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UTILISATION OF GREEN ENERGY AMONG HOUSEHOLDS IN BOTSWANA

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&
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UNFPA

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Presentation Outline

- INTRODUCTION
- LITERATURE REVIEW
- METHODOLOGY
- FINDINGS AND DISCUSSIONS
- POLICY IMPLICATIONS
- CONCLUSIONS AND RECOMMENDATIONS

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Introduction

- There is intensive global dependence on fossil fuels, Botswana inclusive
- Botswana envisages a reduction on its reliance on fossil fuels
- It targets a **50%** proportion of domestic households to generate their electric power from renewable sources by 2036 (solar, biogas, wind)
- Notably, the **NDP 8, NDP 9 and NDP 10** also emphasized the reduction of dependence on fossil fuels which was noted to be increasing in **NDP10**
- This echoes **SDG 7** target **7.2** to substantially increase the share of renewable energy in the global energy mix by 2030 - thus, transitioning towards green energy
- Population and Housing Census of 2011 – **notes 64.08%** reliant on clean fuels - however, the main contributor is traditionally biomass (mostly firewood)

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Aim and Objectives

- The aim of this study is to determine the extent of use of green energy sources by the local populace and based on this aim, the main objectives of the study are:

a. **Establish main energy source(s) utilised by households in Botswana.**

b. **To establish green energy sources utilised for various energy uses by households in Botswana.**

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Significance of the study

- The findings of this study shall serve as a baseline to establish the milestone reached by Botswana on green energy utilisation in addressing SDGs
- Botswana's intended nationally determined contribution have set GHGs emissions reduction of 15% by 2030 (UNCCC, 2022), utilisation of green or clean energy is indispensable
- Policy makers and implementers may utilise the findings to inform adoption of green energy across all sectors
- Thus, meeting the SDGs and Vision 2036 defined objectives on energy (Government of Botswana, 2016; Statistics Botswana and UNFPA, 2018).

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Literature Review Highlights

- The national energy use survey of 2022, indicatively highlighted the households utilised mostly biomass, petrol (gasoline), diesel, paraffin, liquid petroleum gas, coal, and electricity,

Green Energy utilisation

- Development of green energy sub-sector remains a major challenge for the African continent
- Though renewable energies remain limitedly exploited, Botswana has the potential for intensively adopting renewable energy, particularly, in rural areas, farms and cattle post (solar, wind and bioenergy).

Transition to Green energy utilisation, a drive to zero emissions

- Promotion and facilitation of the implementation of a clear long-term vision for renewable energy development;
- Support the growth of solar rooftop and home systems through strong incentives and policy instruments
- Develop local human capacities along the project value chain

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Government Initiatives and Policies Promoting Green Energy

- Botswana is making efforts towards development and implementation of legislation and strategies for exploitation of renewable energy.
- E.g. Renewable Energy Strategy of Botswana (RESB) and the National Energy Efficiency Strategy (NEES) in 2019; National Energy Policy

Opportunities and Challenges for Household Green Energy Utilisation

- Turning energy challenges into transitioning opportunities is indispensable
- Also offers energy security and are often environmentally friendly

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METHODOLOGY

- Primary data from the National Population and Housing Census of 2022 was analyzed using SPSS & STATA
- It helped to establish the extent of use of green energy in the country
- Was categorized across primary uses, lighting, main or alternative cooking source, heating space and/or water
- Descriptive statistics were used to summarize the findings
- Notably, trends towards adoption & use of renewable energy sources was analysed

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FINDINGS AND DISCUSSIONS

Main Sources of Energy

- Currently, all households have access to electricity, though from various sources, compared to **74%** in 2011
- The predominant energy source for lighting is electricity from the national grid, generated primarily from fossil fuels, used by **73%** of all the households
- Green energy still comprises a relatively small proportion of the total energy consumption for lighting at only **7.85%** from solar.
- The primary energy source for cooking was Liquefied Petroleum Gas used by **35%;** firewood **(30%)** & electricity **(25%).**
- The primary source for cooking from green energy sources was biogas, used by about **7%** of the total population
    - Green energy sources are utilised as an alternative energy source for cooking by about **6%** of the total households

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Principal & alternative sources of cooking energy for households

- Most of the households **(30%)** have no alternative energy sources
- Those reporting alternative energy sources, indicated electricity from the national grid, firewood, and LPG
- The most prominent green energy source for cooking is biogas, used by **7.21%** of the population as the primary source and by **3.85%** as an alternative energy source
- There were significant differences in the means of households using all the green energy sources (solar and biogas) in rural and urban areas (urban and urban villages)
- Generally, there is a higher use of green energy sources in urban areas compared to rural areas
- There are households with no alternative cooking sources and/or energy sources for heating spaces, which could be indicative of vulnerability to energy poverty.

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Table 1: Principal sources of energy (N = 695, 561)

Source of energy	Lighting	Cooking	Alternative Cooking	Heating Space	Heating Water
Electricity- national grid	73.47	25.30	24.23	30.00	52.88
Electricity – off grid	0.36	0.59	0.49	0.45	0.49
Electricity Solar	1.10	-	-	-	-
Electricity Battery	0.68	-	-	-	-
Electricity generator	0.08	0.05	0.09	0.03	0.04
Solar home system	2.04	0.26	0.18	0.30	0.62
Solar lantern	4.71	n/a	n/a	n/a	n/a
LPG	0.49	34.88	14.44	1.39	3.80
Candle	8.61	n/a	n/a	n/a	n/a
Kerosene/ Paraffin	5.43	0.37	0.54	0.19	0.13
Firewood	1.06	29.65	18.84	25.24	37.23
Coal/ charcoal	0.02	0.44	1.49	0.65	0.63
Biogas	-	7.21	3.85	0.47	0.99
Crop residue/grass/straw/ shrub	-	0.21	1.69	0.10	0.20
Animal dung/ waste	-	0.08	0.61	0.07	0.06
None	-	-	30.62	38.94	2.54
Other	1.95	0.97	2.94	2.17	0.38
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

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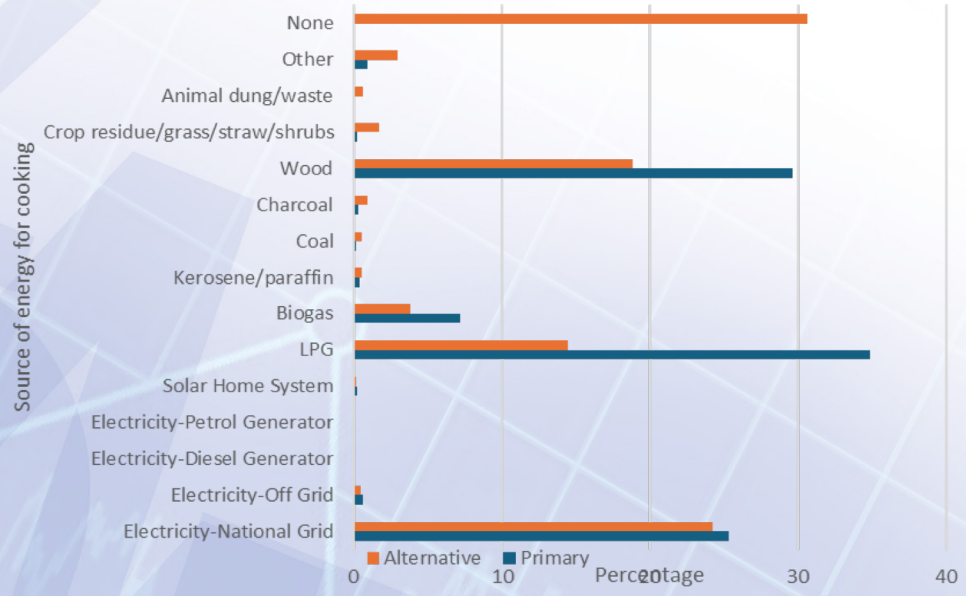
Principal & alternative sources of cooking energy for households



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Sources of Renewable Energy for Lighting, Cooking and Heating by Locality at Household Level

- **Table 2** indicates substantial variations existing on sources of green energy used along rural-urban continuum
- Firewood remains the dominant source of energy for cooking (e.g. town and cities **(3.2%);** urban villages **(15.3%)** and rural areas **(64.4%)**
- However, promotion of alternative green energies is essential in order to prevent deforestation
- Statistics indicatively highlight a relative increase of solar energy in the rural areas as opposed to urban areas
- It can also be noted that rural areas still utilise cow dung for cooking and heating

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Table 2: Percentage Distribution of Households by Source of Renewable Energy for Lighting, Cooking and Heating by Locality

			Towns and Cities	Urban Villages	Rural Areas	Total %
Solar Home Systems	Lighting		0.3	0.5	5.2	2.1
	Cooking		0.2	0.2	0.4	0.3
	Heating	space	0.3	0.3	0.4	0.3
		water	0.9	0.6	0.5	0.6
Solar Lantern	Lighting		0.5	0.9	12.3	4.7
Biogas	Lighting		-	-	-	-
	Cooking		8.9	8.9	3.9	7.2
	Heating	space	0.5	0.6	0.3	0.2
		water	1.0	1.2	0.8	1.0
Firewood	Lighting		0.1	0.3	2.7	1.1
	Cooking		3.2	15.3	64.7	29.7
	Heating	space	4.7	14.6	52.0	25.3
		water	7.7	26.2	70.0	37.3
Cow dung	Lighting		-	-	-	-
	Cooking		0.0	0.0	0.2	0.1
	Heating	space	0.0	0.0	0.1	0.1
		water	0.0	0.0	0.2	0.1
Crop waste	Lighting		-	-	-	-
	Cooking		0.0	0.0	0.6	0.2
	Heating	space	0.0	0.1	0.2	0.1
		water	0.0	0.1	0.5	0.2
Total no. HH			**150142**	**307268**	**239835**	

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Sources of Household Green Energy for Cooking by District

- There is overreliance on firewood in the **Delta (85.8%)** and **CKGR (85.7%)** region, an opportunity to introduce more energy sources like biogas and solar
- Ironically, it is noted that some of the enumerated households in Gaborone reported use of biogas;
- This may be attributed to the tripartite dwelling system of Batswana who are likely to own biodigester at the farm

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Table 3: Percentage Distribution of Households Source of Green Energy for Cooking by District

DISTRICT NAME	SOURCES OF RENEWABLE HOUSEHOLD ENERGY FOR COOKING					TOTAL HOUSEHOLDS
	Solar home System	Biogas	Wood	Crop residue/ grass/ straw/ shrubs	Animal dung/waste	
Gaborone	0.2	8.5	0.9	0.0	0.0	82421
Francistown	0.2	12.3	6.4	0.0	0.0	33811
Lobatse	0.1	7.3	4.2	0.0	0.0	9839
Selibe Phikwe	0.2	10.5	10.3	0.0	0.0	13330
Orapa	0.1	0.3	0.0	0.0	0.0	3049
Jwaneng	0.1	1.4	1.2	0.0	0.0	6586
Sowa	0.1	0.7	2.4	0.0	0.0	1106
Southern	0.3	3.8	36.6	0.2	0.1	37806
Barolong	0.1	4.6	50.3	0.6	0.4	16498
Ngwaketse West	0.3	3.5	68.5	0.7	0.1	6588
South East	0.2	9.5	7.7	0.0	0.1	36327
Kweneng East	0.3	12.0	17.8	0.1	0.1	100751

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Kweneng West	0.2	4.9	69.4	1.1	0.4	15920
Kgatleng (Wards)	0.2	8.3	25.7	0.1	0.0	36538
Central Serowe -Palapye	0.2	7.5	39.6	0.3	0.1	56992
Central Mahalapye	0.2	2.9	49.8	0.3	0.1	36683
Central Bobonong	0.2	3.8	52.8	0.3	0.1	22212
Central Boteti	0.6	2.9	38.5	0.8	0.1	21259
Central Tutume	0.2	5.8	53.5	0.2	0.1	46626
North East	0.2	6.5	39.9	0.2	0.0	20912
Ngamiland East	0.3	6.7	36.3	0.1	0.0	31591
Ngamiland West	0.3	2.8	67.4	0.8	0.1	17921
Chobe	0.3	7.0	25.3	0.0	0.0	10124
Delta	1.6	0.0	85.8	0.5	0.5	192
Ghanzi	0.5	3.3	42.9	0.3	0.1	15158
CKGR	1.2	0.0	85.7	0.0	0.0	84
Kgalagadi South	0.4	2.6	47.3	0.4	0.3	9749
Kgalagadi North	0.2	1.5	42.5	0.1	0.0	7172
Total	0.3	7.2	29.7	0.2	0.1	697245

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Sources of Household Green Energy for Heating by District

- Firewood remains the dominant source of green energy for heating water & space in various districts **(see Appendix 1)**
    - **E.g.** Borolong (47.6%), Ngwaketse West (61.3%), Delta (86.3%), and CKGR (85.7%)
- **NB:** other renewable energies, that were historically not so common, like solar and biogas are gaining traction in various districts such as Kweneng East (0.8%) and Kgatleng (Wards) (0.8%) used for heating space
- The same form of green energy has been utilised for heating water from South East (1.0%), Kweneng East (1.6%), Kweneng West (1.2%) and Central Tutume (1.2%) districts

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Appendix 1: Percentage Distribution of Households Source of Renewable Household Energy for Heating Space and Water

DISTRICT NAME	SOURCES OF HOUSEHOLD RENEWABLE ENERGY FOR HEATING SPACE					SOURCES OF HOUSEHOLD RENEWABLE ENERGY FOR HEATING WATER					TOTAL HOUSEHOLDS
	Solar home System	Biogas	Wood	Crop residue/ grass/ straw/ shrubs	Animal dung/waste	Solar home System	Biogas	Wood	Crop residue/ grass/ straw/ shrubs	Animal dung/waste	
Gaborone	0.3	0.5	2.2	0.0	0.0	1.0	1.0	3.4	0.0	0.0	82421
Francistown	0.3	0.6	6.3	0.0	0.0	0.5	1.0	12.5	0.0	0.0	33811
Lobatse	0.0	0.5	8.1	0.0	0.0	0.1	1.8	12.5	0.0	0.0	9839
Selibe Phikwe	0.0	0.2	10.2	0.1	0.0	0.6	0.7	20.3	0.0	0.0	13330
Orapa	3.3	0.0	0.1	0.0	0.0	5.7	0.0	0.0	0.0	0.0	3049
Jwaneng	0.4	0.2	3.0	0.0	0.0	1.6	0.3	5.5	0.0	0.0	6586
Sowa	0.0	0.0	1.7	0.0	0.0	0.2	0.1	16.1	0.0	0.0	1106
Southern	0.2	0.3	32.3	0.1	0.1	0.3	0.6	52.7	0.5	0.1	37806
Barolong	0.1	0.2	47.6	0.0	0.2	0.1	0.7	62.4	0.1	0.2	16498
Ngwaketse West	0.2	0.2	61.3	0.2	0.1	0.7	0.6	73.2	0.9	0.5	6588
South East	0.2	0.6	12.2	0.1	0.0	0.8	1.0	17.4	0.1	0.0	36327
Kweneng East	0.3	0.8	18.8	0.1	0.1	0.4	1.6	28.6	0.1	0.1	100751
Kweneng West	0.2	0.6	68.3	0.2	0.2	0.3	1.2	72.9	0.5	0.4	15920
Kgatleng(Wards	0.3	0.8	23.1	0.0	0.0	0.5	1.3	38.7	0.1	0.1	36538

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Central Serowe -Palapye	0.1	0.5	32.7	0.1	0.1	0.3	1.1	47.8	0.2	0.1	56992
Central Mahalapye	0.3	0.3	41.1	0.3	0.1	0.4	0.7	57.5	0.5	0.1	36683
Central Bobonong	0.1	0.1	39.7	0.1	0.0	0.7	0.4	62.3	0.4	0.0	22212
Central Boteti	0.2	0.2	33.7	0.2	0.3	0.6	0.5	43.7	0.4	0.1	21259
Central Tutume	0.4	0.6	36.9	0.1	0.0	0.5	1.2	59.0	0.3	0.0	46626
North East	0.1	0.2	34.6	0.1	0.1	0.4	0.6	47.8	0.1	0.0	20912
Ngamiland East	0.3	0.3	24.5	0.1	0.1	0.5	0.8	39.1	0.1	0.1	31591
Ngamiland West	0.4	0.1	39.2	0.3	0.2	1.3	0.4	64.5	0.3	0.1	17921
Chobe	0.9	0.5	12.8	0.0	0.1	1.6	0.9	30.0	0.0	0.0	10124
Delta	1.1	0.5	86.3	0.5	0.0	1.1	0.0	86.8	0.5	0.0	192
Ghanzi	0.6	0.2	35.4	0.1	0.0	1.6	0.7	50.5	0.2	0.0	15158
CKGR	1.2	0.0	85.7	0.0	0.0	3.6	0.0	86.9	0.0	0.0	84
Kgalagadi South	0.3	0.2	43.3	0.3	0.2	0.3	0.4	51.4	0.8	0.1	9749
Kgalagadi North	0.3	0.1	41.6	0.1	0.0	0.5	0.2	49.4	0.1	0.0	7172
Total	**0.3**	**0.5**	**25.3**	**0.1**	**0.1**	**0.6**	**1.0**	**37.3**	**0.2**	**0.1**	**697245**

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Trends on Green Energy Utilisation

- The relative use and adoption of green energy remains insignificant.
- Noted green energy used consists of firewood, cow dung, biogas, solar energy, crop residue
- With firewood subject to debates due to the capacity of communities to sustainably manage its availability; it remains the main source of energy for cooking; with a declining trend from **45.7%** in 2001 to **29.7%** in 2022.
- Solar uptake indicated to be gradually increasing and statistics show that the increase is in rural areas who accounted for **73%** of all solar connections in 2003 , and these are likely to be less connected to the national electricity grid; hence, relatively higher proportions
- Nationally, solar has increased from **0.2%** to **4.7%** connectivity
- For example, the statistics from energy use survey indicate that there are **29,256** households using Solar Photovoltaic Systems in the country, **11,777** uses solar water heating system while 216 have biogas digesters
- Nevertheless, the visibility of all these green energy systems remains higher in the rural villages.
- All biogas digesters were reportedly found in rural areas

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National Energy Source Tends among Households (%) for Lighting, Cooking and Heating – 1981 to 2022

Household Energy Source		1981	1991	2001	2011	2022
Solar Systems	Lighting	-	-	0.2	0.5	6.8
	Cooking	-	-	0.2	0.1	0.3
	Heating	-	-	-	0.1	0.3
Biogas	Lighting	-	-	0.1	--	--
	Cooking	-	-	0.6	0.9	7.2
	Heating	-	-	-	0.1	0.5
Wood	Lighting	-	-	5.6	3.6	1.1
	Cooking	85.8	63.3	45.7	41.2	29.7
	Heating	-	-	-	47.7	25.3
Cow dung	Lighting	-	-	-	-	-
	Cooking	-	-	0.1	0.1	--
	Heating	-	-	-	-	0.2
Crop waste	Lighting	-	-	-	-	-
	Cooking	-	-	0.1	-	0.2
Other	Lighting	-	-	6.7	0.4	2.0
	Cooking	-	-	0.2	0.1	1.3
	Heating	-	-	-	33.6	39.0

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NB: No data available (-); Zeros (--)
Some data from: Statistics Botswana, 2014
NB: For heating purpose, the value includes animal dung, crop waste, gra0.5ss, shrubs and straws

POLICY IMPLICATIONS

- There is a need to make the transition from non-renewable to renewable energy sources at household level
- To ensure that Botswana aligns and achieve the SDG 7 on clean energy, there should be developmental consideration in achieving Vision 2036, National Development Plans, Botswana Energy Policy, Renewable Energy Strategy, Integrated Resource Plans, Climate Change Strategy and Action Plan and other policies
- Therefore, should not only promote green energy but rather plans, budget for and allocate funds for development of infrastructures (physical and services)
- It is imperative to set targets and incentivize green technologies adoption, utilisation and implementation of policy initiatives for households
- This will help Botswana achieve the set target of increasing the share of renewable energy in the national energy mix.

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CONCLUSIONS AND RECOMMENDATIONS

- With noted minimal utilisation of green energy at household level nationwide, the enhancement of entrepreneurship approaches in the energy sector is imperative
- Relevant department to intensively raise awareness on green energy opportunities through entry points at grassroots levels such as kgotla meetings where the local communities are likely to be engaged.
- Communities to intensify employment of the possible green energies at household levels.
- The country to intensively invest in renewable energy infrastructure that is currently limited.
- The country to offer subsidies or tax incentives for communities to adopt green energies
- Capacity building on available avenues for green energy at household level
- Offer financial capital (grants and loans) for projects geared towards the use or adoption of renewable energy technologies.
- Also, offer incentives for individual households for using renewable energy sources like solar panels or biogas.
- Intensively entrepreneurise green energy sources as a form of climate change mitigation and adaptation measure as well as economic strategies for communities

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THANK YOU

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