ENERGY
CATALYST

Country Guide: Botswana

June 2020

Innovate UK

UKaid
from the British people

Country Guide: Botswana

Botswana is located in the centre of Southern Africa, bordered by Zimbabwe in the east, South Africa in the south, Namibia in the west and Angola and Zambia in the north.

Botswana is widely regarded as one of Africa's success stories. The economy has risen from being one of the poorest in the world at independence in 1966 to an upper-middle-income status by the 1990s. This rise is largely attributed to the discovery and subsequent exploitation of diamonds together with good governance.

Botswana is a democratic, multi-party republic, with the president of Botswana being both head of state and head of government. For the past five decades, the developmental focus has been centred on four key pillars: Sustainable Environment, Rapid Economic Growth, Economic Independence and Social Justice. Through focused improvement within these four key areas, Botswana has set itself a target of becoming a high-income country by 2036.

Figure 1 Map of South Africa. Source: d-maps

Environment and resources

Botswana is divided into three main environmental regions: the hardveld, consisting of rocky hill ranges and areas of shallow sand cover in the eastern areas of Botswana; the sandveld, consisting of deep Kalahari sand; and the third region, consisting of ancient salt pans and the permanently flooded Okavango Delta on the northern sandveld in the lowest part of the Kalahari Basin. Towards the hills, North of Lobatse, is the highest point (1,490m) while in the easternmost parts of the country within the Limpopo valley, the lowest point can be found at 660m.

The annual climate ranges from dry temperate weather in winter to humid subtropical weather during summer. In summer (October to March), temperatures can rise to approximately 34 °C, particularly in the northern and south-west areas of Botswana. In winter (April to September) frost frequently occurs during the night, particularly as very limited cloud cover is a common occurrence during these dry months. This often results in cold night and early morning temperatures at around 0 °C.

Average annual rainfall during summer ranges between 635 mm in the far north-east areas to less than 127 mm in the far south-west areas. These rains are typically limited to summer downpours between December and March.

Figure 2: Okavango Delta, Botswana

Water resources are limited to wetlands, ephemeral and perennial rivers as well as water stored in reservoirs. The perennial rivers (Chobe, Limpopo, Zambezi and Okavango) are shared watercourses, of which their management and use are subject to the Southern African Development Community (SADC) Protocol on shared watercourses.

In terms of agriculture, output constitutes less than a tenth of the national Gross Domestic Product (GDP) as very little land is suitable for cultivation. As a result, cattle rearing is the dominant farming practice within Botswana.

Diamonds, on the other hand, have provided the economic stimulus that has helped Botswana develop into an upper-middle-income country. Orapa, Letlhakane and Jwaneng provide some of the world's largest diamond resources and are largely responsible for the economic growth of Botswana. Additionally, nickel and copper have been mined at Selebi-Phikwe since 1974 while coal is mined at Morupule near Palapye and is responsible for providing feedstock for Botswana's electricity generation.

In 2018, mining and quarrying, finance and business services and general government services contributed 16.3%, 14.2% and 13.8% respectively to the total GDP. Trade, hotels and restaurants, on the other hand, contributed the largest proportion at 20.7% of the total GDP, highlighting the increasing importance of this industry in Botswana.

Tourism, particularly wildlife safaris, is one of the largest contributors to GDP in Botswana, recorded at 13.4 %, and is also a major employer, comprising 8.9% of the country's total employment. As many of the tourism hotspots are located in rural areas, off-grid PV solutions (Xigera Energy Centre, &Beyond PV systems) have recently offered a potential energy solution to lodges located within areas where electricity access is limited.

Demographics and economics

The population of Botswana is extremely low, measuring approximately 2.25 million in 2018 with a yearly population growth rate of 2.2%. The percentage of the population 12 years and older who have HIV and AIDS was recorded at 33.5%. This has placed a massive burden on the Government of Botswana with regards to providing medical assistance to people affected with such diseases, which significantly raises the health costs and highlights the importance of investing in preventive measures to lessen this burden on the economy. While Botswana has one of the most comprehensive national health programmes in Africa, the governance of the hospital system along with inadequate resources limit service delivery and thereby negatively impact healthcare in the country.

Approximately 69% of the population live in urban areas. The average population density is approximately four persons per square kilometre, ranking as one of the lowest in Africa. Botswana's dependency ratio is 67.3 (which is higher than the world average), meaning that for every 100 people in the productive age-group (15 to 64 years), there are 67 people who are depending on them. This increases the pressure on those providing financially as their income and consumption patterns are spread among many members in the household. However, the living conditions of the Botswana people have significantly improved as a result of a decline in poverty: between 2011 and 2016, the share of the population living on less than $1.90 a day fell from 29.8% to 16.1% and the Gini index fell from 60.5% in 2010 to 53.3% in 2015.
While significant strides have been made to improve economic conditions within the country, unemployment was recorded at 20.7% in 2018 and remains a critical developmental challenge for the government.

As reflected by the Vision 2036 Presidential Task Team, pursuing the vision of prosperity for all will require clarity on the way forward with regards to:

- A concerted effort towards diversification, moving away from diamonds as an economic mainstay
- Adopting inward-looking strategies or opening up the country to investors, thereby creating a vibrant economy and society integrated into the global economy
- Whether Botswana continues with policies that keep the country dependent on the state, or whether focus should be placed on fostering independence, self-reliance and entrepreneurial spirit, with the role of government being transformed from control to facilitation.

Table 1: Botswana at a glance

Capital	Gaborone
Total Area	82 730 km^2
Population	2.25 million (2018)
Official languages	Setswana and English
Rural Population	31% (2018)
GDP	US $ 18 616 M (2018)
GDP Per Capita	US $ 8 258 (2018)
Currency	Botswanan Pula (BWP)
Exchange rate 02/03/2020	1 GBP = 14.12 BWP
Exchange rate 15/01/2018	1 GBP = 13,19 BWP
Access to Electricity	62.82% (2017)

Addressing these will entail: accelerating reforms to the business environment; effective support for entrepreneurship; improving the quality of infrastructure (water and electricity), and improving essential basic services (education, health, and social safety nets).

In the yearly World Bank survey on "Doing Business", a comparison of business regulation in 190 economies, Botswana scored lower than the sub-Saharan African average. The 2020 edition of Doing Business ranks Botswana 159 out of the 190 countries surveyed, with a score of 76.2 out of 100 for the ease of starting a business.

Figure 3 provides the ranking and scores of Botswana compared to other economies for various 'Doing Business' topics, showing areas where Botswana is performing well and those that need to be improved. Access to electricity and enforcing contracts are the biggest areas of weakness for Botswana, which negatively impact doing business within the country and therefore limit business development.

Figure 3: World Bank doing business 2020 global rankings and scores for various 'Doing Business' topics in Botswana. Source: World Bank Group, 2020

Energy

Botswana has vast coal reserves (approximately 212 billion tons) resulting in 79% of installed capacity coming from coal fired power stations. Electricity imports, diesel and solar power provide the remaining capacity at 19.9%, 0.4% and 0.1% respectively.

Two power plants (Morupule A and B) near Palapye supply the majority of the country's electricity with the shortfall being covered by imports from South Africa. Morupule B's current capacity is 600 MW. However, it has faced technical challenges and at times has been closed for repairs or operated at partial capacity.

Installed capacity in 2017 was recorded at 892 MW (the majority coming from Morupule A and B) with the operating capacity measured at 410 MW. Peak demand has been recorded at approximately 900 MW. Botswana has traditionally been dependant on the South African Power Pool for energy imports but has more recently greatly reduced this reliance.

As illustrated in the National Development Plan (NDP) 11 published in 2016, the Botswanan Government (with support from the World Bank) has started to lay the foundations for the scaling-up of the deployment of renewable energy technologies in the country's energy supply mix. A number of studies have been undertaken by the Government that include:

- A Country Wide Survey – Solar Water Heating Systems in Botswana

- Bankable Feasibility Study for a 200 MW Concentrated Solar Thermal Power Plant in Botswana
- A Feasibility Study for Production and Use of Biofuels in Botswana
- Botswana Biomass Energy Strategy
- Renewable Energy Feed-in Tariff for Botswana

Furthermore, the Botswana Energy Master Plan sets out various goals for rural electrification, of which the following programmes have been identified:

1. Promotion of solar energy by the Botswanan government
2. Integration of grid and non-grid technologies
3. Encouragement of research and development concerning renewable energy sources
4. Identification of an appropriate institutional framework for rural electricity using renewable energy
5. Development of strategies for removing the barriers to the widespread use of renewable energies
6. Promotion of women and children's welfare through the provision of PV power generation (lighting)
7. Reaching 100% national power access by 2030

Energy challenges

Refined petroleum fuels are still being imported from South Africa to supplement energy requirements - however, limited supply routes have led to periodic shortages in fuel supply. Further challenges exist due to inadequate internal strategic storage capacity and the challenge of supplying energy to areas far removed from each other.

With regards to electricity, the main challenges in supply are in the electricity transmission and distribution network, which lacks grid access in the north-west and south-west regions (Figure 4). Furthermore, electric power transmission and distribution losses have been reported to be as high as 79%.

The current trend towards 2030 indicates that 200,000 households will still be without electricity access in 2030 while 300,000 households will be without access to clean cooking. As a result, policy objectives such as Vision 2036 are focusing on ensuring improved security and reliability of energy supply to all sectors of the economy.

Figure 4: Transmission and distribution network. Source: USEA, 2013

Solar Energy

Botswana is well endowed with over 3,200 hours of sunshine per year, and average global irradiation of 21 MJ per m^2/day throughout the country. The average daylight hours in Botswana ranges from 9.9h in summer to 8.2 hours in winter. This amounts to one of the highest insulation rates in the world. However, solar PV only contributes approximately 4.5 MW to the country's electricity generation (less than 1% of the total).

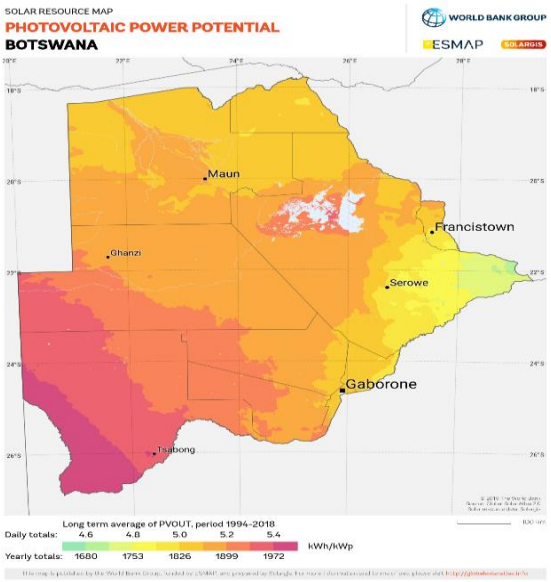

Figure 5: Solar resource Botswana. (2019 The World Bank, Source: Global Solar Atlas 2.0, Solar resource data: Solargis)

The NDP highlights solar power as a promising off-grid solution and indicates that electricity subsidies will continue in low income urban, semi-urban, and rural areas.

Furthermore, in order to create a more enabling environment, the government has also set up an energy regulator, the Botswana Energy Regulatory Authority (BERA), which began operation in September 2017. BERA's 2030 targets include increasing access to electricity to 100%, with 15% of the generation coming from renewable sources.

In August 2019, Botswana Power Corp announced a tender for 250 MW Solar PV projects to be built by Independent power producers (pre-qualify closed in September 2019) with the intentions to reduce the reliance on power imports from South Africa (Eskom).

Wind

Countrywide average wind speeds range from 2.0 to 3.5 m/s, and are, therefore, insufficient for large-scale wind energy development.

Hydro

Hydroelectricity generation has presented a challenge in Botswana due to low and uneven rainfall that has caused severe water restrictions and supply interruptions. Furthermore, as water resource applicable to hydropower generation is not bound to Botswana (due to the watercourse being international therefore subject to SADC Protocol), hydropower power generation projects are subject to international discussions of water use, adding further complexity to project development.

Biomass

A major source of energy for rural and low-income urban communities within Botswana is derived from firewood and charcoal. This reliance has resulted in deforestation, leading to a decrease in fuel-wood supply, except for the northern areas. On the other hand, Botswana experiences bush encroachment which has posed a threat to biodiversity and rangeland productivity. While this presents a significant ecological challenge, it also provides an opportunity in which there may be potential to explore possible means of deriving economic value from bush removal. As illustrated in Namibia, de-bushing large diameter bush stocks have provided economic returns through lucrative charcoal and fuelwood production. Preliminary research into bioenergy feedstock derived from bush invaders such as *A. tortilis* have shown promise in terms of providing an alternative energy source related to biomass.

In terms of biogas, Botswana has an estimated cattle population of approximately 2.2 million heads, thereby illustrating a promising biogas potential. The Government of Botswana in collaboration with the United Nations Development Programme (UNDP) is implementing a project entitled "Promoting production and utilization of Biogas from Agro-waste in South-Eastern Botswana", alternatively known as the Biogas Project. The biogas project aims to promote the production and utilisation of biogas from the south-eastern part of Botswana (two project demonstration sites exist in Malotwane and Ditlhowe). The project has set a target of constructing 30 demonstration sites as a pilot of the technology.

Energy stakeholders and programmes

The Ministry of Minerals Resources, Green Technology and Energy Security directs and coordinates overall national policies on minerals, energy and water resources, with the Botswana Power Corporation (BPC) acting as the sole provider of generation, transmission, distribution and retail services. The main energy stakeholders and their associated roles are described in **Error! Reference source not found.** 2. Additionally, Botswana energy-related support programmes are described in Table 3. These programmes illustrate the main project activities, aims and objectives within the country.

Table 2: Overview of the main stakeholders in the energy sector within Botswana

Institution	Role
Ministry of Minerals Resources, Green Technology and Energy Security	The Ministry formulates, directs and coordinates overall national policies on minerals, energy and water resources. The Department of Energy sits within the Ministry and defines, implements and coordinates the national energy policy. The overall policy goal for the sector is to provide affordable, environmentally friendly and sustainable energy services in order to promote social and economic development.

Ministry of Environment, Wildlife and Tourism (MEWT)	MEWT and specifically the Department of Meteorological Services engage on climate change issues with crossover into the energy sector which includes, for example, fuel wood resources.
Botswana Power Corporation	The Botswana Power Corporation (BPC) is the state-owned electrical power generation, transmission and distribution Company. It was established in 1970 and is currently the only electricity supplier in the country.
Botswana Energy Regulatory Authority (BERA)	BERA is responsible for providing an efficient energy regulatory framework for electricity, gas, coal, petroleum products, solar and all forms of renewable energy.
Botswana Renewable Energy Agency (under discussion)	The country is engaged in ongoing discussions on institutional energy reforms. The establishment of a dedicated agency responsible for promoting the use and uptake of renewable energy in Botswana is foreseen.
Botswana Development Corporation Limited (BDC)	Established in 1970 the BDC is the country's main agency for commercial and industrial development. The Government of Botswana owns 100 % of the Corporation, which invests in commercially viable projects in all sectors, except large-scale mining.
Botswana Investment and Trade Centre (BITC)	The BITC is an organisation established by an act of Parliament, to become an integrated Investment and Trade Promotion Authority (ITPA). BITC is mandated with the promotion and attraction of investment, export promotion, and the supporting of national development, including management of the National Brand.

Table 3: Support programmes in Southern Africa applicable to Botswana

Programme	Main activities
Power Africa	Power Africa is a regional project in sub-Saharan Africa which aims to provide 30,000 megawatts (MW) of cleaner, more efficient electricity generation capacity and 60 million new home and business connections. Power Africa is currently working with the Botswana Power Corporation, Botswana's Department of Energy, and implementation of the Botswana Electrical Regulatory Authority (BERA).
International Renewable Energy Agency IRENA	The Ministry of Mineral Resources, Green Technology and Energy Security, in cooperation with IRENA, recently initiated the Renewables Readiness Assessment (RRA) process with a view to support the country's efforts in strengthening the enabling environment for renewable energy deployment. The RRA is a country-initiated process that identifies short- and medium-term actions for the rapid up-scaling of renewables. In November 2019, the RRA Expert Consultation workshop brought together relevant stakeholders for the development of renewables in Botswana. They discussed the challenges and opportunities for the development of renewables, the outcomes of which will provide substantive inputs for the analysis that will be conducted as part of the RRA process.
EEP Africa - Energy and Environment Partnership	The immediate objective of the programme is to contribute to the reduction of poverty by promoting an inclusive and job-creating green economy and by improving energy security in the Southern and East Africa regions while mitigating global climate change. A call for proposals has been launched (end March 10, 2020) to support renewable energy and energy efficiency projects in Africa, including Botswana.
Southern African Solar Thermal Training and Demonstration Initiative (SolTrain)	SolTrain is a Regional Project in Southern Africa that assists local institutions in improving the efficiency and quality of their solar systems and in building maintenance capacity. SOLTRAIN is pleased to announce that the programme will be extended to the fourth phase with Clean Energy Research Centre (CERC), University of Botswana being a local partner.

Industry associations

The Renewable Energy Association of Botswana (REAB) was officially launched in 2018 with the aim of fostering the diffusion of renewable energy technologies and innovation in Botswana. The main objectives are:

- Renewable energy communication
- Development of improved renewable energy technologies' products and processes
- Initiate the implementation of renewable energy technologies' industry standards
- Renewable energy technologies' information and education services

Solar Industries Association of Botswana which aims to facilitate wide scale use of solar in Botswana. The main objectives are:

- Dissemination of solar industry information
- Foster high standards of practice in design, installation, manufacture and maintenance
- Cultivate the highest ideals and ethics in industry

References and further reading

Botswana Vision 2036: Achieving prosperity for all
https://library.wur.nl/ojs/index.php/Botswana_documents/article/view/16023

National development plan 11, April 2017 – March 2023, draft
https://library.wur.nl/ojs/index.php/Botswana_documents/article/view/16024

The World Bank, Source: Global Solar Atlas 2.0, Solar resource data: Solargis
https://globalsolaratlas.info/download/botswana

Doing Business - World Bank
https://www.doingbusiness.org/content/dam/doingBusiness/country/b/botswana/BWA.pdf

Botswana Demographic Survey Report 2017
http://www.statsbots.org.bw/sites/default/files/publications/Botswana%20Demographic%20Survey%20Report%202017.pdf

Sustainable Development Goals Botswana
https://library.wur.nl/ojs/index.php/Botswana_documents/article/view/16036

Official UK Government travel advice for Botswana
https://www.gov.uk/foreign-travel-advice/botswana

Useful contacts

British High Commission
Plot 1079-1084,
Main Mall
off Queens Road,
Gaborone
Botswana
Gaborone.Enquiries@fco.gov.uk

Botswana High Commission , UK
6 Stratford Place
London W1C 1AY
United Kingdom
+44 20 7499 0031
bohico@govbw.com

Ministry of Employment, Labour Productivity and Skills Development
Private Bag 516
Block 8, Government Enclave
Gaborone
+267 3732700 / 2600
Government website link
melsdpr@gov.bw

Ministry of Environment, Natural Resources Conservation and Tourism
Private Bag BO 199 Gaborone,
Botswana
Plot 13064 Government Enclave
+267 3647900 / +267 3914955
Government website link
MENT_PR@gov.bw

Ministry of Infrastructure and Housing Development
Fairgrounds Office Park, Plot 61923
Private Bag 007
Gaborone
+267 3958500
Government website link

Ministry of Investment, Trade and Industry
Private Bag 004
Gaborone
Botswana
Plot 54380, Central Business District
+267 3601200
Government website link
mitipru@gov.bw

Ministry of Local Government and Rural Development
Private Bag 006
Government Enclave
Main Mall
Gaborone
Government website link
+267 3658400

Ministry of Mineral Resources, Green Technology and Energy Security
Private Bag 0018
Gaborone
Botswana
Fairground Office Park
Plot 50676, Block C
Gaborone
Government website link
+267 3656600

Botswana Power Corporation
Main Mall
Gaborone, South East
+267 3607000
https://www.bpc.bw/
Contactcentre@bpc.bw

Botswana Energy Regulatory Authority BERA
Plot 8842,
Extension Town Centre,
Lobatse, Botswana

+267 533 0932
http://www.bera.co.bw/
info@bera.co.bw

Renewable Energy Associate of Botswana (REAB)
Dr Tobias Bader
Department of Mechanical, Energy & Industrial Engineering Faculty of Engineering & Technology
P/Bag 16 Palapaye, Botswana
+267 4931817
badert@biust.az.bw

Botswana Trade and Investment Centre
Mr. Moemedi Mokgosi
Director, International Business
6 Straford Place
London W1C 1AY
United Kingdom
+44 207 4990031
https://www.gobotswana.com/contact-us
enquiries@bitc.co.bw

Please contact your Client Relationship Manager if you want help with introductions to specific individuals with these institutions.