463
Bobirwa	255	300	299	255	175
Kweneng East	815	1,146	1,105	1,011	890
Southern	440	536	698	205	181
Gantsi	418	520	531	425	355
Mahalapye	460	502	397	376	449
Kgatleng	336	318	311	321	274
Chobe	80	66	77	48	80
Kgalagadi South	183	225	156	132	128
Tutume	365	339	480	327	292
Boteti	480	343	299	279	211
Okavango	168	210	226	150	92
Gaborone	1,059	1,149	1,059	863	241
Francistown	560	598	623	492	423
South East	288	403	334	92	253
Lobatse	195	224	188	150	139
Selibe Phikwe	269	228	222	194	199
Kweneng West	293	288	259	155	159
Mabutsane	108	158	110	122	78
Jwaneng	143	156	165	74	93
Good Hope	147	229	172	176	196
Kgalagadi North	138	206	121	166	168
Tonota	185	222	106	219	119
National	8,454	9,645	9,088	7,306	6,072

Source: Adapted from Ministry of Health and Statistics Botswana reports

Figure 3.1b Tuberculosis cases by district 2007 - 2011



The prevalence of a disease is an indication of the proportion of people per given number of the population at a point in time or period, having the disease. It allows factoring out of the population size so as to examine proportionate cases of the disease in comparing districts or other populations. Table 3.1c shows the prevalence of TB in the districts based on the projected populations for the years 2007 to 2011.

Table 3.1c Tuberculosis prevalence (per 100,000) for districts 2007 – 2011 (based on districts projected population figures)

Year	2007	2008	2009	2010	2011
Ngamiland	301	370	388	322	265
North East	360.1	370	329	358	288
Serowe/Palapye	426.8	519	436	379	283
Bobirwa/ central Bobonong	384.6	451	447	378	257
Kweneng East	398.8	553	525	472	409
Kanye Moshupa /Ngwaketse	418.4	512	668	196	173
Gantsi	1,215.80	1,496	1,509	1,191	980
Mahalapye	434.3	474	373	351	416
Kgatleng	443.7	416	402	409	344
Chobe	395.6	320	367	224	366
Kgalagadi South	686.1	836	574	479	458
Tutume	289.5	267	375	252	223
Boteti	945.5	668	575	529	394
Gaborone	496.3	526	474	378	103
Francistown	600.8	629	642	497	419
South East	441.4	608	496	134	363
Lobatse	651.1	742	618	488	447
Selibe Phikwe	534.7	450	435	377	382
Kweneng West	692.5	673	598	353	356
Mabutsane / Ngwaketse West	970.7	1,401	961	1,049	659
Jwaneng	869	933	971	429	530
Good Hope / Barolong	273.1	417	307	307	335
Kgalagadi North	802.5	1,181	683	922	918

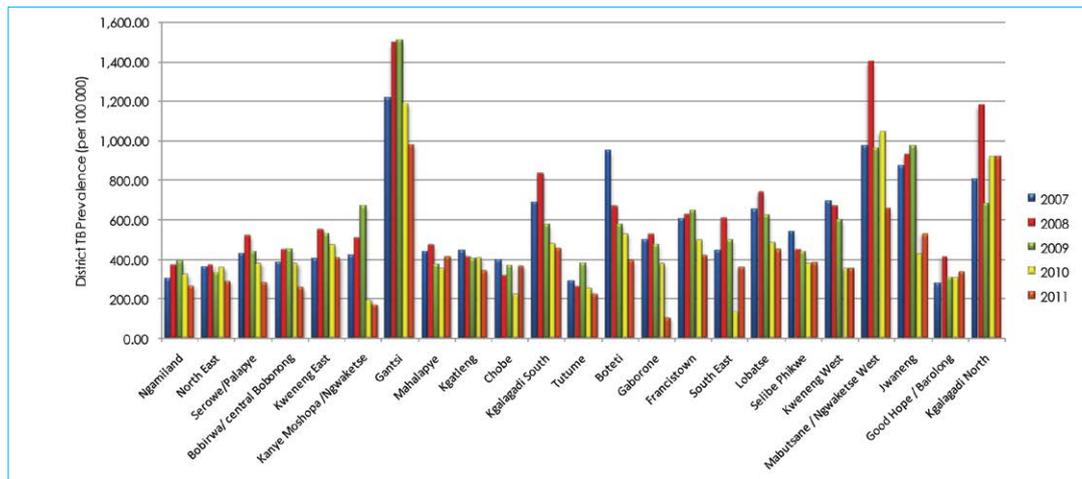
Source: Adapted from Ministry of Health and Statistics Botswana reports

Note: Districts not exhaustive

Population projections sourced from Statistics Botswana based on 2001 Census

Gantsi consistently recorded a high prevalence of TB. The other districts that also have higher prevalence TB are Mabutsane, Jwaneng and Kgalagadi North.

Figure 3.1c Districts Tuberculosis prevalence 2007 – 2011 (based on projected populations and notifications for the period)



Source: Adapted from Ministry of Health and Statistics Botswana reports

Disease incidence is an indication of the new cases of a disease in a given population at a given time. Table 3.1d shows the proportion of new cases of TB to all cases of TB per district, for the year 2006. Due to the lack of data on cases, available data on new and repeat outpatient attendances is hereby used as a proxy for the incidence of tuberculosis.

Table 3.1d Pulmonary Tuberculosis new and repeat outpatient attendances by district (2006)

District	New	Repeat	all	% new
Ngamiland	436	512	948	46
North East	179	401	580	31
Serowe/Palapye	463	1,027	1,490	31
Bobirwa	510	1,068	1,578	32
Kweneng East	697	1,744	2,441	29
Southern	350	1,719	2,069	17
Gantsi	181	305	486	37
Mahalapye	255	841	1,096	23
Kgatlang	515	625	1,140	45
Chobe	47	70	117	40
Kgalagadi South	155	494	649	24
Tutume	-	777	777	-
Boteti	274	584	858	32
Okavango	131	209	340	39
Gaborone	740	1,067	1,807	41
Francistown	962	597	1,559	62
South East	290	992	1,282	23
Lobatse	138	337	475	29
Selebi Phikwe	115	502	617	19
Kweneng West	366	485	851	43
Mabutsane	98	167	265	37
Jwaneng	144	285	429	34
Goodhope	122	444	566	22
Kgalagadi North	134	296	430	31

Source: Adapted from Ministry of Health and Statistics Botswana reports
Dashes = no data

The proportions of 2006 new TB outpatient attendances to all TB outpatient attendances for the districts are illustrated graphically in figure 3.1d. The highest proportion of new attendances for 2006 was recorded in Francistown where more than half the attendances were new attendances at 62 percent. This is followed by Ngamiland, Kgatleng, Kweneng West and Gaborone at 46 percent, 45 percent, 43 percent and 41 percent respectively.

The proportions of new TB attendances to all TB attendances in 2006 for the districts are also illustrated in figure 3.1e, emphasizing the number of attendances per district, where Kweneng East and Southern districts show the highest numbers of TB outpatient attendances.

Figure 3.1d Pulmonary TB percentage proportion of new to repeat outpatient attendances by district 2006

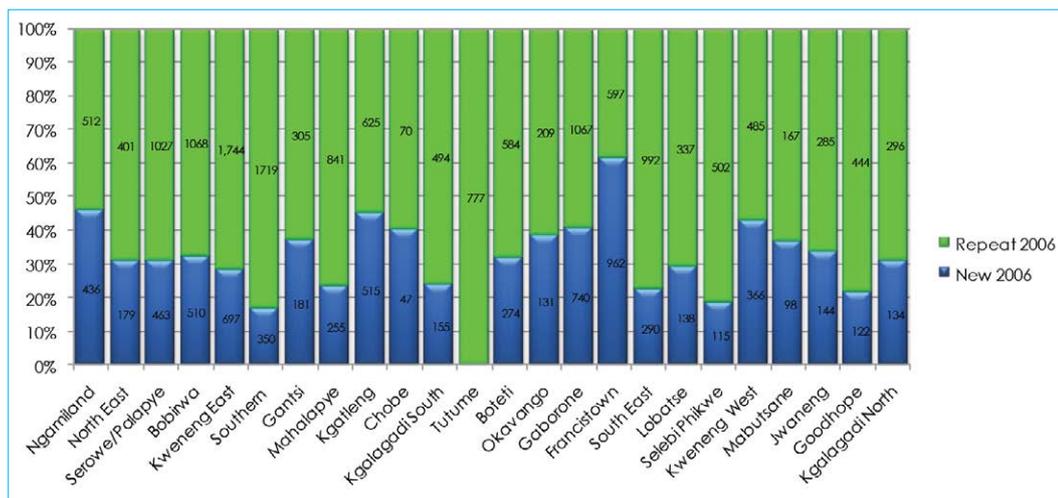
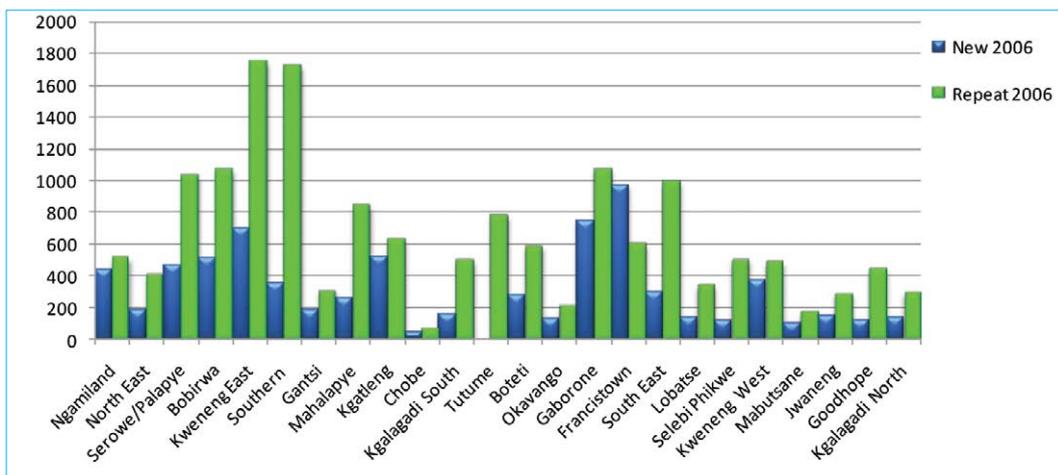


Figure 3.1e Pulmonary TB numbers of new and repeat outpatient attendances by district 2006



Pulmonary TB new and repeat attendances for the year 2008 are presented in Table 3.1e. In 2008, the highest recorded new attendances were in Kweneng East, at 1,372 new attendances. New attendances in relation to the repeat attendances were recorded highest in Francistown district and the Charleshill sub-district. Mabutsane followed at 41 percent, and Kweneng East and Gantsi both at 39 percent. Francistown and the Kweneng East districts recorded higher proportions for both 2006 and 2008.

Table 3.1e Pulmonary TB new and repeat outpatient attendances by district 2008

District	New 2008	Repeat 2008	all	% New
Ngamiland	135	266	401	34
North East	144	429	573	25
Serowe/Palapye	469	1,290	1,759	27
Bobirwa	436	975	1,411	31
Kweneng East	1,372	2,171	3,543	39
Southern	183	772	955	19
Gantsi	166	260	426	39
Mahalapye	215	777	992	22
Kgatleng	407	752	1,159	35
Chobe	41	94	135	30
Kgalagadi South	139	337	476	29
Tutume	211	577	788	27
Boteti	279	643	922	30
Okavango	96	861	957	10
Gaborone	508	1,612	2,120	24
Francistown	922	1,021	1,943	47
South East	193	770	963	20
Lobatse	208	404	612	34
Selebi Phikwe	229	701	930	25
Kweneng West	279	581	860	32
Mabutsane	96	138	234	41
Jwaneng	112	183	295	38
Goodhope	109	520	629	17
Hukunsi	87	230	317	27
Tonota Sub District	75	153	228	33
Moshupa Sub District	195	974	1,169	17
Tlokweng Sub District	36	207	243	15
Charles Hill Sub District	109	125	234	47

Source: Adapted from Ministry of Health and Statistics Botswana reports

Figure 3.1f illustrates the percentage proportions of new to repeat TB outpatient attendances for the districts, in 2008, while Figure 3.1g shows the same with emphasis on the number of new and repeat attendances. Kweneng East recorded the highest number of attendances at 3,543 attendances for TB, with the total between 1,372 new attendances and 2,171 repeat attendances.

Figure 3.1f Pulmonary TB percentage proportion of new to repeat outpatient attendances by district 2008

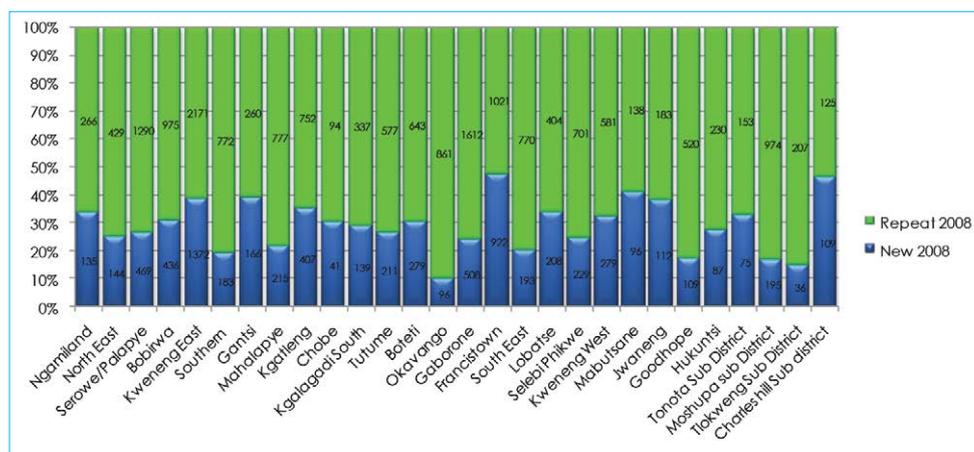
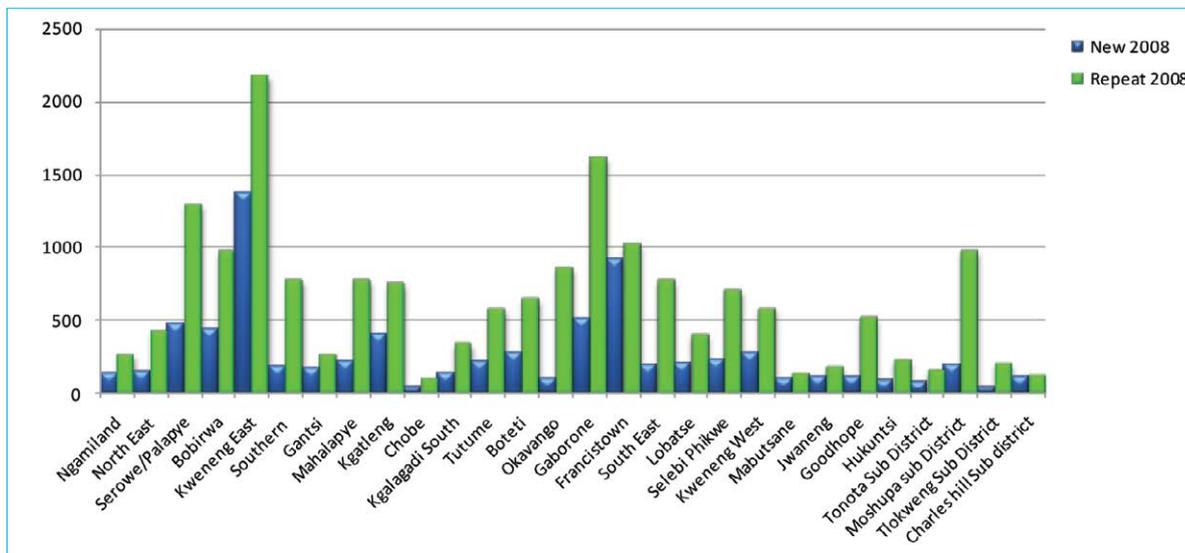


Figure 3.1g Pulmonary TB numbers of new and repeat outpatient attendances by district 2008



The proportion between new outpatient attendances and the district population is shown in Table 3.1f. The proportion of new tuberculosis attendances to district population in the years 2006 and 2008 is shown graphically in Figure 3.1h. Most of the districts show a lower proportion of new attendances for tuberculosis in 2008 than in 2006. Kweneng East, Lobatse, and Selibe Phikwe show increased new attendances of tuberculosis. Selibe Phikwe hosts a copper nickel mine and occasionally experiences sulphur dioxide air pollution, which may affect the respiratory health of its residents, and exacerbate chances of transmission of tuberculosis. Selibe Phikwe also often records higher levels of HIV prevalence, which exacerbates the opportunistic tuberculosis infection.

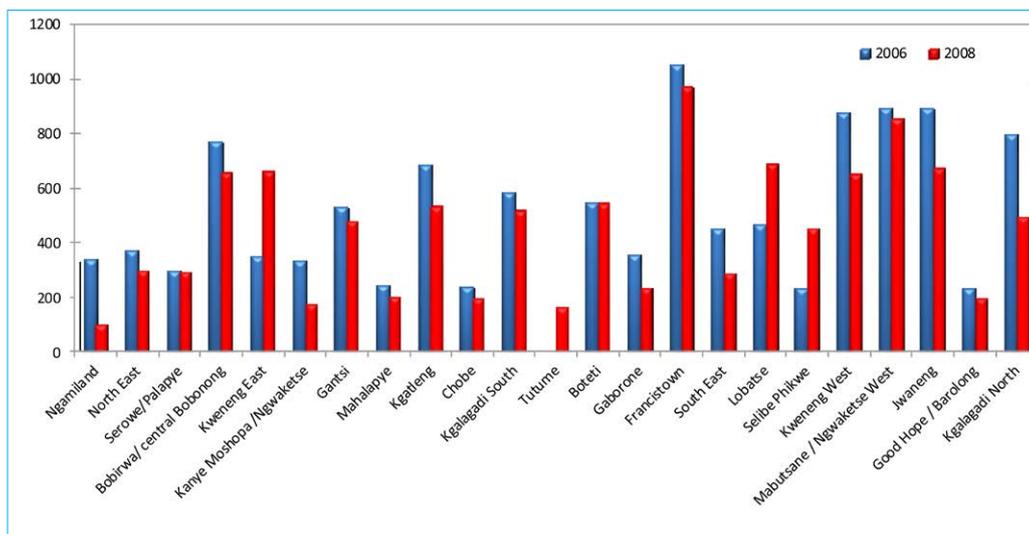
Table 3.1f Proportion of new tuberculosis attendances to population (per 100,000) in 2006 and 2008 by district

District	2006	2008
Ngamiland	336	102
North East	372	299
Serowe/Palapye	297	296
Bobirwa/ central Bobonong	770	655
Kweneng East	346	662
Kanye Moshupa /Ngwaketse	330	175
Gantsi	531	478
Mahalapye	240	203
Kgatleng	686	532
Chobe	237	199
Kgalagadi South	585	517
Tutume	-	166
Boteti	545	543
Gaborone	355	233
Francistown	1,052	970
South East	451	291
Lobatse	463	689
Selibe Phikwe	230	452
Kweneng West	873	652
Mabutsane / Ngwaketse West	892	851
Jwaneng	889	670
Good Hope / Barolong	231	198
Kgalagadi North	798	499

Source: Calculated from Ministry of Health Statistics

Dashes = no data

Figure 3.1h Proportion of new tuberculosis attendances to population (per 100,000) in 2006 and 2008 by district



3.2 Water Related Diseases and Conditions

This refers to all water-related diseases and conditions that result from micro-organisms in the water that humans drink (Framework for the Development of Environmental Statistics; 2013). The Framework for the Development of Environmental Statistics (FDES) gives the examples of diarrhoeal disease, gastroenteritis, and water borne parasite infection.

3.2.1 Diarrhoea

“Diarrhoea is a common symptom of gastrointestinal infections caused by a wide range of pathogens, including bacteria, viruses and protozoa” (United Nations Children’s Fund; 2009). Examples of such are Rotavirus in babies and children, E. coli, Shigella, Campylobacter, Cryptosporidium and Salmonella among others. There is acute Diarrhoea and chronic diarrhoea. Acute Diarrhoea usually lasts one (1) or two (2) days but may last longer, while chronic Diarrhoea is that which lasts four (4) weeks and more (National Institutes of Health 2011). Despite general declines, diarrhoea is the second most (after pneumonia) common cause of death among under five children worldwide, (post neonatal) accounting for about 1.5 million deaths per year, a toll that is higher than that of malaria, measles and AIDS combined (United Nations Children’s Fund 2009). For Botswana, Diarrhoea and gastroenteritis of presumed infectious origin was the second highest cause of deaths in infants and children under the age of 5, for the years 2009 and 2010.

Environmental factors greatly determine the transmission of diarrhoeal pathogens. The pathogens are largely transmitted from one person’s stools or faeces to another through the mouth, by way of ingestion of contaminated food or water. Such contamination can be the result of breaches in hygiene precautions, inadequate sanitation and handling of human waste and such, which are often characteristic of poverty stricken environments and disaster stricken situations among others. Such conditions are common in developing countries, and may account for more than 80 percent of child deaths due to diarrhoea being in Africa and South Asia (United Nations Children’s Fund 2009). Diarrhoea is also the main cause of outpatient attendances in Botswana’s health facilities.

Botswana’s disease surveillance and reporting system produces data on acute diarrhoea in under five year old children, acute diarrhoea in people over 5 years old, diarrhoea with some dehydration, diarrhoea with severe dehydration and diarrhoea with blood.

Table 3.2a shows the cases of acute diarrhoea for children under 5 years old and for people of over five years in Botswana from 1995 to 2003. Figures 3.2a and 3.2b illustrate the data for children under five years old and people over 5 years old in a graph, showing the cases for under 5 children to have peaked in 1998 at 69,042 cases, while for over 5 year old people the peak was also in 1998 with 62,595 cases notified (Figure 8.2). The general trends show that acute diarrhoea in children less than 5 years old increased minimally between 1995 and 2003 while that in people over 5 years old decreased slightly.

Table 3.2a Acute diarrhoea cases under and over 5 years old (1995 to 2003)

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003
Acute Diarrhoea <5	53,276	57,418	66,761	69,042	63,298	64,375	64,591	58,085	58,050
Acute Diarrhoea >5	-	-	50,595	62,144	51,666	55,965	57,153	51,357	51,174

Source: Statistics Botswana and Ministry of Health Statistics
Note: Dashes = no data

Figure 3.2a Acute diarrhoea cases in children under 5 years old (1995 to 2003)

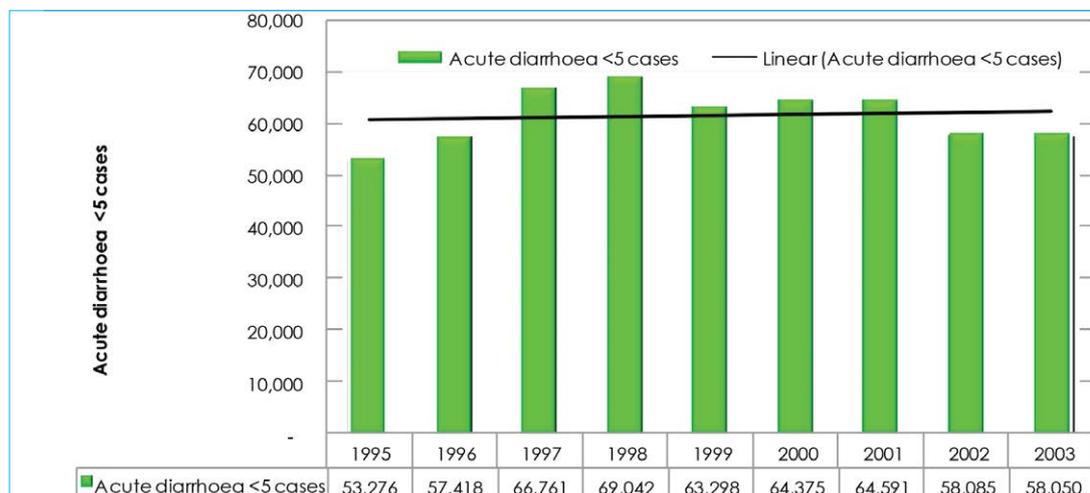


Figure 3.2b Acute diarrhoea cases in over 5 year olds (1997 to 2003)

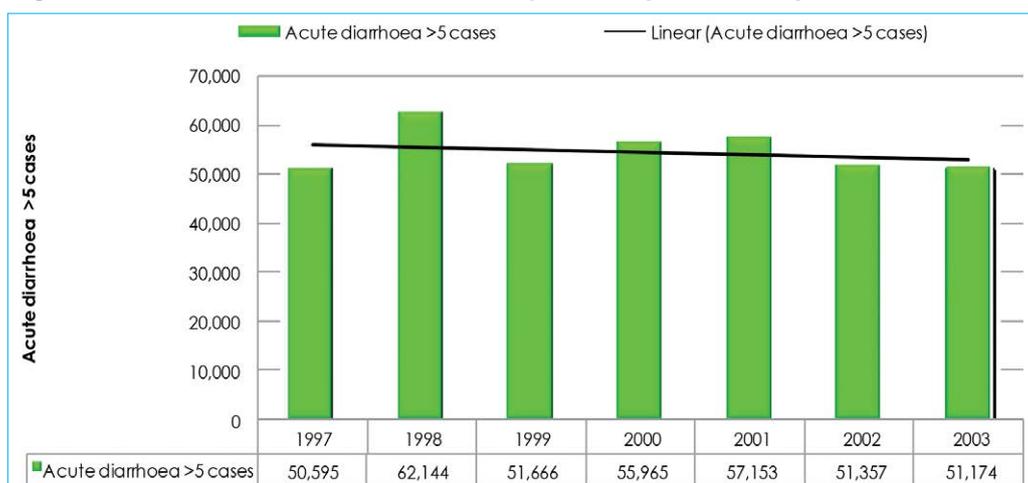
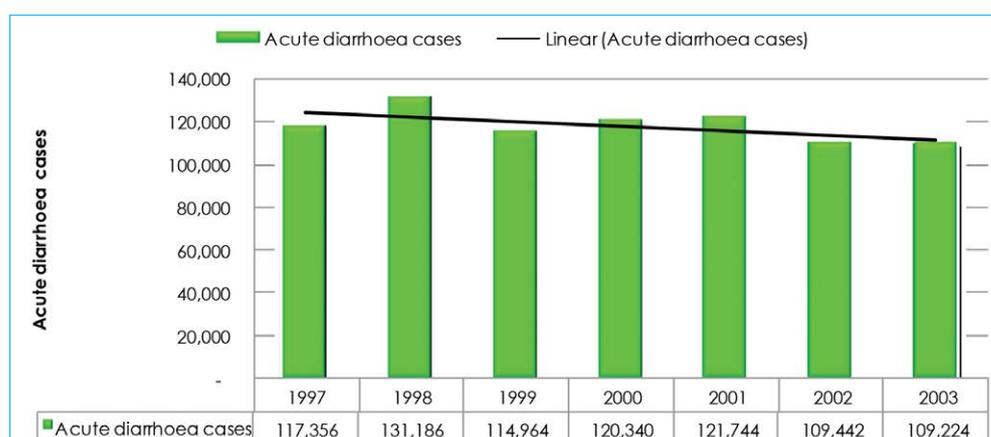


Figure 3.2c indicates the trend in the total diarrhoea cases and shows a general decline during the period 1997 to 2003.

Figure 3.2c Diarrhoea cases in Botswana 1997 to 2003



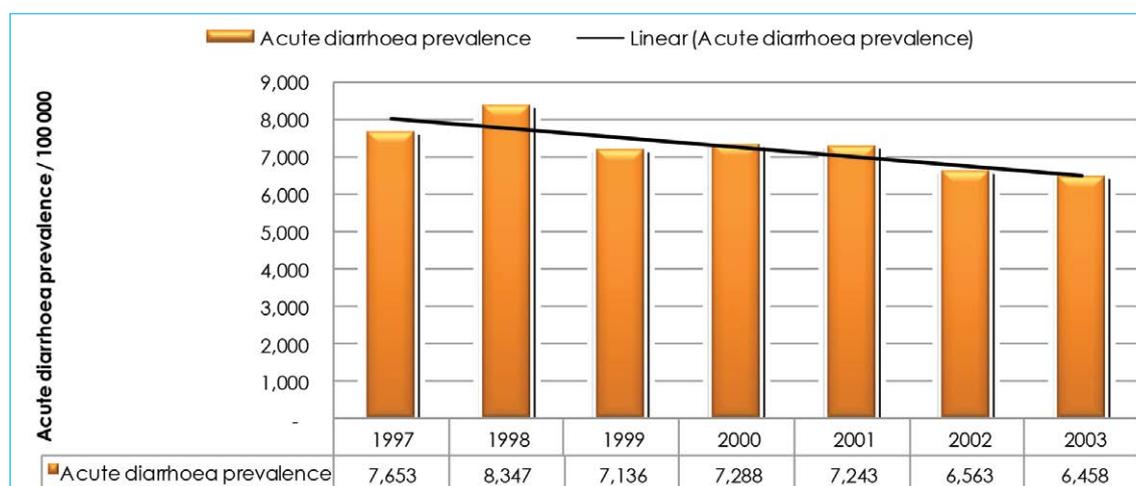
The prevalence of diarrhoeal cases has been calculated using the total cases of diarrhoea and projected populations, and is seen in Table 3.2b. Figure 8.4 shows the trend in the prevalence of diarrhoea cases for the period 1997 to 2003. 1998 recorded the highest number of cases of diarrhoea for this period, registering 131,186 cases. Prevalence of the disease was thus also highest in 1998 for the same period.

Table 3.2b Diarrhoea cases and prevalence 1997 to 2003

	1997	1998	1999	2000	2001	2002	2003
Population	1,533,393	1,571,728	1,611,021	1,651,296	1,680,863	1,667,486	1,691,390
Diarrhoea cases	117,356	131,186	114,964	120,340	121,744	109,442	109,224
Prevalence	7,653	8,347	7,136	7,288	7,243	6,563	6,458

Source: Statistics Botswana and ministry of Health Statistics
Population statistics sourced from Statistics Botswana projections based on census

Figure 3.2d Prevalence of diarrhoea (1997 – 2003)



3.2.1.1 Diarrhoea Mortality

Diarrhoea is the second leading cause of death among children under 5 years of age in the world (United Nations International Children's Fund 2009). Table 3.2c shows the diarrhoea deaths.

Trends demonstrated in figures 3.2e and 3.2f indicate increasing diarrhoea deaths, both for the under 5 years old and the over 5 years old cohorts. The year 2003 has the highest number of cases of death from diarrhoea during the period 1990 to 2003. The diarrhoea death rate per 100,000 of the population shows a rise during the period of 1995 to 2003. This is illustrated in figure 8.8. Therefore, while total numbers of diarrhoea cases declined during 1995 through 2003, deaths resulting from acute diarrhoea increased. This could indicate improved hygiene or other preventative measures, though coupled with increasing failures to cure or to successfully treat diarrhoea. While less patients are suffering from diarrhoea, the probability of those infected dying from it has increased.

Table 3.2c Acute diarrhoea deaths (1990 – 2003)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Acute diarrhoea <5 deaths	28	20	37	26	24	24	27	31	24	51	74	79	93	146
Acute diarrhoea >5 deaths	20	16	15	26	27	9	13	1	20	28	29	55	-	136
Total acute diarrhoea deaths	48	36	52	52	51	33	40	32	44	79	103	134	93	282
Acute diarrhoea death rate	-	2.7	3.8	3.7	3.6	2.3	2.7	2.1	2.8	4.9	6.2	8	5.6	16.7

Source: Statistics Botswana and Ministry of Health Statistics
Note: Dashes = no data

Figure 3.2e Acute diarrhoea deaths for under five year olds (1990 – 2003)

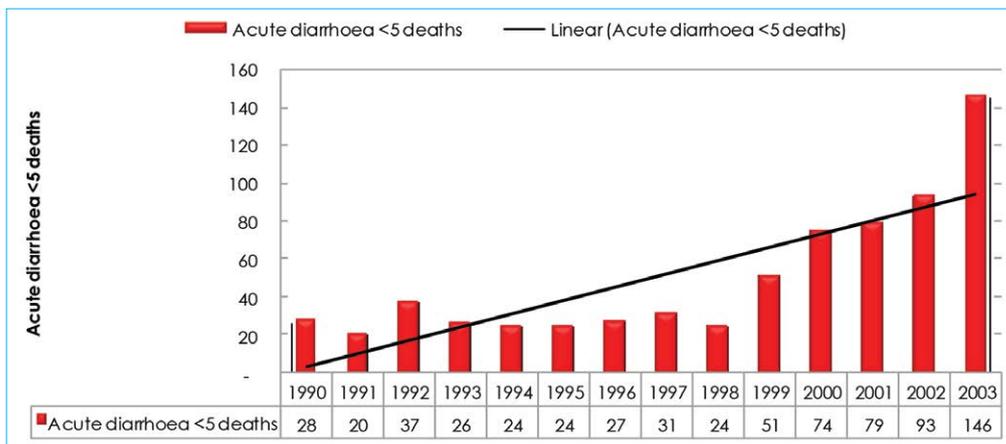


Figure 3.2f Acute diarrhoea deaths for five years old and over (1990 – 2003)

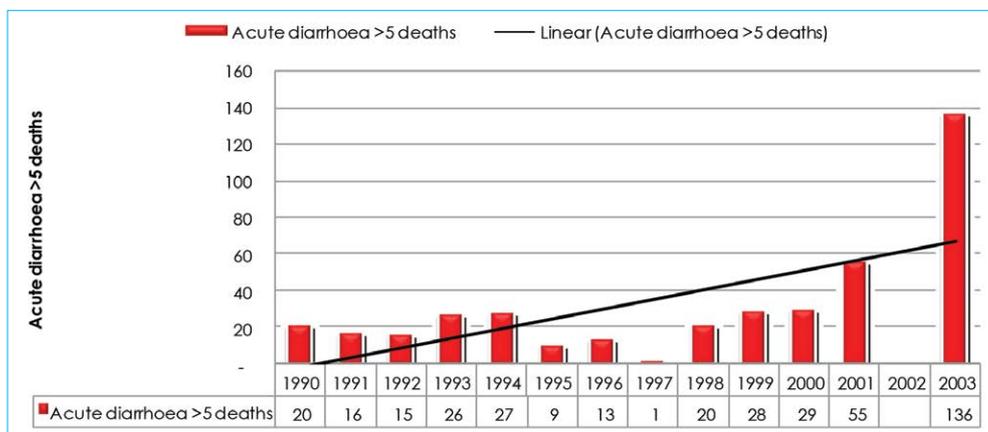


Figure 3.2g Total Acute diarrhoea deaths (1990 – 2003)

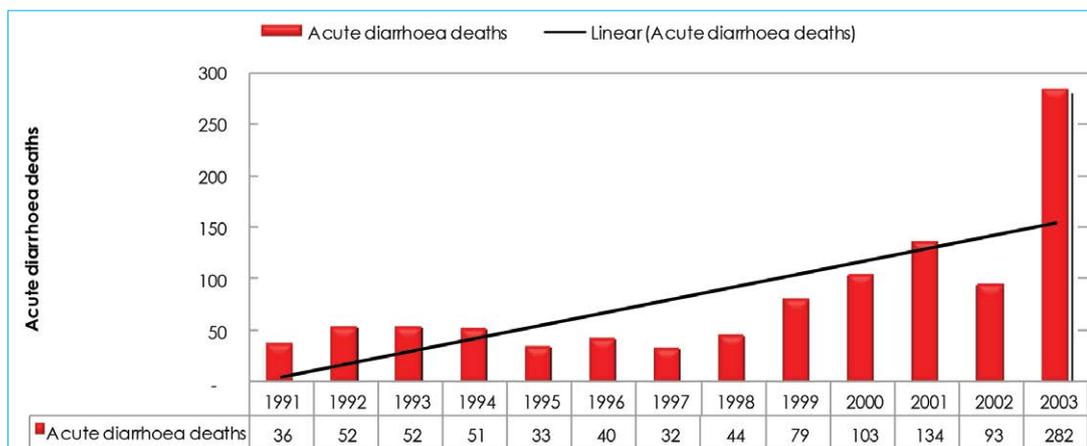
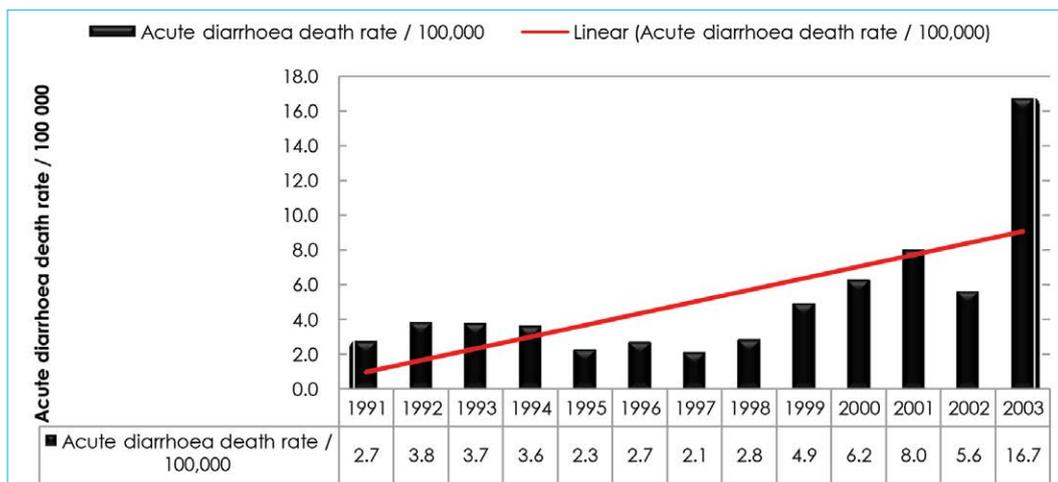


Figure 3.2h Acute diarrhoea death rate per 100, 000 of population (1991 – 2003)



3.2.1.2 Types of diarrhoea

Table 3.2c shows the cases for the different classifications of diarrhoea cases in Botswana over the period 2004 to 2009. Data for 2007 was not available. There are three classes of diarrhoea in the country and these are diarrhoea with some dehydration, diarrhoea with severe dehydration and diarrhoea with blood. Diarrhoea with some dehydration is most common. Figure 3.2i demonstrates the trends.

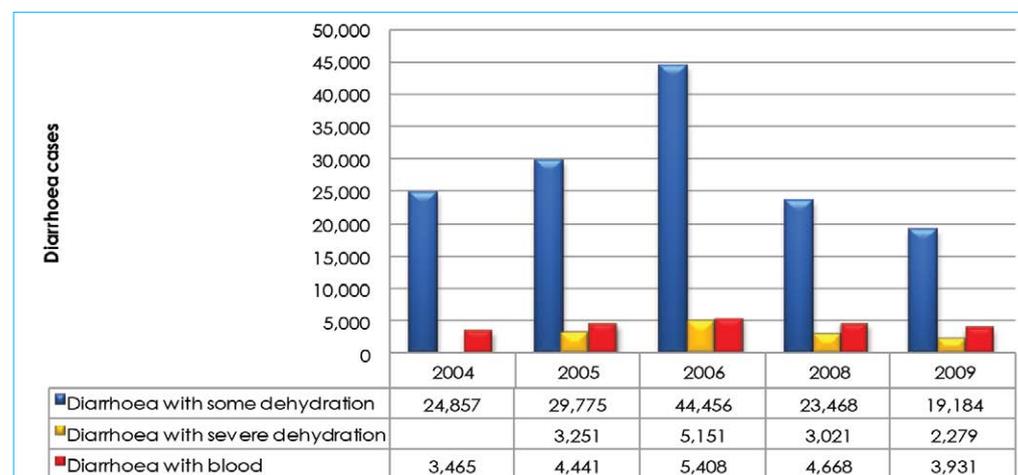
Table 3.2c Types of diarrhoea cases 2004 – 2006, 2008 and 2009

Year	2004	2005	2006	2008	2009
Diarrhoea with some dehydration	24,857	29,775	44,456	23,468	19,184
Diarrhoea with severe dehydration	-	3,251	5,151	3,021	2,279
Diarrhoea with blood	3,465	4,441	5,408	4,668	3,931

Source: Statistics Botswana and Ministry of Health Statistics

Note: Dashes = no data

Figure 3.2i Types of diarrhoea cases (2004, 2005, 2006, 2008 and 2009)



3.2.1.3 Incidence

Due to the nature of acute diarrhoea being a short term illness (versus chronic diarrhoea), the cases are predominantly new cases. Figure 3.2j, 3.2k and 3.2l show this by juxtaposing the new outpatient attendances with repeat attendances for the years 2006, 2008 and 2009.

Figure 3.2j Diarrhoea new and repeat outpatient attendances by district 2006

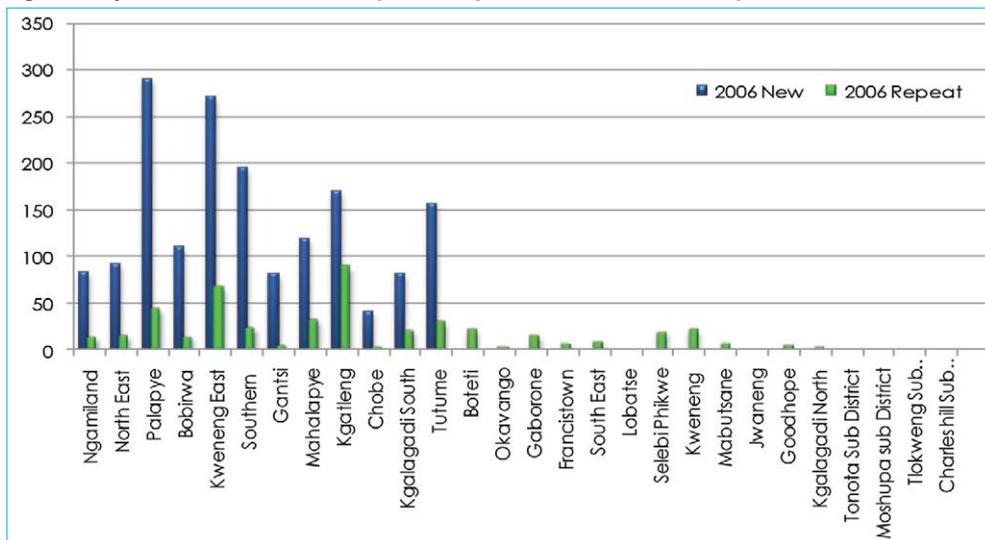


Figure 3.2k Diarrhoea new and repeat outpatient attendances by district 2008

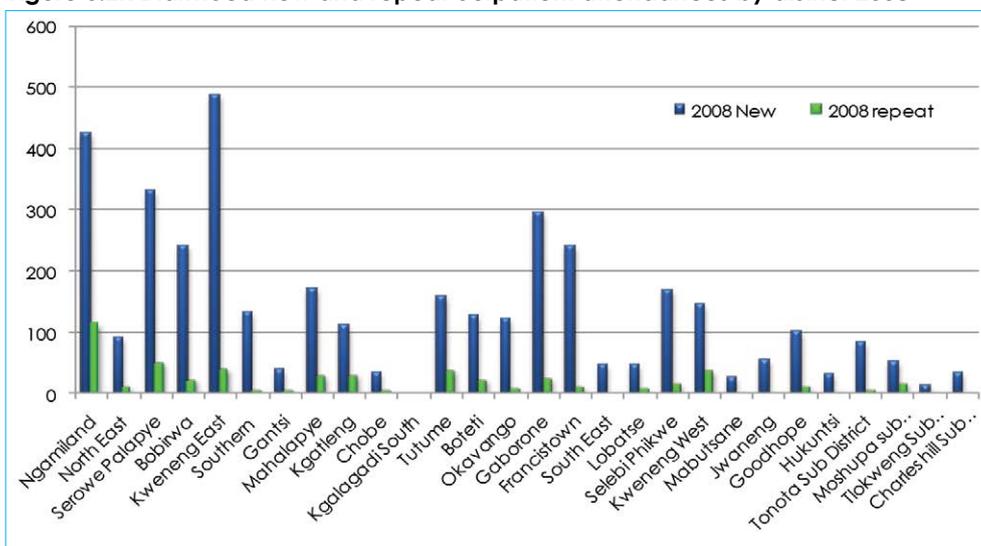
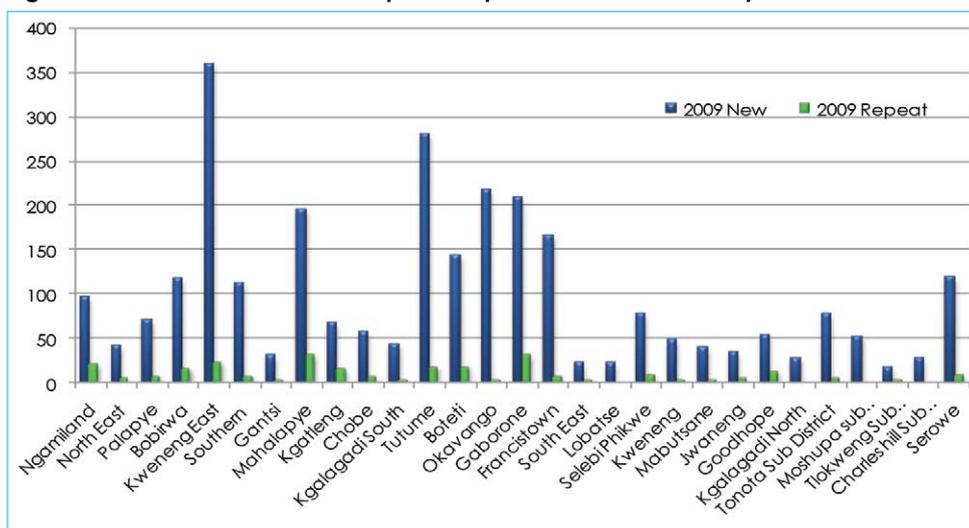


Figure 3.2l Diarrhoea new and repeat outpatient attendances by district 2009



3.3 Vector Borne Diseases

The Framework for the development of environmental statistics suggests some vector borne diseases. Included are vector borne diseases that are transmitted by vectors like insects and arachnids (spiders and scorpions) that carry viruses, bacteria, protozoa and other pathogens (FDES; 2013). The FDES gives the examples of malaria, dengue fever, yellow fever and Lyme disease. Malaria is one of the diseases classified as a 'notifiable' disease by the Ministry of Health in Botswana, which means all cases suspected and confirmed will be reported to the authorities.

3.3.1 Malaria

Most of the malaria in Botswana is caused by the malignant Plasmodium Falciparum sporozoites and the Anopheles arabiensis mosquito is the only vector. (Government of Botswana; 2009) The prevalence and incidence of Malaria is largely determined by the climatic state (moist and warm) for the breeding conditions of the anopheles mosquito. Environments strewn with all types of waste material also create suitable breeding places for the vectors of malaria.

Table 3.3a shows the national confirmed malaria cases figures for the period 1995 to 2009. A graphic depiction is illustrated by figure 3.3a.

There is a downward trend in malaria cases in Botswana, due to elimination programmes by the Ministry of Health. The year 1996 had the highest number of cases at 24,192 cases followed by the subsequent year 1997, at 17,848 cases. The least number of cases were recorded in 2007 & 2005.

Table 3.3a Malaria cases in Botswana (1995 – 2009)

Year	Cases
1995	2,209
1996	24,192
1997	17,848
1998	5,027
1999	12,443
2000	7,758
2001	4,720
2002	1,284
2003	1,886
2004	3,453
2005	530
2006	2,606
2007	464
2008	1,201
2009	885

Source: Statistics Botswana and Ministry of Health Statistics

Figure 3.3a Malaria cases in Botswana (1995 – 2009)

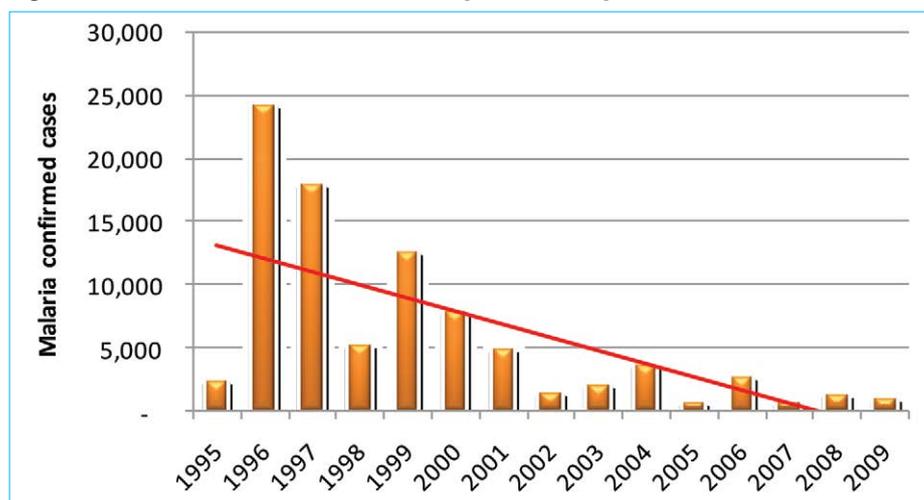


Table 3.3b shows the available figures for confirmed malaria cases by districts for the years 2003, 2004, 2006, 2008 and 2009. The districts Okavango, Chobe, Ngamiland, Tutume and Boteti show the highest cases of confirmed malaria reported. Climatic conditions in these districts are favourable for the proliferation of malaria vectors.

Table 3.3b Malaria cases by district (2003, 2004, 2006, 2008 and 2009)

Year	2003	2004	2006	2008	2009
Ngamiland	237	271	282	361	157
North East	7	6	12	7	2
Serowe/Palapye	53	86	51	79	18
Bobirwa	78	38	33	350	75
Kweneng East	15	3	119	18	38
Southern	4	-	-	0	0
Gantsi	92	34	44	7	8
Mahalapye	12	9	16	13	18
Kgatleng	5	2	15	2	9
Chobe	461	755	530	29	42
Kgalagadi South	11	1	-	0	0
Tutume	210	351	271	41	223
Boteti	157	88	261	30	37
Okavango	454	1,741	789	183	170
Gaborone	14	13	23	8	4
Francistown	53	43	45	14	37
South East	8	2	16	11	2
Lobatse	3	-	-	0	0
Selibe Phikwe	3	6	8	34	10
Kweneng West	1	1	88	9	7
Mabutsane	-	-	-	0	14
Jwaneng	4	3	2	0	10
Good Hope	1	-	-	5	0
Kgalagadi North	3	-	1	0	0
Tonota	-	-	-	-	4
	1,886	3,453	2,606	1,201	885

Source: Statistics Botswana and Ministry of Health Statistics

Note: Dashes = no data. Years 2005 and 2007 data not available
Data is missing for years 2005 and 2007

3.3.2 Mortality

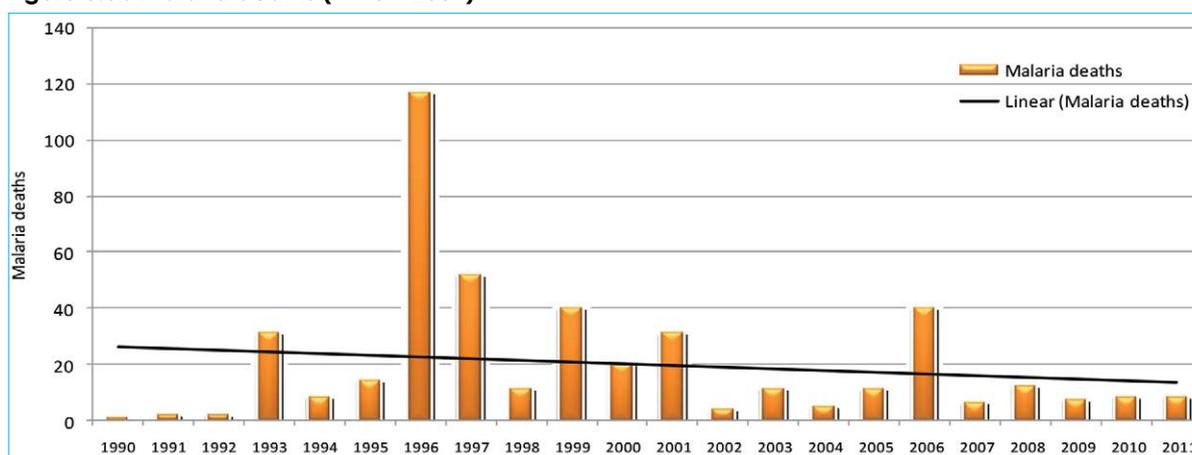
Malaria deaths during the period 1990 to 2009 are indicated in Table 3.3c and Figure 3.3b. The highest number of deaths was in 1996 at 117 deaths, followed by the year 1997 with 52 deaths nationwide.

Table 3.3c Malaria deaths (1990 – 2009)

Year	Malaria deaths
1990	1
1991	2
1992	2
1993	31
1994	8
1995	14
1996	117
1997	52
1998	11
1999	40
2000	20
2001	31
2002	4
2003	11
2004	5
2005	11
2006	40
2007	-
2008	12
2009	7

Source: Statistics Botswana and ministry of Health Statistics
Note: Dashes = no data

Figure 3.3b Malaria deaths (1990 – 2009)



The years 1996, 1997 and 1999 recorded the highest rates of mortality from Malaria. The general trend is that of falling rates of death from Malaria (Table 3.3d). This is indicated graphically in Figure 3.3c which shows the Malaria death rate per 100 000 of the population. The most recent death rate recorded higher than 1 per 100 000 of population is that for the year 2006, which was buoyed by the Okavango district Malaria deaths recorded at 17 deaths. Okavango district is one of the districts prone to Malaria in Botswana.

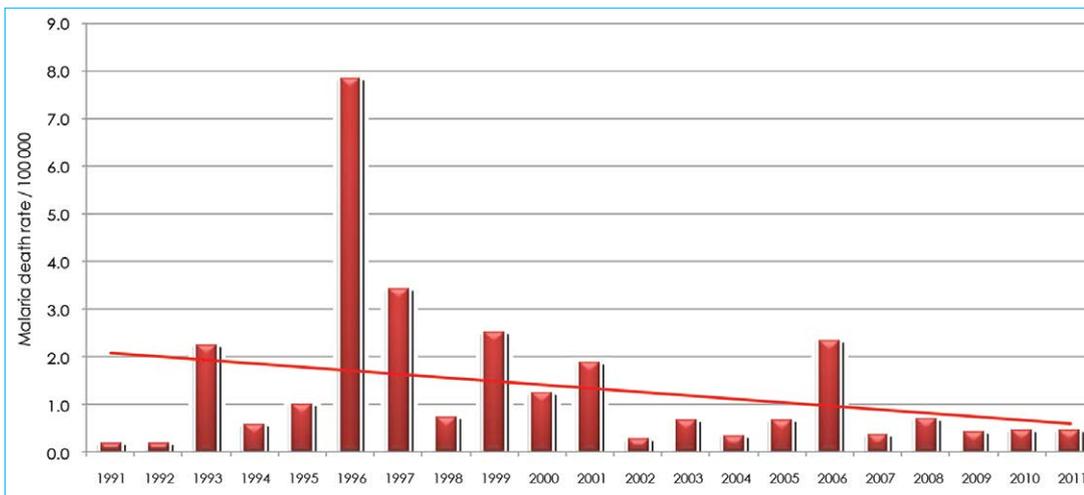
Table 3.3d Malaria death rate in Botswana (1991 to 2011)

Year	Malaria death rate
1991	0.2
1992	0.1
1993	2.2
1994	0.6
1995	1
1996	7.8
1997	3.4
1998	0.7
1999	2.5
2000	1.2
2001	1.8
2002	0.2
2003	0.7
2004	0.3
2005	0.6
2006	2.3
2007	0.3
2008	0.7
2009	0.4
2010	0.4
2011	0.4

Source: Statistics Botswana, ministry of Health Statistics and World Health Organisation Statistics

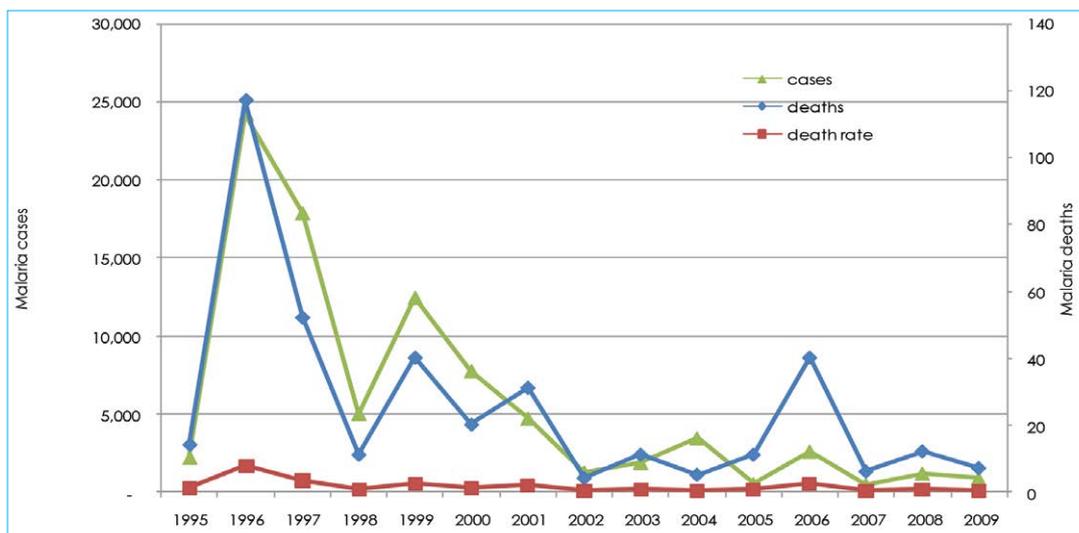
Note: blanks = no data. Years 2005 and 2007 data not available

Figure 3.3c Malaria death rate per 100 000



Juxtaposing the Malaria cases, deaths and death rate as in figure 3.3d shows that the cases and deaths trends correspond over the years. The years that had higher Malaria confirmed cases (1996, 1997, 1999 and 2006) also had the higher numbers of deaths.

Figure 3.3d Malaria deaths and death rate



The prevalence and incidence of Malaria is largely determined by the climatic conditions which should be moist and warm for the breeding environment of the anopheles mosquito. Such conditions dominate in districts such as Okavango, Ngamiland and Chobe, and thus Malaria cases and deaths are highest there. Changing climatic conditions and global warming bear possibilities of the proliferation of mosquitoes and Malaria in areas previously known to have limited cases of Malaria.

3.4 Health Problems Associated with Excessive UV Radiation Exposure

In this topic, the Framework for Development of Environmental Statistics (FDES) gives examples of skin cancers and cataracts as health problems associated with excessive radiation exposure. The earth is protected from excessive Ultra Violet (UV) radiation by the stratospheric ozone layer, which is a naturally occurring gas. Ozone is depleted by the emission of ozone depleting substances (ODS) into the environment. Depletion of the ozone layer results in increased UV radiation reaching the earth's surface, which leads to higher chances of overexposure to UV radiation and the associated adverse effects such as skin cancer, cataracts and immune suppression (United States Environmental Protection Agency; 2010). The Montreal Protocol is an international agreement that aims at phasing out the use of the ODS so as to protect the ozone layer. Excessive UV radiation is the main factor responsible for skin cancers.

Botswana gets sunshine throughout most of the year. Mean annual sunshine hours vary from 8.2 to 9.7 hours per day (Department of Meteorological Services 2014; online).

Cancer is not wholly a result of excessive UV radiation from the sun. Skin cancers are more the result of such radiation. Eye cataracts are also a possible result of excessive UV radiation.

Table 3.4a shows the trend of cancer cases for Botswana during the period 1998 to 2008. Figure 3.4a illustrates the same graphically. During this period cancer cases in Botswana peaked at 1,402 in 2007. The years 2004, 2006, 2005 and 2003 followed at 1,366, 1,325, 1,314 and 1,244 respectively. The trend shows that there are increasing cancer cases in the country.

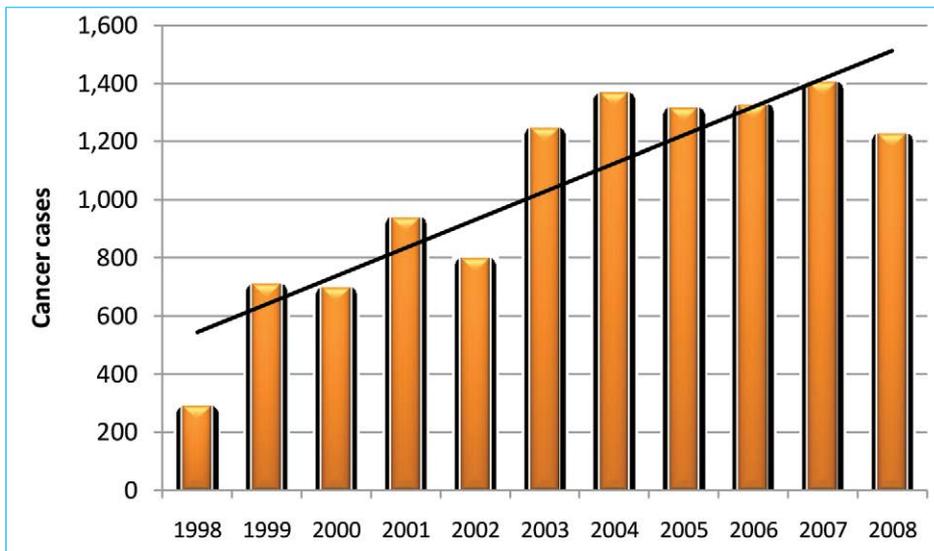
Table 3.4a Cancer cases in Botswana

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
1.1.											
Cancer cases	347	708	696	938	798	1,244	1,366	1,314	1,325	1,402	1,225

Source: Statistics Botswana and ministry of Health Statistics

Note: blanks = no data.

Figure 3.4a Cancer cases in Botswana



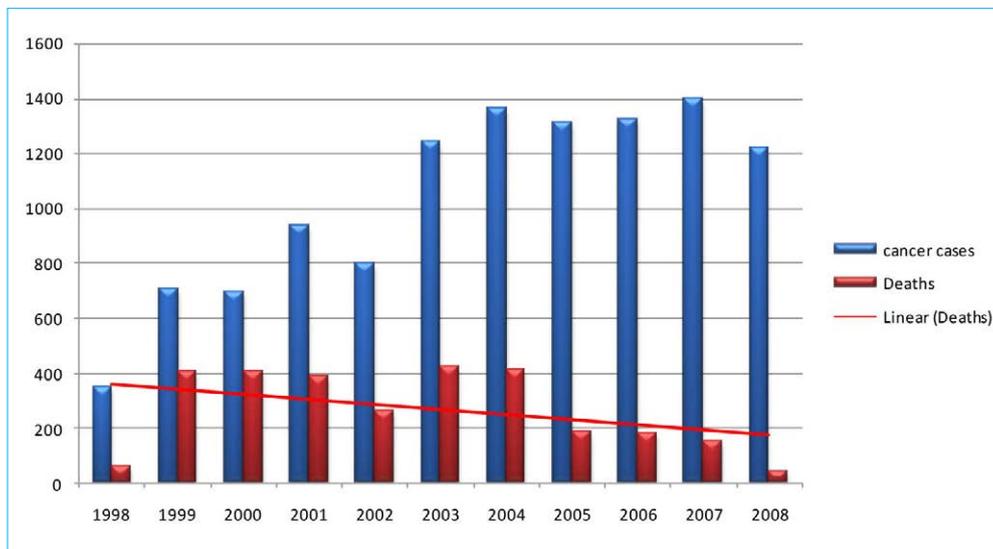
While cancer case numbers rose sharply from 1998 to 2008, cancer deaths declined over the same period. Table 3.4 b shows the numbers of cancer deaths against the number of cases during this period. Figure 3.4 b shows the trends in the cases against the numbers of cancer deaths for the period.

Table 3.4b Registered cancer cases and deaths (1998-2008)

Year	Registered cancer cases	Deaths
1998	347	63
1999	708	408
2000	696	406
2001	938	389
2002	798	265
2003	1,244	423
2004	1,366	413
2005	1,314	188
2006	1,325	181
2007	1,402	154
2008	1,225	44
Total	11,363	2,934

Source: Ministry of Health

Figure 3.4b Registered cancer cases and deaths (1998-2008)



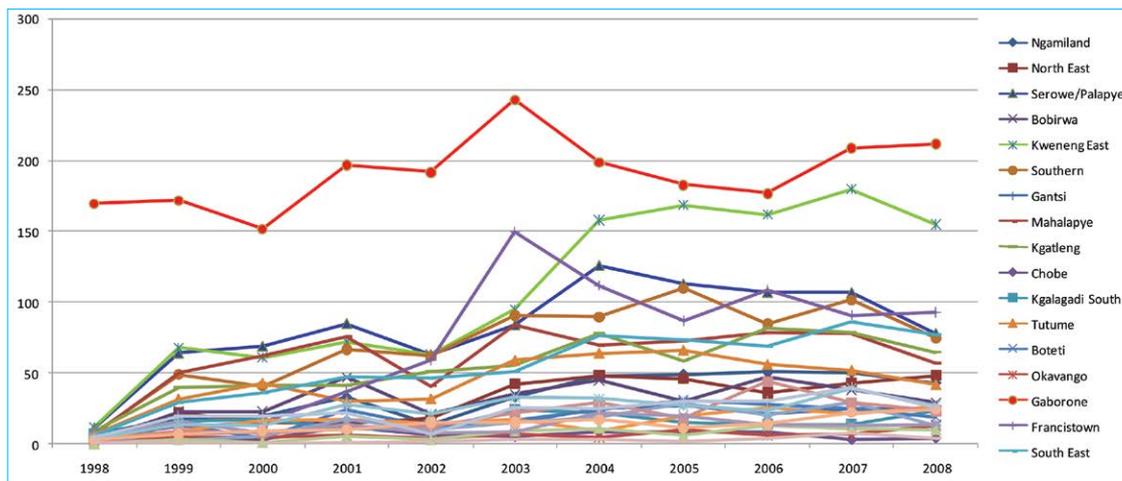
The key environmental determinant of skin cancer is excessive ultraviolet (UV) radiation from the sun. Generally all the districts get sunshine for most of the year in Botswana. There is, however, variance in the figures of cancer cases for the districts. There is no evidence that the variance in district cases is related to any environmental factors. Table 3.4c and Figure 3.4c show the cancer cases for the districts for the period 1998 to 2008. Gaborone shows the highest recorded cases of cancer. This could be due to the higher number of referral hospitals in the capital city, which is where cancer cases are most likely to be diagnosed, treated and therefore reported. Kweneng East demonstrates relatively high cancer case numbers from 2004, while Serowe/Palapye and Southern districts show consistently comparatively high case numbers.

Table 3.4c Cancer cases by district (1998 - 2008)

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Gaborone	170	172	152	197	192	243	199	183	177	209	212
Francistown	6	12	15	37	59	150	112	87	109	91	93
Lobatse	3	9	16	17	14	17	9	19	25	21	26
Selibe Phikwe	2	3	6	17	10	15	19	28	20	29	13
Serowe/Palapye	11	64	69	85	63	84	126	113	107	107	78
Mahalapye	7	50	62	76	41	84	70	73	79	78	57
Jwaneng	5	16	8	14	8	9	22	20	14	13	14
Ngamiland	7	18	20	33	14	33	48	49	51	50	43
North East	3	22	15	14	18	42	48	46	36	43	48
Bobirwa	2	23	23	47	21	35	45	30	47	38	29
Kweneng East	12	68	61	72	63	95	158	169	162	180	155
Southern	8	49	41	67	62	91	90	110	85	102	75
Gantsi	6	7	8	12	11	15	25	27	21	25	25
Kgatleng	9	40	41	41	51	56	78	59	82	79	65
Chobe	0	3	3	12	6	5	8	8	8	3	4
Kgalagadi South	7	16	17	11	10	24	22	15	14	14	23
Tutume	7	32	43	30	32	59	64	66	56	52	42
Botefi	1	14	4	24	12	17	24	31	28	25	19
Okavango	1	5	5	6	4	7	5	10	6	7	13
South East	6	29	36	47	46	51	76	73	69	86	77
Kweneng West	2	9	8	11	12	22	29	18	44	29	23
Mabutsane	0	3	1	5	3	9	11	6	13	11	10
Good Hope	4	14	13	28	21	33	32	27	23	39	27
Kgalagadi North	3	7	9	10	15	15	17	11	14	22	24
Tonota	5	20	20	22	7	26	25	30	30	40	26
Charles Hill	1	1	0	1	2	3	3	2	4	8	4
Outside Botswana	0	1	0	2	1	3	1	4	1	1	0
Unknown	0	1	0	0	0	1	0	0	0	0	0
National	*347	708	696	938	798	1,244	1,366	1,314	1,325	1,402	1,225

Source: Statistics Botswana and Ministry of Health Statistics

Figure 3.4c Cancer cases by district 1998 - 2008



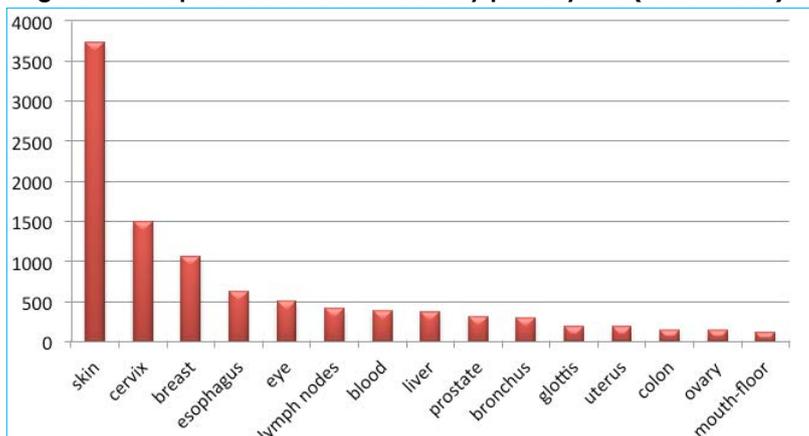
Various cancers make up the recorded numbers of cancer cases. The cancer associated with excessive UV radiation is skin cancer, which recorded the highest numbers of cases over the ten years period studied. Table 3.4d shows the top 15 cancers that recorded the highest numbers of cases, by primary site on the human anatomy, recorded during the time period 1998 to 2008. Figure 3.4d demonstrates the same graphically. Cancer of the skin dominates the numbers with 24 percent of the cancer cases recorded between 1998 and 2008. This is followed by cancers of the cervix, breast, oesophagus and eye with 13.2, 9.3, 5.5, and 4.4 percent respectively.

Table 3.4d Top 15 recorded cancers by primary site (1998 – 2008)

	Primary site	Frequency	Percent
1	Skin	3,732	24
2	Cervix	1,496	13.2
3	Breast	1,061	9.3
4	Oesophagus	620	5.5
5	Eye	505	4.4
6	Lymph nodes	416	3.7
7	Blood	382	3.4
8	Liver	378	2.8
9	Prostate	317	2.8
10	Bronchus	303	2.7
11	Glottis	190	1.7
12	Uterus	188	1.6
13	Colon	143	1.3
14	Ovary	142	1.2
15	Mouth-floor	119	1

Source: Ministry of Health

Figure 3.4d Top 15 recorded cancers by primary site (1998 – 2008)



Skin cancers were the most common cancers during the 1998 to 2008 period. Table 3.4e shows the total cancer numbers for selected types of cancers by their primary site on the body, in the districts for the ten years. The selected cancers are those more likely to be related to environmental factors.

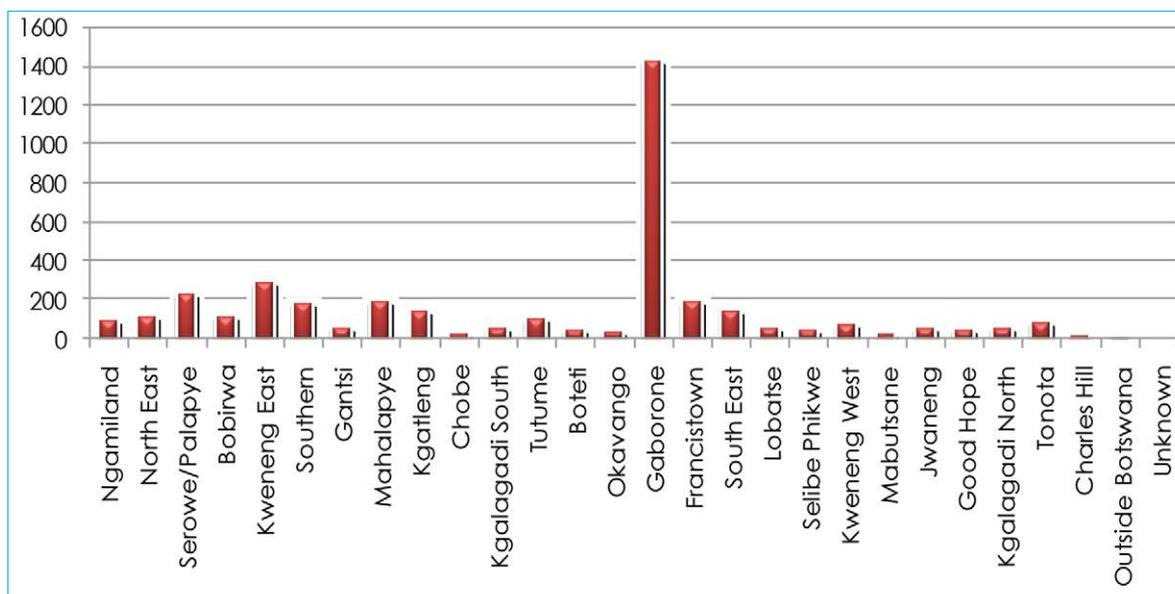
Table 3.4e Cancer cases by type of cancer (primary site) for selected cancers (1998 – 2008)

	Skin	Oesophagus	Eye	Lymph Nodes	Blood	Thyroid	Total selected	All cancers
Ngamiland	92	19	21	12	9	4	157	366
North East	108	22	11	8	8	4	161	337
Serowe/Palapye	226	66	36	25	44	5	402	913
Bobirwa	103	23	16	12	6	1	161	342
Kweneng East	280	58	55	54	56	5	508	1,198
Southern	177	45	18	25	37	9	311	783
Gantsi	49	8	7	4	4	1	73	182
Mahalapye	188	34	27	18	10	4	281	678
Kgatleng	136	48	24	16	19	3	246	605
Chobe	20	3	0	3	2	1	29	61
Kgalagadi South	44	5	3	5	6	1	64	173
Tutume	100	41	27	16	13	0	197	483
Boteti	41	9	11	5	8	5	79	199
Okavango	25	0	4	2	2	0	33	69
Gaborone	1,426	74	121	94	72	16	1,803	2,137
Francistown	187	40	60	42	16	3	348	772
South East	136	31	15	21	24	3	230	596
Lobatse	51	4	2	11	6	2	76	177
Selibe Phikwe	41	9	11	6	8	3	78	164
Kweneng West	68	9	7	7	9	1	101	207
Mabutsane	17	5	1	2	2	0	27	72
Jwaneng	50	9	3	9	3	1	75	144
Good Hope	40	25	8	5	4	1	83	262
Kgalagadi North	44	11	6	5	2	1	69	147
Tonota	76	21	10	8	8	0	123	251
Charles Hill	6	1	1	1	2	1	12	29
Outside Botswana	1	0	0	0	2	0	3	14
Unknown	0	0	0	0	0	0	0	2
National	3,732	620	505	416	382	75	5,730	11,363

Source: Statistics Botswana and Ministry of Health Statistics

Figure 3.4e shows the district skin cancer cases over the 1998 to 2008 period. Most of the skin cancer cases recorded were in Gaborone, which is where most of the overall cancer cases were registered too. The same applies for the other selected cancers of the oesophagus, eye, thyroid, blood and Lymph nodes.

Figure 3.4e Skin cancer cases by district (1998 – 2008)



3.5 Toxic Substance and Nuclear Radiation Diseases and Conditions

This includes diseases and conditions that are associated with exposure to toxic substances, residuals, and or waste that result from localized emissions. Examples from the FDES are chronic illnesses of the respiratory system such as pneumonia, upper respiratory diseases, asthma and chronic pulmonary diseases.

3.5.1 Pneumonia

Pneumonia is an inflammatory condition of the lungs usually caused by infection with bacteria and virus and less commonly by parasites and fungi. It is caused when an individual breathes in pneumonia causing germs into the lungs, especially at times of immune deficiency. Pneumonia and diarrhoea are regarded as diseases of poverty and are closely associated with such factors as poor home environments, under nutrition and lack of access to essential services, United Nations Children’s Fund (2012). Pneumonia is one of Botswana’s notifiable diseases and is thus closely monitored. It is one of the major causes of death among infants, under-fives, and all age groups in Botswana. (Statistics Botswana: 2013).

Table 3.5a shows the cases of pneumonia and severe pneumonia in Botswana for the selected years between 2003 and 2009. Overall pneumonia cases were very high in 2003 at 13,011 cases, compared to the other years observed. The year 2008 followed with less than half the cases of 2003, at 5,191 cases, and 2004 with 4,464 cases. The cases of severe pneumonia and overall pneumonia cases generally fluctuate similarly. Severe pneumonia cases contribute to the broader numbers of pneumonia cases.

Table 3.5a Botswana cases of Pneumonia 2003, 2004, 2006, 2008 and 2009

Year	2003	2004	2005	2006	2008	2009
Pneumonia	13,011	4,464	3,755	3,975	5,191	3,194
Severe Pneumonia	-	791	517	569	909	548

Source: Statistics Botswana and ministry of Health Statistics
Note: blanks = no data

Indications are that the year 2003 had comparatively high numbers of pneumonia cases. The general trend however, is that of declining numbers of pneumonia cases in Botswana.

Table 3.5b and figure 11.2 show the district cases of pneumonia. The high cases of pneumonia recorded in 2003 were largely the result of high numbers of cases in the urban centres of Gaborone and Francistown, where 1,023 and 3,782 cases were recorded respectively.

Table 3.5b Pneumonia cases 2003, 2004, 2006, 2008 and 2009

Year	2003	2004	2005	2006	2008	2009
Ngamiland	881	45	-	225	456	165
North East	327	100	-	46	322	220
Serowe/Palapye	460	199	-	119	45	0
Bobirwa	879	82	-	13	382	197
Kweneng East	796	751	-	420	335	326
Southern	603	353	-	189	435	103
Gantsi	205	344	-	179	190	297
Mahalapye	638	171	-	145	234	197
Kgatleng	374	201	-	433	437	29
Chobe	88	101	-	69	28	19
Kgalagadi South	461	124	-	47	27	18
Tutume	437	164	-	42	131	30
Boteti	216	76	-	318	183	4
Okavango	269	1,048	-	64	262	187
Gaborone	1,023	675	-	398	421	447
Francistown	3,782	229	-	460	301	0
South East	375	262	-	47	123	227
Lobatse	95	140	-	275	56	0
Selibe Phikwe	478	65	-	9	123	42
Kweneng West	111	130	-	88	143	279
Mabutsane	43	3	-	19	220	78
Jwaneng	251	43	-	173	106	116
Good Hope	120	20	-	139	92	106
Kgalagadi North	99	82	-	58	139	107
Botswana	13,011	4,464	3,755	3,975	5,191	3,194

Source: Statistics Botswana and ministry of Health Statistics

Note: blanks = no data

Figures 3.5a and 3.5b show the distribution of pneumonia cases across the districts of the years of available data, with and without the outlier year 2003. There is no spatial pattern of pneumonia cases apparent.

Figure 3.5a Pneumonia cases by district 2003, 2004, 2006, 2008 and 2009

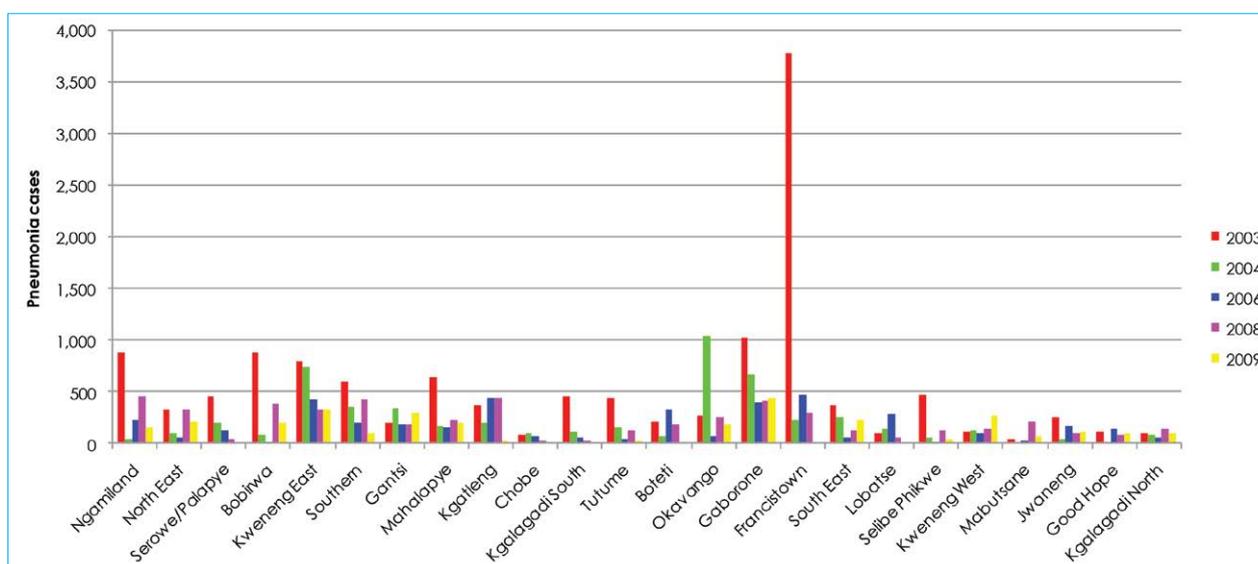


Figure 3.5b Pneumonia cases by district 2004, 2006, 2008 and 2009 (exclusion of year 2003)

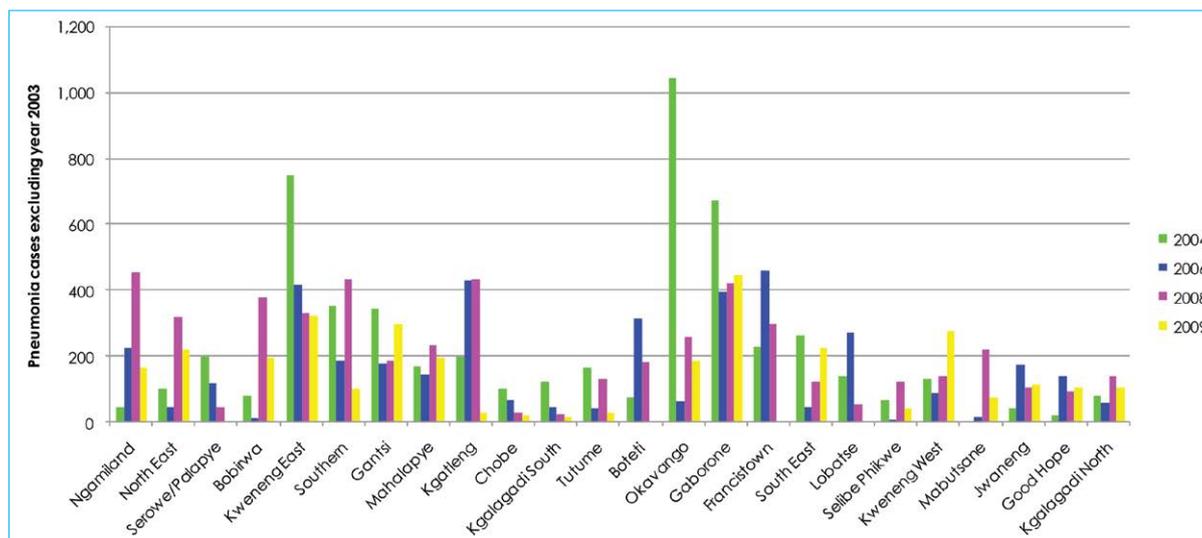


Table 3.5c shows the prevalence of Pneumonia as per 100,000 of the population, calculated using the projected populations of the districts of the country, for some selected years. The apparent trend is that of falling prevalence of pneumonia in Botswana.

Table 3.5c Prevalence of Pneumonia in Botswana (per 100,000)

Year	Cases	Population	Prevalence
2003	13,011	1,691,390	769.2
2004	4,464	1,711,335	260.8
2005	3,755	1,727,371	217.4
2006	3,975	1,739,554	228.5
2007	-	1,756,651	-
2008	5,191	1,776,282	292.2
2009	3,194	1,798,371	177.6

Source: Calculated using data from Statistics Botswana and ministry of Health
Note: Dash = no data

3.5.2 Mortality

Pneumonia is responsible for many of the deaths of infants, children under 5 and over five year old people in Botswana. Table 3.5d shows pneumonia deaths for 2003 and 2004 and data is missing for most of the districts. Evidently Francistown's high record of pneumonia cases in 2003 resulted in relatively high numbers of deaths from pneumonia. While Gaborone also had high recorded cases of pneumonia in the year 2003, it recorded relatively low deaths from pneumonia for that year. The reason for this is not clear from data and statistics, but may be due to the higher number of referral hospitals and therefore more access to earlier treatment and care, which is vital for the survival of pneumonia patients.

Table 3.5d Pneumonia deaths by district 2003 and 2004

District	2003	2004
Ngamiland	18	-
North East	2	-
Serowe/Palapye	29	6
Bobirwa	1	-
Kweneng East	9	-
Southern	-	1
Gantsi	3	3
Mahalapye	-	-
Kgatleng	-	-
Chobe	-	-
Kgalagadi South	-	-
Tutume	-	-
Boteti	-	-
Okavango	-	-
Gaborone	2	-
Francistown	226	5
South East	-	-
Lobatse	-	-
Selibe Phikwe	2	6
Kweneng West	2	3
Mabutsane/ Ngwaketse West	-	-
Jwaneng	-	-
Good Hope/ Barolong	-	1
Kgalagadi North	-	22
National	294	26

Source: Statistics Botswana and ministry of Health Statistics

Note: Dashes = no data

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