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Climate Adaptation and Energy Reform: Strengthening Botswana's Macroeconomic Resilience

Emanuele Massetti, Danielle Minnett, and Filippos Tagklis

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Adaptation and Energy Reform: Strengthening Botswana's Macroeconomic Resilience
Prepared by Emanuele Massetti, Danielle Minnett, and Filippos Tagklis

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ABSTRACT: Botswana faces mounting macroeconomic risks from intensifying climate trends and fiscal strain from electricity subsidies. Rising temperatures, more frequent extreme heat, and longer droughts threaten agricultural yields, labor productivity, and long-term growth. Electricity subsidies further compound these risks, limiting the government's capacity to respond effectively. This paper examines the macroeconomic and fiscal implications of climate shocks, outlines priorities for adaptation measures, and proposes energy sector reforms to reduce subsidy burdens. Aligning climate resilience and energy security with fiscal sustainability is critical to safeguard development.

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SELECTED ISSUES PAPERS

Climate Adaptation and Energy Reform: Strengthening Botswana’s Macroeconomic Resilience

Botswana

Prepared by Emanuele Massetti, Danielle Minnett, and Filippos Tagklis

A. Introduction

1. Growing macroeconomic risks from observed climate trends and projections, alongside fiscal strain from electricity subsidies, call for effective adaptation policies and energy sector reforms. The intersection of climate trends, macroeconomic risks, and fiscal pressures in Botswana presents a critical challenge that demands urgent policy attention. The continued and intensifying warming trend, marked by more frequent extreme heat events and prolonged droughts, poses significant macroeconomic threats to the nation's development trajectory. These climate-induced shocks are projected to diminish agricultural yields and labor productivity across various sectors, directly impacting economic growth and undermining revenue generation. In the near term, such shocks can sharply reduce growth rates, while over the long run, they threaten to contract GDP substantially and strain public finances through a shrinking tax base and increased demands for social protection and adaptation spending. The fiscal strain from electricity subsidies further compounds these risks, limiting the government's capacity to respond effectively. Without decisive adaptation policies and comprehensive energy sector reforms, the economy faces mounting vulnerabilities that could slow long-term growth.

2. Recognizing these stakes, this paper will examine the macroeconomic implications of observed and projected climate trends in Botswana, analyze the fiscal impacts of energy sector challenges, and outline a strategic framework for adaptation and reform. The paper will first explore the nature and magnitude of the climate risks confronting the country. It then provides broad guidelines for effective and efficient adaptation, including practical suggestions on how to prioritize actions listed in the country Nationally Determined Contribution (NDC). Finally, the paper addresses the critical issue of electricity subsidies that strain public finances, emphasizing the need for solutions that promote fiscal sustainability while enhancing energy security.

B. Macroeconomic Risks from Climate Change

Climate Trends and Projections

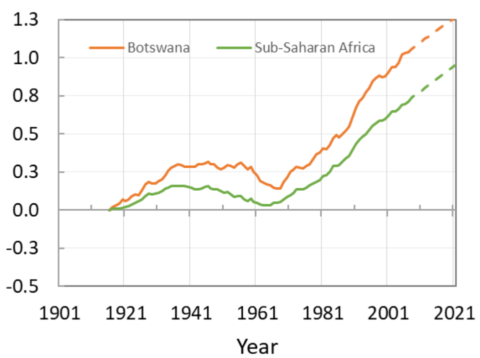
3. Botswana is already experiencing notable warming, with implications for water security, agriculture, and health. The country's climate is predominantly semi-arid to arid, with limited rainfall and high evapotranspiration (Richardson et al., 2022). Over the past century, Botswana has warmed by more than 1.2 °C relative to pre-industrial levels—faster than the Sub-Saharan African average (Figure 1).[1] The mean annual temperature was equal to 21.9 °C during the 1985–2014 baseline period and is estimated to have exceeded 22.3 °C by 2020. The mean annual temperature is lower than that of most countries in the world, and of almost all other Sub-Saharan countries, but seasonal variation is large, and hot days are normally recorded from November to February. Botswana has among the lowest annual precipitation totals globally—around 400–500 mm/year (Figure 1). High temperatures during the hottest months and structural aridity make the

[1] IMF staff estimate using CRU data (Harris et al., 2020). Average mean annual temperature between 1901–1930 used as a proxy for pre-industrial levels. Mean annual temperature is projected by estimating a linear trend.

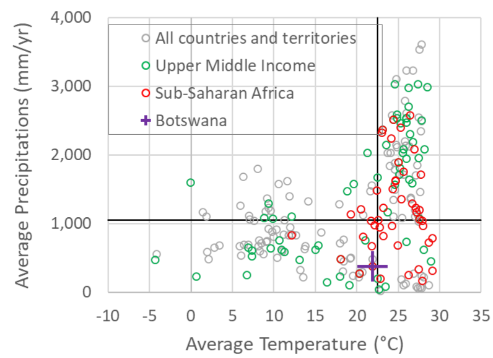
country vulnerability to future warming and dryer conditions, particularly through potential impacts on rainfed agriculture, pastoral systems, and the climate-sensitive Okavango Delta.

Figure 1. Observed and Projected Changes in Average Annual Temperature and Total Annual Precipitation

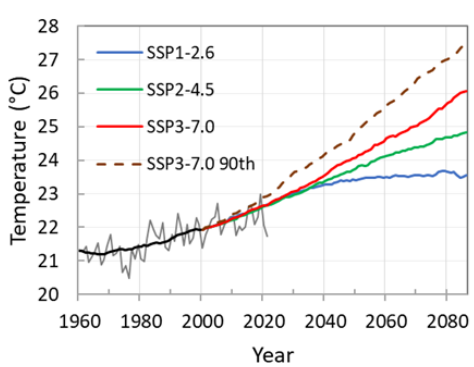
Temperature Anomalies
(Relative to 1901–1930, ºC)



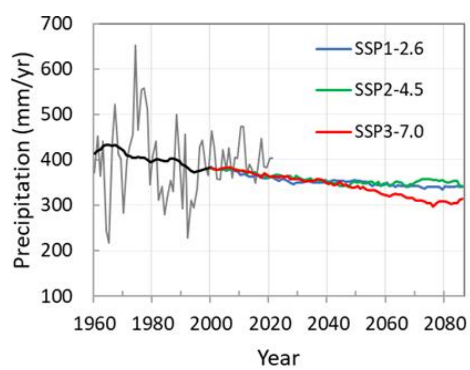
Cross-Country Comparison of Average Climatic Conditions (1985–2014)



Projected Average Annual Temperature (ºC)



Projected Total Annual Precipitation (mm)



Source: FADCP Climate Dataset (Massetti and Tagklis, 2024), using CRU data (Harris et al., 2020) and CMIP6 projections (Copernicus Climate Change Service, 2021).

Notes: All temperature and precipitation are calculated using CRU. The observed temperature changes 1985-2014 (2000) with respect to 1901-1930 (1915) can be used as a proxy of warming relative to the pre-industrial period. In the second row, the gray line describes historical values based on observations (CRU for temperature and precipitation. The black line describes the 30-year moving average around each year. Colored lines represent the median of 30-year moving averages of CMIP6 anomalies added to the observed value (thick black line in the year 1999). SSP3-7.0 (red) is a high emission scenario. SSP1-2.6 scenario (blue) is in line with the Paris goal to keep global mean temperature increase below 2 ºC with respect to pre-industrial times. SSP2-4.5 (green) represents continuation of present trends.

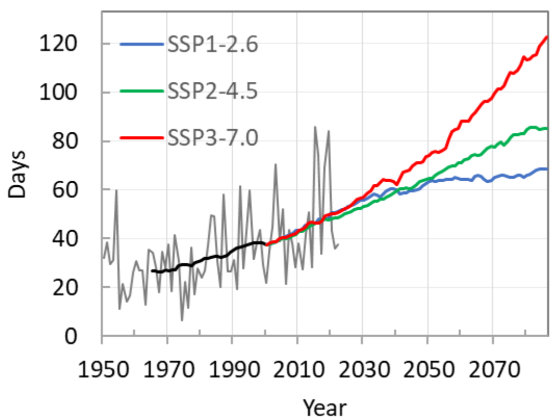
4. **Botswana is projected to face significant warming over the coming decades and annual precipitation is expected to decline slightly.** Climate projections show a consistent rise in average temperatures under all scenarios, with median warming of 1.5–2.2 °C by 2050 and 1.6-4.1 °C by 2085, relative to the 1985–2014 baseline. Under a high-emissions/fast-warming scenario (SSP3-7.0, 90th percentile), temperatures could rise by nearly 5.5 °C by the end of the century (Figure 1). In contrast, annual rainfall is projected to decline, from a historical average of around 420 mm/year to approximately 350 mm/year by 2085 across scenarios. While year-to-year variability has historically dominated rainfall outcomes, the long-term drying trend is expected to exceed internal variability and become statistically significant with most climate-models in agreement by the latter half of the century.

5. **Extreme heat and prolonged dry spells are intensifying in Botswana while trends in heavy rainfall events are uncertain.** The number of days with maximum daily temperatures exceeding 35 °C (TX35) – a commonly used threshold to characterize hot days – has increased steadily over the past two decades, consistent with observed warming trends. This rise in extreme heat is expected to continue under all emissions scenarios, with high confidence, further amplifying heat-related stress across sectors (Figure 2). Consecutive dry days (CDD), a key drought indicator, have also shown a marked upward trend since the 1990s, with an average increase of over 30 days relative to historical conditions, and are projected to continue increasing throughout the century (Figure 2). Heavy rainfall events have become more intense, but trends remain within natural variability and projections do not indicate significant changes. While intense rainfall events—measured by annual maximum one-day (Rx1day) and five-day (Rx5day) precipitation—have shown upward trends in recent years, these changes remain within the bounds of year-to-year variability and are not statistically significant (Figure). Projections suggest that the lack of statistically significant trends in these intense precipitation events is likely to persist under all emissions scenarios.

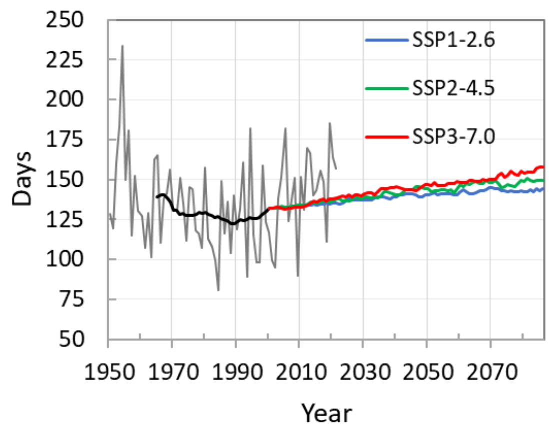
6. **This analysis of climate trends and projections highlights increasing risks for the macroeconomic outlook and for the most vulnerable part of the population.** The combined effect of higher temperatures and reduced rainfall, exacerbated by more frequent extreme temperature and longer dry periods, amplify existing aridity problems and increase pressure on Botswana's already water-stressed ecosystems and rainfed livelihoods. The largest impacts are going to be felt by farmers that rely on rainfed agriculture and other vulnerable parts of the population, but higher temperatures and increased aridity have the potential to worsen productivity across sectors with adverse macroeconomic consequences.

Figure 2. Projected Changes in the Number of Hot Days (TX35) and Consecutive Dry Days (CDD)

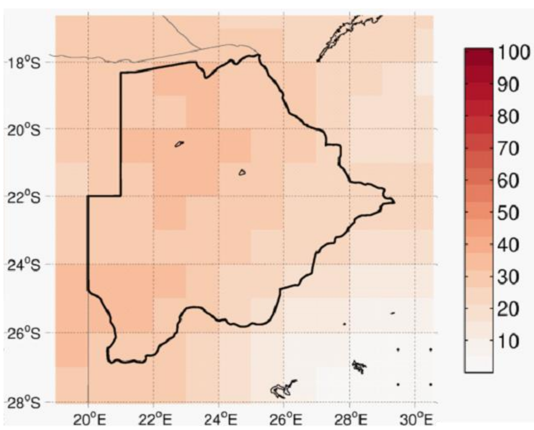
Days with Max Daily Temp. Above 35 °C



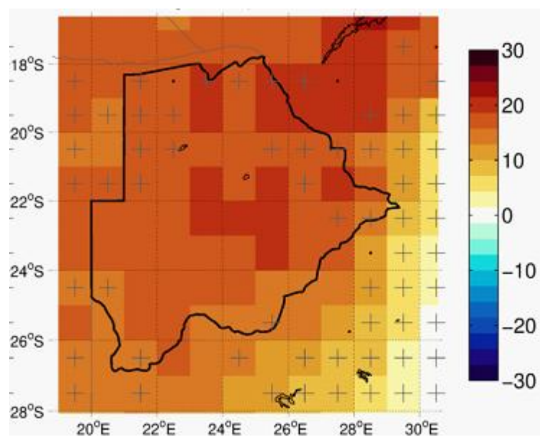
Annual Max Consecutive Dry Days (CDD)



TX35: 2041–2060 (SSP2-4.5)



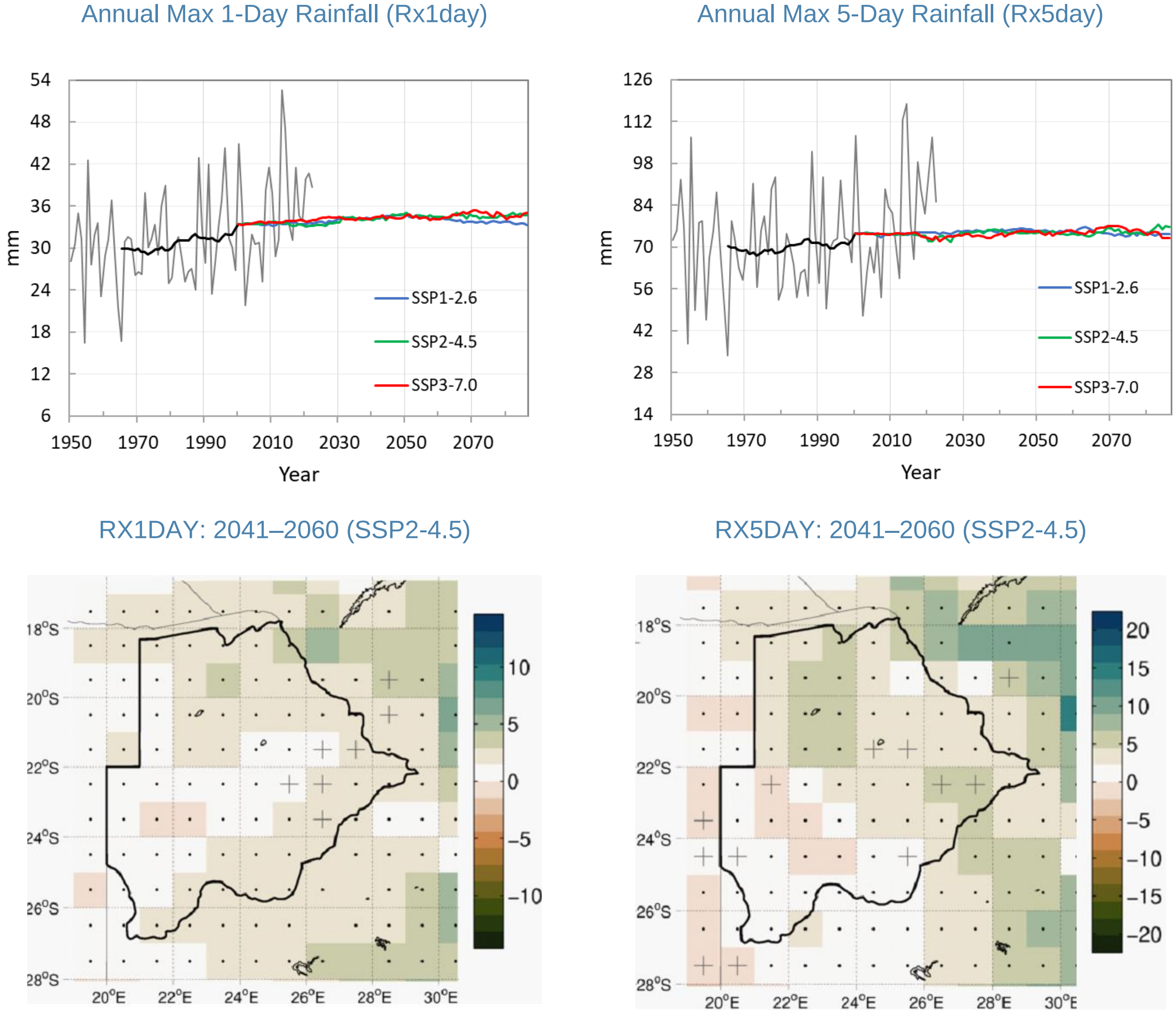
CDD: 2081–2100 (SSP2-4.5)



Source: FADCP Climate Dataset (Massetti and Tagklis, 2024), based on ERA5 reanalysis (Hersbach et al., 2023), CMIP6 projections (Copernicus Climate Change Service, 2021), and Copernicus Interactive Climate Atlas (C3S Atlas: https://atlas.climate.copernicus.eu/atlas).

Notes: Timeseries show country averages. Gray line: historical annual mean TX35 and CDD (ERA). Black line: 30-year moving average centered on each year. Colored lines: median 30-year moving averages of CMIP6 ensemble temperature anomalies added to ERA5 baseline (1999 black line). Scenarios: SSP3-7.0 (red: high emissions); SSP1-2.6 (blue: Paris-aligned <2°C); SSP2-4.5 (green: current trends). Maps: SSP2-4.5 projected changes vs. 1991-2020 baseline for 2041-2060 (medium-term) and 2081-2100 (long-term). Ensemble robustness (AR6 method): Robust Signal (≥80 percent models agree on sign); Conflicting Signals (crosses: <80 percent agreement but significant); No Change/No Robust Signal (dots: low change/significance, <66 percent emergent signals).

Figure 3. Projected Changes in Extreme Rainfall (Rx1day and Rx5day)



Source: FADCP Climate Dataset (Massetti and Tagklis, 2024), based on ERA5 reanalysis (Hersbach et al., 2023), CMIP6 projections (Copernicus Climate Change Service, 2021), and Copernicus Interactive Climate Atlas (C3S Atlas: https://atlas.climate.copernicus.eu/atlas).

Notes: Timeseries show country averages. Gray line: historical annual mean RX1DAY and RX5DAY (ERA5). Black line: 30-year moving average centered on each year. Colored lines: median 30-year moving averages of CMIP6 ensemble precipitation anomalies added to ERA5 baseline (1999 black line). Scenarios: SSP3-7.0 (red: high emissions); SSP1-2.6 (blue: Paris-aligned <2°C); SSP2-4.5 (green: current trends). Maps: SSP2-4.5 projected changes vs. 1991-2020 baseline for 2041-2060 (medium-term). Ensemble robustness (AR6 method): Robust Signal (≥80% models agree on sign); Conflicting Signals (crosses: <80% agreement but significant); No Change/No Robust Signal (dots: low change/significance, <66% emergent signals).

Projected Macroeconomic Impact of Weather Shocks Climate Change in Botswana

7. **The warming trend predicted for this century can cause significant reductions in GDP, particularly with slow or no adaptation.** Higher temperatures can reduce labor (Kjellstrom et al., 2009; Somanathan, et al., 2021; Kahn et al., 2021) and agricultural productivity (Kurukulasuriya et al., 2006; Malhi,

Kaur, and Kaushik, 2021), increase energy spending for air conditioning (Isaac and Van Vuuren, 2009), and intensify aridity due to accelerated evapotranspiration (Serdeczny et al., 2017). The impact of warming can be particularly severe if temperatures exceed critical thresholds, beyond which both agricultural and labor productivity decline sharply (Schlenker and Roberts, 2009; Akyapi, Bellon, and Massetti, 2025). Estimating the macroeconomic impact of these climatic changes presents numerous methodological challenges, and long-term projections are inherently uncertainty. However, the empirical literature has made progress, offering useful insights.

8. **A worst-case warming scenario could result in a 10 percent annual economic loss by the end of the century if adaptation is slow.**[2] Without adaptation these losses can double (Mohaddes and Raissi, 2024), while rapid adaptation could reduce losses to 3 percent of GDP for the same temperature scenario. Moderate global emissions cuts can keep GDP losses under 1 percent (SSP2-4.5 scenario in Figure 4), while deeper reductions that stabilize global temperature are projected to boost growth by removing the drag on the economy from the present warming trend. These losses arise from both direct and indirect impacts of higher average annual temperatures across sectors. They include the effects of increased aridity due to accelerated evapotranspiration, but do not account for reduced rainfall, more frequent extreme temperatures, and droughts. Furthermore, these estimates do not consider potentially large negative impacts from abrupt climatic changes, environmental collapse, and societal transformations indued by climate change.

9. **Extreme temperatures are estimated to already cause significant negative impacts on GDP, and their macroeconomic importance is expected to grow as they become more frequent.** Empirical evidence suggests that in years with a higher than usual number of hot days (maximum daily temperature above 35 °C), GDP growth is 2 percentage points below the norm (Akyapi, Bellon, and Massetti, 2025).[3] Fewer cool days than usual also decrease growth, but the negative effect is approximately half that of hot days. Based on these estimates, it can be concluded that the increased frequency of hot days over the past four decades in Botswana has reduced GDP by 2.4 percent below its potential without climate change.[4] Two-thirds of this loss are attributable to the increased frequency of hot days, and one-third to the decreased frequency of cool days. As shown in Figure 2, the number of hot days is projected to increase across all scenarios. The number of cool days is also expected to decline because of the warming trend. Without adaptation, losses from these climatic trends could be substantial and add further stress to macroeconomic losses from slow-moving warming.

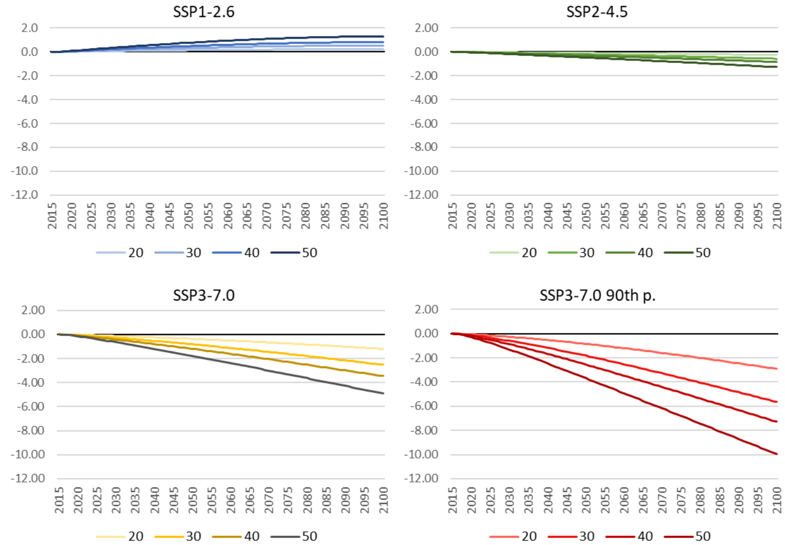
[2] SSP3-7.0 90th percentile scenario, implying an increase of mean annual temperature equal to +4.1 °C in Botswana in 2071–2100 compared to the 1985-2014 reference period. This loss is calculated relative to a scenario in which temperature continues increasing following observed trends and is already lower than in a hypothetical scenario without climate change. For a more extensive discussion, see Centorrino et al. (2025).

[3] Recent estimates of the impact of weather shocks on GDP growth obtained by applying machine learning methods to a large climate dataset for a panel of world countries indicate that three key weather variables – extreme temperatures, severe droughts, and days with cool temperatures – have a sizeable impact on annual GDP growth. The estimates presented here use a model estimated for a panel of Sub-Saharan countries. In the specific case of Botswana, droughts do not generally cause large economic impacts.

[4] While the effects of year-to-year weather shocks on the macroeconomy offset each other in the absence of trends (hotter and cooler than normal years tend to alternate), it variables are trended their net effect can be different from zero compared to a counterfactual scenario without climate trends.

Figure 4. Macroeconomic Effects of Warming and Weather Shocks

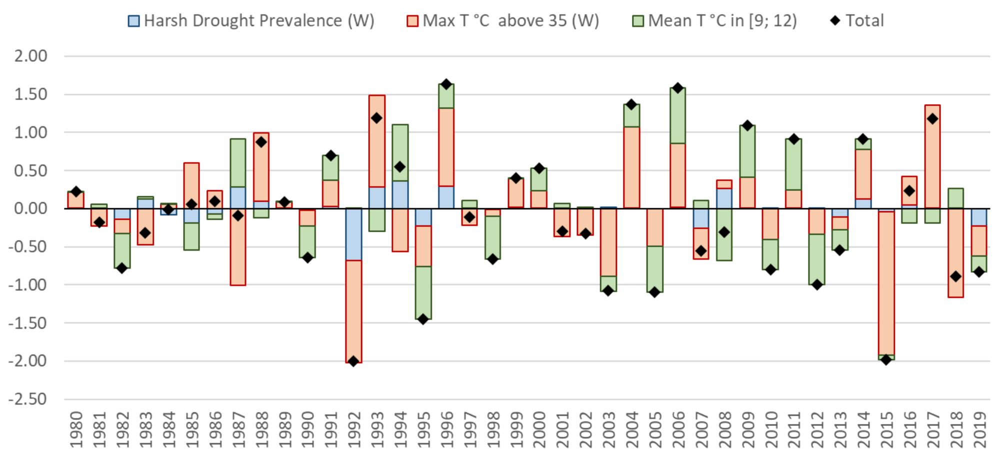
GDP Losses Relative to a Scenario with Continuation of Present Trends (Percentage)



Source: Centorrino et al. (2025) using Kahn et al. (2021), and CMIP6 data (Copernicus Climate Change Service, Climate Data Store, 2021) processed by Massetti and Tagklis (2024).

Notes: The impact of the warming trend for each scenario is estimated using Kahn et al. (2021) under the assumption that adaptation can offset the warming trend after 20, 30, 40, or 50 years. Impacts are measured as percentage deviations of real GDP per capita relative to a reference scenario in which the warming trend follows the historical pattern. Country specific warming trends are calculated for each scenario using the bias-adjusted ensemble median projections of temperature anomalies with respect to 1985-2014 over 30-year time periods centered around each year using CMIP6 data.

Impact of Selected Climate Variables on Growth in Botswana (Percentage)



Source: IMF staff using Akyapi, Bellon, and Massetti (2025).

Notes: Notes: Impact on GDP per capita growth in Botswana of variables selected in by Akyapi, Bellon, and Massetti (2025), using a panel of Sub-Saharan countries. Harsh Drought Prevalence: Share of grid-months during which the Palmer Drought Severity Index (PDSI) is < -4. Max T °C above 35: Share of grid-days with maximum daily temperature greater than 35°C. Mean T °C in [9; 12): Share of grid-days with mean temperature in the interval [a,b). (W) indicates population-weighted variables Black diamonds indicate the net impact of all variables.

C. Adaptation Policy Recommendations

10. Adaptation can substantially reduce climate change impacts while minimizing fiscal costs if supported by efficient public policies. While estimating with precision what should be done, and at what cost is extremely difficult, it is possible to build a roadmap for including adaptation into macrofiscal planning by starting from important general principles. IMF staff developed guidance to help countries adapt by integrating climate change in macro-fiscal planning (Gonguet et al. 2021; Bellon and Massetti, 2022a,b; Aligishiev, Bellon, and Massetti, 2022; Sakrak et al. 2022).

11. A crucial first step in estimating investment needs is to differentiate between investment in climate change adaptation and investment in development. While nearly all development investments reduce climate vulnerability as a side benefit – for example, expanding the use of irrigation to deal with present needs also aids in managing future climate change stress, paving rural roads increases their flood resilience, and transitioning employment from informal agriculture to formal sectors fosters economic growth and overall economic resilience – adaptation investments are those driven exclusively by climate change. Often, adapting to climate change requires marginal adjustments to existing development investments, such as larger water storage tanks to manage longer dry periods. Only the additional cost of these water tanks attributable to climate change should be considered an adaptation expense (Bellon and Massetti, 2022). This distinction enables accurate estimation of budgetary pressures and prevents double counting of investment needs.

12. By focusing on strictly additional measures, the government can simplify and strengthen the country's climate change adaptation strategy. Botswana's Second Updated Nationally Determined Contribution (NDCs) under the Paris Agreement outlines approximately forty measures across eight areas aimed at reducing vulnerability to weather shocks and climate change (Government of Botswana, 2024),[5] though not all are strict adaptation measures. While all these measures are beneficial in decreasing vulnerability to weather shocks and climate change, many are driven primarily by development needs.

13. The impact of government action and spending can be maximized by focusing on public provision of climate services, on boosting water sector efficiency. Investing in climate services – including by expanding early warning systems, climate risk mapping, and defining a system to measure the impacts of climate change is a key government goal in the national NDC and deserves the highest priority. This information is instrumental to mainstream climate change into all government operations, for example by integrating climate change into Public Financial Management (PFM). Measures to increase efficiency of water supply and water use – such as water transfer schemes, minimizing water losses, and strengthening transboundary agreements on water – deserve immediate attention because they alleviate present risks while build a system that can efficiently adapt to the increasing water stress predicted by climate models. As market inefficiencies and policy failures may limit private adaptation or create distortions, another key role for the government is to continue promoting reforms that ease the efficient use of all resources and ensure competitive access to markets. For example, access to credit markets allows farmers to invest in adaptation and efficient

[5] Adaptation measures are listed across eight areas: climate services, water, livestock, crops, forestry, biodiversity and rangeland, health, infrastructure.

water pricing creates incentives to conserve water. Finally, the government has an important role in addressing adverse distributional impacts of climate change ensuring a just transition.

14. Cost-benefit analysis (CBA) can play an important role in selecting public adaptation projects. Adaptation investment yields beneficial effects, but investing in adaptations with low economic and social returns may crowd out investment in more impactful development measures. For instance, choices about investing in climate resilient infrastructure, improved drainage systems, water desalination facilities, rooftop rainfall catchment on public buildings, and other actions identified in the NDC often require balancing levels of protection with associated costs. These trade-offs are best evaluated by systematically comparing social costs and benefits. What to do, when, how, and at what cost ultimately relies on ethical choices that should reflect the preferences of each society. However, CBA, complemented by analysis and correction of distributional impacts, can help decision makers maximize overall social welfare by avoiding wasting scarce resources. To achieve this goal, it is essential that CBA is applied to adaptation as well as to all other development programs in a consistent manner (Bellon and Massetti, 2022).

D. Powering the Future: Accelerating Botswana's Shift to Renewables

Background

15. Electricity supply in Botswana is dominated by coal-fired generation, with minimal contribution from renewable sources. Domestic installed capacity is approximately 900 MW, of which around 630 MW is used during peak hours.[6] Coal-fired plants, Morupule B (~600 MW) and Morupule A (~132 MW), account for over 96 percent of domestic power.[7] Diesel generators at Orapa (90 MW) and Matshelagabedi (73 MW) plants provide roughly 160 MW of contingency generation. Meanwhile, renewable energy remains marginal, with only 6 MW of installed solar photovoltaic (PV) capacity (IRENA, 2021).

16. Botswana's electricity supply remains heavily dependent on imports, making regional connections through the Southern African Power Pool (SAPP) an essential component of the energy system. The Morupule B plant continues to face persistent operational challenges and is undergoing extensive remedial work, limiting its ability to operate at full capacity. Meanwhile, Morupule A is projected to be retired from service by 2027. Botswana's heavy reliance on these plants, combined with the high costs of diesel generation, has caused the country to be dependent on electricity imports. Currently, about 48 percent of final power consumption is generated domestically, while 52 percent is sourced through the Southern African Power Pool (SAPP)[8], primarily from Zambia, Namibia, and South Africa. In 2023, Botswana spent $156 million on electricity imports, making it the 55th largest importer of electricity globally.[9] Around 60 percent of SAPP electricity generation comes from coal generation and around 24 percent from hydro.[10] Last year, the unit costs of imported power increased by an estimated 166 percent (Timothy, 2025). Although imported electricity can

[6] World Bank, 2024, SAD Centre for Renewable Energy and Energy Efficiency (n.d.)
[7] IEA (n.d)
[8] IEA (n.d)
[9] OEC, Electricity in Botswana (n.d)
[10] SAPP, 2021 Annual Report (Latest available)

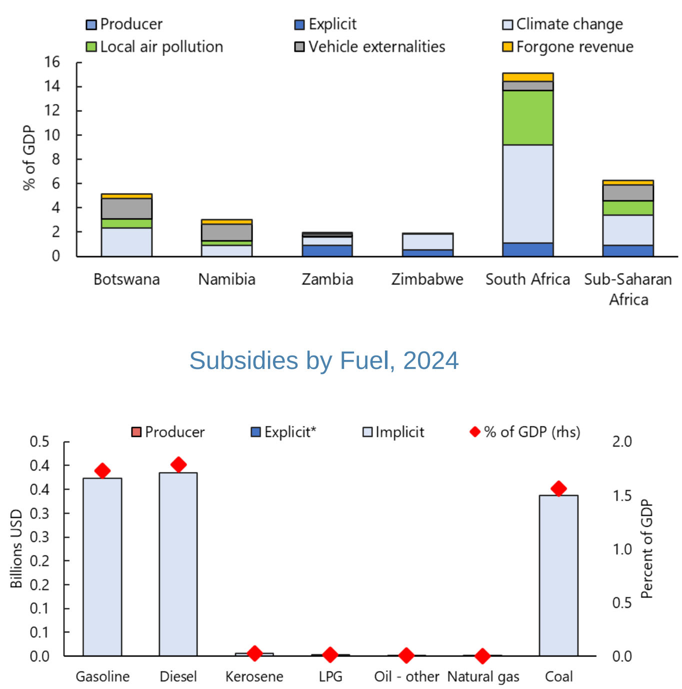
carry higher per-unit costs, participation in the SAPP provides Botswana with the ability to draw on regional surplus generation during periods of domestic shortfall. At the same time, high dependency on imported electricity can cause energy security concerns. Load-shedding in South Africa is affecting service levels in the neighboring villages across the border in Botswana (World Bank, 2024).

17. **Botswana's electricity market operates under a single-buyer model, with the Botswana Power Corporation (BPC) serving as the sole off-taker for all domestically generated power and electricity imports.** BPC is state-owned and is responsible for generation, transmission, and distribution, as well as implementing the government's rural electrification program funded by the Ministry of Minerals and Energy (MME). While this model provides a centralized framework for sector planning and investment coordination, it also concentrates off-taker risk into a single entity. BPC's network spans large distances, leading to transmission and distribution losses, which averaged 15.35 percent in 2021 (World Bank, 2024). Other key sector players include the MME, which oversees policy and regulation and the Botswana Energy Regulatory Authority (BERA), responsible for licensing and tariff setting. The single-buyer arrangement underscores the need for robust financial management and contractual certainty to ensure investor confidence and long-term supply security.

18. **Despite relatively high overall access to electricity, disparities remain stark between urban and rural areas.** National electrification stood at approximately 72–76 percent in recent years, outpacing many neighboring countries, but remaining low in comparison to similar per capita income countries. Additionally, access remains uneven. Urban access has reached around 95.5 percent, whereas rural access has lingered around 25 percent—causing equity challenges.[11] Though a small levy on electricity bills supports low-income grid connections, many households have struggled with upfront connection costs at the household level, including wiring and appliance affordability (World Bank, 2024). The zero-cost connection policy, launched in 2024, established the free supply of a pre-wired electrical distribution system known as a ready board, for customers earning up to P2,400 per month.

Figure 5. Implicit Subsidies

Subsidies by Component, 2024



Source: IMF Fossil Fuel Subsidies Database.

[11] SDG 7.1.1 Electrification Dataset, World Bank, Accessed 08/14/2024

Regardless of these efforts, off-grid and decentralized solutions have not yet been mainstreamed (World Bank, 2023).

19. **Although Botswana does not provide explicit fossil fuel subsidies, implicit subsidies are estimated at around 5 percent of GDP.** Implicit subsidies occur when the retail price fails to include external costs, inclusive of the standard consumption tax. These external costs encompass contributions to climate change from greenhouse gas emissions, health impacts—especially premature deaths—caused by harmful local pollutants such as fine particulate matter, and the negative effects of road fuel use, including traffic congestion and accident-related costs. The IMF also includes forgone consumption tax revenue that would be collected if implicit costs were included in pricing. Implicit subsidies are high compared to neighboring countries aside from South Africa (see Figure 5). As a result, energy prices do not fully reflect their true economic cost, reinforcing carbon-intensive consumption patterns and potentially delaying a shift toward cleaner alternatives.

20. **Electricity subsidies continue to place a considerable strain on Botswana's public finances, as tariffs remain well below the cost of supply.** BPC tariff increases of 10 percent, 22 percent, and 3 percent occurred in April 2018, 2020, and 2021, respectively. Requests by BPC for further 5 percent adjustments in 2022–2023 and 2023–2024 were denied, even as operational costs rose. The subsidies reflect a persistent cost-recovery gap, with tariffs at 30–32 thebe/kWh (0.021–0.0224 USD/kWh) below actual generation and import costs, contributing to operational losses of P498 million in FY2023 (Timothy, 2025). For the upcoming year, BPC is already confirmed to receive around P1.2 billion as subsidy support that is part of a P3–4 billion package under the Transitional National Development Plan, though the estimated shortfall for 2025–2026 is P3.4 billion (Timothy, 2025). As a result of the subsidies, current average domestic tariffs, at roughly $0.09/kWh, are among the lowest in the Southern African Development Community.

Targets and Plans

21. **Botswana has set highly ambitious energy goals and updated their Integrated Resource Plan (IRP) with a substantial renewable energy rollout that still involves coal generation.** The government has targeted a 50 percent share of renewable energy generation in Vision 2036 and aims for universal electricity access and net energy exporter status by 2030. Under its Nationally Determined Contribution (NDC), the country has pledged a 15 percent reduction in greenhouse gas emissions relative to a business-as-usual (BAU) scenario by 2030, conditional on securing adequate financing. As electricity generation—followed by transport—accounts for the largest share of non-Land Use, Land-Use Change, and Forestry (LULUCF) CO_2 emissions, the government's updated 2025 Integrated Resource Plan outlines a substantial renewable energy rollout, with incoming renewable energy installed capacity at 1950 MW. Implementation is being spearheaded by the Projects and Energy Development Unit (PEDU) under the MME, which is preparing competitive tenders for large-scale solar and wind projects. The IRP also plans to continue to invest in coal generation. The 600 MW Mmamabula power plant, already procured and expected to be completed in 2027, will add significant capacity. Meanwhile, the plan aims to have another coal plant in Palapye established by 2027 with an additional 615 MW and a coal bed methane project reaching 100MW of installed capacity. However, it is important to note that the plan is not informed by a least-cost generation analysis or renewable energy feasibility studies, and as such, the feasibility of the proposed projects remains uncertain.

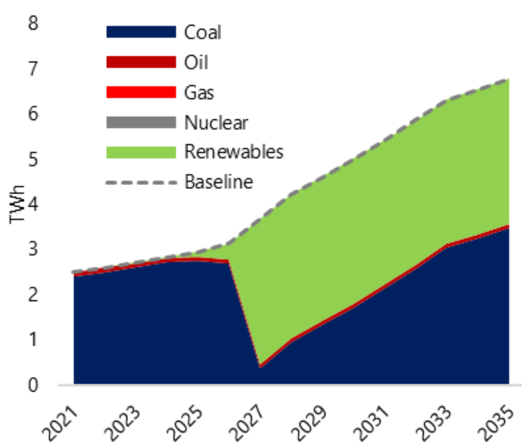
22. The outcomes of the updated IRP are modeled by the Climate Policy Assessment Tool (CPAT). CPAT is a spreadsheet-based model providing projections of fuel use and GHG emissions for the major energy sectors in over 200 countries. The impacts of carbon pricing and other mitigation policies depend on their proportionate impacts on future fuel prices and the price responsiveness of fuel use in different sectors. The former is based off international energy price forecasts and emissions factors while the latter is parameterized to the mid-range of existing modelling literature and empirical evidence on fuel price elasticities. The model is linked to input-output tables to infer impacts on production costs in different industries, consumer prices, and burdens on household income groups. CPAT, which was developed jointly by IMF and World Bank staff, is widely used in IMF surveillance, cross-country, and technical assistance reports (see Annex 4 for more details).

23. CPAT analysis indicates that a substantial influx of renewable energy capacity would significantly reshape Botswana's generation mix and drive a notable decline in GHGs compared to the country's current emission trajectory. Under the IRP, renewable energy—particularly solar PV—is projected to surpass the demand for coal-fired generation within the first year of being introduced (see Figure 6, panel a) since the price for renewable energy is lower than coal-generation. However, since the IRP ends in 2027, and no additional renewable energy is planned beyond this horizon, the demand for coal-generation increases again as energy demand grows and the modelling assumes a reduction of imported electricity.[12] Therefore, to maintain the high renewable energy share, more renewable energy projects would need to come online after the 2027 time horizon. Under the IRP, power sector emissions are expected to fall by approximately 54 percent and overall emissions by 30 percent compared to 2030 baseline levels, thereby exceeding the country's NDC (see Figure 6, panel c). The majority of energy-related revenue comes from excise taxes on gasoline and diesel consumption, thus the reduction in coal generation would not significantly diminish government revenue streams (see Figure 6, panel D). In addition to climate benefits, a transition to renewable sources would reduce reliance on aging coal plants, improve air quality, and enhance energy security by diversifying supply sources.

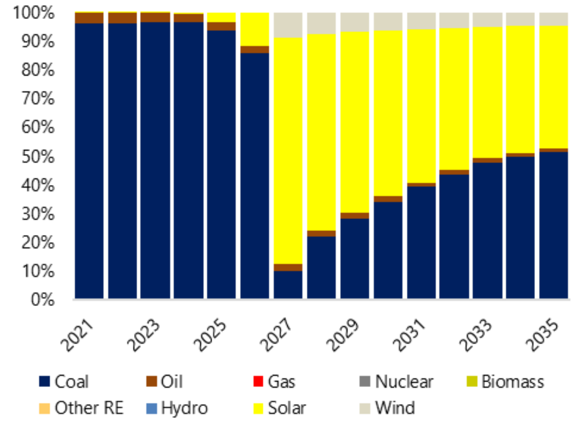
[12] The CPAT is modeling the IRP business-as-usual scenario, which has the highest electricity demand compared to other scenarios. The CPAT is using an assumed 10 percent fall in annual electricity imports for the time horizon of the IRP and a 5 percent fall in annual electricity imports until 2033.

Figure 6. CPAT Results Modelling the Updated IRP

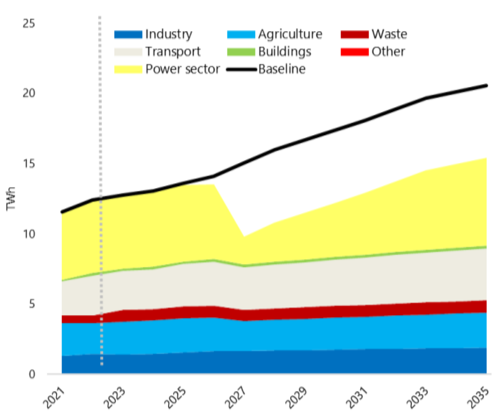
Electricity Generated by Source in Botswana (TWh)



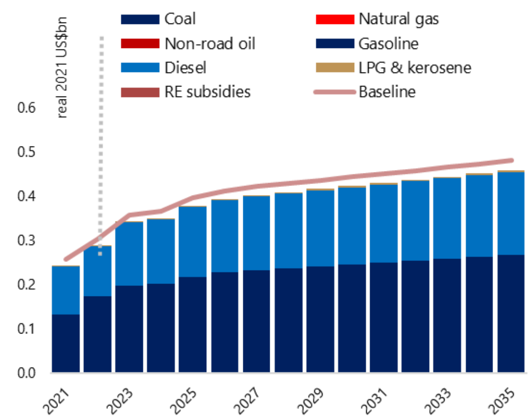
Electricity Generated by Source (Percent of Generation)



Projected GHG Emissions under IRP (Compared to Baseline, exc LULUCF)



Total Revenues by Fuel Source Net of Subsidies



Source: IMF calculations using CPAT.

Table 1. Capacity and Demand of Electricity in SAPP Countries

Country	Utility	Installed Capacity (MW)	Operating Capacity (MW)	Current Peak Demand (MW)	Peak Demand Plus Reserves (MW)	Capacity Excess/Shortfall Including Reserves (MW)
Angola	RNT	3,129	2,500	1,869	2,138	362
Botswana	BPC	927	459	610	698	-239
BRC	SNEL	2,457	1,076	1,376	1,574	-498
Lesotho	LEC	74	70	150	172	-102
Malawi	ESCOM	352	351	326	373	-22
Mozambique	EDM/HCB/MOTRACO	2,724	2,279	1,850	2,116	163
Namibia	Nampower	614	389	695	695	305
South Africa	Eskom	50,774	48,463	38,897	41,374	7,089
Swaziland	SEC	70	55	232	265	-210
Tanzania	TANESCO	1,366	823	1,051	1,202	-379
Zambia	ZESCO/CEC/LHPC	2,734	2,734	2,194	2,510	224
Zimbabwe	ZESA	2,045	1,535	1,615	1,847	-292
Total	—	67,266	60,754	50,865	54,964	6,401

Source: Southern African Power Pool, 2025

24. However, the plan's focus on becoming an energy export could lead to oversupply risks. Bringing over 3000 MW of installed coal and renewable energy capacity online before 2027 presents a risk of oversupply relative to the current peak demand of just 630 MW. However, it is important to note that the capacity factor of solar is low, at around 20 percent. Therefore, when including capacity factors, the level of additional supply is closer to 1050MW of capacity, which is still an oversupply of domestic generation. The interconnected SAPP grid, means Botswana can access broader markets, monetize excess generation, and improve energy security across the region. However, it is important to question if there will be demand available for excess generation. In 2024, excess capacity, including reserves, for the region was 6,401MW (see Table 1) and there may be less demand for coal-based power as countries, like South Africa, accelerate their energy transitions. Regional competition may be another constraint as SAPP members are also planning to expand generation capacity (see Table 2). Lastly, the country could face infrastructure constraints since export potential depends on transmission interconnectors, which require significant time and investment to develop. If regional demand growth and connection lags behind supply expansion, Botswana could face difficulty selling its surplus power, forcing it to operate plants below capacity factors and undermining the economic case for the investments.

Table 2. Generation Expansion Plans for Other SAPP Countries

Country	Planned Capacity Additions by 2030	Key Details & Technologies
South Africa	~29,500 MW total new capacity by 2030	As outlined in the Integrated Resource Plan (IRP 2019), additions include 14,400 MW of wind, 6,000 MW of solar PV, 3,000 MW of gas, 1,500 MW of coal, and 513 MW of pumped storage. The South African Renewable Energy Masterplan (SAREM) further targets 3 GW of new renewables annually, increasing to 5 GW/year by 2030, with emphasis on local manufacturing and energy storage.
Mozambique	+2,000 MW hydropower by 2030; long-term plan to reach 17,720 MW by 2043	The 2023 Energy Transition Strategy prioritizes large hydro expansions, especially the 1,500 MW Mphanda Nkuwa Hydroelectric Project, alongside grid expansion to boost electricity access and exports. The Integrated Master Plan envisions exports rising from ~1,500 MW to 7,000 MW in the long term.
Zambia	+6,308 MW by 2030, with ~3,443 MW from renewables	The Integrated Resource Plan (2023) aims to raise the share of variable renewable energy sources (solar, wind) from 3% to 33% by 2030. Key projects include the 255 MW Lunsemfwa Hydro (2027) and multiple 100 MW+ solar PV plants, such as Chisamba Solar.
Namibia	~140 MW confirmed projects; additional capacity in planning	Projects include the 40 MW Otjikoto Biomass Power Station (2027) and a 100 MW large-scale solar PV plant (commissioning 2026). The country is supported by a $138.5 million World Bank loan for grid upgrades to integrate renewables and improve reliability.

Sources: South Africa Department of Mineral Resources & Energy, 2019; Enerdata 2025, Jowett, 2025, Bungane, 2018;, Zambia Ministry of Energy IRP; Global Transmission Report, 2025 ; Reuters, 2025; Reuters, 2024a ,, Reuters,2024b;, Nambia Ministry of Mines & Energy, 2022.

Table 3. Key features of Botswana's Renewable Energy PPA Framework

Feature	Description
Well-Structured Competitive Process	Sealed-bid, location-specific, two-stage tenders ensure transparency and fairness.
Pre-Developed Project Sites	Botswana Power Corporation (BPC) selects and prepares sites, including grid connection points.
Rigorous Pre-Qualification	Bidders must demonstrate strong technical and financial capability.
Robust Financial Commitments	Bid bonds (up to US $1M) and performance bonds (US $4M) required, enhancing project delivery discipline.
Long-Term Revenue Certainty	Projects awarded a 25-year Power Purchase Agreement (PPA) with BPC, providing predictable cash flows.
Currency & Inflation Risk Mitigation	PPA price partially indexed to local inflation and Pula/USD exchange rate—offering financial stability to investors.
Government Backing without Sovereign Guarantee	No sovereign guarantee, but support via a three-month liquidity facility and a government-issued letter of comfort.
Incentivized Local Ownership	Projects expected to include 40% local equity, applied only if local market capacity exists—balancing inclusivity and feasibility.
Dual Evaluation Criteria	Evaluation based on both price and economic development impact.

Source: Information taken from Kruger, W., Alao, O., & Betz, S. (2024).

Table 4. Renewable Energy Auction Rounds in Botswana

Auction Rounds	Initiation Year	Volume Requested (MW)	Project-Size Limits (MW)	Technology Requested	Capacity Procured (MW)
Round 1	2015, relaunched 2017, and again in 2019	100	50	CSP or PV	50 MW
Round 2	2015	100	100	CSP	Nil
Round 3	2018	N/A	N/A	Solar PV	Nil
Round 4	2022	N/A	N/A	Solar PV	Nil
Round 5	2022	200	100	CSP	Nil

Source: Kruger, W., Alao, O., & Betz, S. (2024).

Building an enabling environment for renewable energy

25. Evidence-based planning is essential to ensure that energy investments are both efficient and achievable. The IRP provides a strategic outline for future energy development, but it is not based on a least-cost generation analysis or renewable energy feasibility studies, which limits confidence in its economic efficiency and technical viability. Basing energy planning on least-cost and feasibility analyses is crucial because it ensures that resources are allocated optimally, generation options are technically achievable, and the system can reliably meet demand at the lowest possible cost. Without this foundation, the plan risks promoting solutions that may be financially or operationally unsustainable, potentially leading to higher costs for consumers and delays in achieving energy security and renewable integration goals.

26. Committing to a clear, consistent auction schedule with transparent rules can rebuild investor trust and secure long-term renewable energy investment. While Botswana's Renewable Energy PPA Framework offers notable strengths (see Table 3), past disruptions to auctions have undermined investor confidence, making transparency and predictability essential going forward. Multiple utility-scale solar auctions have been canceled or delayed, eroding trust among developers and financiers (see Table 4), and highlighting the need for better planning. For example, the 100 MW PV tender announced in 2017 was canceled in 2019 and later reissued in smaller lots, some of which the government did not pursue. To restore credibility and attract sustained investment, Botswana must ensure procurement auctions are rolled out in a transparent, consistent, and timely manner.

27. Incorporating clear methodologies to remunerate and integrate generation from variable sources to the national grid can provide the clarity needed for an investment-ready power system. Clear rules and standards give Independent Power Producers (IPPs) and private investors the confidence to commit capital, knowing their projects can connect to the grid efficiently and operate under predictable conditions. The current grid code lacks comprehensive technical standards for integrating renewable energy, storage, and distributed generation and lacks clarity on grid access protocols and interconnection requirements for IPPs. BPC's workforce includes only a limited number of engineers skilled in transmission and connection planning, which further hinders the smooth integration of renewable energy (Kruger, Alao, and Betz, 2024).

Updating the gride code to incorporate RE, ensuring there is institutional capacity to provide timely grid connection approvals, as well as, monitor and enforce compliance, can encourage investment into the sector. Meanwhile, robust provisions for managing variable renewable energy (e.g., forecasting, curtailment protocols, or ancillary services) help maintain grid stability as more solar and wind power come online, preventing outages and ensuring consistent supply.

28. Increasing electricity tariffs to cost-reflective levels and phasing out subsidies can play a pivotal role in enabling a country to expand its renewable energy share. When tariffs reflect actual costs, utilities can recover their operating expenses, maintain infrastructure, and invest in grid upgrades or new generation capacity, including renewable energy projects. This financial stability also makes the sector more attractive to private investors, as they can see a clear path to recovering their costs and earning a reasonable return. For example, Namibia, with a peak electricity consumption comparable to Botswana's, implemented cost-reflective tariffs following a national tariff and cost-of-service study. These actions enabled NamPower to operate without external subsidies, meet its financial obligations, and attracted an influx of Independent Power Producers— all renewable—that now contribute 25 percent of installed capacity (Baker and Bischof-Niemz, 2022). In addition, reducing subsidies eases the fiscal burden on the government, freeing up public resources that can be redirected to other priorities.

29. Reaching cost-reflective levels does not mean everyone has to pay the full cost. For example, Namibia's tariff structure uses cross-subsidies in which tariff support flows from businesses/high-consuming residents to low-consuming domestic users. For Botswana, a cross-subsidization approach could make electricity more affordable for rural communities. Under such a scheme, revenues from customers connected to the main grid would be used to subsidize electricity for consumers in areas of solar mini-grids, thereby supporting rural electrification efforts and narrowing the access gap between urban and rural areas. By sharing costs across the customer base, the model would advance social equity while encouraging the uptake of renewable energy solutions. It would also provide a more predictable revenue stream for mini-grid operators, strengthening their long-term financial sustainability and enabling wider access to reliable electricity.

30. Successful cross-subsidization would require careful designing, including transparent tariff setting, consumption metering, and addressing sector inefficiencies. A transparent compensation mechanism should include clear participation criteria to promote cost efficiency (including estimating the impact of adding new mini-grids on tariffs), cost recovery calculations for participating mini-grids, studies on the impact of increased main grid tariffs on customers, and periodic tariff reviews. Effective metering of electricity consumption, including using advance metering infrastructure (AMI), would be useful, and could reduce commercial losses irrespective of cross-subsidization. Long-term planning of the sector, including mini-grids sites, will help to leverage economies of scale to lower the costs. Finally, addressing operational losses is crucial to ensure transparency and effectiveness of the scheme.

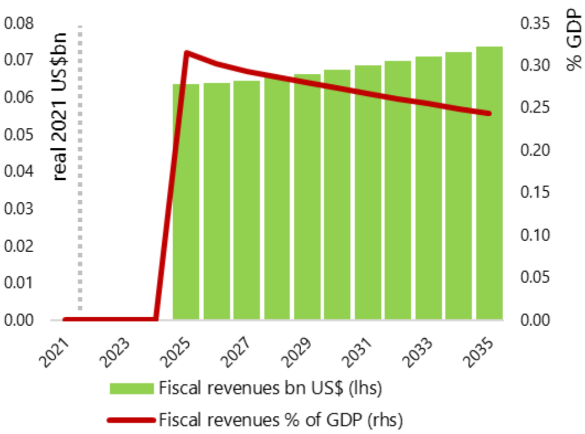
31. Instead of direct cross-subsidization, additional revenues from urban tariffs could be used to subsidize green technology in rural areas. In this case, the revenue subsidizes the technologies instead of the consumer. Each approach targets affordability in different ways: one through revenue redistribution, the other through cost reduction via technology. If technology is subsidized, priority should be given to technologies that improve energy access, enhance reliability, and reduce emissions—such as solar mini-grids, battery storage systems, and efficient appliances. Careful assessment of the impact of urban tariff adjustments on consumers would still be necessary to maintain affordability while generating sufficient revenue. Long-term sector planning, including identifying priority rural sites for green technology rollouts, could help maximize economies of scale and cost efficiency. Finally, periodic reviews of both the tariff structure and the rural deployment program would be essential to ensure transparency, effectiveness, and sustained benefits.

32. Holding large electricity users accountable for their energy mix can also help drive a cleaner and more equitable power sector. In Botswana, the mining sector is responsible for approximately half of all productive electricity usage. Copper and nickel operations account for 49 percent of the mining sector's electricity consumption, with the diamond subsector not far behind at 45 percent, giving it significant influence over national energy outcomes (World Bank Group, 2016). The government can leverage distributed energy policies and self-generation requirements to ensure these companies contribute to the renewable transition. For example, mining companies could be required, perhaps through an adopted decree by MME, to increase the share of renewable-based electricity in their power mix by at least a set percentage each year until 2030, with unmet targets triggering compensatory investments in rural electrification, particularly in isolated communities. With industry leaders like Debswana already aiming for carbon neutrality by 2030, such measures could accelerate the shift toward sustainable and inclusive energy development while shifting some of the investment burden to the private sector.

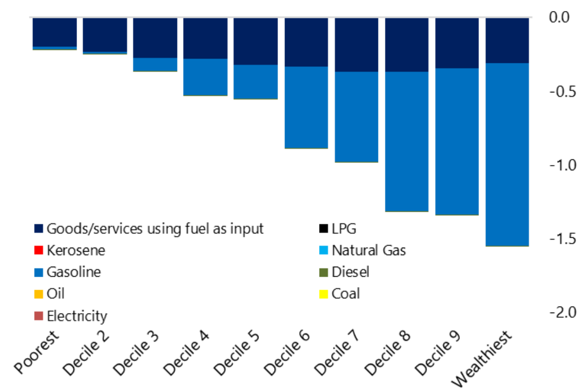
33. Aligning the current tax structure with the green agenda can simultaneously boost government revenues and accelerate renewable energy adoption. There is a zero-rated VAT on diesel and petrol—which currently avoids the standard 14 percent rate. Maintaining zero-rated VAT on fuels can unintentionally incentivize higher consumption of diesel and petrol and undermine national climate commitments. Applying the standard VAT to these fuels could generate an additional 0.25 percent of GDP in revenues by 2035 (see Figure 7, panel a), which can provide more flexibility during a period of fiscal consolidation and help to level the playing field across technologies. This policy would be progressive as wealthier households have greater access to gasoline and diesel-requiring equipment, like vehicles (see Figure 7, panel b). Expenditures from the general budget, including spending on health, education, and social protection often support lower-income individuals. As a result, by recycling the additional revenues into the general budget, this policy can improve consumption levels for lower income households (see Figure 7, panel c). It also would reduce CO_2 emissions, particularly from gasoline in the transport sector (see Figure 7, panel d).

Figure 7. CPAT Results from Applying Standard VAT on Diesel and Petrol

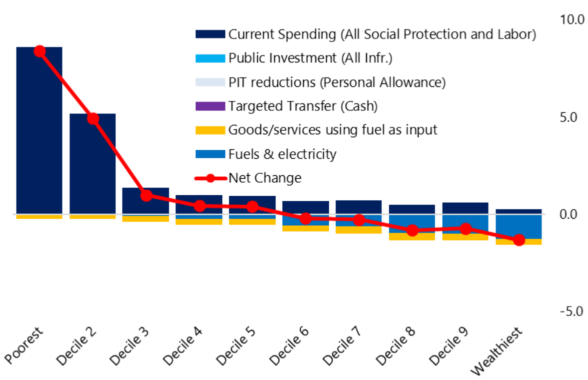
Additional Fiscal Revenues from Fossil Fuel Excises (Against the Baseline)



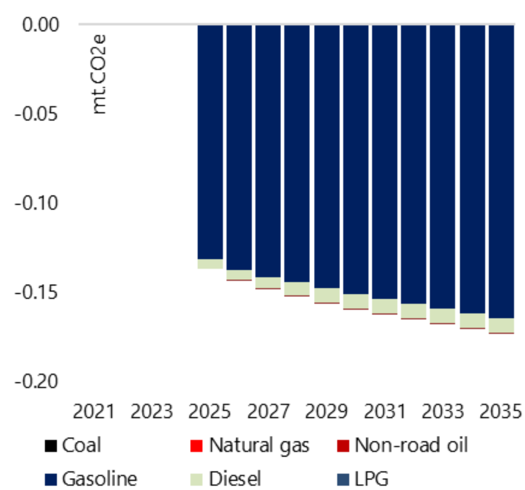
Relative Mean Consumption Effect (Percent of Consumption for $0-Carbon tax per tCO2e in 2030), Botswana



Relative Mean Consumption Effect with Revenue Recycling, Botswana (Percent Consumption, VAT on Diesel and Petrol in 2030)



Change in Energy CO2 Emissions by Fuel



Source: IMF calculations using CPAT

Box 1. South Africa's Carbon Tax: A Pioneering Policy in Africa

Implementation & Design:

South Africa introduced its Carbon Tax Act in June 2019, becoming the first African nation to enact a national carbon tax. The policy was designed in phases, with generous tax-free allowances (between 60–95%) during the initial phase to ease industries into the transition. This approach helped industries acclimate without sudden cost shocks.

Revenue Generation & Use:

Although revenues are pooled into the general government fund and not ring-fenced, they are utilized to support green initiatives—such as energy efficiency incentives, solar water heaters, and free basic energy for low-income households. In 2022 alone, the carbon tax generated approximately R1.6 billion.

Box 1. South Africa's Carbon Tax: A Pioneering Policy in Africa (concluded)

Driving Renewable Energy Investment:
The tax signal, particularly as allowances phase down, is increasingly making fossil fuel–based power more expensive—causing businesses to pivot toward clean energy. The upcoming 2026 carbon tax overhaul further accelerates this by reducing allowances (from 60 percent to 30 percent, with annual reductions through 2030).

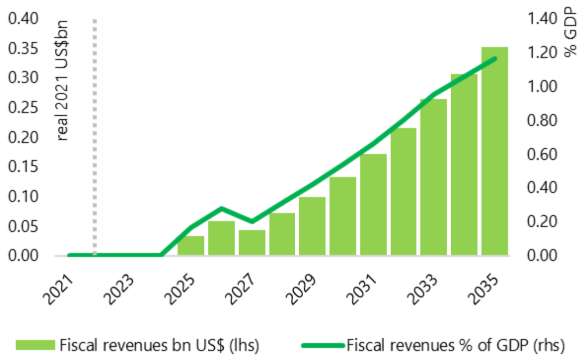
Broader Climate Policy Integration:
This carbon pricing framework dovetails with South Africa's broader climate strategy, including its new climate change law that mandates carbon budgets for large emitters and requires municipal adaptation plans— reinforcing the carbon tax's impact.

34. **Establishing a carbon price would take Botswana's green fiscal reforms a step further by directly incentivizing emissions reductions while generating new revenue streams.** A well-designed carbon tax would help internalize the environmental costs of fossil fuel consumption, reducing the implicit subsidies that currently make high-emission energy sources artificially cheap. Applying a predictable and gradually increasing carbon price encourages industries, including major energy consumers like the mining sector, to invest in cleaner technologies and improve efficiency. South Africa was the first in the region to impose a carbon tax (see Box 1). Today, the tax is 13USD/tCO_2 but it expected to rise to 30USD/tCO_2 by 2030. Carbon taxation is gaining popularity across the region with introduction of carbon taxes expected in Tanzania and Senegal. If Botswana imposed a 5USD/ tCO_2 carbon tax that escalates to 25USD/tCO_2 by 2030, additional fiscal revenues could increase over 1.2 percent of GDP (by 2035) with only a small change in electricity prices, of 11 percent, over the next five years (see Figure 8, panel a & b). The impact on GDP from the carbon tax is negligible (see Figure, panel c). However, the carbon tax would complement the IRP to reduce emissions to an even greater extent, particularly in the industrial sector (see Figure, panel d).

35. **The revenues collected could be strategically repurposed into the budget or applied as targeted support for vulnerable households.** Even without considering revenue recycling, carbon pricing is inherently progressive in Botswana because poorer households typically have lower fossil fuel consumption and therefore bear a smaller share of the tax burden (see Figure 9, panel a). When considering the additional general budget support, which can include adaptation needs, consumption effects are positive, and highly progressive (see Figure 9, panel b). Cash transfers can also be used to target the lower income households impacted by carbon taxation which could further increase their consumption effect as well as improve political acceptability (see Figure 9, panel c).

Figure 8. CPAT Results - Carbon Tax Starting at $5/tCO2 and Increasing to $25/tCO2 by 2030

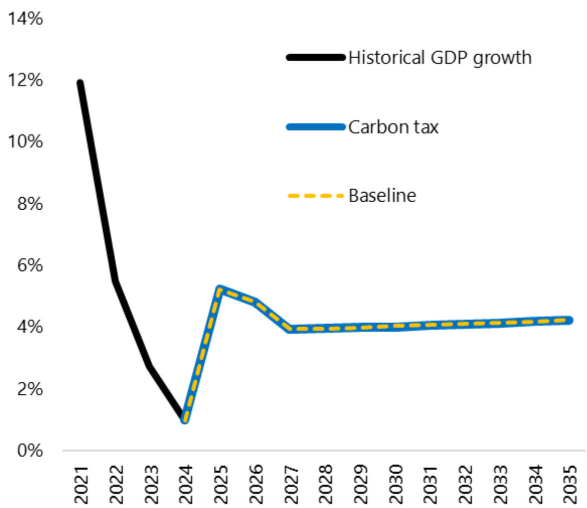
Additional Fiscal Revenues from Fossil Fuel Excises (Against the Baseline)



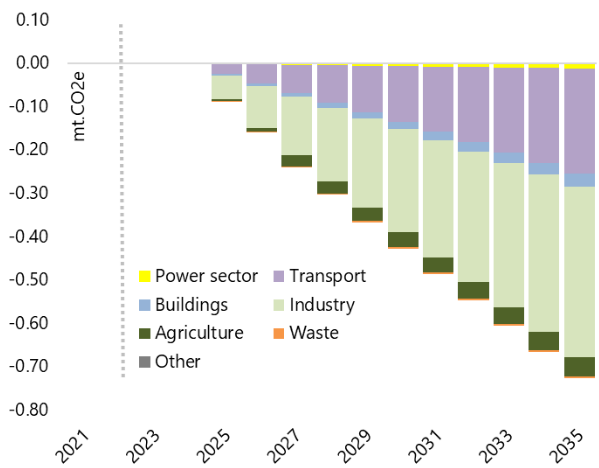
Energy Price Change for $25/tCO2 in 2030 (Weighted by Consumption)

Fuel	Unit	Baseline	Baseline + - Carbon tax	% change
Gasoline	US$ per liter	0.85	0.91	7%
Diesel	US$ per liter	0.85	0.91	8%
LPG	US$ per liter	0.51	0.56	9%
Kerosene	US$ per liter	0.73	0.80	9%
Oil	US$ per barrel	54.5	66.2	22%
Coal	US$ per gigajoule (GJ)	1.90	4.26	124%
Natural gas	US$ per gigajoule (GJ)	9.74	11.14	14%
Electricity	US$ per kwh	0.090	0.099	11%

GDP: Annual Growth Forecasts (Baseline and Policy Scenario)



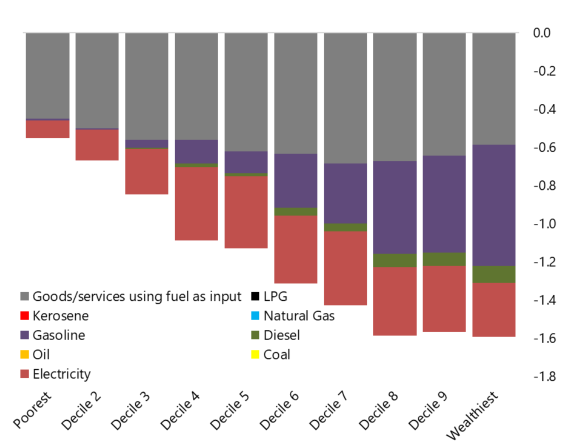
Abatement of GHGs by Sector Excluding LULULCF



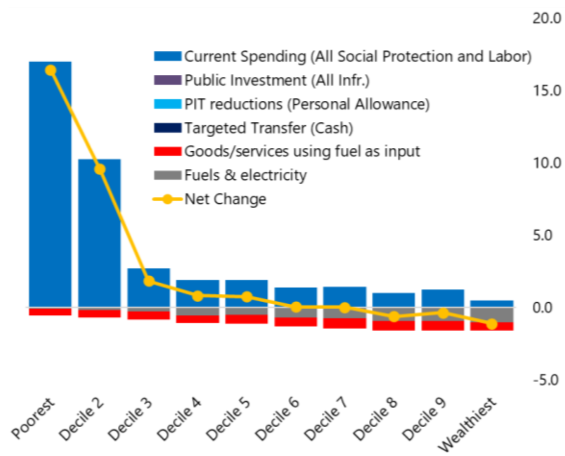
Source: IMF calculations using CPAT.

Figure 9. Distributional Impacts from the Modelled Carbon Tax

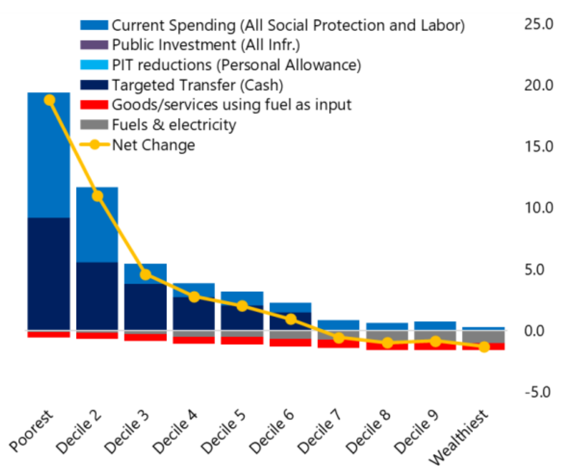
Relative Mean Consumption Effect (Percent Consumption for $25 Carbon Tax per tCO2e in 2030), Botswana



Relative Mean Consumption Effect (Percent Consumption for $25 – Carbon Tax per tCO2e in 2030, Botswana)



Relative mean consumption effect with revenue recycling (Percent Consumption, in 2030), Botswana



Source: IMF calculations using CPAT.

36. **Targeted import duty exemptions for renewable energy technologies can boost adoption of clean energy solutions but needs to be weighed against other priorities.** By removing or reducing tariffs on equipment such as solar PV panels, batteries, and inverters, governments can make these technologies more affordable. Lower upfront costs would improve the financial viability of renewable energy projects, attract private investment, and encourage wider market participation. In turn, this could accelerate the transition away from fossil fuels, enhance energy security, and support national climate commitments. Forgone tariff revenues could limit government resources that could be used for other critical programs and, if exemptions are not well-targeted, they could disproportionately benefit wealthier households and businesses that are better able to invest in renewable systems, widening inequality in energy access. However, this type of policy would lower the imports of more expensive, fossil-based electricity which is currently subsidized.

37. Lastly, positioning Botswana as a key supplier in the global clean energy transition offers a pathway to diversify its economy. As the world accelerates its shift to green technologies, the demand for critical minerals—such as cobalt, copper, manganese, and nickel—is expected to surge, creating an opportunity for Botswana to capitalize on its endowments of these resources. Developing this sector responsibly could help reduce the country's heavy reliance on diamonds while tapping into new, high-growth global markets. However, to maximize benefits and avoid economic pitfalls like Dutch Disease, the country will need to diversify its economy beyond resource exports by investing in other sectors like manufacturing and services, as well as manage resource revenues prudently to prevent currency overheating. Robust environmental safeguards, strong governance, and sustainable mining practices must be paired with new mineral development to ensure long-term economic and social returns.

E. Conclusions

38. Increasing macroeconomic risks from current and projected climate trends, combined with fiscal pressures from electricity subsidies, underscore the need for robust adaptation policies and energy sector reforms in Botswana. The persistent warming trend in the country is expected to intensify, with more frequent episodes of extreme heat and longer drought periods. These changes are anticipated to reduce agricultural yields and labor productivity across multiple sectors, further deteriorating the macroeconomic outlook. In the short term, extreme heat events have been shown to lower growth by up to 2 percentage points. As these events become more common, short-term macroeconomic risks are likely to increase. Over the longer term, a sustained warming trend could lead to as much as a 10 percent reduction in GDP by the century's end compared to projections under current conditions. Such losses may have cascading fiscal consequences, resulting from decreased revenues due to a shrinking tax base and increased spending on social protection and climate adaptation.

39. The government can substantially reduce these macroeconomic impacts by refining the adaptation measures outlined in the Second Updated Nationally Determined Contribution (NDC). Priority should be given to investing in climate services, such as expanding early warning systems, conducting climate risk mapping, and establishing mechanisms to measure climate change impacts, which are critical steps for integrating climate considerations into PFM. Improving water sector efficiency can help address immediate water shortages and build resilience against growing water stress. Furthermore, reforms to reduce market inefficiencies can facilitate private adaptation in all sectors, crowding-in private investment and reducing fiscal risks.

40. There is also an opportunity to ease fiscal pressures stemming from electricity sector subsidies. The ambitious renewable energy expansion set out in the updated Integrated Resource Plan could help lower energy imports, diminish reliance on less efficient coal plants, and cut power sector emissions by over 50 percent compared to a business-as-usual scenario for 2030. Proper planning, including a least-cost generation plan, and adjusting the tax system to support climate goals—such as applying the standard VAT rate to diesel and petrol, and gradually introducing a low-level carbon price—would further strengthen the fiscal position.

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