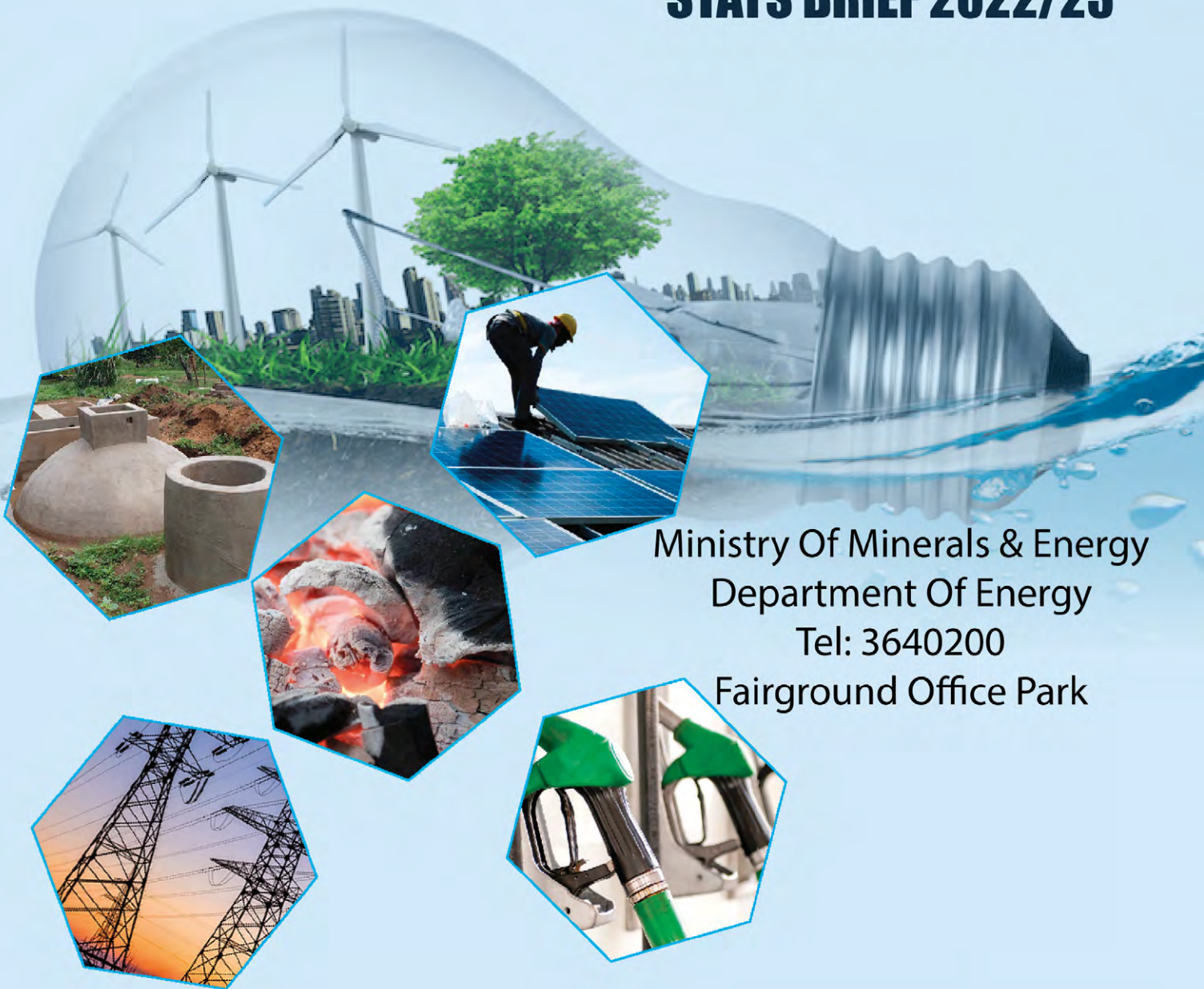





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NATIONAL ENERGY USE SURVEY

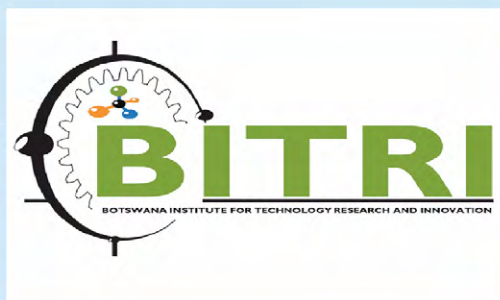
STATS BRIEF 2022/23



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**NATIONAL ENERGY USE SURVEY
STATS BRIEF 2022/23**

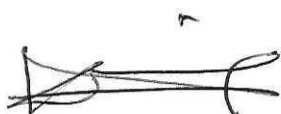
Preface

This Stats Brief presents preliminary results of the 2022/23 National Energy Use Survey (NEUS). The results are provisional and may be adjusted upon release of the main report after completion of data analysis.

The Brief focuses primarily on the main indicators in the Energy Sector, such as national energy consumption, which includes sources of energy for cooking, electrification rates and the penetration of renewable energy technologies.

The 2022/23 National Energy Use Survey was conducted by Department of Energy in collaboration with Statistics Botswana and Botswana Institute for Technology Research and Innovation (BITRI).

We are grateful to officers at all levels in the tripartite partnership for their enduring guidance and support for the success of this exercise, and to all individuals who contributed to this national project. I wish to thank in particular households who made time to respond to the questionnaires.



.....
Pelaelo Khowe
Ag Permanent Secretary
Ministry of Minerals and Energy
November 2023



.....
Burton S. Mguni
Statistician General
Statistics Botswana
November 2023

Contents

1.	INTRODUCTION.....	1
1.1	Scope.....	1
1.2	Objectives.....	1
2.	PRELIMINARY RESULTS AND ANALYSIS.....	2
2.1	National Energy Consumption by District, Locality Type and per Household.....	2
2.2	Electrification by District, Locality Type and Income Level.....	5
2.3	Penetration of Renewable Energy Technologies by District, Locality Type and Income Level.....	8
2.4	Energy Consumption for Cooking.....	10

List of Tables

Table 2.1A:	Total Annual Energy Consumption of the Different Sources of Energy by District (TJ).....	2
Table 2.1B:	Annual Energy Consumption per Household By District.....	3
Table 2.2A:	Electrification Proportions of Households by District and to the National Level.....	5
Table 2.2B:	Grid and off Grid Electrification proportions of Households by District and to the National Level.....	6
Table 2.2C:	Electrification Shares of Households by Monthly Income Levels.....	7
Table 2.3A:	Penetration of Solar Water heaters, Photovoltaic (PV) and Biogas by District.....	8
Table 2.3B:	Penetration of Solar Water Heaters, PV and Biogas By Locality Type.....	8
Table 2.3C:	Penetration of Solar Water heaters, PV and Biogas by Monthly Income Levels.....	9
Table 2.4:	Shares of Households Using Fuels as a Main Source for Cooking (%) By District.....	10

List of Figures

Figure 1:	Total Annual Energy Consumption of the Different Sources (%).....	2
Figure 2:	Total Energy Consumption per Household by locality type (%).....	4
Figure 3:	Ways of Electrification by Locality Type.....	7

1. INTRODUCTION

Department of Energy (DoE) in collaboration with Statistics Botswana (SB) and Botswana Institute for Technology Research and Innovation (BITRI) conducted the National Energy Use Survey (NEUS). This was necessitated by the fact that SB is the national statistics authority institution and BITRI is a research institution in the energy space.

The National Energy Use Survey collected data for energy consumption in the Household sector in Botswana. Information regarding the energy consumption of different energy sources such as firewood, petrol, diesel, coal, electricity, etc. for the households' different end uses (cooking, water heating, etc.) was collected and analysed.

The survey was the first of its kind and will be conducted every five (5) years. NEUS field work was conducted over a two (2) months period from the 14th of November 2022 to the 17th of February 2023. The fieldwork was divided into two phases/rounds to cater for the festive season from mid-December until mid-January 2023 during which the teams went for a break of twenty-four (24) days. The first round commenced on the 14th of November 2022 and was completed on the 16th of December 2022 while the second round started on the 9th of January 2023 and ended on the 17th of February 2023.

1.1 Scope

NEUS covered all the sampled households in Botswana and provided a detailed picture of the breakdown of consumption of each energy product. It also provided important and critical information that is currently not available such as the consumption of biomass and installations of solar systems. The survey covered 355 Enumeration Areas (EAs) which translated to 4,260 households.

The survey results will be published in the main report presenting the methodology of computation of the results and the main conclusions that were drawn from the data analysis. This should include among others:

- **the total annual energy consumption per energy product, and per sector, which will also be used for the production of the energy balance;**
- **computation of the quantities and types of energy consumed by households;**
- **computation of the quantities and types of energy consumed for cooking, space heating, water heating, and lighting;**
- **Computation of energy consumption per income level, and per geographical area.**
- **electrification level and off-grid electrification technologies;**
- **renewable energy technologies penetration;**
- **Perception of Renewable Energy (RE) and Energy Efficiency (EE) technologies; barriers to the introduction of RE and EE technologies.**

1.2 Objectives

The main objective of the survey is to strengthen the energy sector by improving energy statistics and providing robust data for energy planning, policy formulation and review.

Reliable statistics in the form of a detailed energy balance and energy indicators are necessary in order to monitor the energy sector and the implementation of related strategies. The specific objectives of the National Energy Use Survey in households are:

- a) To estimate the level of energy use in households in the country.**
- b) To analyse the structure of energy consumption per use in the household.**
- c) To provide data for energy planning studies and related models.**

2. PRELIMINARY RESULTS AND ANALYSIS

2.1 National Energy Consumption by District, Locality Type and per Household

Table 2.1A: Total Annual Energy Consumption of the Different Sources of Energy by District (TJ)

District	Biomass	Petrol (Gasoline)	Diesel	Paraffin	LPG	Coal	Electricity	Total
Gaborone	502.8	1 237.7	330.3	3.6	236.0	30.0	1 115.4	3 455.7
Francistown	358.3	280.4	100.3	1.5	65.0	8.4	241.4	1 055.3
Lobatse	171.5	81.2	34.1	3.3	41.7	5.4	77.4	414.6
Selibe Phikwe	177.1	101.9	10.6	0.3	26.9	0.0	78.4	395.1
Orapa	2.3	61.9	26.8	0.0	14.6	4.4	11.8	121.8
Jwaneng	160.5	41.5	0.0	0.7	18.3	0.0	50.6	271.7
Sowa	40.7	19.8	6.0	0.0	3.8	0.0	11.0	81.3
Ngwaketse South	2621.1	299.8	58.3	5.6	101.6	1.3	138.1	3 226.0
Borolong	486.0	147.5	20.3	3.4	39.7	0.0	96.0	792.9
Ngwaketse West	536.3	48.3	146.7	0.9	3.1	0.0	3.1	738.5
South_East	1 122.8	397.1	147.0	1.7	115.4	12.3	287.7	2 083.9
Kweneng East	3 217.4	958.5	328.3	8.1	223.6	12.5	837.0	5 585.4
Kweneng West	1 475.6	62.7	92.9	2.1	18.1	4.8	42.2	1 698.4
Kgatleng	2 015.8	392.2	114.3	4.6	72.3	1.1	248.8	2 849.1
Serowe Palapye	2 917.1	337.5	82.0	5.4	72.6	8.9	270.2	3 693.8
Central Mahalapye	2 587.5	238.0	176.5	7.5	57.0	0.0	149.8	3 216.2
Central Bobonong	1 353.9	104.8	31.6	0.6	18.7	0.0	66.3	1 575.9
Central Boteti	1 251.6	227.1	39.9	0.6	56.4	0.0	136.8	1 712.4
Central Tutume	2 469.3	230.1	88.9	2.9	54.7	0.0	142.7	2 988.6
North East	1 035.8	212.3	39.2	1.8	49.5	1.0	132.7	1 472.3
Ngami East	1 523.4	356.4	71.9	5.7	113.4	0.0	227.1	2 297.8
Ngamiland West	399.1	33.6	5.0	0.1	7.9	4.1	34.8	484.6
Chobe	350.7	62.6	14.0	0.5	14.0	0.0	67.2	509.0
Ghanzi	592.7	215.0	140.0	0.8	19.5	0.0	57.0	1 025.1
Kgalagadi South	410.7	76.2	24.0	1.6	15.5	5.9	29.7	563.7
Kgalagadi North	580.7	56.1	25.7	0.5	6.3	0.0	23.5	692.7
National Level	28 360.8	6 280.1	2 154.5	63.9	1 465.6	100.3	4 576.5	43 001.7

Figure 1: Total Annual Energy Consumption of the Different Sources (%)

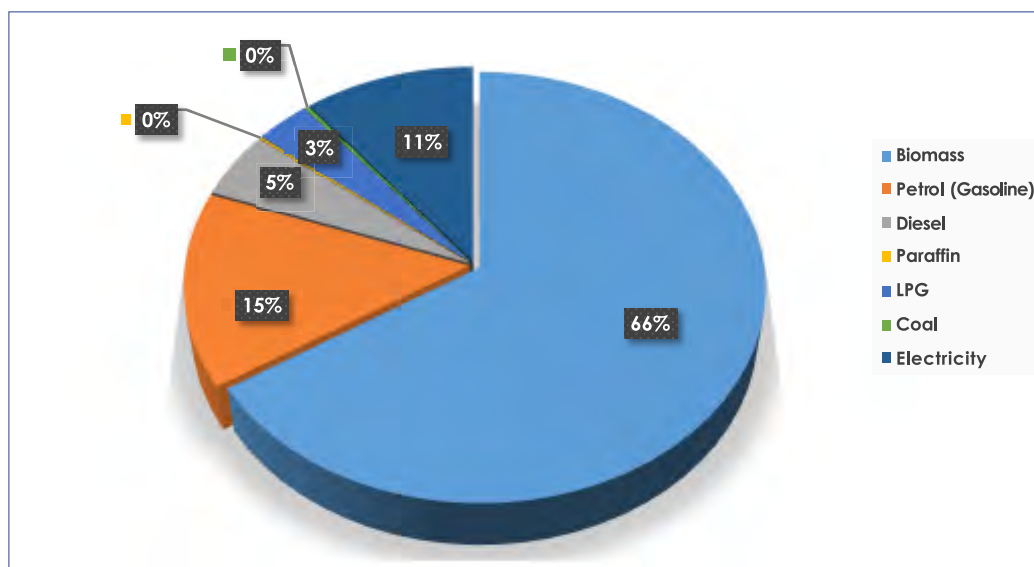


Table 2.1A and **figure 1** shows the Annual Total Energy Consumption (TEC) of different energy forms in the households at the national level by district in Tera joules (TJ). The table shows that the National Total Energy Consumption by all Energy forms is 43,001.7TJ per annum. The figures further indicate that Total Energy consumption by Energy form is dominated by Biomass at 28,360.8TJ, a contribution of 66.0% to the National consumption with Kweneng East being the highest in terms of Biomass

Consumption at 3,217.4TJ. Paraffin was the least consumed Energy form at an annual consumption of 63.9TJ nationwide, a contribution of 0.2% to National Total Energy consumption. The table also indicates that Electricity consumption is the highest in Gaborone District at an annual consumption of 1,115.5TJ, a share of 24.4% of the Total Electricity Consumption by the District. According to the table, Petrol is used more than Diesel across all the districts at 6,280.1TJ and 2,154.5TJ respectively. The use of Liquefied Petroleum Gas (LPG) is also dominated by the Gaborone district at 236TJ followed by Kweneng East at 223.6TJ per annum.

Table 2.1B: Annual Energy Consumption per Household By District

District	Total Energy Consumption (TJ)	No. of Households	Energy Consumption per Household	Energy Consumption per Household (GJ)
Gaborone	3 455.7	82 981	0.04	41.6
Francistown	1 055.3	33 001	0.03	32.0
Lobatse	414.6	10 543	0.04	39.3
Selibe Phikwe	395.1	11 574	0.03	34.1
Orapa	121.8	3 195	0.04	38.1
Jwaneng	271.7	6 900	0.04	39.4
Sowa	81.3	1 037	0.08	78.4
Ngwaketse South	3 226.0	35 114	0.09	91.9
Borolong	792.9	21 793	0.04	36.4
Ngwaketse West	738.5	4 561	0.16	161.9
South_East	2 083.9	36 257	0.06	57.5
Kweneng East	5 585.4	90 186	0.06	61.9
Kweneng West	1 698.4	18 457	0.09	92.0
Kgatleng	2 849.1	35 045	0.08	81.3
Serowe Palapye	3 693.8	58 305	0.06	63.4
Central Mahalapye	3 216.2	38 001	0.08	84.6
Central Bobonong	1 575.9	18 941	0.08	83.2
Central Boteti	1 712.4	26 853	0.06	63.8
Central Tutume	2 988.6	43 018	0.07	69.5
North East	1 472.3	21 079	0.07	69.8
Ngami East	2 297.8	32 937	0.07	69.8
Ngamiland West	484.6	16 585	0.03	29.2
Chobe	509.0	10 942	0.05	46.5
Ghanzi	1 025.1	9 906	0.10	103.5
Kgalagadi South	563.7	10 633	0.05	53.0
Kgalagadi North	692.7	8 002	0.09	86.6
National Level	43 001.7	685 844	0.06	62.7

Table 2.1B illustrates the Annual Total Energy Consumption per household in Gigajoules (GJ). The table shows how much Energy on average a household consumes. On average, a household in Botswana consumes 62.7GJ of Energy per year. A household in Ngwaketse West consumes the highest amount of energy at 161.9GJ, followed by Ghanzi and Ngwaketse South at 103.5GJ and 91.9GJ respectively. Furthermore, the table shows that a household in Ngamiland West consumes less energy than a household in any other district at 29.2GJ.

Energy consumption of a household can vary significantly according to various factors such as lifestyle choices, the number of individuals residing in each household, Geographical location, type of house, etc.

Figure 2: Total Energy Consumption per Household by Locality Type (%)

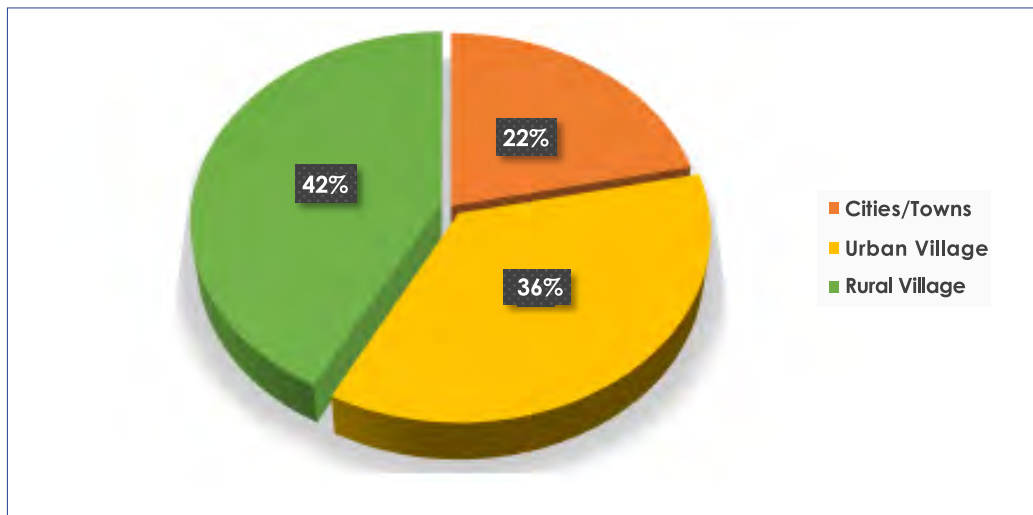


Figure 2 further demonstrates how much on average a household consumes energy in percentages by locality type. According to the figure, a household in a rural village consumes 75.8GJ (a share of 42%) of energy per year, being the highest energy consumption by a household across the country. The figure also indicates that the average household Energy consumption of Cities/Towns is the least of other locality types at 38.8GJ (which is a share of 22%). This may be attributed to the use of energy efficient appliances used by households in Cities/Towns as compared to other areas, as well as the predominant use of Biomass in rural areas.

2.2 Electrification by District, Locality Type and Income Level

Table 2.2A: Electrification proportions of Households by District and to the national level.

District	Connected to electricity			Households not connected to electricity	Number of households in District
	Number	Proportion in District (%)	Proportion to national level (%)		
Gaborone	69 357	94.3	10.9	4 172	73 529
Francistown	25 217	86.2	4.0	4 022	29 239
Lobatse	8 239	81.9	1.3	1 818	10 057
Selibe Phikwe	8 794	88.5	1.4	1 138	9 932
Orapa	2 365	100.0	0.4	0	2 365
Jwaneng	6 293	91.2	1.0	607	6 900
Sowa	1 014	100.0	0.2	0	1 014
Ngwaketse South	20 561	62.9	3.2	12 110	32 671
Borolong	14 698	86.6	2.3	2 282	16 980
Ngwaketse West	626	14.3	0.1	3 739	4 365
South_East	28 931	85.3	4.6	5 004	33 935
Kweneng East	70 406	82.8	11.1	14 653	85 059
Kweneng West	6 451	38.2	1.0	10 456	16 907
Kgatleng	24 591	77.0	3.9	7 337	31 928
Serowe Palapye	37 500	66.4	5.9	18 981	56 481
Central Mahalapye	21 671	59.9	3.4	14 480	36 151
Central Bobonong	9 985	54.7	1.6	8 260	18 245
Central Boteti	19 627	77.5	3.1	5 703	25 330
Central Tutume	21 066	54.9	3.3	17 288	38 354
North East	18 126	88.6	2.9	2 340	20 466
Ngami East	22 931	75.6	3.6	7 396	30 327
Ngamiland West	5 728	36.6	0.9	9 904	15 632
Chobe	9 009	84.6	1.4	1 641	10650
Ghanzi	6 792	67.2	1.1	3 317	10 109
Kgalagadi South	4 475	47.8	0.7	4 882	9 357
Kgalagadi North	3 891	48.1	0.6	4 202	8 093
National Level	468 344	73.9	73.9	165 732	634 076

Table 2.2A shows electricity connection and shares in terms of proportion of connected households relative to districts and the national level. Out of 634 076 households 468 344 households are connected to electricity while 165 732 households are not connected to electricity. At the national level, the connectivity to electricity stands at 73.9%. Orapa and Sowa districts have the highest connectivity at 100%, while Gaborone and Jwaneng districts constituted above 90% connectivity. Ngwaketse West has the lowest connection rate at only 14.3%, Ngamiland West at 36.6%, Kweneng West at 38.2%, Kgalagadi South at 47.8% and Kgalagadi North at 48.1% which are the districts with less than 50% connection.

Table 2.2B: Grid And Off Grid Electrification Proportions Of Households By District And To The National Level.

District	Households Connected To Grid Electricity		Households With Off Grid Electricity		Total Households With Electricity	Off-Grid Contribution To Electricity
	Number	Share (%)	Number	Share (%)		
Gaborone	69 357	14.9	0	0.0	69 357	0.00
Francistown	25 217	5.4	0	0.0	25 217	0.00
Lobatse	8 239	1.8	0	0.0	8 239	0.00
Selibe Phikwe	8 794	1.9	0	0.0	8 794	0.00
Orapa	2 365	0.5	0	0.0	2 365	0.00
Jwaneng	6 293	1.3	0	0.0	6 293	0.00
Sowa	1 014	0.2	0	0.0	1 014	0.00
Ngwaketse South	19 959	4.3	602	31.4	20 561	2.93
Borolong	14 698	3.2	0	0.0	14 698	0.00
Ngwaketse West	626	0.1	0	0.0	626	0.00
South_East	28 931	6.2	0	0.0	28 931	0.00
Kweneng East	70 190	15.0	216	11.3	70 406	0.31
Kweneng West	6 451	1.4	0	0.0	6 451	0.00
Kgatleng	24 591	5.3	0	0.0	24 591	0.00
Serowe Palapye	37 323	8.0	177	9.2	37 500	0.47
Central Mahalapye	21 435	4.6	236	12.3	21 671	1.09
Central Bobonong	9 985	2.1	0	0.0	9 985	0.00
Central Boteti	19 627	4.2	0	0.0	19 627	0.00
Central Tutume	21 041	4.5	25	1.3	21 066	0.12
North East	18 126	3.9	0	0.0	18 126	0.00
Ngami East	22 931	4.9	0	0.0	22 931	0.00
Ngamiland West	5 615	1.2	113	5.9	5 728	1.97
Chobe	8 752	1.9	257	13.4	9 009	2.85
Ghanzi	6 589	1.4	203	10.6	6 792	2.99
Kgalagadi South	4 475	1.0	0	0.0	4 475	0.00
Kgalagadi North	3 801	0.8	90	4.7	3 891	2.31
National Level	466 425	100.0	1 919	100.0	468 344	0.41

Table 2.2B shows electricity connection and shares in terms of proportion of connected households relative to districts and the national level. Out of 468 344 households that are connected to electricity, 466 425 households are connected to grid electricity, 1,919 are off-grid connections. At the national level off-grid contribution is 0.41%. From **Table 2.2B** it can also be deduced that Ngwaketse South has the highest off-grid connections at 31.4% followed by Chobe at 13.4% and Central Mahalapye at 12.3%. Out of 27 districts, 14 districts have no off-grid connections. Ghanzi District has the highest contributions of off-grid connections at 3.0% followed by Ngwaketse South and Chobe District at 2.9% each and Ngamiland West at 2.0%.

Table 2.2C: Electrification Shares of Households by Monthly Income Levels

Income Level (BWP)	Households connected to grid electricity		Households with off-grid electricity		Households not connected to electricity		Connected To Electricity	Proportion To National	Off-Grid Contribution To Electricity	Total
	Number	Share (%)	Number	Share (%)	Number	Share (%)				
No income	47 065	10.1	0	0.0	36 444	22.0	56.4	7.4	0.0	83 509
1- 1000	48 647	10.5	0	0.0	42 427	25.6	53.4	7.7	0.0	91 074
1001-3000	124 919	26.9	1362	60.7	65 334	39.5	65.9	20.0	1.1	191 615
3001-5000	73 960	15.9	166	7.4	12 314	7.4	85.8	11.7	0.2	86 440
5001-7000	35 494	7.6	113	5.0	3 055	1.8	92.1	5.6	0.3	38 662
7001-9000	24 521	5.3	0	0.0	2 359	1.4	91.2	3.9	0.0	26 880
9001-12000	28 688	6.2	0	0.0	1 019	0.6	96.6	4.5	0.0	29 707
12001 and above	81 707	17.6	602	26.8	2 503	1.5	97.0	13.0	0.7	84 812
National Level	465 001	100.0	2 243	100.0	165 455	100.0	73.8	73.8	0.5	632 699

²The inconsistency in the total number of households for the tables 2.2A and 2.2C is due to the fact that some respondents did not disclose the income levels for their households.

Table 2.2C illustrates electrification shares of households by monthly income level. Almost 60% of the households in Botswana are in the P3000 or less income bracket, showing a highly skewed income distribution. The figures show that households with income level 1001-3000 have the highest share of electricity connected to the grid which accounts for 26.9%. This is because there are more households in this income bracket. However, in general, chances of households with income of P3000 or less being connected to the grid electricity diminishes more than 6 times when compared to that of a household with income more than P3000. The high-income earners which is 12001 and above follow at a share of 17.6%. The same trend is noticed in households with off-grid electricity where income level 1001-3000 accounts for 60.7% and 12001 above accounts for 26.8%.

Figure 3: Ways of Electrification by Locality Type

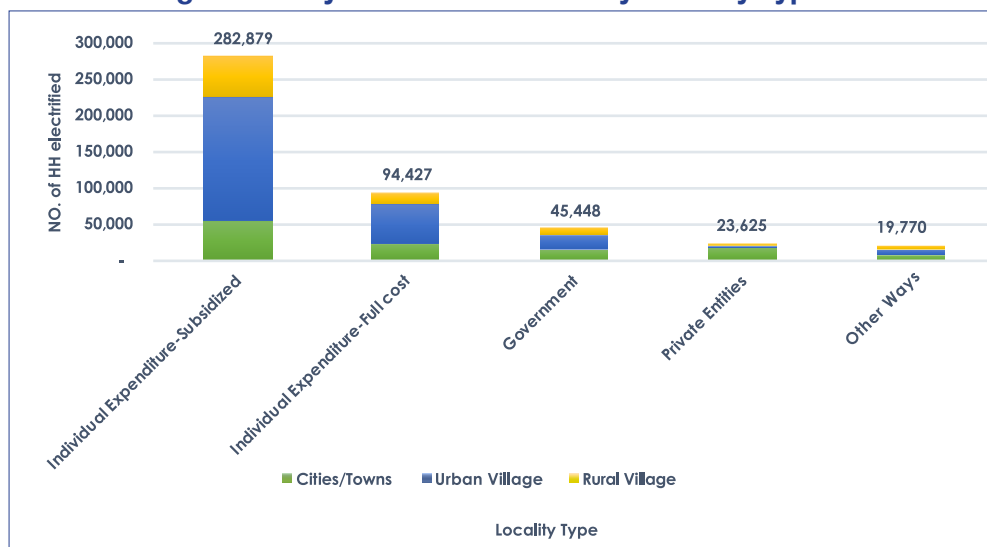


Figure 3 shows ways of electrification for the Grid connected households relative to the locality type. Out of 466,147 households connected to the grid; 282,879 (61.0%). Households were connected to the grid by subsidized individual expenditure. Furthermore, 94,427 (20.0%) of the households were connected to the Grid by full individual expenditure followed by the government connection at 45,448 (10.0%); private entities at 23,625 (5.0%) and lastly the other means of connection at (4.0%). The other means include the connection by the parastatals as well as those households that did not know the means of electrification for their houses mainly because they are rented. Private entities are households connected by the private companies and non-governmental organizations. The 282,879 households connected to the grid might be attributed to the implementation of the NESC programme.

2.3 Penetration of Renewable Energy Technologies by District, Locality Type and Income Level

Table 2.3A: Penetration of Solar Water heaters, Photovoltaic (PV) and Biogas by District

District	Households with PV Systems		Households with solar waterheating systems		Households with biogas digesters	
	Number	Share (%)	Number	Share (%)	Number	Share (%)
Gaborone	1 437	4.9	679	5.8	0	0.0
Francistown	0	0.0	1 254	10.6	0	0.0
Lobatse	0	0.0	0	0.0	0	0.0
Selibe Phikwe	134	0.5	210	1.8	0	0.0
Orapa	0	0.0	1 253	10.6	0	0.0
Jwaneng	0	0.0	704	6.0	0	0.0
Sowa	23	0.1	0	0.0	0	0.0
Ngwaketse South	2 255	7.7	0	0.0	0	0.0
Borolong	202	0.7	117	1.0	0	0.0
Ngwaketse West	625	2.1	94	0.8	0	0.0
South East	2 245	7.7	1 119	9.5	0	0.0
Kweneng East	3 462	11.8	937	8.0	216	100.0
Kweneng West	1 222	4.2	0	0.0	0	0.0
Kgatleng	2 001	6.8	661	5.6	0	0.0
Serowe Palapye	2 919	10.0	858	7.3	0	0.0
Central Mahalapye	1 453	5.0	236	2.0	0	0.0
Central Bobonong	1 986	6.8	0	0.0	0	0.0
Central Boteti	496	1.7	0	0.0	0	0.0
Central Tutume	2 875	9.8	0	0.0	0	0.0
North East	193	0.7	135	1.1	0	0.0
Ngami East	1 731	5.9	642	5.5	0	0.0
Ngamiland West	1 280	4.4	731	6.2	0	0.0
Chobe	268	0.9	865	7.3	0	0.0
Ghanzi	1 151	3.9	1 136	9.6	0	0.0
Kgalagadi South	603	2.1	146	1.2	0	0.0
Kgalagadi North	692	2.4	0	0.0	0	0.0
National Level	29 256	100.0	11 777	100.0	216	100.0

Table 2.3A shows the penetration of renewable energy sources by the districts. There are a total of 41,249 renewable energy systems countrywide with the most being the Solar Photovoltaic Systems at 29,256, followed by 11,777 Solar Water Heater systems and 216 Biogas Digester systems. Kweneng East, Serowe, Palapye and Ngwaketse West regions account for the largest share of Solar Photovoltaic Systems at 11.7%, 10.0%, and 7.7% respectively. For the solar water heaters, the penetration is high in Orapa and Francistown at 10.6% share of each, followed by Ghanzi at 9.6% share and South East at 9.5% share. The biogas digesters were recorded in the Kweneng East district, this is attributed to the roll-out of the Biogas Programme in the southern part of the country which included Kweneng, Kgatleng, South-East and Southern Districts only.

Table 2.3B: Penetration of Solar Water Heaters, PV and Biogas By Locality Type

Locality Type	Households with PV Systems		Households with solar waterheating systems		Households with biogas digesters	
	Number	Share (%)	Number	Share (%)	Number	Share (%)
Cities & Towns	1 595	5.5	4 100	34.8	0.0	0.0
Urban Villages	4 987	17.0	5 617	47.7	0.0	0.0
Rural Villages	22 674	77.5	2 058	17.5	216.0	100.0
National Level	29 256	100.0	11 777	100.0	216.0	100.0

Table 2.3B shows the penetration of renewable energy by locality type. The figures show higher penetration at 77.5% in rural areas for Solar Photovoltaic Systems followed by the urban villages. Biogas systems are found in rural villages only. Solar for water heating is mainly used in Urban Villages at 47.7%, that is, households with solar water heaters are common in urban villages followed by the cities/towns at 34.8% and lastly the rural villages at 17.5%.

Table 2.3C: Penetration of Solar Water heaters, PV and Biogas by Monthly Income Levels

Income Levels(BWP)	Households with PV Systems		Households with solar Water heating systems		Households with biogas digesters	
	Number	Share (%)	Number	Share (%)	Number	Share (%)
No income	4 424	15.1	288	2.4	0	0.0
1- 1000	5 480	18.7	551	4.7	0	0.0
1001 - 3000	9 766	33.4	617	5.2	216	100.0
3001 - 5000	2 166	7.4	68	0.6	0	0.0
5001 - 7000	2 109	7.2	392	3.3	0	0.0
7001 - 9000	839	2.9	1 098	9.3	0	0.0
9001 - 12000	1 085	3.7	1 815	15.4	0	0.0
Above 12000	3 386	11.6	6 947	59.0	0	0.0
National Level	29 256	100.0	11 777	100.0	216	100.0

Table 2.3C shows the renewable energy penetration relating to household income. For photovoltaic systems, the households within the 1001-3000 income bracket have the highest share at 33.4% followed by the less than 1000 income earners households at 18.7% and the category with no income at 15.1%. For the solar water heaters, the above 12000 income group accounts for a 59.0% share of the total water heaters followed by the 9001-12000 and 7000-9000 income groups at 15.4% and 9.3% respectively. All the biogas digesters are in the 1001-3000 income range.

2.4 Energy Consumption for Cooking

Table 2.4: Shares of Households Using Fuels as a Main Source for Cooking (%) By District

District	Electricity	LPG	Paraffin	Coal	Wood	Other	Total
Gaborone	34.9	65.1	0.0	0.0	0.0	0.0	100.0
Francistown	31.7	60.6	0.7	0.0	6.4	0.7	100.0
Lobatse	33.5	58.7	1.4	0.0	6.5	0.0	100.0
Selibe Phikwe	27.0	60.6	0.0	0.0	12.5	0.0	100.0
Orapa	20.0	80.0	0.0	0.0	0.0	0.0	100.0
Jwaneng	21.5	74.6	0.0	0.0	3.8	0.0	100.0
Sowa	59.5	38.2	0.0	0.0	2.3	0.0	100.0
Ngwaketse South	23.8	28.4	0.0	0.0	47.8	0.0	100.0
Borolong	31.1	40.1	0.0	0.0	28.8	0.0	100.0
Ngwaketse West	6.1	12.3	0.0	0.0	81.6	0.0	100.0
South_East	32.3	53.5	0.0	0.0	14.2	0.0	100.0
Kweneng East	22.0	56.9	0.0	0.0	20.9	0.2	100.0
Kweneng West	11.3	12.0	0.0	0.0	76.6	0.0	100.0
Kgatleng	23.5	47.8	0.0	0.3	28.3	0.0	100.0
Serowe Palapye	17.4	36.7	0.0	0.4	45.5	0.0	100.0
Central Mahalapye	19.4	25.6	0.0	0.0	55.0	0.0	100.0
Central Bobonong	12.2	16.2	0.0	0.0	71.5	0.0	100.0
Central Boteti	15.7	54.7	0.0	0.0	29.6	0.0	100.0
Central Tutume	16.6	18.3	0.0	0.0	65.1	0.0	100.0
North East	28.8	34.0	0.0	0.0	37.2	0.0	100.0
Ngami East	26.7	38.8	0.0	0.0	34.5	0.0	100.0
Ngamiland West	21.1	5.7	0.0	0.0	73.2	0.0	100.0
Chobe	36.4	37.3	0.0	0.0	26.3	0.0	100.0
Ghanzi	27.0	43.5	0.0	0.0	29.5	0.0	100.0
Kgalagadi South	28.7	21.4	0.0	0.0	49.9	0.0	100.0
Kgalagadi North	31.9	17.4	0.0	0.0	50.7	0.0	100.0
National Level	24.4	42.7	0.1	0.1	32.8	0.1	100.0

Table 2.4 shows the percentage by share of the use of energy for cooking at both district and national levels by households. The figures show that Liquefied Petroleum Gas (LPG) is the mainly used source of energy for cooking at 42.7% followed by Firewood at 32.8% whilst electricity accounts for 24.4% and the rest which are paraffin, coal and others only account for around 0.3%. From the table, it can also be deduced that the cities and towns mainly use electricity and LPG as the main source of energy for cooking. For the rest of the country, firewood dominates as the source of energy used for cooking.

Appendices

Joule: The International System of Units (SI) unit of work or energy, equivalent to one 3600th of a watt-hour.

Appendix 1: Unit conversion for energy

Unit	joules	Indices
Kilojoule (Kj)	1,000	10 ³
Megajoule (Mj)	1,000,000	10 ⁶
Gigajoule (Gj)	1,000,000,000	10 ⁹
Terajoule (Tj)	1,000,000,000,000	10 ¹²

Natural Unit		Energy Units	
		Megajoule(MJ)	Terajoule(TJ)
1kg of sub-bituminous Coal	1Kg ≈ 0.001 TCE	1kg ≈ 30000000MJ	1kg ≈ 30 TJ
1kg of firewood		1kg ≈ 14.9 MJ	1Kg ≈ 0,0000149 TJ
1kg of LPG	1Tonne = 1000kg	1ton ≈ 46150 MJ	1 ton ≈ 0.04615 TJ
1l of Petrol	1 Mtoe = 1000000 toe 1 m ³ petrol = 0,86 toe 1l diesel = 0.001m ³	1ton ≈ 44750 MJ	1 ton ≈ 0.0448 TJ 1 ton ≈ 0.0000342 TJ
1l of Diesel	1 m ³ diesel = 0,98 toe 1l diesel = 0.001m ³	1ton ≈ 43380 MJ	1 ton ≈ 0.0434 TJ
1l of Kerosene(Paraffin)	1l ≈ 0.000817 tons.	1ton ≈ 43920 MJ	1ton ≈ 0,04392 TJ
1Gwh	1GWh ≈ 1000 MWh	1GWh ≈ 3600000 MJ	1 GWh ≈ 3.6 TJ

Appendix 2: NCVs of different types of biomass (Converting from Natural units to Energy Units)

Biomass Type	Net calorific values (kJ/kg)	Source:
Charcoal	30800	IEA
Firewood (dry)	17000	South Africa DoE
Shrubs	16300	(1) ³
Wood waste	17000	Same as dry firewood
Wood Pellets/Briquettes	18400	(2) ⁴
Crop Waste	14000	(3) ⁵
Animal waste/dung	4200	(4) ⁶

Appendix 3: Proposed Net Calorific Values of other Energy Sources (Converting Natural Units to Energy Units)

Carrier	Calorific Value	Calorific Value Unit	Density
LPG	26.7	MJ/l	0.54
Paraffin Power	37.5	MJ/l	0.81
Gas SASOL	18.0	MJ/m ³	
Diesel	38.1	MJ/l	0.84
Electricity	3.6	MJ/kWh	
Gas	41.0	MJ/m ³	
Heavy Fuel Oil	41.6	MJ/l	0.98
Petrol	34.2	MJ/l	0.72
Paraffin Illuminating CSS (StatsSA) Data	37.0	MJ/l	0.79
Aviation Gas	33.9	MJ/l	0.73
Jet Fuel	34.3	MJ/l	0.79
Coal Eskom Average	20.1	MJ/kg	
Coal (General purpose)	24.3	MJ/kg	
Coal (Coking)	30.1	MJ/kg	
Coke	27.9	MJ/kg	
Coke oven gas	17.3	MJ/m ³	
Blast furnace gas	3.1	MJ/m ³	
Bagasse (wet)	7.0	MJ/kg	
Bagasse fibre (dry)	14.0	MJ/kg	
Biomass (wood dry typical)	17.0	MJ/kg	
Gas Sasol - methane rich	35.0	MJ/m ³	






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