



DEMOCRATIC REPUBLIC OF SÃO TOMÉ AND PRÍNCIPE

SELECTED ISSUES

August 2025

This paper on the Democratic Republic of São Tomé and Príncipe was prepared by a staff team of the International Monetary Fund as background documentation for the periodic consultation with the member country. It is based on the information available at the time it was completed on July 16, 2025.

Copies of this report are available to the public from

International Monetary Fund • Publication Services

PO Box 92780 • Washington, D.C. 20090

Telephone: (202) 623-7430 • Fax: (202) 623-7201

E-mail: publications@imf.org Web: <http://www.imf.org>

Price: \$18.00 per printed copy

International Monetary Fund
Washington, D.C.



DEMOCRATIC REPUBLIC OF SÃO TOMÉ AND PRÍNCIPE

SELECTED ISSUES

July 16, 2025

Approved By
the African Department

Prepared by Sneha Agrawal, Julia Bersch, Elsa de Brito, Hector Carcel-Villanova, Alsis Cruz, Bahrom Shukurov, Azar Sultanov, Dilson Tiny, and Ke Wang

CONTENTS

STRENGTHENING INFLATION FORECASTING IN SÃO TOMÉ AND PRÍNCIPE **3**

A. Introduction	3
B. Inflation Structure and Recent Developments	4
C. Methodology and Data	11
D. Results from Model Estimation	12
E. Model Evaluation and Forecasting Inflation	14
F. Conclusion and Policy Recommendations	15

FIGURES

1. Inflation Developments	6
2. REER and NEER	9
3. Pseudo Out of Sample Forecast–End-of-Period Inflation (2003–29)	15

TABLES

1. Model Results	13
2. Model Residual Evaluation	14
3. Multicollinearity Evaluation	14

BOXES

1. Estimating the VAT Impact on Inflation	7
2. Empirical Assessment of the NEER Passthrough on Inflation in Island Microstates	10

References	17
------------	----

STRENGTHENING MONETARY POLICY AND LIQUIDITY MANAGEMENT IN SÃO TOMÉ AND PRÍNCIPE

A. Introduction	18
B. Overview of the Banking Sector of São Tomé and Príncipe	19
C. The Current Monetary Policy and Liquidity Management Framework	20
D. Liquidity Situation in the Banking Sector	24
E. Recommendations	27
F. Conclusion	31

FIGURES

1. Bank Assets (Q1-2025)	19
2. Credit to the Private Sector, Growth Rate	19
3. Past Due Loans to Gross Loans (Percent)	20
4. Monetary Developments	26

BOX

1. Economic Rationale for the BCSTP's Monetary Policy Framework	23
---	----

References	32
------------	----

POLICY OPTIONS TO STRENGTHEN SÃO TOMÉ AND PRÍNCIPE'S RESILIENCE TO NATURAL DISASTERS

A. São Tomé and Príncipe's Vulnerability to Natural Disasters	33
B. Application for the DIGNAD Model and Scenario Analysis	36
C. Conclusion and Policy Recommendations	43

FIGURES

1. Evolution of CO ₂ eq Emissions (In Gigagrams)	34
2. Natural Disasters in DIGNAD Model	36
3. Impact of Climate-Resilient Infrastructure Investment	39
4. Climate-Resilient versus Standard Infrastructure Investment	40
5. Alternate Financing Options and Timelines for Disaster Management	41

TABLE

1. Calibrated Parameters and Initial Values (In Percent)	37
--	----

References	44
------------	----

STRENGTHENING INFLATION FORECASTING IN SÃO TOMÉ AND PRÍNCIPE¹

This paper examines the drivers of inflation in São Tomé and Príncipe and develops a model for forecasting it. It finds that both supply and demand factors contribute to inflation in the country. Supply-side factors consist of inflation inertia, import food prices, and global or regional crises, whereas factors affecting demand are associated with weakened macroeconomic discipline in the lead-up to elections. To effectively reduce and manage inflation, a comprehensive policy mix must address both supply and demand factors.

A. Introduction

1. This inflation analysis builds upon the 2018 Selected Issue Paper, which provided a comprehensive examination of inflation dynamics in São Tomé and Príncipe.² That paper laid the groundwork for understanding the factors influencing inflation trends in the country. This analysis employs the Phillips Curve approach within the framework of the Autoregressive Distributed Lag Model, while also integrating recent developments, particularly the effects of global market fluctuations. As a result, the analysis centers on inflation forecasting, providing valuable insights for policymaking.

2. While inflation in São Tomé and Príncipe significantly declined under the peg regime, recent surges in global food and energy prices have exerted substantial upward pressure on inflation. Over the past 15 years, the country has made notable strides in controlling inflation, largely attributed to the implementation of a Euro peg in 2010. This policy helped stabilize prices by anchoring the local currency to the Euro, which in turn facilitated more predictable economic conditions. However, the recent increase in global food prices, driven by various factors including supply chain disruptions and geopolitical tensions, pushed inflation rates in São Tomé and Príncipe into double digits. This situation has created a considerable inflation differential compared to the Euro area and has strained the peg, raising concerns about its sustainability.

3. Given these challenges, strengthening inflation forecasting tools is crucial for informing effective policies aimed at reducing and stabilizing inflation. Accurate forecasting can help the government of São Tomé and Príncipe anticipate inflationary pressures and implement timely measures to mitigate their impact. Additionally, it can enhance decision-making processes regarding monetary policy, fiscal strategies, and overall economic management. By focusing on these forecasting tools, the government can better navigate the complexities of inflation in the evolving economic landscape of São Tomé and Príncipe.

¹ Prepared by Alsis Cruz and Dilson Tiny, led by Bahrom Shukurov.

² See the [2018 Selected Issue Paper](#), including for background and literature review.

4. This paper is organized as follows. In Section B, we explore the structure of inflation and recent developments that have influenced price levels. Section C outlines the methodology and data sources used in our analysis, ensuring a robust framework for our findings. In Section D, we present the results from our model estimation, highlighting key trends and patterns in inflation behavior. Section E focuses on the evaluation of our model and offers forecasts for future inflation trends. Finally, Section F concludes with policy recommendations aimed at addressing inflationary pressures and fostering economic stability.

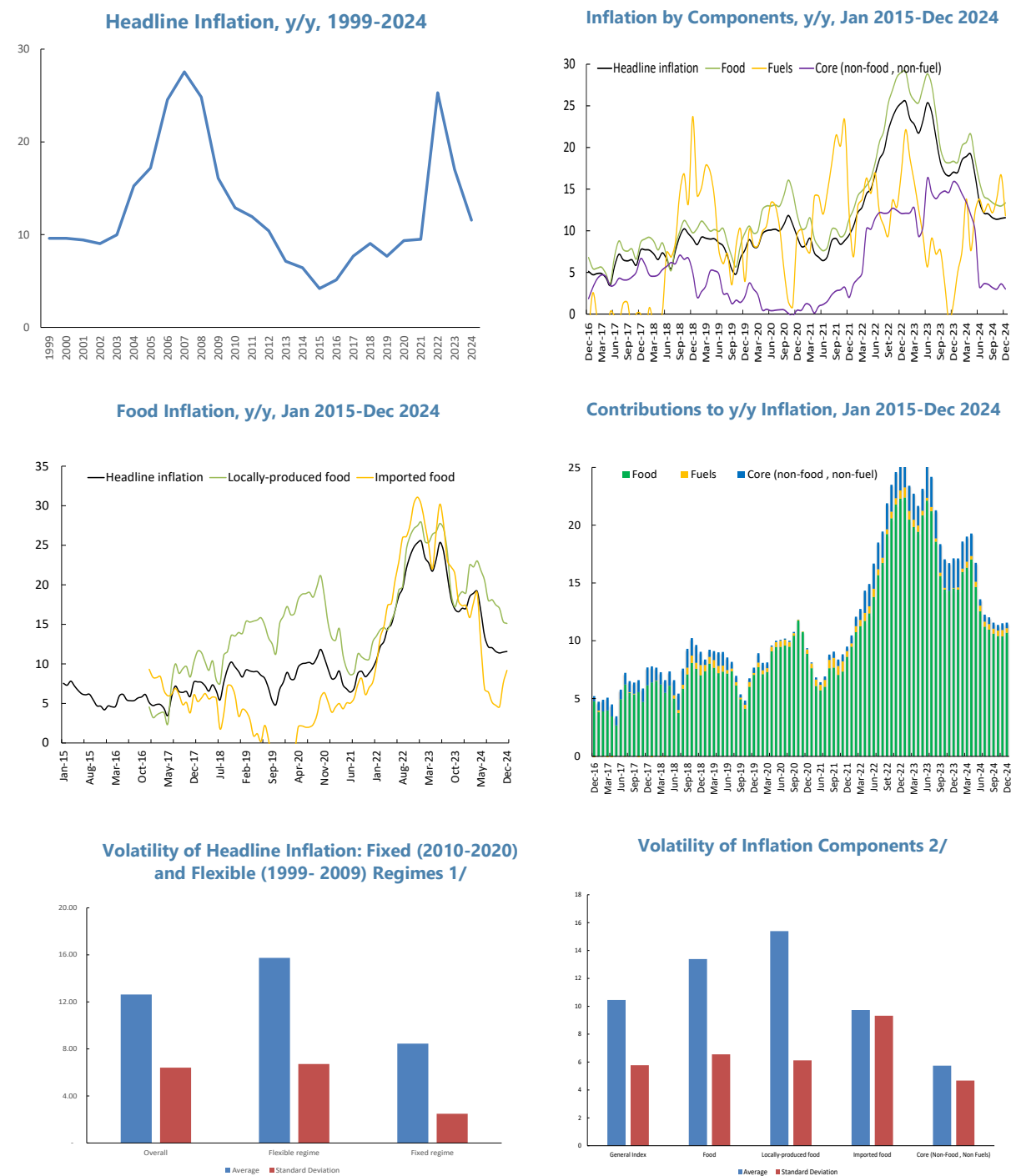
B. Inflation Structure and Recent Developments

5. The composition of the Consumer Price Index (CPI) in São Tomé and Príncipe underscores the dominant role of food. The CPI basket, updated in 2015 to reflect evolving consumption patterns, includes 12 subindexes and a total of 79 categories of goods and services. Within this basket, food represents approximately 70 percent, highlighting its significant influence on overall inflation. Notably, nearly half of the food items in the CPI are locally produced, emphasizing the crucial role of domestic agriculture in maintaining price stability. This dependence on local food production can also shape how inflationary pressures are felt in the country, especially in light of global market fluctuations. While fuel and electricity make up around 6 percent of the CPI basket, any adjustments to both can substantially impact inflation, given second-round effects. Core inflation, which excludes food, fuel, and electricity prices, constitutes the remaining portion of the CPI basket, representing about 24 percent.

6. The transition between exchange rate regimes in São Tomé and Príncipe has significantly influenced inflation dynamics and price stability (Figure 1). Since 1999, the country has transitioned through two distinct exchange rate regimes: a flexible exchange rate until 2009 and a peg to the euro from 2010 onward. During the flexible regime, average inflation was notably higher at 16.4 percent from 1999 to 2009, compared to a more stable 8.4 percent under the peg from 2010 to 2020. This difference underscores the impact of the exchange rate policy on price stability. Furthermore, volatility in inflation was significantly greater during the flexible regime, with a standard deviation of 6.5 percent, compared to just 2.5 percent under the pegged regime. This reduction in volatility suggests that the peg provided a more predictable economic environment, contributing to lower and more stable inflation rates in São Tomé and Príncipe.

7. While the fixed exchange rate provided relative price stability, prices increased significantly by 2023. Under this regime, inflation decreased from 16.1 percent in 2009 to approximately 3.9 percent in 2015, broadly aligning with inflation rates in Portugal and the Eurozone. However, since 2017, inflation has trended upward, primarily driven by rising food prices, averaging about 8 percent annually from 2017 to 2021. By 2023, inflation surged to over 25 percent, partly due to the global inflationary shock, leading to significant price increases for imported food, followed by substantial rises in the prices of locally produced food. These volatile food price hikes have also impacted other components of the CPI, causing core inflation to spike from around 2 percent in 2021 to 15.9 percent by the end of 2023 (Figure 1).

8. The recent decline in global food prices, combined with prudent macroeconomic policies, has led to a reduction in inflation in São Tomé and Príncipe. Driven by the unwinding of food price increases in 2023 and 2024, alongside fiscal consolidation and monetary tightening, inflation fell to 11.6 percent year-over-year by December 2024, while core inflation decreased to 3.0 percent during the same period (Figure 1). This decline occurred despite the introduction of VAT in June 2023, which we estimate contributed about 5 percentage points to price increases in 2023 (Box 1).

Figure 1. São Tomé and Príncipe: Inflation Developments (In Percent)

1/ Volatility is measured by calculating the standard deviations of annual y/y inflation rates across sub-periods.

2/ Same as in footnote 1, but for monthly y/y inflation rates from January 2015 to December 2024.

Source: INE and Staff calculations.

Box 1. São Tomé and Príncipe: Estimating the VAT Impact on Inflation

This box aims to empirically assess the impact of the Value Added Tax (VAT) introduction on inflation in São Tomé and Príncipe. The VAT, set at a main rate of 15 percent, was introduced in June 2023. Certain products and services are subject to a reduced rate of 7.5 percent, while others are fully exempt from the tax. If VAT coverage were complete and its impact on prices were immediate, our mechanical estimates indicate that CPI inflation in São Tomé and Príncipe would have risen by 5 percentage points in June 2023. However, the impact of the VAT introduction continued to unfold through the end of 2023.

Using a methodology similar to that of Gautier and Lalliard (2013), we find that the impact of the VAT introduction on inflation in São Tomé and Príncipe was estimated at 4.9 percentage points. For comparison, we also evaluated the impact of VAT in Sub-Saharan African countries that have implemented it in recent years, which is estimated at 3.2 percentage points.

VAT impact on inflation in São Tomé and Príncipe

To implement the “difference in differences” approach, we begin by calculating the differences in the monthly changes of the CPI for São Tomé and Príncipe as follows:

$$DIFF_{STP,m} = \pi_m^{2023} - avg(\pi_m) \quad (1)$$

Where π_m^{2023} is the monthly price variations in 2023 and $avg(\pi_m)$ is the average of monthly price variations in 2015-2022. This difference quantifies the inflation gap experienced by São Tomé and Príncipe in 2023 compared to a “normal” baseline.

Next, we calculate the counterfactual inflation for São Tomé and Príncipe, representing what inflation would have been without the introduction of VAT. To do this, we analyze inflation in Cabo Verde, as both countries share similar cyclical factors, including being island economies, having a pegged exchange rate to the Euro, and maintaining strong ties to Portugal. We also determine the inflation gap observed in Cabo Verde compared to a “normal” baseline, as follows:

$$DIFF_{CV,m} = \pi_m^{2023} - avg(\pi_m) \quad (2)$$

Where π_m^{2023} is the monthly price variations in 2023 and $avg(\pi_m)$ is the average of monthly price variations in 2015-2022.

We proceed to estimate the impact of VAT on inflation in São Tomé and Príncipe for June 2023 by calculating the difference between (1) and (2), as follows:

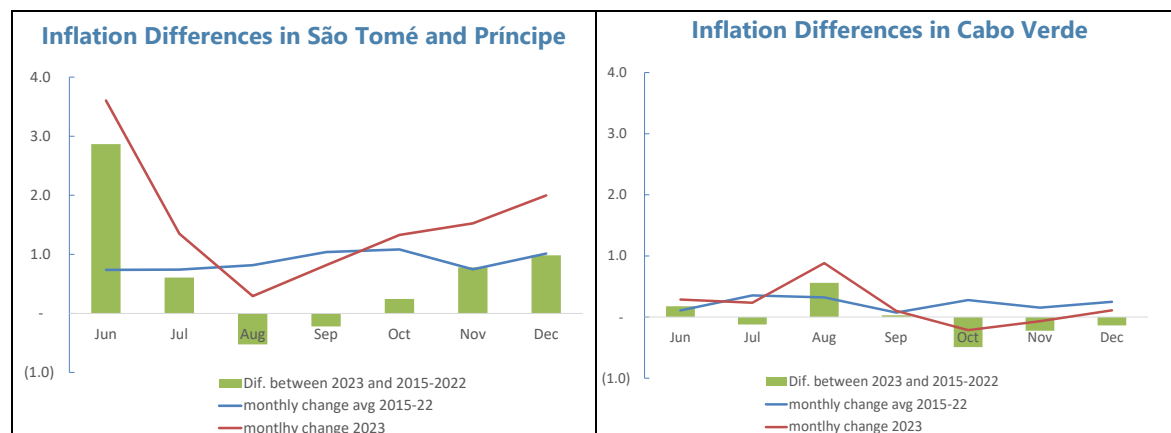
$$DD_m = DIFF_{STP,m} - DIFF_{CV,m} \quad (3)$$

The “difference in differences” estimate indicates that the introduction of VAT in São Tomé and Príncipe in June 2023 was associated with an inflation increase of 2.7 percentage points.

Assuming broad VAT coverage by the end of 2023, we calculate the difference-in-differences for June to December 2023. This approach indicates that the impact of the VAT introduction on inflation in São Tomé and Príncipe was 4.9 percentage points in 2023 (Figures 1 and 2).

Box 1. São Tomé and Príncipe: Estimating the VAT Impact on Inflation (concluded)

However, this estimate should be interpreted with caution due to differing domestic policy responses in São Tomé and Príncipe and Cabo Verde that are not accounted for in this model.



VAT impact on inflation in other Sub-Saharan Africa countries

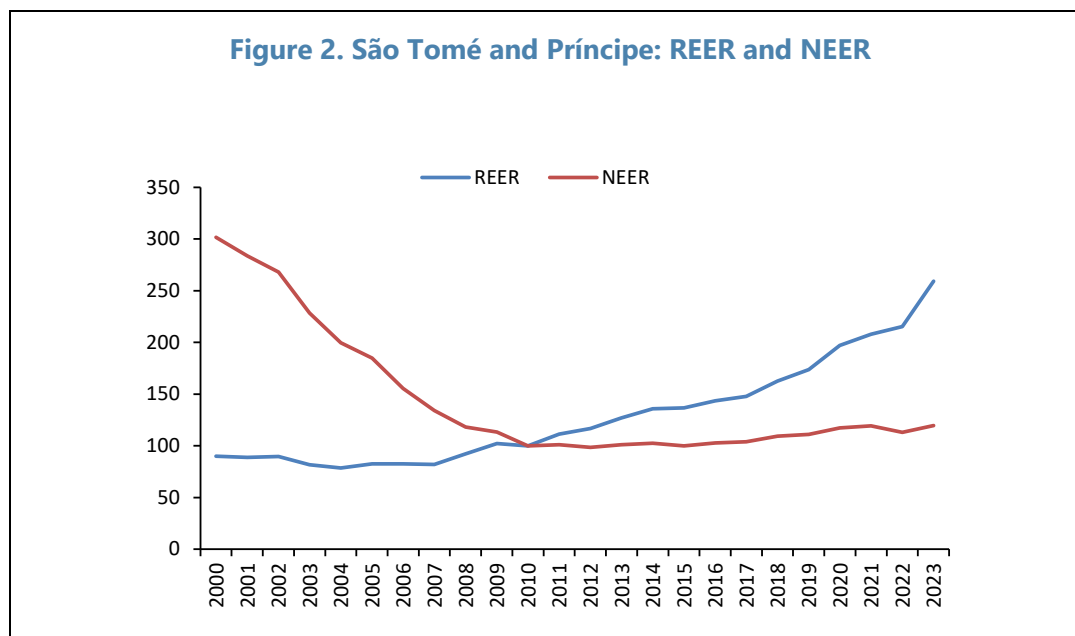
We also conducted a Panel Least Squares regression using data from 11 Sub-Saharan African countries that have implemented VAT since 1990, excluding São Tomé and Príncipe. Most of these countries introduced VAT at a rate of 15 percent, though a few had higher rates and one had a lower rate. The regression equation is as follows:

$$\pi_{it} = c + \alpha\pi_{it-1} + \beta'X_{it} + \mu_{it}$$

where π_{it} is annual average inflation of country i in period t , c is constant, X_{it} is a dummy variable for the year when the VAT was introduced in each country, μ_{it} is the error term. The model indicates that, holding all other factors constant, the introduction of VAT is linked to a 3.17 percentage point increase in average inflation among the Sub-Saharan African countries studied (Table 1). This coefficient is both positive, as anticipated, and statistically significant.

Panel Model Results			
	Description	Panel Model	
		Coef.	P value
Dummy	VAT implementation	3.17	0.00
$Inflation_{(t-1)}$	Lagged inflation	0.52	0.00
c	Constant	1.9	0.00
R^2	0.40		
Adjusted R^2	0.33		
Observations	362		

9. **High inflation rates, coupled with the appreciation of the Euro against the US dollar, have resulted in notable increases in both the Real Effective Exchange Rate (REER) and the Nominal Effective Exchange Rate (NEER) in São Tomé and Príncipe.** From 2010 to 2023, the REER has experienced substantial appreciation. This trend can be attributed to persistent high inflation levels and the country's pegged exchange rate system. As inflation rose, the REER also increased, indicating a decline in the country's competitiveness (Figure 2). In parallel, the NEER has risen by 20 percent during the same period, largely driven by the Euro's strengthening against the US dollar.



10. **To evaluate the impact of exchange rate fluctuations on the local economy, we conducted an analysis of the passthrough effect of changes in the nominal effective exchange rate (NEER) on inflation in micro-islands (Box 2).** This analysis examines a sample of seven micro-islands with fixed exchange rate regimes from 2001 to 2023. In our model, we controlled for external factors, including the effects of the global crises, to ensure a comprehensive understanding of the dynamics at play. The estimated passthrough effect of NEER changes on inflation in these micro-islands is approximately -0.33, indicating that a 10 percent appreciation/depreciation of the NEER correlates with a decline/increase in annual inflation by 3.3 percentage points, respectively.

Box 2. São Tomé and Príncipe: Empirical Assessment of the NEER Passthrough on Inflation in Island Microstates

This box aims to quantify the passthrough of the nominal effective exchange rate (NEER) to domestic prices by analyzing a sample of seven micro-islands with fixed exchange rate regimes from 2001 to 2023, selected based on data availability.¹

Model Specification:

We estimate NEER passthrough using the following OLS panel regression model:

$$\pi_{it} = c + \alpha\pi_{it-1} + \sum_{j=0}^k \beta_j NEER_{it-j} + \delta D_t + \mu_{it}$$

Where π_{it} is annual average inflation of country i in period t ; $NEER$ is the annual NEER change, and k is the respective lag length with $k=1$ (based on the Akaike and Schwarz information criteria); D_t is a dummy control variable representing the global crises that impacts both inflation and the NEER; μ_{it} is the error term.

Empirical findings

The regression model suggests that keeping everything else constant:

- On average, a 10 percent appreciation/depreciation of the NEER is associated with a decline/increase in annual inflation by 3.3 percentage points. This coefficient is negative as expected and statistically significant.
- The lagged NEER coefficient is negative, as expected, but not statistically significant, indicating that the passthrough effect on inflation occurs within the same year.
- The model indicates that inflation inertia and the effects of the global crises significantly contribute to driving inflation in these countries.

Panel Model Results

<i>Explanatory variable</i>	Coef.	P value
<i>Inflation_(t-1)</i>	0.24	0.00
<i>NEER_(t)</i>	-0.33	0.00
<i>NEER_(t-1)</i>	-0.20	0.10
Global crises	2.10	0.02
Constant	1.63	0.00
<i>R²</i>	0.36	
<i>Adjusted R²</i>	0.31	
<i>Observations</i>	140	
<i>Number of countries</i>	7	
<i>Country fixed effects</i>	yes	

¹ Antigua and Barbuda, Barbados, Dominica, Grenada, St. Kitts and Nevis, Saint Lucia, and Saint Vincent and the Grenadines.

C. Methodology and Data

11. The model captures inflation by accounting for inflation expectations, as well as demand-side and supply-side shocks. It employs the Phillips Curve approach based on the Autoregressive Distributed Lag Model, similar to the methodology used by Lanau, Robles, and Toscani (2018), with additional enhancements as outlined below. The model incorporates the following key drivers of inflation:

- **Inflation inertia/expectations.** This component is based on the assumption that economic agents form expectations about future inflation using a backward-looking approach. To achieve this, the model employs past inflation as a proxy for these expectations, reflecting adaptive expectations.
- **Demand-side shocks.** These factors capture the positions of the economic cycle, represented by lagged real GDP growth, and the effects of looser macroeconomic discipline during national elections, indicated by a dummy variable.
- **Supply-side shocks.** The model incorporates Portugal's food inflation as a proxy to capture imported inflation shocks, reflecting São Tomé and Príncipe's heavy reliance on imported food, its exchange rate peg to the Euro, and Portugal's status as its main trading partner.³ Furthermore, the model includes domestic fuel price adjustments. To enhance its robustness, a dummy variable is included to account for the effects of significant crises: the global economic and financial crisis of 2007-2008, the COVID-19 crisis in 2020, and the crisis stemming from Russia's invasion of Ukraine in 2022. Additionally, another dummy variable is introduced to capture the effects of the pegged exchange rate regime.

12. We tested several other variables in the model, but none yielded satisfactory results. Government expenditure displayed a negative coefficient, which was contrary to expectations; however, it was statistically insignificant. The nominal effective exchange rate showed positive coefficients that contradicted theoretical expectations and was also statistically insignificant. Similarly, international reserves and BCSTP credit to the government exhibited positive coefficients but lacked statistical significance. Furthermore, incorporating these variables into the model would fail to satisfy several residual diagnostic tests, including those for serial correlation, heteroskedasticity, and normality.

13. The analysis uses annual data from 1998 to 2023, including: end-of-period inflation and real GDP growth in São Tomé and Príncipe, end-of-period food inflation in Portugal, and changes in fuel prices in São Tomé and Príncipe. Additionally, the analysis incorporates dummy variables to account for election periods in São Tomé and Príncipe as well as structural breaks associated with global and regional crises, along with the transition to a pegged exchange rate regime.

³ Over the past 10 years, imports from Portugal have represented an average of 49 percent of total imports to São Tomé and Príncipe, with European countries collectively accounting for 55 percent of total imports.

D. Results from Model Estimation

14. Prior to estimating the models, we ensured the stationarity of the series by conducting the Augmented Dickey-Fuller and Phillips-Perron tests. The number of lags for each variable was automatically determined using the Akaike Information Criterion (AIC).

Modeling End-of-Period Inflation

$$\pi_t = c + \alpha\pi_{t-1} + \beta_1 imp.inf_t + \beta_2 imp.inf_{t-1} + \delta cycle_{t-1} + \theta fuel_t + \varphi D1_t + \gamma D2_t + \omega D3_t + \mu_t$$

where π is the end-of-period inflation rate in São Tomé and Príncipe; c is a constant; $imp.inf$ is the end-of-period food inflation rate in Portugal; $cycle$ is real GDP growth in São Tomé and Príncipe; $fuel$ is the percentage change in domestic fuel prices; $D1$ is a dummy variable for elections in São Tomé and Príncipe; $D2$ is a dummy variable for the structural breaks associated with the global crises; and $D3$ is a dummy variable representing the structural break related to the introduction of the pegged exchange rate regime in São Tomé and Príncipe.

15. Inflation inertia imported food prices, global crises, national elections, and the pegged exchange rate regime significantly impact inflation in São Tomé and Príncipe. The model's estimates (Table 1) suggest that keeping everything else constant, a change in end-of-period inflation:

- **is influenced by past inflation.** A one-percentage point increase in the lagged end-of-period inflation of São Tomé and Príncipe results in a 0.49-percentage point rise in end-of-period inflation. This coefficient is statistically significant and aligns with economic theory, as economic agents tend to adopt a backward-looking approach when forming their expectations.⁴
- **is driven by Portugal's food inflation.** A one-percentage point increase in Portugal's food inflation correlates with a 0.76-percentage point rise in end-of-period inflation in São Tomé and Príncipe, a result that is statistically significant and aligns with economic theory, considering the peg to the Euro and the strong trade relationship with Portugal. Additionally, a one-percentage point increase in the one-lagged end-of-period Portugal's food inflation raises end-of-period inflation in São Tomé and Príncipe by 0.17 percentage point; however, this coefficient is not statistically significant.
- **is impacted by national elections.** In São Tomé and Príncipe, elections typically lead to increased fiscal spending, often accompanied by monetary financing and a general lack of macroeconomic discipline during these periods. Our analysis indicates that elections result in a 2.37-percentage point rise in end-of-period inflation during the election year, and this coefficient is statistically significant.

⁴ This observation is consistent with empirical research conducted for developing countries (see Loungani and Swagel, 2001) and can be attributed to the fixed exchange rate regime coupled with structural supply-side constraints.

- **is affected by the effects of global crises.** The model indicates that a global crisis would result in an increase of 3.17 percentage points in end-of-period inflation for São Tomé and Príncipe. This finding is statistically significant and aligns with economic theory, considering the country's vulnerability to supply chain disruptions typically associated with global or regional crises.
- **is influenced by the business cycle.** An increase of one percentage point in the lagged GDP growth results in a 0.45-percentage point rise in end-of-period inflation in São Tomé and Príncipe. This finding aligns with economic theory and empirical studies⁵ and the coefficient is statistically significant.
- **is impacted by the pegged exchange rate regime.** Our findings indicate that the implementation of the pegged regime contributed to a 4.01-percentage point slowdown in end-of-period inflation, and this coefficient is statistically significant.
- **is influenced by domestic fuel price adjustment.** An increase of one percentage point in domestic fuel price results in a 0.06-percentage point rise in end-of-period inflation in São Tomé and Príncipe. While this finding aligns with economic theory and empirical studies, the coefficient is not statistically significant. We retained this variable in the model to account for supply-side shocks.

Table 1. São Tomé and Príncipe: Model Results

	<i>Description</i>	<i>Results</i>	
		Coeff.	P value
π_{t-1}	Lagged end-of-period inflation	0.485	0.0001
$imp.inf_t$	End-of-period Portugal food inflation	0.761	0.0005
$imp.inf_{t-1}$	Lagged end-of-period Portugal food inflation	0.167	0.2433
$cycle_{t-1}$	Lagged Real GDP growth	0.454	0.0490
$fuel_t$	STP fuel price change	0.063	1.1766
$D1_t$	Dummy – elections	2.365	0.0480
$D2_t$	Dummy – global crises	3.172	0.0317
$D3_t$	Dummy – pegged regime	-4.014	0.0176
c		3.766	0.1125
R^2		0.964835	
<i>Adjusted R²</i>		0.941392	
<i>Observations</i>		21	

⁵ See Peiris and Barnichon (2007).

E. Model Evaluation and Forecasting Inflation

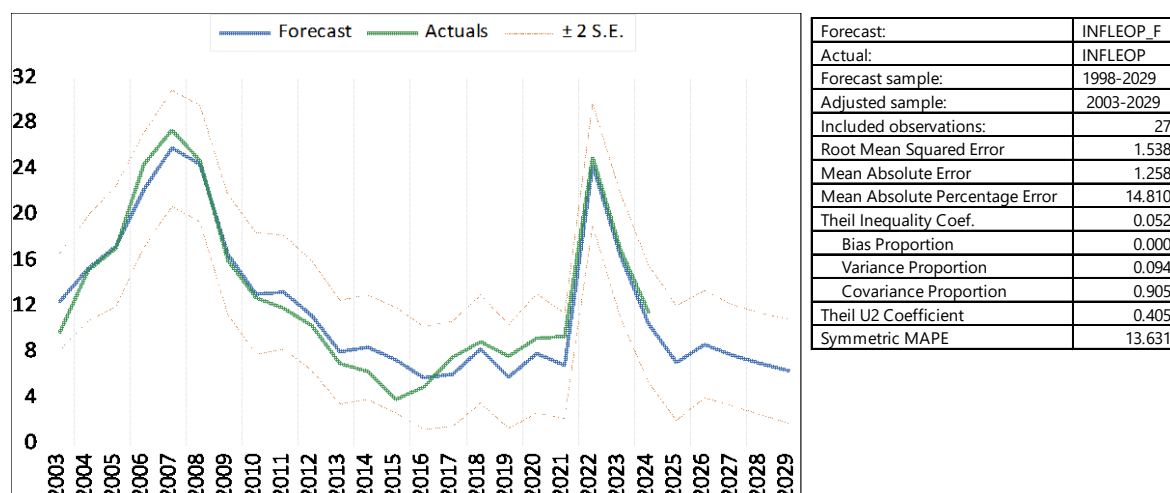
16. The model appears well-suited for forecasting inflation in São Tomé and Príncipe. It has undergone tests for autocorrelation, heteroscedasticity, and normality. The Breusch–Godfrey LM test shows no serial correlation, the Breusch-Pagan-Godfrey test confirms constant error variance, and the residuals are normally distributed according to the Jarque-Bera statistic (Table 2). Additionally, the Variance Inflation Factors (VIF) test indicates relatively low correlation among the independent variables (Table 3).

Table 2. São Tomé and Príncipe: Model Residual Evaluation

Breusch-Godfrey Serial Correlation LM Test:		
Null hypothesis: No serial correlation at up to 2 lags		
F-statistic	Prob. F(2,10)	0.8262
Obs*R-squared	Prob. Chi-Square(2)	0.6747
Heteroskedasticity Test: Breusch-Pagan-Godfrey		
Null hypothesis: Homoskedasticity		
F-statistic	Prob. F(8,12)	0.4022
Obs*R-squared	Prob. Chi-Square(8)	0.3351
Scaled explained SS	Prob. Chi-Square(8)	0.9699
Normality Test:		
Jarque-Bera		0.331581
Probability		0.847224

Table 3. São Tomé and Príncipe: Multicollinearity Evaluation

	Coefficient	Uncentered	Centered
Variable	Variance	VIF	VIF
π_{t-1}	0.01	11.88	2.68
$imp.inf_t$	0.03	3.58	2.58
$imp.inf_{t-1}$	0.02	2.59	1.87
GDP_{t-1}	0.04	7.08	1.50
ICRISIS	1.70	2.29	1.85
ELECTION	1.15	1.94	1.47
PEG	2.13	10.00	3.33
FUEL	0.00	3.60	2.20
C	4.84	34.06	NA

Figure 3. São Tomé and Príncipe: Pseudo Out of Sample Forecast–End-of-Period Inflation (2003–29)

Source: INE and staff calculations and estimations.

17. The model predicts a gradual decline in inflation in São Tomé and Príncipe over the medium term (Figure 3). It has demonstrated reasonably good performance in pseudo out-of-sample forecasts, achieving notable accuracy over the past 15 years. This is further supported by the Theil U2 coefficient, which indicates low bias and variance. Based on the model's projections, end-of-period inflation is expected to decline to 7.7 percent in 2025. It is anticipated to rise slightly to 9.1 percent in 2026 due to the national elections, before gradually declining to 6.5 percent by 2029, assuming all other factors remain constant.

F. Conclusion and Policy Recommendations

18. Our empirical results indicate that both supply and demand factors play a significant role in driving inflation in São Tomé and Príncipe. Several key influencers have been identified, including inflation inertia, which occurs when past increases in inflation serve as a critical proxy for inflation expectations among consumers and businesses, leading to a self-perpetuating cycle where high inflation fuels future inflation. Additionally, import food prices proxied by Portugal's food inflation significantly impact inflation in São Tomé and Príncipe. Global and regional crises also exacerbate inflationary pressures in São Tomé and Príncipe, as economic disruptions lead to supply chain interruptions, increased commodity prices, and reduced availability of essential goods. Furthermore, weakened macroeconomic discipline during domestic elections in São Tomé and Príncipe has been identified as a substantial driver of inflation. As a result of these factors, inflation in São Tomé and Príncipe has risen substantially in recent years, despite the stability provided by the country's pegged exchange rate regime.

19. To effectively reduce and control inflation in São Tomé and Príncipe, a comprehensive policy mix must be implemented that addresses both supply and demand factors.

By implementing these strategies, São Tomé and Príncipe can work towards stabilizing prices, reducing inflationary pressures, and fostering a more resilient economy.

- On the demand side, it is essential to maintain coherent macroeconomic policies that include ongoing fiscal consolidation and managing public debt levels to create a more stable economic environment. Prudent monetary policy and liquidity management is also crucial; by carefully managing liquidity in the economy and raising interest rates, authorities can alleviate local demand pressures.
- On the supply side, increasing local food production is vital for reducing reliance on imported food. This can be achieved through various initiatives, such as improving the processing of primary agricultural products to add value and reduce waste, thereby making local food more competitive against imports. Additionally, infrastructure development, including the construction of greenhouses and other agricultural facilities, can enable year-round production and improve yields. Promoting sustainable agricultural practices will not only increase food production but also contribute to environmental conservation and resilience against climate change.

References

- Aisen, A., Manguinhane, E., and Simone, F. (2021). *An Empirical Assessment of the Exchange rate Pass-through in Mozambique*. IMF Working Paper 21/132.
- Craigwell, R., Greenidge, K., and Maynard, T. (2007). *Exchange Rate Regimes and Monetary Autonomy: Empirical Evidence from Selected Caribbean countries*. Central Bank of Barbados.
- Gautier E., Lalliard A. (2013). *How do VAT Changes Affect Inflation in France?* Banque de France Bulletin, Q4.
- Jasova, M., Moessner, R., and Takats, E. (2016), *Exchange Rate Pass-through: What Has Changed Since the Crisis?* BIS Working Paper No. 538.
- Karam, M. P. D., Vlcek, M. J., and Guo, M. S. (2019). *Decomposing the Inflation Dynamics in the Philippines* (No. 2019/153). International Monetary Fund.
- Lanau, M. S., Robles, A., and Toscani, M. F. G. (2018). *Explaining Inflation in Colombia: A Disaggregated Phillips Curve Approach*. International Monetary Fund.
- Loungani, P., and Swagel, P. (2001). *Sources of Inflation in Developing Countries*. International Monetary Fund.
- Moriyama, K., and Naseer, A. (2009). *Forecasting inflation in Sudan*. International Monetary Fund.
- Nguyen, A. D., Dridi, M. J., Unsal, M. F., and Williams, M. O. (2015). *On the Drivers of Inflation in Sub-Saharan Africa*. International Monetary Fund.
- Peiris, M. S. J., and Barnichon, R. (2007). *Sources of Inflation in Sub-Saharan Africa* (No. 2007/032). International Monetary Fund.
- Stocker, M., Ha, J., and Yilmazkuday, H. (2019). *Currency Depreciations, Inflation and Central Bank Independence*. World Bank Global Economic Prospects, Special Focus 1.2.
- Wang, J., Ronci, M., Farhan, N., Takebe, M., and Shanghavi, A. (2008). *The Choice of Monetary and Exchange Rate Arrangements for a Small Open, Low-Income Economy: The Case of Sao Tome and Principe*, IMF Working Paper 08/118.

STRENGTHENING MONETARY POLICY AND LIQUIDITY MANAGEMENT IN SÃO TOMÉ AND PRÍNCIPE¹

This paper presents strategic recommendations aimed at improving the monetary policy and liquidity management framework in São Tomé and Príncipe. It also includes an analysis of the banking system, an evaluation of the existing monetary policy and liquidity management practices, and an examination of the current liquidity conditions within the banking sector. This paper should not be considered as a replacement for the specialized technical assistance that the authorities of São Tomé and Príncipe may require to effectively address specific issues.

A. Introduction

1. **São Tomé e Príncipe, a small island nation with limited resources and capacity, is grappling with significant macroeconomic imbalances.** The economy heavily relies on imports and foreign aid, stemming from a narrow production base and limited export capabilities. Although the fixed exchange rate regime pegged to the euro has been essential in promoting economic stability and maintaining low inflation rates over the years, recent developments have raised concerns. There has been a noticeable slowdown in economic growth, accompanied by a marked increase in inflation. These trends are associated with rising external and internal imbalances, primarily driven by external shocks and expansionary fiscal policies that have led to domestic price increases. These imbalances, coupled with a decline in foreign inflows, have led to a significant reduction in the country's foreign exchange reserves.
2. **At this critical juncture, the authorities are enacting reforms to address significant macroeconomic imbalances.** These reforms focus on improving fiscal balances, enhancing domestic production capabilities, reducing reliance on imports, and creating a more resilient economic framework that can withstand external shocks. In alignment with these efforts, the Central Bank of São Tomé and Príncipe (BCSTP) has tightened its monetary policy to support the government's initiatives.
3. **In this context, the BCSTP has made significant progress in developing its liquidity management framework, with support from IMF technical assistance.** Nonetheless, additional actions are required to ensure these measures are effective. The BCSTP remains dedicated to overcoming the challenges that lie ahead.
4. **This paper offers strategic insights aimed at enhancing the effectiveness of the monetary policy and liquidity management framework in São Tomé and Príncipe.** The paper aims to provide an overview of the banking system in São Tomé and Príncipe (Section B), assess the current monetary policy and liquidity management framework (Section C), describe the liquidity situation within the banking sector (Section D), and offer pertinent recommendations (Section E)

¹ Prepared by Elsa de Brito, Hector Carcel Villanova, and Alsis Cruz, led by Bahrom Shukurov.

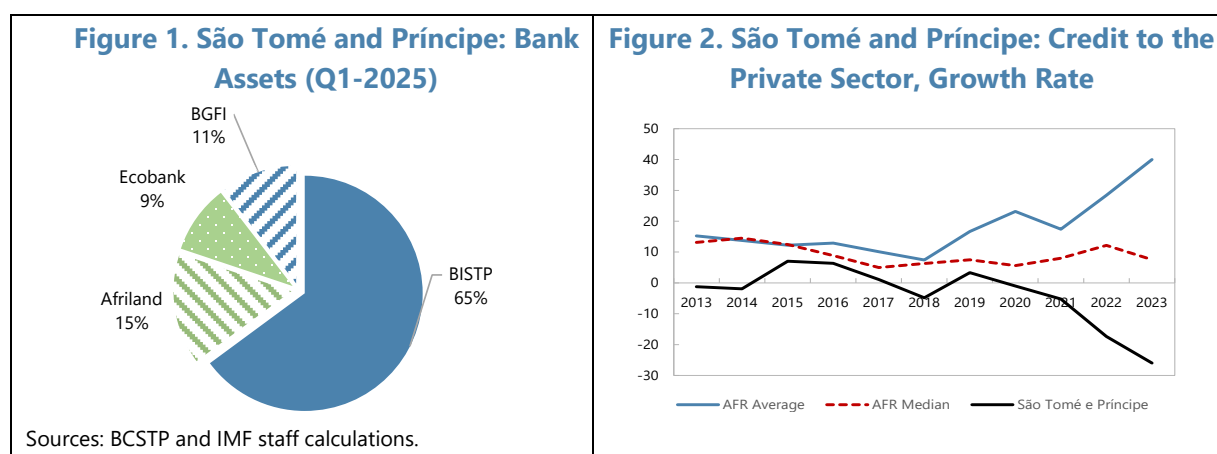
along with a conclusion (Section F). It is important to emphasize that the purpose of this paper is to provide high-level guidance and should not be seen as a replacement for the technical assistance that the authorities of São Tomé and Príncipe may seek to address specific challenges effectively.

B. Overview of the Banking Sector of São Tomé and Príncipe

5. The banking sector of São Tomé and Príncipe is small and faces significant challenges.

These include high operating costs and low asset quality and profitability. Following its liberalization in the early 2000s, the sector grew as the Banco Internacional de São Tomé e Príncipe (BISTP) was joined by three new banks in 2004, increasing the total to eight by 2008. However, uncertain prospects in the commercial oil sector led the BCSTP to place three banks under administration within a decade, highlighting weaknesses in regulatory oversight. Limited investment opportunities in the small domestic market hinder banks' financing capabilities. Additionally, a significant portion of deposits is held in foreign currencies, reflecting a lack of confidence in the local currency and economy.

6. The banking sector is marked by significant concentration, with the largest bank controlling 65 percent of total assets (Figure 1). This high level of concentration poses considerable challenges, as it not only hinders competition but also elevates systemic risk within the financial landscape. When a single institution holds such a substantial share of assets, it can lead to a lack of diversity in financial services, limiting choices for consumers and businesses alike. Furthermore, this concentration distorts the overall assessment of the system's liquidity levels, as excess reserves may become disproportionately concentrated in one institution. Such a scenario undermines the BCSTP's ability to effectively manage liquidity, complicating their efforts to implement monetary policy and maintain financial stability. The vulnerability of the financial system to shocks increases, as the failure or distress of the dominant bank could have cascading effects throughout the entire economy, highlighting the urgent need for regulatory reforms aimed at fostering a more competitive and resilient banking environment.



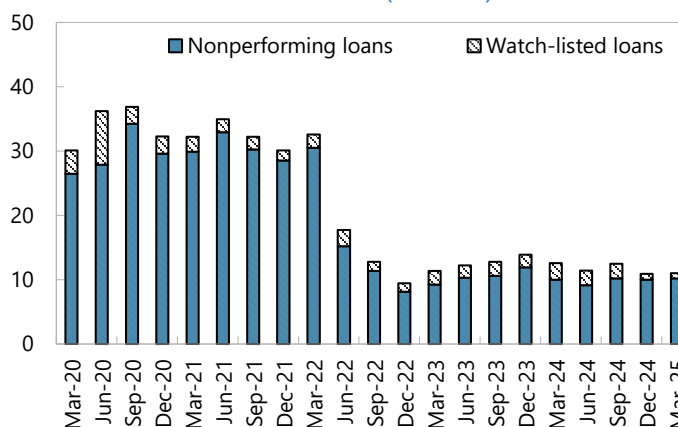
7. Several challenges contribute to the reluctance of banks in São Tomé and Príncipe to lend to the private sector. First, economic instability has affected the country, characterized by a stagnation and uncertain macroeconomic conditions, which have negatively impacted the stability

and lending capacity of the banking sector. Additionally, limited financial infrastructure poses significant hurdles, while structural deficiencies such as weak contract enforcement and the absence of a robust credit information system increase the risk of defaults, prompting banks to adopt a more cautious approach. Furthermore, the widespread informal sector complicates lending activities, as many businesses and individuals lack formal registration and bank accounts, making it challenging for banks to accurately assess creditworthiness.

8. As a result, private sector credit experienced a sharp decline since 2019. Over the past decade, the growth rate of credit to the private sector in São Tomé and Príncipe has consistently lagged behind that of regional peers, exhibiting a marked decline since 2019 (Figure 2). After nearly five years of contraction, private sector credit has dropped to less than 8 percent of GDP, down from 24 percent pre-pandemic. While credit interest rates have shown a downward trend over the last ten years, the current interest rates remain close to 20 percent, reflecting macroeconomic imbalances and the high operating costs of financial institutions. This elevated rate effectively excludes a significant number of economic agents from accessing the formal financing system.

9. The high level of non-performing loans (NPLs) makes banks reluctant to extend new credit. This caution has led banks to prioritize holding more liquid assets as a strategy to mitigate the risks associated with potential loan defaults. Moreover, uncertainties within the judicial system—particularly regarding the enforcement of collateral—further discourage lending, as banks are often uncertain about their ability to recover loans in the event of defaults. As a result, the regulatory environment has become more stringent, prompting banks to adopt conservative lending practices.

Figure 3. São Tomé and Príncipe: Past Due Loans to Gross Loans (Percent)



Source: BCSTP and IMF staff calculations.

10. Recent regulatory changes introduced in 2022 concerning asset classifications, provisioning, and capital adequacy have positively impacted the sector. These reforms have contributed to a notable reduction in systemwide NPLs, which decreased to 10 percent of total loans by Q1:2025, down from a pandemic peak of approximately 34 percent in Q3:2020 (Figure 3).

C. The Current Monetary Policy and Liquidity Management Framework

11. The BCSTP's regulatory framework incorporates a variety of instruments designed to implement monetary policy and manage liquidity. These include (i) open market operations (OMO), which are initiated by the BCSTP through auctions of its Certificates of Deposit (CDs); (ii) the required reserves (RR) that mandate that banks maintain a certain amount of funds as reserves in their accounts at the BCSTP to help regulate liquidity in the banking system; and (iii) standing

facilities that allow for temporary liquidity absorption or lending. The BCSTP may utilize Treasury Bills (T-bills) for monetary policy purposes in accordance with the T-bills Legal Framework, although their issuance is currently primarily focused on financing budgetary requirements. In exceptional circumstances, the BCSTP may conduct refinancing operations, allowing struggling credit institutions to obtain loans for an extended period as a non-conventional monetary policy measure. The policy reference interest rate is used for these operations; however, this rate is not employed as a benchmark for monetary policy activities, nor do banks use it to set their deposit or lending rates.

Open Market Operations

12. The regulation governing OMOs was established in 2014; however, this instrument has only been actively utilized to absorb excess liquidity in the banking system more effectively since 2020. The regulatory framework allows for a variety of operations, including outright transactions, repo and reverse repo agreements, and foreign exchange swaps, all aimed at managing liquidity effectively. The regulation also specifies a broad range of eligible collateral. Furthermore, the OMO framework facilitates competitive auctions and direct sales or purchases for monetary operations. CDs, which are securities with maturities ranging from 1 to 360 days, can be utilized for both short- and long-term sterilization purposes. Until November 2021, CDs were issued through fixed quantity and rate tenders, predominantly with a one-month maturity. Since July 2022, the issuance of CDs has shifted to a fixed-quantity, variable-rate tender process, thereby enhancing the effectiveness of monetary operations.

Required Reserves

13. The RR remain the cornerstone of the BCSTP's monetary policy and liquidity management framework. Established in 1992, the RR has consistently been the primary tool employed by the BCSTP to regulate liquidity within the financial system. Commercial banks are required to maintain unremunerated reserves, specifically set at 28 percent for their local currency liabilities—an increase from 18 percent prior to mid-2022—and 21 percent for their foreign currency liabilities, which comprise 90 percent in local currency and 10 percent in foreign currency. Notably, these rates are considered high by international standards. The calculation of the RR is based on the monthly average of deposits recorded in the second month prior to the month of compliance, allowing for a maintenance period of one month.

Standing Facilities

14. The BCSTP's monetary policy and liquidity management framework encompasses both deposit and lending facilities. The deposit facility enables commercial banks to deposit their excess reserves, while the lending facility provides marginal liquidity, with both loan and deposit operations limited to a maturity of five days. Recently, neither of these instruments has been utilized in the implementation of monetary policy, and they are not linked to the BCSTP's key policy rate, which is set at 10 percent. The interest rate for the lending facility is 10.5 percent, whereas the deposit facility offers a rate of 0 percent. Due to the unremunerated nature of the deposit facility,

banks typically do not utilize it. Additionally, given the significant levels of excess liquidity in the banking system, banks generally find little need to access the lending facility.

15. The BCSTP's strict collateral requirements ensure loan security but may unintentionally restrict borrowing capacity for some institution. Acceptable forms of collateral include BCSTP's securities, CDs, T-bills, and deposits in foreign currencies. The BCSTP's CDs and securities are valued at face value and must be free from encumbrances. For foreign exchange assets, collateral valuation is based on the exchange rate established by the BCSTP, with these securities valued at market value and also free from charges. The total collateral must be at least 125 percent of the requested loan amount. Furthermore, eligible instruments will only be accepted as collateral if their value exceeds the bank's reserve requirement at the BCSTP. While this policy is intended to encourage prudent lending practices, it may limit borrowing capacity for some institutions, potentially affecting their ability to secure loans when needed.

New Monetary Policy Framework

16. To support effective monetary policy, the BCSTP has recently introduced a new monetary policy framework. This framework sets a target for core inflation, calculated as the six-month moving average, at 3.1 percent (the average during the period before the pandemic). The BCSTP aims to keep banks' excess reserves in local currency below a specified threshold by issuing CDs at variable rates until the six-month moving average of core inflation falls below the target (see Box 1 for economic rationale for this framework). The BCSTP currently sets this threshold at STN 275 million (previously STN 200 million). The BCSTP is also committed to introducing 12-month CDs to complement the existing 1-month, 3-month, and 6-month options, thereby helping to absorb structural excess liquidity. Moreover, when excess reserves fall below STN 275 million, the MPC may contemplate offering limited amounts of CDs every month to extract interest rate signals from the market.

Monetary Policy Committee

17. The Monetary Policy Committee (MPC), established in 2013, sets key interest rates and provides guidance on financial stability. The committee is composed of the following members: (i) the Governor of the BCSTP, (ii) the Deputy Governor, (iii) Administrators and Directors responsible for liquidity management, markets, economic studies, statistics, and supervision, and (iv) three senior advisors from the BCSTP with expertise in finance and economics. The MPC is tasked with setting the policy reference rate and the lending facility rate. Moreover, the MPC provides recommendations to local entities on matters related to financial stability, fiscal policy, and government debt management. The MPC convenes quarterly and issues a press release outlining its key decisions.

Box 1. São Tomé and Príncipe: Economic Rationale for the BCSTP's Monetary Policy Framework

The BCSTP focuses on core inflation to implement its price stability commitment. The BCSTP targets core inflation in its monetary framework because core inflation excludes large and volatile components like food and energy prices, providing a clearer view of underlying inflation trends. By concentrating on core inflation, the BCSTP can communicate its commitment to price stability more effectively, ensuring that its policies are informed by persistent economic factors rather than short-term fluctuations.

Interest rates derived from the market through the issuance of the BCSTP's CDs are essential for shaping monetary policy. Central banks typically tighten monetary policy by raising policy rates, a strategy designed to control inflation and stabilize the economy. However, in São Tomé and Príncipe, the policy rate set by the BCSTP has proven ineffective in influencing market behavior or guiding lending and borrowing rates. This ineffectiveness undermines the BCSTP's ability to implement a coherent monetary policy and achieve its economic objectives. Therefore, it is essential to establish a dependable benchmark interest rate that can fulfill this role.

By reducing excess reserves through the issuance of CDs, the BCSTP can facilitate an increase in interest rates. The current threshold of STN 275 million is established to support this goal, representing the lowest feasible level that will not disrupt banks' operational activities. By issuing CDs to meet this threshold, the BCSTP aims to accomplish two key objectives: (i) an increase in CD rates and (ii) the establishment of these rates as a reliable guiding policy rate for the BCSTP, thereby improving the transmission of monetary policy in São Tomé and Príncipe. As the banking system strengthens, the necessity for banks to maintain high excess reserves will decrease, allowing the BCSTP to adjust the threshold accordingly.

Interbank Money Market

18. The interbank money market (IMM) regulation outlines the framework for banks to exchange funds. Effective since 2015, this regulation allows banks to exchange funds held in their accounts with the BCSTP for a maximum period of one year. These transactions can be conducted bilaterally and may be either collateralized or non-collateralized. Eligible collateral includes foreign currency deposits, T-bills, and BCSTP CDs. Interest rates are negotiable between banks, with payments settled upon maturity. Transactions are required to be conducted in local currency unless collateral is foreclosed, and the BCSTP oversees these operations. While the BCSTP intends to publish statistical information on IMM activities, the market is currently inactive due to insufficient trust among banks. Moreover, the infrastructure for registering and settling the IMM operations remains underdeveloped. As a result, banks are hesitant to engage in interbank trading and therefore maintain higher excess reserve levels.

Liquidity Forecasting

19. The BCSTP initiated a liquidity forecasting framework some time ago, but progress has faced significant challenges due to resource limitations and difficulties in obtaining accurate data. The BCSTP began developing a liquidity forecasting framework in 2011, adopting a

straightforward, step-by-step approach centered around a one-day liquidity forecasting model based on anticipated cash flows from autonomous factors. Efforts were made to extend this forecasting exercise to one month. However, progress was impeded by resource scarcity, which led to a de-prioritization of liquidity forecasting efforts. Additionally, the challenge of obtaining accurate information has hindered the development of longer-term liquidity projections. The Treasury Directorate at the Ministry of Economy and Finance (MEF) has sought to improve the predictability of its cash flows, yet significant obstacles persist. Payments for specific government expenditures are contingent on fund availability, which may not align with the BCSTP's data collection timeline. Furthermore, forecasting government resources deposited at the BCSTP is complicated by the unpredictable timing of withdrawals.

D. Liquidity Situation in the Banking Sector

20. The liquidity dynamics in the system have fluctuated significantly from persistent excess reserves before 2017 to notable changes during and after the pandemic. Before 2017, the system faced persistent structural excess liquidity with excess reserves increasing to a peak of STN 783 million by early 2017. Government spending has been the primary driver of this liquidity expansion, while the banking system has struggled to lend to the private sector due to high levels of NPLs, lending risks, and various judicial and administrative obstacles. From 2017 to 2019, excess reserves steadily decreased, reaching a low of STN 494 million by the end of 2019. This reduction was mainly attributed to decreased external support. In contrast, from 2020 to mid-2022, there was a significant increase in excess reserves during the pandemic crisis, largely due to external support aimed at mitigating the adverse effects of COVID-19 (Figure 4).

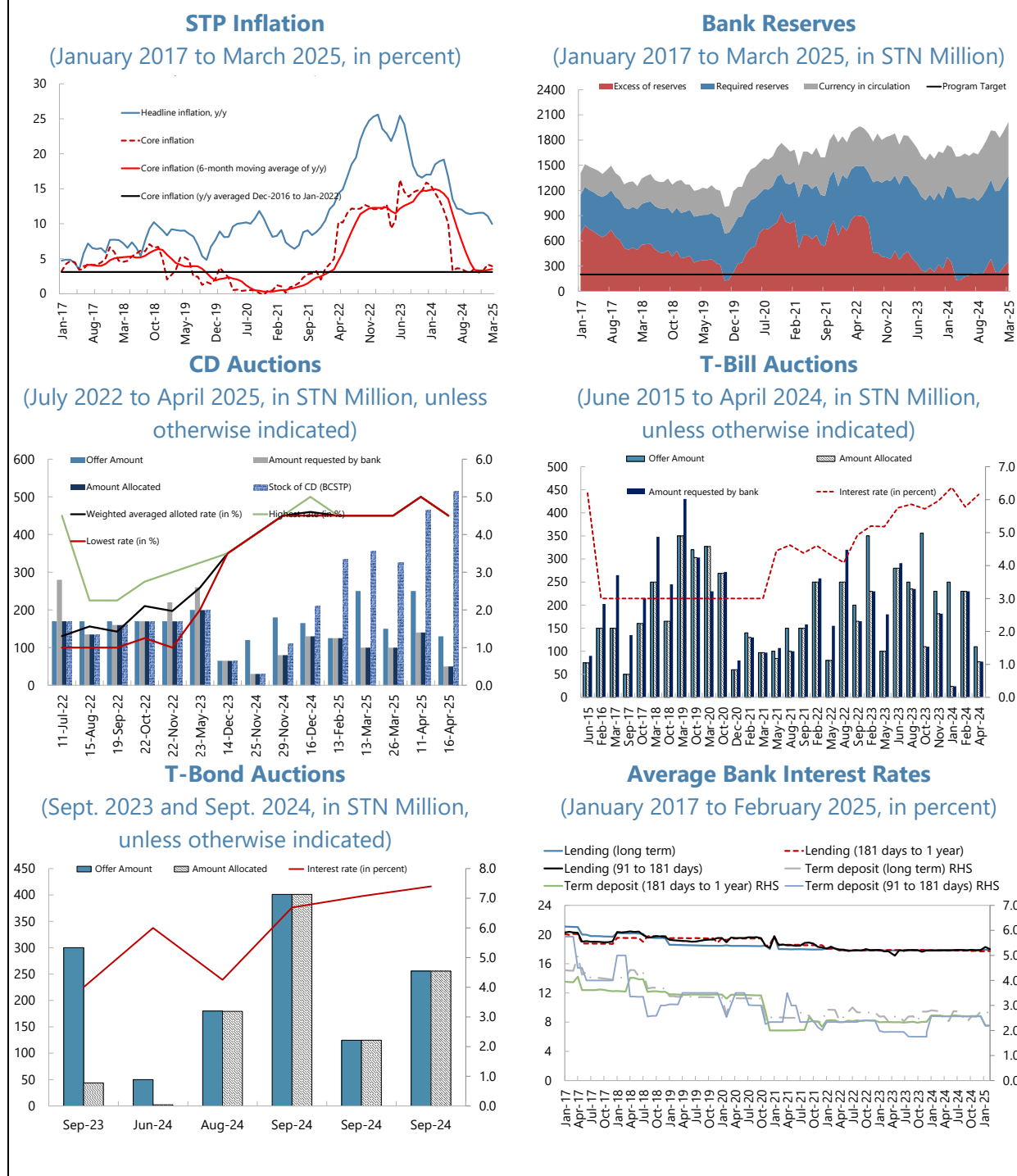
21. Excess liquidity has significantly decreased since mid-2022, driven primarily by a combination of fiscal consolidation measures and monetary policy tightening. The government has focused on improving public financial management and reducing fiscal deficits. Efforts to rein in public spending, along with the introduction of a Value-Added Tax (VAT), have contributed to better fiscal discipline. The BCSTP has also been instrumental in this process by implementing tighter liquidity management policies, including through increasing reserve requirements for commercial banks and enhancing the monitoring of financial institutions to ensure compliance with regulatory standards. The BCSTP has also stopped extending credit to the government. Collectively, these measures have helped stabilize the macroeconomic environment.

22. The implementation of the new monetary policy framework has led to a gradual increase in interest rates and a notable reduction in core inflation. Since mid-2022, the BCSTP has conducted several CD auctions, leading to a gradual increase in the weighted average interest rates, which rose from 1.3 percent in July 2022 to 4.6 percent by December 2024. Concurrently, the BCSTP has continued to rely on T-bill issuances, with T-bill interest rates climbing from approximately 4 percent in mid-2022 to 6.2 percent in April 2024. Additionally, the MEF has initiated the issuance of two-year T-bonds, offering interest rates ranging from 4 to 6 percent. In response, short-term deposit interest rates in the banking system saw only a modest increase, rising from 2.3 percent in mid-2022 to 2.6 percent by December 2024, primarily due to a weak monetary transmission channel. Nevertheless, the measures implemented have helped reduce the six-month

moving average of core inflation from approximately 12 percent during the period from mid-2022 to the end of 2023 to 3.3 percent by December 2024 (Figure 4).

23. Excess reserves experienced an increase in the last quarter of 2024 and early 2025, driven by foreign exchange inflows and new regulatory measures. Excess reserves increased despite the sizable issuance of CDs, which saw their stock rise to STN 335 million by mid-February 2025—50 percent higher than excess reserves in January 2025. This growth in excess reserves is attributed to an inflow of foreign exchange, stemming from external disbursements from bilateral and multilateral partners. Additionally, the BCSTP's recent regulation requiring banks to sell 25 percent of their foreign exchange revenues to the BCSTP further contributed to this increase.

24. The uneven distribution of excess liquidity in the banking sector hampers effective liquidity absorption and highlights significant challenges in interbank trading. Excess liquidity within the banking sector is unevenly distributed, with one commercial bank holding around two-thirds of the total liquidity surplus. Consequently, not all of this excess liquidity may be readily available for absorption. Banks need to retain a portion of excess liquidity for transactional and precautionary needs, particularly given the lack of a functioning standing credit facility, a robust interbank market, acceptable collateral, and trust among banks.

Figure 4. São Tomé and Príncipe: Monetary Developments

E. Recommendations

25. The BCSTP's clear objectives and effective monetary policy framework are crucial for maintaining price stability. While fiscal policy plays a key role in controlling inflation in São Tomé and Príncipe, the BCSTP's actions are equally important. The establishment of clear objectives by the BCSTP that align with its overarching goals, particularly in maintaining price stability, is a significant achievement. A well-defined target for core inflation, coupled with the effective implementation of monetary policy and liquidity management tools, serves as a critical benchmark for measuring the BCSTP's success. The interest rates set through the issuance of the BCSTP's CDs can shape monetary policy and act as a reliable benchmark for the institution, influencing overall interest rates within the banking system over time. However, several key issues need to be addressed, including unabsorbed surplus liquidity, low intermediation, and a lack of trust among market participants.

Open Market Operations

26. The BCSTP's implementation of diverse CD options and T-bills is vital for effectively addressing liquidity challenges and enhancing its understanding of market interest rates. It is essential for the BCSTP to introduce 12-month CD options and utilize T-bills for monetary policy purposes. This strategy will help absorb structural excess liquidity in the economy and achieve the target for excess reserves, currently set at STN 275 million. As the banking system becomes more robust, the need for banks to maintain high excess reserves will diminish, allowing the BCSTP to adjust the threshold accordingly. Once excess reserves dip below the established target or core inflation falls below the 3.1 percent target, offering a limited quantity of CDs would enable the BCSTP to effectively assess interest rate signals in the market. To facilitate this evaluation, the BCSTP could either continue conducting CD auctions with one-month maturities or initiate auctions with shorter maturities of 7 or 14 days. By implementing these measures, the BCSTP would gain valuable insights into market demand for these instruments and better gauge prevailing interest rate trends.

27. The BCSTP could enhance the effectiveness of OMOs by promoting transparency, diversifying counterparties, and leveraging technology to foster a more competitive and inclusive market environment. To improve OMOs in an environment of significant market concentration, the BCSTP could enhance transparency by clearly communicating its objectives, strategies, and participation criteria, which fosters a more competitive market environment. Issuing longer-term instruments can provide additional flexibility in managing market conditions. Additionally, diversifying the pool of eligible counterparties to include smaller institutions and non-bank entities can reduce reliance on dominant players. Regular market assessments, improved communication channels with participants, and incentives for smaller institutions to engage in OMOs can encourage broader participation. Furthermore, leveraging technology through electronic trading platforms can enhance efficiency, while establishing a framework for monitoring and reporting the outcomes of OMOs can build trust and further promote inclusivity in the financial market.

Required Reserves

28. The BCSTP could enhance the RR system by calculating the RR base using the average of the last month's data. This adjustment would provide a more accurate reflection of current banking conditions and liquidity needs. The existing practice of relying on banks' liabilities with a two-month lag fails to capture the most recent balance sheet positions of banking institutions. By adopting a more timely approach, the BCSTP can ensure that the RR are aligned with the current economic environment, thereby promoting better stability and responsiveness in the banking sector.

29. The treatment of RR plays an important role in shaping the dynamics between commercial banks' deposit and lending rates, impacting overall liquidity management and the effectiveness of monetary policy. Unremunerated RR affect the spread between deposit and lending rates, as banks need to establish this spread to cover costs and generate profits. When banks are mandated to hold a portion of their assets as non-interest-bearing balances at the central bank, it leads to considerably higher average interest rates on loans compared to deposits. To alleviate this distortion, RR should ideally be remunerated at or near the targeted policy rate. Consequently, the BCSTP's decision on whether to remunerate RR and at what level will depend on their intended purpose. If the objective is to drain liquidity cheaply, RRs should not be (fully) remunerated. In contrast, if the aim is to correct the above-mentioned distortions in the banking system and narrow the spread between lending and deposit rates, remuneration becomes more advantageous. The fact that most central banks do not provide such remuneration indicates a stronger emphasis on the goal of draining liquidity cheaply.

Standing Facilities

30. To enhance the effectiveness of the standing lending facility, the BCSTP could implement key improvements to access and operational parameters. This includes making the facility permanently available instead of limiting it to five days. Additionally, restrictions on access could be lifted, allowing eligible institutions unlimited borrowing as long as they provide acceptable collateral. The lending facility rate could be set above the BCSTP CD rate to serve as a penalty, discouraging unnecessary borrowing and establishing a ceiling for interbank interest rates. It is essential to distinguish between the standing lending facility, which should remain a monetary policy tool for qualifying banks, and the lender of last resort function, which provides loans to solvent institutions that have exhausted other funding options. This differentiation should be reflected in the parameters governing each facility, including maturity, collateral policy, and pricing, to promote effective balance sheet restructuring among banks.

31. The BCSTP could take steps to operationalize the standing deposit facility by ensuring that interest rates are linked to the BCSTP CD rate. By creating a connection between the deposit facility rate and the BCSTP CD rate, the BCSTP could develop a more cohesive framework that influences overall market dynamics. As a result, banks would be motivated to adjust their interest rates in response to changes in the CD and deposit facility rates, contributing to a more stable financial environment. The deposit facility rate could be linked to the BCSTP CD rate in a manner that ensures the former remains below the latter, thereby maintaining a relationship between the

two rates while encouraging lending in the interbank market, prompting banks to lend excess reserves rather than depositing them with the BCSTP. This would help ensure that the BCSTP CD rate influences other interest rates and creates a corridor for short-term market rates, facilitating a smoother monetary policy transmission.

Emergency Liquidity Assistance

32. The BCSTP could enhance the emergency liquidity assistance (ELA) framework to facilitate institutions' access to liquidity during temporary shortages. Although a framework is currently in place, it lacks a clear distinction between various types of liquidity needs, including short-term liquidity requirements, temporary needs, and those associated with the resolution framework. This ambiguity can lead to confusion among banking institutions regarding the appropriate avenues for liquidity support. To address these issues, the BCSTP could establish well-defined categories for liquidity needs, ensuring that institutions can easily identify and access the necessary support for their specific circumstances. Furthermore, standardizing the rates applied to each facility within the ELA framework would enhance transparency and predictability, allowing institutions to make informed decisions regarding liquidity management. By refining the ELA framework in these ways, the BCSTP can bolster financial stability and support institutions more effectively during times of liquidity stress.

Interbank Money Market

33. The BCSTP could enhance the IMM by strengthening the legal framework, investing in technology, and promoting the tradability of CDs. To enhance transactions in the IMM, it is critical to strengthen the legal and regulatory framework, ensuring enforceable contracts and developing reliable systems for sharing information about market conditions to foster trust. Additionally, investing in technology and infrastructure, such as electronic trading platforms, is vital for supporting trading and settlement processes. Making CDs tradable within the interbank market is essential for facilitating smoother transactions among banks and with the BCSTP. This initiative requires establishing a robust collateral framework to instill confidence among market participants, ensuring that banks feel secure in their dealings. By implementing these measures, the BCSTP can create a more dynamic IMM, promote interbank trading, and reduce the need for banks to maintain high levels of excess reserves.

Liquidity Forecasting

34. It is essential for the BCSTP to initiate liquidity forecasting. Although there have been advancements in understanding liquidity concepts, challenges in data collection continue, underscoring the need to improve data quality through collaboration with data providers. Developing robust data collection systems that provide accurate and timely information on government transactions, foreign exchange operations, and banking sector activities is critical. Moreover, enhancing coordination between the MEF and the BCSTP is vital, particularly for sharing forecasts of government expenditures and revenues.

35. Additionally, the BCSTP should have a clear understanding of liquidity situation during the month it needs to decide on liquidity absorption. There may be instances where current month excess reserves fall below the targeted threshold, even when previous month data—used for assessment—indicates higher levels. In such cases, further reducing excess reserves could be counterproductive. To gain insight into current liquidity levels, the BCSTP could employ simple estimation methods using the available high-frequency data.

36. The BCSTP could initially focus on liquidity forecasting for one month, with plans to extend this to one year once validated, thereby enhancing liquidity management. Establishing daily routines for monitoring bank reserves and implementing medium to long-term liquidity assessments is vital. Investments in IT systems and human resources are necessary to automate forecasting processes and improve data analysis capabilities. Regular reviews of forecasting models will enable the BCSTP to respond effectively to changing economic conditions. Additionally, expanding liquidity projections to encompass the maturities of issued CDs, T-bills, and Treasury Bonds (T-bonds) will offer a more comprehensive understanding of liquidity conditions, enhancing the planning process for auctions.

BCSTP Recapitalization

37. Recapitalizing the BCSTP is a critical step toward enhancing its financial stability and credibility, allowing it to manage liquidity and implement monetary policy more effectively. Recapitalization would strengthen the BCSTP's balance sheet, ensuring it has the necessary financial resources to effectively conduct monetary policy. This process would involve the government injecting capital into the BCSTP, either through direct transfers or by issuing government bonds. Additionally, the BCSTP could retain a higher portion of its profits to build up its capital reserves over time. By recapitalizing the BCSTP, the authorities can enhance its credibility and ability to absorb liquidity, ultimately supporting economic stability and growth.

Communication

38. The BCSTP could further enhance its communication strategy with stakeholders, including financial institutions, the government, and the public. Transparency in policy decisions and the rationale behind them fosters trust and confidence in the central bank's actions. This can be achieved through regular reports, press releases, and public forums that outline the central bank's economic outlook and policy intentions. Additionally, it is crucial to hold regular meetings with commercial banks to explain the rationale behind specific monetary policy decisions and to keep them informed about monetary policy and liquidity management issues. Effective communication will empower the BCSTP to shape market expectations and behaviors, thereby enhancing the overall effectiveness of its monetary policy framework and help build trust among market participants.

Capacity Development

39. Continuing to enhance the BCSTP’s analytical capacity should be an ongoing process. Developing the analytical tools and skills necessary for effective implementation of monetary policy, liquidity management, and other critical areas needs to be a continuous endeavor. This commitment to strengthening analytical capacity is vital for the BCSTP to adapt to changing economic conditions and respond effectively to emerging challenges. The IMF stands ready to support this journey by providing ongoing technical assistance and training to the authorities of São Tomé and Príncipe, ensuring they have the resources and knowledge needed to effectively navigate their specific challenges.

F. Conclusion

40. Strengthening the monetary policy and liquidity management operations in São Tomé e Príncipe is essential for tackling the significant macroeconomic challenges the country faces. The current economic landscape, marked by inflationary pressures, necessitates that the BCSTP implement strategic measures to enhance liquidity management and create a stable financial environment. By setting clear objectives and implementing a coherent monetary policy and liquidity management framework, the BCSTP can effectively help reduce inflation.

41. The recommendations presented in this paper can lead to more effective implementation of monetary policy and strengthen the monetary transmission mechanism. These include introducing diverse CD options, enhancing the RR system, and improving standing facilities, among others. Establishing a robust liquidity forecasting framework and refining communication strategies with stakeholders will also be essential for fostering transparency and trust, both of which are critical for executing effective monetary policy. Moreover, recapitalizing the BCSTP is essential for enhancing its financial stability and credibility, thereby improving liquidity management and monetary policy effectiveness. The IMF is prepared to continue providing technical assistance to the authorities of São Tomé and Príncipe to help address their specific challenges.

42. Ultimately, successfully implementing these strategies will not only aid in reducing inflation but also promote economic growth and development in São Tomé e Príncipe. The continued commitment of the BCSTP, along with collaboration from various stakeholders, is vital in navigating the complexities of the current economic environment and achieving long-term stability. By prioritizing these initiatives and addressing existing challenges, São Tomé e Príncipe can pave the way for a more sustainable and prosperous economic future.

References

- Berg, A., Pattillo, C., Shabsigh, G., and others. (2015). *Evolving Monetary Policy Frameworks in Low-Income and Other Developing Countries*. International Monetary Fund.
- Gray, S. (2011). *Central Bank Balances and Reserve Requirements*. IMF Working Paper 11/36. International Monetary Fund.
- Maehle, N. (2020). *Monetary Policy Implementation: Operational Issues for Countries with Evolving Monetary Policy Regimes*. IMF Contributor Notes. International Monetary Fund.
- Staff of Central Bank of São Tomé and Príncipe (2023). *Annual Report on Monetary Policy and Financial Stability*. Central Bank of São Tomé and Príncipe.
- Staff of International Monetary Fund. *IMF Country Reports for São Tomé and Príncipe*. International Monetary Fund.

POLICY OPTIONS TO STRENGTHEN SÃO TOMÉ AND PRÍNCIPE'S RESILIENCE TO NATURAL DISASTERS¹

São Tomé and Príncipe's is highly vulnerable to natural disasters and strengthening resilience is macro-critical. The government faces significant challenges, including weak infrastructure, insufficient protection against floods, and lack of financial resources. Simulations using the DIGNAD model illustrate the impact of investing in climate-resilient infrastructure and strengthening public investment efficiency on economic growth and debt, compared to ex-post disaster management and financial contingency funds. Given São Tomé and Príncipe's large needs and debt vulnerabilities, international financial support is key to strengthen resilience.

A. São Tomé and Príncipe's Vulnerability to Natural Disasters

1. São Tomé and Príncipe is a small island state comprising two islands and several islets.

The climate is humid tropical with two seasons, the rainy season with frequent rainfall (around September to May) and the dry season (*Gravana*) with lower temperatures (around June to August). Average temperatures are relatively stable throughout the year, while there are large differences in rainfall between different parts of the country, determined by the location of the mountains.

2. São Tomé and Príncipe is highly vulnerable to natural disasters and the impact of climate change. This is mainly due to its insularity and small territory, as well as its fragile ecosystems and the exposure of its natural resources to human pressure. Furthermore, most people live along the coast and near rivers, where also most physical assets are located. The main climate hazard for São Tomé and Príncipe is floods, followed by landslides which are often secondary effects of floods, and floods result mainly from heavy rains.²

3. Quantifying São Tomé and Príncipe's exposure and vulnerability to natural disasters is challenging, due to weak or non-existent data. The most significant natural disaster in recent years occurred between December 2021 and February 2022, when floods triggered by intense rainfall caused significant damage, estimated at around 6 percent of GDP.³ According to a World Bank study (2024), the rainfall event that caused these severe floods occurs, on average, once every 20 years in São Tomé and Príncipe.⁴ It also finds that the country's flood risk profile is relatively flat, without large differences between annually recurring floods and those occurring every 50 or 100 years. The country experiences floods on an annual basis and even minor floods can have a large impact, as the population and assets are concentrated in relatively small coastal areas and infrastructure is very weak (and hence susceptible). Also, there are very limited flood protection

¹ Prepared by Sneha Agrawal, Julia Bersch, Azar Sultanov, and Ke Wang.

² See, e.g., WB (2024), [Sao Tomé-et-Príncipe | GFDRR](#), and [Sao Tome and Principe - Vulnerability | Climate Change Knowledge Portal](#).

³ See [2022 Article IV staff report](#).

⁴ See also [Rising Waters, Rising Hopes: Shaping Resilience in São Tomé and Príncipe Through Flood Risk Analysis](#).

measures such as levees and dunes, even to protect against recurring annual floods. According to the World Bank, São Tomé and Príncipe ranks among the most vulnerable countries to climate change due to its unique geography, fragile ecosystems, and low socioeconomic development.⁵ Climate change impacts the country mainly through higher temperatures, increased precipitation, rising sea levels, advancing coastal erosion which can increase the risk of flooding, and extreme weather events. The World Bank is currently working on its first Country Climate and Development Report (CCDR) for São Tomé and Príncipe, an important diagnostic tool, which is expected to be completed in 2026. The CCDR is expected to help prioritize the most impactful actions to boost adaptation and resilience and reduce greenhouse gas emission, while delivering on broader development goals.⁶

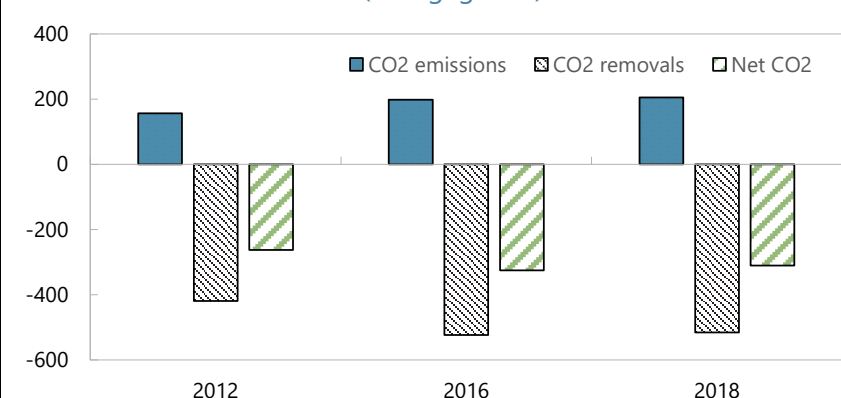
4. As a full member of the United Nations Framework Convention on Climate Change (UNFCCC) São Tomé and Príncipe is committed to reduce its greenhouse gas emissions (GHG) by 27 percent by 2030 compared to a business-as-usual scenario.

While the country's emissions are negligible in international comparison, the authorities still aim at improving their overall emission balance as part of their Nationally Determined Contributions (NDC).⁷ Through 2018 (latest year with available data), the energy sector was the country's largest emitter, followed by the agriculture and waste

sectors. At the same time, the "forest and other land uses" sector worked as CO₂ sequester, more than compensating for the CO₂ emissions of other sectors, making São Tomé and Príncipe on balance a net carbon sink.⁸ In their 2021 NDC, the authorities target a reduction in GHG by 27 percent by 2030, with an

estimated total cost of around US\$150 million. This nearly doubles the 2015 GHG reduction target, with a focus on forestry, energy, transport, and industrial sectors.

Figure 1. São Tomé and Príncipe: Evolution of CO₂eq Emissions (In Gigagrams)



5. To achieve the targeted emission reduction, São Tomé and Príncipe will promote the use of renewable energy, improve energy efficiency, and implement sustainable land

⁵ See <https://storymaps.arcgis.com/stories/2b69b33c3c75482b86ec985e1dca6f49>.

⁶ See [Country Climate and Development Reports \(CCDRs\)](#).

⁷ See São Tomé and Príncipe (2021).

⁸ See São Tomé and Príncipe (2021).

management practices. In addition to mitigation, the 2021 NDC emphasizes the importance of adaptation measures to cope with the impact of climate change, particularly in vulnerable sectors such as coastal zones, agriculture, and water resources. Key adaptation actions include improving disaster risk management, developing early warning systems, and enhancing climate resilience across various infrastructure and social systems. São Tomé and Príncipe is seeking international support and financing to meet its climate goals, acknowledging the challenges it faces as a small island developing state. In its first biannual update report (BUR) in 2022, São Tomé and Príncipe provided details on mitigation measures, the national monitoring, reporting, and verification (MRV) system, and highlighted the country's capacity and financial needs to effectively report emissions, aiming to support climate-resilient development and demonstrate the positive impact of mitigation and adaptation actions.⁹ The authorities recently presented an action plan for the decarbonization and resilience of the energy sector (PADRES), which outlines steps to move away from fuel-based electricity production towards renewables.¹⁰

6. The country has adjusted its institutional set-up to better coordinate policy action.¹¹

The General Directorate for the Environment (DGA), under the Ministry of Infrastructure, Natural Resources and Environment, was created in 2007 and is responsible for the execution and coordination of policies and government strategies on the environment. The National Institute of Meteorology is responsible for recording and disseminating climate data. In 2011, the National Council for Disaster Preparedness and Response (CONPREC) was established to coordinate disaster risk management activities. In 2012, the National Committee for Climate Change was created to coordinate, manage, train and raise awareness among stakeholders in São Tomé and Príncipe. The authorities have also prepared a Contingency Plan for Natural Disasters (2016-2020), a National Strategy for Disaster Risk Management (last updated in 2016), and a Multisectoral Investment Plan for coastal zone management. A draft disaster risk management law is under consideration, which would introduce an early warning system, assign responsibilities, and have a color-coded alert system. While São Tomé and Príncipe has disaster preparedness and response plans at the national level, the country is working with the World Bank to expand them to the local level.

7. Reducing the country's vulnerability to the impact of natural disasters will depend on climate adaptation actions. These include developing green and grey coastal infrastructure, improving early warning systems, and promoting planned relocations. The authorities aim at reducing climate-related risks and increase the resilience of communities and sectors by strengthening technical and institutional capacities, mainstreaming climate resilience into national and subnational planning and budgeting, and undertaking investments.¹² In June 2022, São Tomé

⁹ See São Tomé and Príncipe (2022).

¹⁰ See, e.g., [Decarbonization in small island developing states?](#)

¹¹ See, e.g., São Tomé and Príncipe (2021 and 2022) and the World Bank's [GFDRR](#).

¹² See São Tomé and Príncipe (2021).

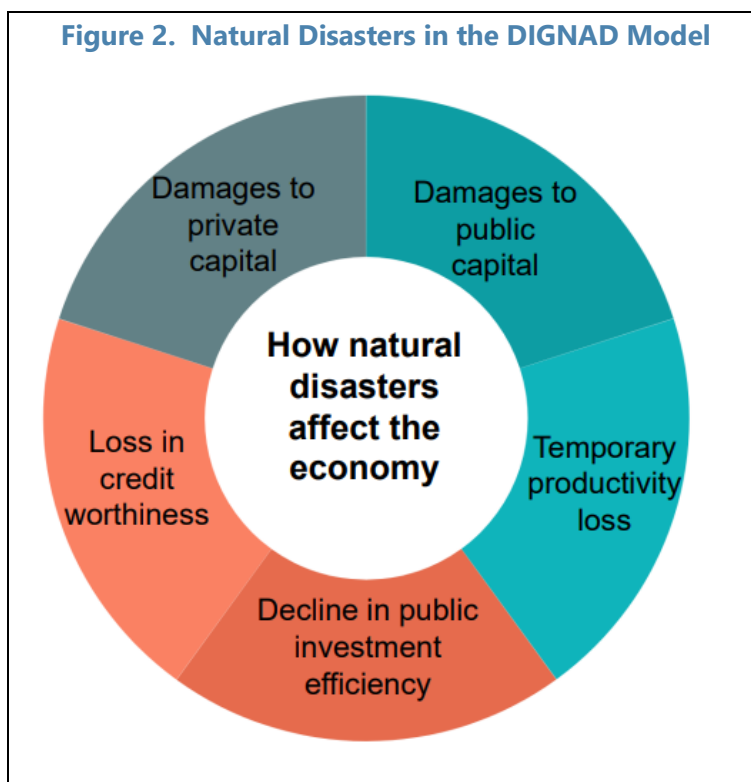
and Príncipe's government, in collaboration with UNEP, launched a process to develop a National Adaptation Plan (NAP), a 42-month project funded by the Green Climate Fund (over US\$2.9 million).¹³ Work on the NAP is ongoing.

8. The World Bank is supporting São Tomé and Príncipe in strengthening its coastal resilience, adaptation and resilience to floods. This is financed through the [West Africa Coastal Areas \(WACA\) Management Program](#), with financial resources of US\$15 million over 5 years, allocated mainly for physical investment, including relocation of people to safe expansion zones (see World Bank, 2023). With World Bank support, São Tomé and Príncipe is also strengthening its early warning system, which monitors weather and hazards, prepares forecasts, and disseminates information.

B. Application of the DIGNAD Model and Scenario Analysis

9. The Debt, Investment, Growth, and Natural Disasters (DIGNAD) model is a dynamic general equilibrium model designed to analyze the impact of investing in climate-resilient capital on economic growth and debt sustainability under various scenarios. The DIGNAD model (Marto, Papageorgiou and Klyuev, 2018) is an extension of the DIG (Debt, Investment and Growth) model of Buffie and others (2012), which has been developed in the Research Department and used at the IMF for many years. In the DIGNAD model natural disasters can affect the economy through five channels: (i) damages to public capital; (ii) damages to private capital; (iii) a temporary productivity loss; (iv) reduced public investment efficiency; and (v) a loss in creditworthiness. Additionally, it assesses debt sustainability risks following a natural disaster and evaluates the effects of ex-ante

Figure 2. Natural Disasters in the DIGNAD Model



¹³ See [São Tomé and Príncipe develops National Adaptation Plan for climate change | Global Adaptation Network \(GAN\)](#).

policies, such as investing in climate-resilient infrastructure (versus non-resilient infrastructure) and building fiscal buffers. The model also considers public investment inefficiency and limitations posed by absorptive capacity constraints. The model captures the challenges of closing infrastructure gaps in developing countries that frequently face natural disasters and captures the linkages among public investment, growth, and debt, such as the investment-growth nexus, the fiscal adjustment, and the private sector response.

10. The risk of a natural event turning into a disaster depends not only on the force of the natural event, but also on the quality of infrastructure and existing structures for rapid responses and assistance in an emergency.

Table 1. São Tomé and Príncipe: Calibrated Parameters and Initial values
(In Percent)

Definition	Value
Grants to GDP ratio	7.8
Domestic public debt to GDP ratio	42.8
Concessional public debt to GDP ratio	59.2
External commercial public debt to GDP ratio	12.3
Return to standard infrastructure	30.0
Return to climate-resilient infrastructure	40.0
Public standard infrastructure investment to GDP ratio	6.0
Depreciation rate of standard public infrastructure	7.5
Depreciation rate of resilient public infrastructure	3.0
Public investment efficiency	50.0

Source: IMF staff calculations.

natural events. São Tomé and Príncipe is highly exposed to natural hazards, its infrastructure and public service provision are fragile, and fiscal space is highly constrained in undertaking needed investment.

11. The model is tailored to São Tomé and Príncipe's economy. The model's steady state aligns the level of standard capital infrastructure investment with projected values for 2025–28, amounting to about 6 percent of GDP and public investment efficiency is set at 50 percent based on the average value in sub-Saharan Africa. The initial domestic public debt value is calibrated using the 2023 value of 42.8 percent of GDP.¹⁴ The parameters defining the standard and resilient infrastructure are in line with Marto, Papageorgiou and Klyuev (2018) and, in the absence of specific information, the parameters of the average LIC in their model were used.

12. To illustrate the macro-fiscal implications of climate change adaptation and reforms for São Tomé and Príncipe, a natural disaster is simulated to occur under the following three simulation sets with three scenarios each.¹⁵ Across all scenarios, the model is calibrated to reflect

¹⁴ This debt definition is aligned with the DSA.

¹⁵ The analysis is conducted using the DIGNAD toolkit by Aligishiev, Ruane, and Sultanov (2023).

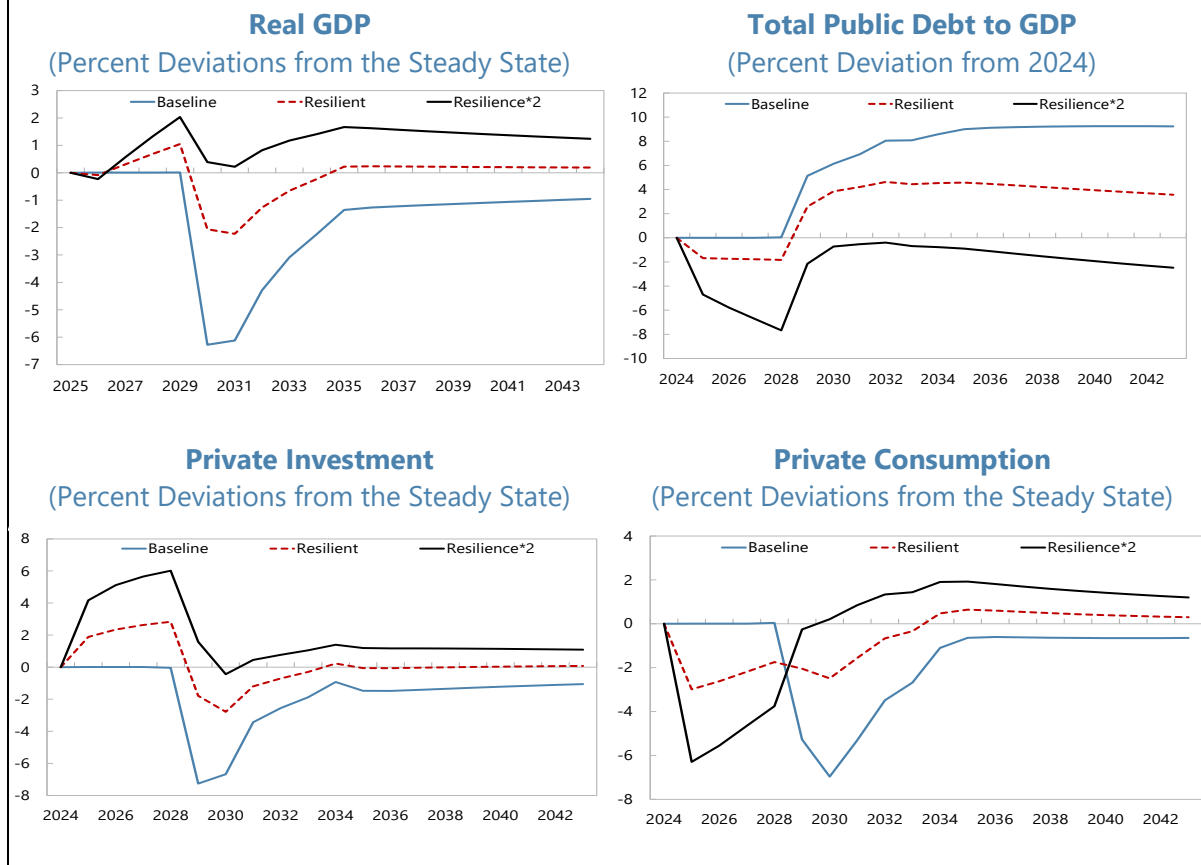
the state of the economy in 2024 (starting point), followed by a simulated natural disaster occurring in 2029, specifically focusing on the macroeconomic effects of one-time flooding on the islands.¹⁶ Each simulation provides insights into potential policy options for São Tomé and Príncipe in response to natural disasters and their implications.

13. Simulation 1 (Figure 3) evaluates the role of adaptation investment in climate-resilient infrastructure and its scalability vis-à-vis a baseline scenario of no intervention in response to the disaster.

- Scenario 1.1. The **baseline scenario** assumes no resilient infrastructure investment by the authorities. A natural disaster is assumed to hit the economy in 2029; the subsequent post-disaster recovery starts right away and spans the next five years. Following a natural disaster, both the government and the private sector need to restore the public and private capital stocks, respectively, since economic activity depends on the infrastructure. To capture the impetus for a swift recovery, we assume that the government rebuilds its damaged infrastructure to its pre-disaster level in about five years. The government can resort to several instruments to finance post-disaster reconstruction, including with debt (domestic, external commercial, or external concessional), grants, or by mobilizing additional domestic revenue. The baseline scenario assumes that the recovery is financed in equal parts with domestic debt and external commercial borrowing.
- Scenario 1.2. The **resilient infrastructure investment scenario** assumes that the authorities invest 2 percent of GDP per year in climate-resilient public infrastructure in 2025-28. The financing is equally split between grants and concessional loans. Assumptions about the disaster and recovery are the same as in the baseline scenario.
- Scenario 1.3. The **resilience scaling-up scenario** illustrates the scalability of the positive impact from increasing climate-resilient infrastructure investment to 4 percent of GDP per year in 2025-28. The additional public investment is assumed to be fully financed with grants, so that the overall financing mix consists of $\frac{3}{4}$ grants and $\frac{1}{4}$ concessional loans.

¹⁶ The calibration assumes a one-off 6 percent point GDP loss, somewhat larger than in recent historical data, but aligned with the damage from flooding STP might experience in the future.

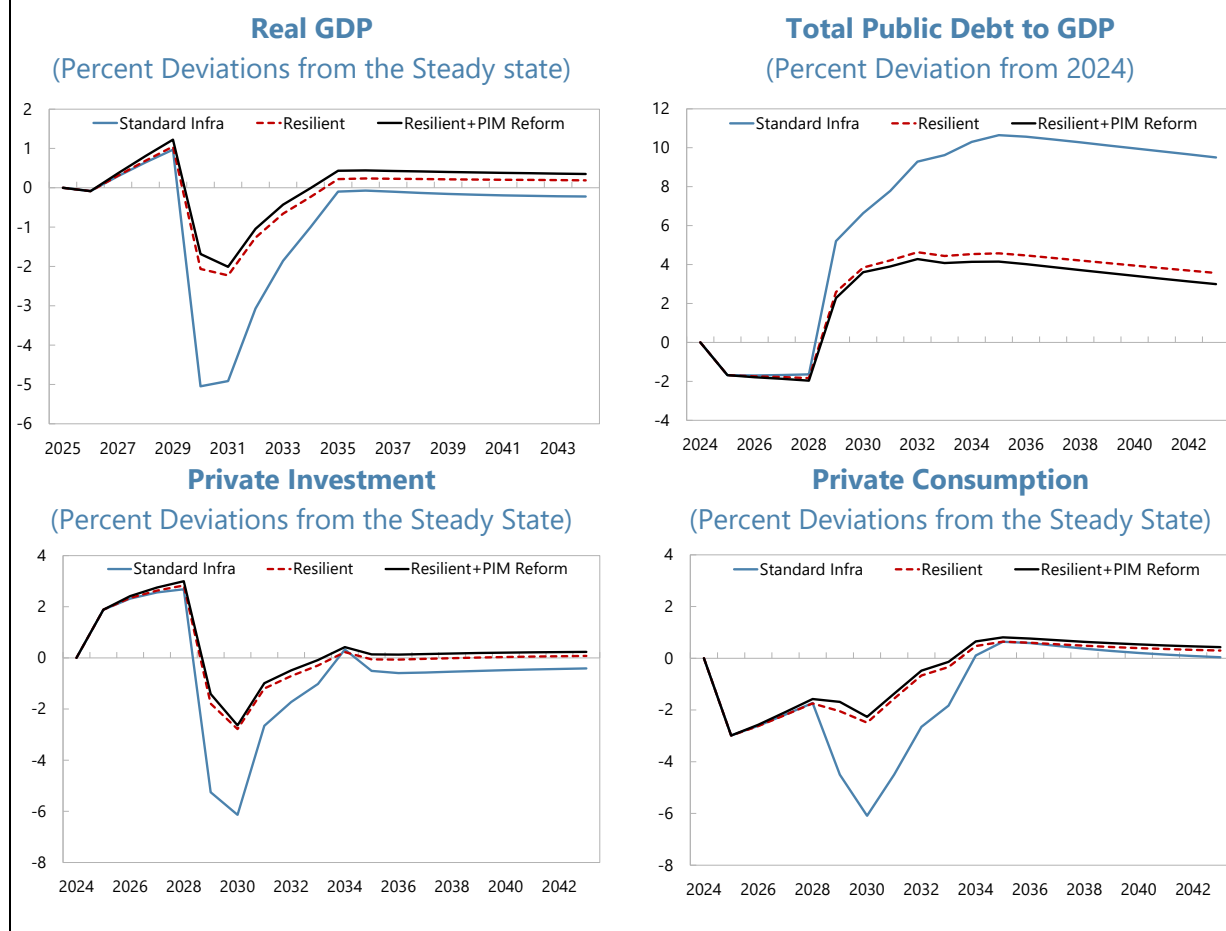
Figure 3. São Tomé and Príncipe: Impact of Climate-Resilient Infrastructure Investment



14. Simulation 2 (Figure 4) illustrates the advantages of resilient infrastructure investment compared to standard investment, as well as the impact of increased public investment efficiency (e.g., from strengthening public investment management).

- Scenario 2.1. The **standard infrastructure scenario** assumes public investment in standard infrastructure of 2 percent of GDP per year in 2025-28. The financing is equally split between grants and concessional loans. A natural disaster is simulated to occur in 2029.
- Scenario 2.2. The **resilient infrastructure investment scenario** is the same as scenario 1.2 and compared to scenario 2.1 replaces standard investment with climate-resilient one.
- Scenario 2.3. The **resilient investment plus PIM reform scenario** showcases the impact from reforms to strengthen public investment efficiency by 10 percentage points, in addition to investing in climate-resilient infrastructure. Everything else remains the same as in scenario 2.2.

Figure 4. São Tomé and Príncipe: Climate-Resilient versus Standard Infrastructure Investment



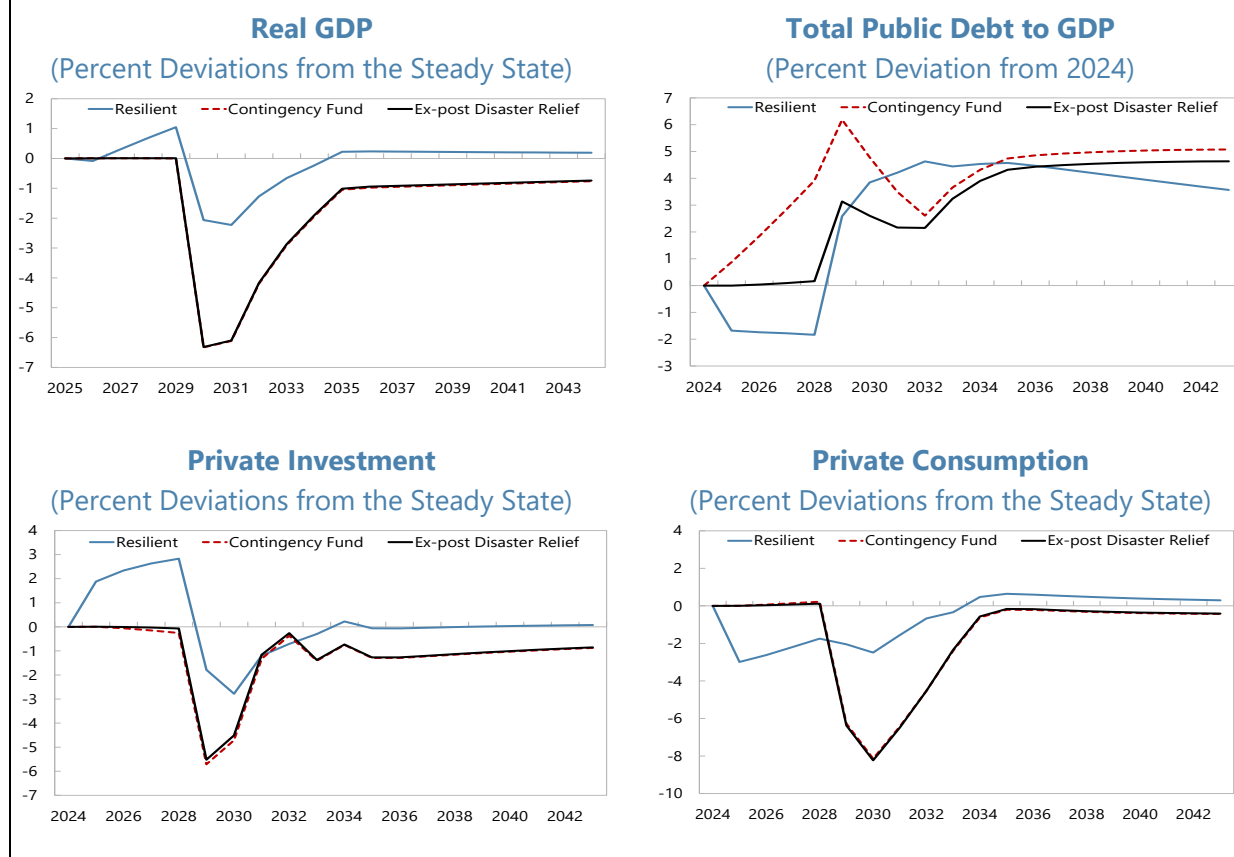
15. Simulation 3 (Figure 5) illustrates the trade-offs between ex-post disaster management and ex-ante disaster preparedness using financial insurance or resilient infrastructure investment.

- Scenario 3.1. The **ex-post disaster management scenario** assumes that a natural disaster hits the economy in 2029 and the subsequent recovery requires investment spending of 2 percent of GDP per year in 2029-2032. The financing is assumed to be equally split between grants and concessional loans.
- Scenario 3.2. The **ex-ante disaster preparedness scenario** assumes that a natural disaster contingency fund is set up, in which the authorities invest 2 percent of GDP per year during 2025-28. The funding is split equally between grants and concessional loans. Once the disaster

hits in 2029, the authorities draw down this fund at a rate of 2 percent of GDP per year in 2029-32.

- Scenario 3.3. The **resilient infrastructure investment scenario** is the same as scenario 1.2. with ex-ante public investment in climate-resilient infrastructure. Compared to scenario 3.2, the same amount of resources is invested in physical infrastructural rather than in a financial contingency fund.

Figure 5. São Tomé and Príncipe: Alternate Financing Options and Timelines for Disaster Management



16. The DIGNAD simulations illustrate how investing in climate-resilient infrastructure (Figure 3) and strengthening public investment efficiency (Figure 4) could increase São Tomé and Príncipe's resilience to natural disasters. The effects operate through the following channels:

- *Public and private investment.* In the baseline scenario the output drop is substantial when the disaster hits the economy and GDP recovers slowly, but even years after the disaster it remains below where it would have been in the absence of a disaster. This slow recovery is due to the fact that even though the government rebuilds public infrastructure within five years after the

disaster, it takes many years for the private sector to rebuild the private capital stock due to adjustment costs, which introduces a scarring effect from natural disasters. Relative to the baseline, the pre-disaster scaling up of public investment crowds in private investment and increases output in all scenarios but at different scales. The increase is larger for resilient than standard investment because resilient capital has higher returns, depreciates more slowly, and crowds in more private capital.

- Growth and its drivers.* When a natural disaster hits, it reduces output in the short term under all scenarios reflecting (i) permanent damages to public infrastructure; (ii) permanent damages to private capital; and (iii) temporary losses of productivity. The GDP decline is highest under the baseline scenario, at 6.3 percentage points, relative to the steady state, compared to about 5 percentage points in the case of standard infrastructure and 2.3 percentage points under the resilient infrastructure scenario. This is because the latter is characterized by greater durability and greater resilience, in that it suffers smaller damages in the aftermath of disaster shocks as well as mitigates damages to standard public infrastructure. Private investment is also more resilient under the resilient infrastructure scenario vis-à-vis both baseline and standard infrastructure scenarios because climate-resilient capital raises returns to private investment, and spurs growth. In scenario 2.3 (with higher public investment efficiency) GDP and private investment increase more pre-disaster than in the other scenarios because higher public investment efficiency means that with the same resources more can be built. This also implies that the post-disaster recovery costs are lower. Over the long run, GDP in the scenario with climate-resilient investment and higher public investment efficiency stabilizes at a higher level compared to other scenarios due to crowding in private investment, higher productivity, and a mitigated impact of natural disasters.
- Public debt.* A natural disaster increases the fiscal deficit due to reconstruction costs, regardless of the type of infrastructure, though the size of the increase differs. With climate-resilient infrastructure, damages and hence repair costs are lower, which leads to a lower fiscal deficit and the debt increase is more contained after the disaster strikes. Moreover, unlike the standard investment scenario, the debt level stabilizes more quickly over the medium- and long-term due to smaller and less-persistent output losses and smaller reconstruction needs (Figure 3). Consequently, in relative terms, resilient infrastructure is associated with lower public debt in the long-term compared to the baseline and standard infrastructure scenarios. With higher public investment efficiency, less spending is required to finance the disaster recovery, yielding even more favorable debt dynamics.
- Private consumption.* Investment in both types of infrastructure crowds-in private investments (varying based on the respective returns), impacting also private consumption during the pre-disaster period. However, results indicate that the decline in private consumption following the shock is less pronounced in the resilient infrastructure scenario compared to the baseline and standard infrastructure investment scenarios. This demonstrates that maintaining high levels of

resilient capital ultimately yields benefits, resulting in a swift recovery and even a rebound in private consumption that exceeds pre-disaster levels.

17. The DIGNAD simulation 3 (Figure 5) results imply that investing in resilient infrastructure is better than both ex-post disaster management and ex-ante disaster preparedness via a financial contingency fund. The timing of financial inflows has no impact on GDP growth, private investment or private consumption, unless they are invested into real capital/infrastructure (monetary neutrality). Hence, the real impact of ex-post disaster management using grants and concessional loans is identical to the ex-ante use of similar financial resources to accumulate a contingency fund to finance the recovery. By contrast, using the same amount of money to build climate-resilient infrastructure leads to better outcomes for GDP growth, private investment, and private consumption in the short- and long-run. Moreover, climate-resilient infrastructure lowers disaster losses and damages and, thereby, repair costs, contributing to lower public debt over the long term.

C. Conclusion and Policy Recommendations

18. The DIGNAD simulations illustrate that climate-resilient public investment could increase São Tomé and Príncipe's resilience to natural disasters. While extreme natural disasters cannot be prevented, their negative impact can be contained by making infrastructure more resilient and strengthening disaster preparedness more generally. Countries that invest in resilient infrastructure, install, and use early warning systems, and invest in climate and environmental protection are better prepared to deal with natural disasters. Therefore, it is important to secure grants and concessional financing for resilient infrastructure and adaptation plans. Strengthening public investment management will also help ensure more efficient use of limited resources, maximizing their impact. Accelerating the preparation of a National Adaptation Plan would also help by providing strategic direction.

References

- Aligishiev, Z., Ruane, C., and Sultanov, A., 2023, “User Manual for the DIGNAD Toolkit”, IMF Technical Notes and Manuals 2023/03, International Monetary Fund, Washington, DC.
- Buffie, E. E., Berg, A., Pattillo, C., Portillo, C. and Zanna, L., 2012, “Public Investment, Growth, and Debt sustainability: Putting Together the Pieces”, IMF WP 12/144.
- Marto, R., Papageorgiou, C., and Klyuev, V., 2018, “Building Resilience to Natural Disasters: An Application to Small Developing States”, *Journal of Development Economics* 135 (November): 574–86.
- São Tomé and Príncipe, 2022, [First Biennial Update Report \(BUR\)](#).
- São Tomé and Príncipe, 2021, [Nationally Determined Contributions \(NDC-STP\) Updated](#).
- World Bank, 2023, “[Voices of WACA in São Tomé and Príncipe \(English\)](#)”. Washington, D.C.: World Bank Group.
- World Bank, 2024, “Island Insights: Surging Seas and Increasing Rains—Analyzing Flood Risks in São Tomé and Príncipe, District by District.” Washington, DC: World Bank.