

TASK FORCE ON CLIMATE, DEVELOPMENT AND THE INTERNATIONAL FINANCIAL ARCHITECTURE

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NAVIGATING DEBT, DEVELOPMENT AND DISASTERS

MAKING DEBT SUSTAINABILITY ANALYSES WORK FOR BANGLADESH

FAHMIDA KHATUN, SYED YUSUF SAADAT, AFRIN MAHBUB AND ZAZEEBA WAZIHA SALEH

ABSTRACT

Bangladesh's external debt servicing record has historically been stellar as a least developed country. The country has comfortably met its external debt servicing obligations, largely thanks to its strong export performance. However, Bangladesh has taken on a large volume of foreign debt to finance multiple infrastructure mega-projects. The country has struggled with macroeconomic management in recent years, and several red flags are now clearly visible. Against this stressed financial background, climate change-related economic loss and damage might generate instability and undermine Bangladesh's debt sustainability.

This study aims to assess the impact of climate change on Bangladesh's debt sustainability by incorporating climate change risks and climate transition resource needs into the debt sustainability estimation. Using the latest loan-specific and natural disaster-specific data from Bangladesh and international sources, it undertakes debt sustainability analysis using the International Monetary Fund's Debt Sustainability Framework for Low-Income Countries and the Debt Stabilizing Primary Balance Approach. The results from multiple scenarios





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and stress tests indicate that the economic loss and damage due to climate change pose a significant threat to Bangladesh's short-run debt sustainability, particularly when combined with other shocks such as an increase in interest rates of variable interest rate loans or fall in exports due to international measures such as the European Union's Carbon Border Adjustment Mechanism.

These findings emphasize the need for better data on the economic impacts of climate change; incorporating loss and damage considerations into debt sustainability analyses; seeking support from the Loss and Damage Fund; negotiating for the transformation of climate loans into grants; reducing emissions to make exports resilient to carbon pricing policies; refraining from taking further variable interest rate loans and improving domestic resource mobilization.

INTRODUCTION

Bangladesh is currently at a crucial phase in its development journey. Completing the United Nations Least Developed Country (LDC) graduation process in 2026 would require Bangladesh to transform its development plans substantially. The growth trajectory of Bangladesh is characterized by a notable structural vulnerability, which manifests in the form of escalating economic and social disparities. In recent years, macroeconomic management in Bangladesh has faced mounting challenges due to several factors, including structural deficiencies, insufficient policy frameworks, ineffective policy execution, poor governance practices and the inability to enact vital reforms.

Many distressing indicators signal a complex macroeconomic challenge in Bangladesh's current economic landscape. These include dwindling revenue collection, an overreliance on borrowing from the central bank, a liquidity crisis within the banking system, foreign exchange scarcity, a depreciating exchange rate, governance issues affecting public expenditure, soaring prices, sluggish export earnings growth, depletion of foreign exchange reserves, disruptions in domestic production, subpar Annual Development Program (ADP) implementation, rising non-performing loans, diminishing remittance inflows, import constraints and energy shortages. These multi-faceted issues underscore the urgent need for comprehensive economic reforms and strategic interventions to stabilize the economy, thereby fostering sustainable growth and improved quality of life for the people of Bangladesh.

A considerable portion of Bangladesh's current macroeconomic difficulties can be traced back to the poor performance of the external sector and the uncertainties surrounding external balances. Addressing these issues at their source— the external sector and balances—is crucial to revive the economy. Unfortunately, the anticipated improvement from the current situation has not yet become apparent. The volatilities and uncertainties have remained persistent and enduring. The external sector's performance is influenced by various factors such as exchange rate stability, foreign exchange (forex) reserves, export performance, availability of forex for letter of credit (L/C) openings, remittance flows and other relevant indicators. These factors indicate that the alarming developments observed

in fiscal year (FY) 2023 continued to impact the external sector's performance in the early months of FY2024.

To support the Government of Bangladesh, in January 2023, the International Monetary Fund (IMF) granted a $4.7 billion loan, out of which $3.3 billion was provided under the Extended Fund Facility (EFF) and Extended Credit Facility (ECF) arrangement, and an additional $1.4 billion was provided under the Resilience and Sustainability Facility (RSF). Bangladesh is the first country in Asia to be granted support through the RSF. Bangladesh's 42-month-long IMF program aims to maintain economic stability, safeguard vulnerable groups, and foster inclusive and environment-friendly growth. Reforms are expected to be made to strengthen the financial sector and update the policy framework while building climate resilience.

Bangladesh Bank, the central bank of the country, has implemented several measures to enhance the balance of payments situation and address the decline in forex reserves. However, the measures have not yet produced the desired outcomes. Furthermore, there have been instances where the signals conveyed by policymakers have been quite contradictory. Although there have been some improvements in the country's trade and current account balances during the early months of FY2024, these gains can mainly be attributed to a significant decrease in imports. However, achieving this came with a price: Bangladesh Bank implemented measures to discourage imports of certain items, as there was a shortage of foreign currency to open L/Cs, and the price of the limited supply of dollars was high. It is important to consider that the decrease in imports may negatively affect investment, employment, production and gross domestic product (GDP) growth in the near future. This is already supported by the lower GDP forecasts for FY2024 from various concerned agencies such as the Asian Development Bank (ADB), the IMF and the World Bank. Several targets outlined in Bangladesh's IMF support program, including requirements for the disbursement of the second tranche, were not met. These factors encompassed the level of gross (BPM6) and net forex reserves, as well as the transition toward a market-oriented approach to exchange rate management. Efforts to prevent capital flight have been lacking, as there are indications of ongoing transactions through unofficial channels. In addition to the uncertainties, there has been growing concern about the reliability of data related to the external sector.

Although Bangladesh's external debt situation is currently considered sustainable by the IMF-World Bank standards, the country is expected to face a significant increase in debt servicing liabilities in the near and mid-term future. This is due to higher interest costs, a larger proportion of non-concessional loans in the borrowing portfolio and stricter terms on loans that have been taken recently. The increasing debt servicing liabilities will further strain the country's declining forex reserves. To address and reverse the significant decline in forex reserves, it is crucial to stabilize external balances and improve the performance of the external sector in line with historical trends. Managing the macroeconomy will continue to be challenging given the current circumstances, with the economy facing more uncertainties and risks.

Against this strained macroeconomic backdrop, the multifaceted effects of climate change continue to disproportionately affect marginalized groups, including women, who tend to



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bear a heavier burden than the rest of the population. Combatting climate change's challenges is even more demanding due to the concurrent need to address LDC graduation issues while managing limited resources. The funds provided under the RSF are anticipated to assist Bangladesh in meeting some of its climate financing needs while playing a catalytic role in getting more support from the private sector to facilitate further financing for climate action. Bangladesh is confronting substantial socioeconomic risks because of climate change and natural catastrophes, and the RSF will provide resources to address these weaknesses while supporting a green economic recovery and maintaining forex reserves. Additionally, reform measures will assist administrative changes by allowing substantial climate investments, reducing challenges and obstacles and enhancing the environment for investment to generate non-tax revenue sources for the government.

The RSF loan will be provided from FY2023 to FY2026 in six equal installments, conditional upon six periodic reviews to address 11 reform measures. These reform measures will assist in addressing Bangladesh's unique needs, such as strengthening the coastal economy's resilience, reducing the risk and impact of floods and tropical cyclones, bridging the infrastructure gap, building resilient facilities and assisting climate change mitigation policy. Implementing these changes will be aided by IMF capacity building, as well as capacity building from other development partners.

The body of published literature on debt sustainability remains inadequate when applied to Bangladesh's current context. Although the IMF and the World Bank have developed a debt sustainability framework (DSF) that evaluates the debt situation of IMF member states by assessing the sustainability of their total public debt and total external debt, not all types of this framework consider the state's vulnerability to climate change (IMF 2017).

According to the Global Climate Risk Index 2021, Bangladesh is ranked the seventh most vulnerable country to climate change (Eckstein, Künzel and Schäfer 2021). Research suggests that the debt-to-GDP ratio of Bangladesh may rise to 56 percent within a year following the shock of a collapse in ecosystem services, which includes the collapse of the production of forestry and fishery products, pollination and other environmental resources (Kraemer and Volz 2022). Thus, climate change is an essential indicator to assess the debt sustainability of Bangladesh. Although some studies integrate climate change factors into the DSF, they are not specifically tailored to the context of Bangladesh.

This research aims to fill this gap in the literature by investigating Bangladesh's debt sustainability by incorporating climate change risks and climate transition resource needs into the estimation of Bangladesh's debt sustainability.

OVERVIEW OF EXTERNAL DEBT OF BANGLADESH

Previous studies of debt sustainability analysis include the application of the debt-dynamics equation, which encompasses the effect of interest rate, exchange rate, budget deficit and economic growth on the debt-to-GDP ratio (Islam and Biswas 2005). Another widely applied method to assess a country's debt sustainability encompasses the idea behind the primary balance, which refers to the difference between government revenue and expenditure,

excluding the interest payments on debt (Bhattacharya and Ashraf 2018). This method is called the debt-stabilizing primary balance approach (DSPBA), which calculates the change between the debt-stabilizing primary budget balance and the actual primary budget balance to define the primary balance gap (Buiter, Persson and Minford 1985; Blanchard O. J., Chouraqui, Hagemann and Sartor 1991). A debt-stabilizing primary balance is calculated by considering a sustainable debt-to-GDP ratio while assuming the economic growth rate and real interest rates are constant (Wyplosz 2007). A positive primary gap would signify a rise in the debt-to-GDP ratio, implying an unsustainable debt, whereas a negative gap would signify otherwise.

Another research study explored the dynamics of Bangladesh's debt sustainability, particularly external financial flows, where the key findings suggested that Bangladesh's ability to service its increasing public debt hinges on the condition that economic growth surpasses the interest payable on loans (Bhattacharya and Ashraf 2018). As of the current assessment, the debt situation in Bangladesh aligns with the parameters set by the DSF developed by the IMF, signifying that the debt is currently sustainable. However, a noteworthy concern arises as the study points out that Bangladesh has been, and is expected to continue, allocating a larger portion of its revenue toward external debt repayment (Bhattacharya and Ashraf 2018). This trend raises concerns about a potential trade-off, as the increasing allocation to debt repayment may limit the funds available for investments in sectors crucial for economic growth (Bhattacharya and Ashraf 2018). The findings underscore the importance of carefully managing the balance between debt obligations and investments to ensure sustained economic growth and prevent the emergence of debt stress in Bangladesh (Bhattacharya and Ashraf 2018). Furthermore, it should also be noted that the stock of external debt increased significantly in the revised budget for FY2024, with foreign loans accounting for 32.3 percent of the budget deficit financing for Bangladesh (MoF 2024).

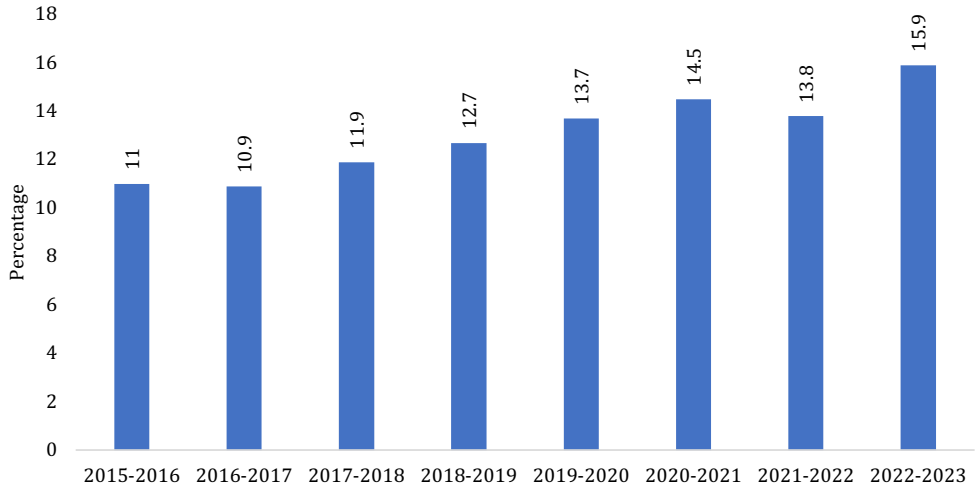
However, according to the IMF debt sustainability study, Bangladesh's debt management strategy has been considered a success, as evidenced by the low risks of external debt distress and total debt distress (Dey and Tareque 2020). The assessment conducted by the IMF indicates that Bangladesh has effectively managed its debt, with a notable absence of defaults on debt payments or requests for rescheduling. Despite these positive aspects, evidence points to a negative impact of external debt on GDP growth (Dey and Tareque 2020). Yet, it also reveals a greater positive effect of external debt on the macroeconomic policy index (Dey and Tareque 2020). This suggests that while external debt may adversely affect economic growth, implementing adequate macroeconomic and human capital policies can potentially mitigate these undesirable consequences (Dey and Tareque 2020). The findings underscore the importance of comprehensive policy frameworks in addressing the complex interplay between external debt and macroeconomic dynamics.

Considering the base year to be 2015-2016, the debt-to-GDP ratio of Bangladesh has been changing in an upward trend between FY2016 and FY2023 (Figure 1). In FY2023, the debt-to-GDP ratio reached its highest, as external debt accounted for 15.9 percent of GDP. This is concerning as it indicates that an increasing proportion of the GDP is being allocated to external debt.



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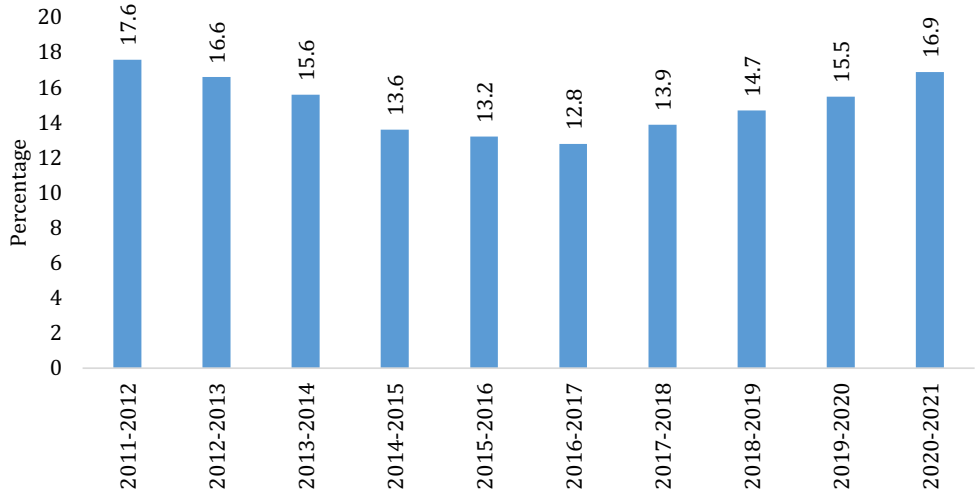
FIGURE 1 External Debt-GDP Ratio (Base Year 2015-2016)



Source: Compiled by authors based on data from Flow of External Resources into Bangladesh (Economic Relations Division 2023).

For consistency, Figure 2 depicts the external debt ratio holding the base year to be 2005-2006. Between FY2012 and FY2016, the debt-GDP ratio decreased from about 18 percent to 13 percent. However, since FY2017, the debt-GDP ratio has gradually increased, accounting for about 17 percent in FY2021. This indicates that external debt accounts for a greater share of GDP.

FIGURE 2 External Debt-to-GDP Ratio (Base Year 2005-2006)

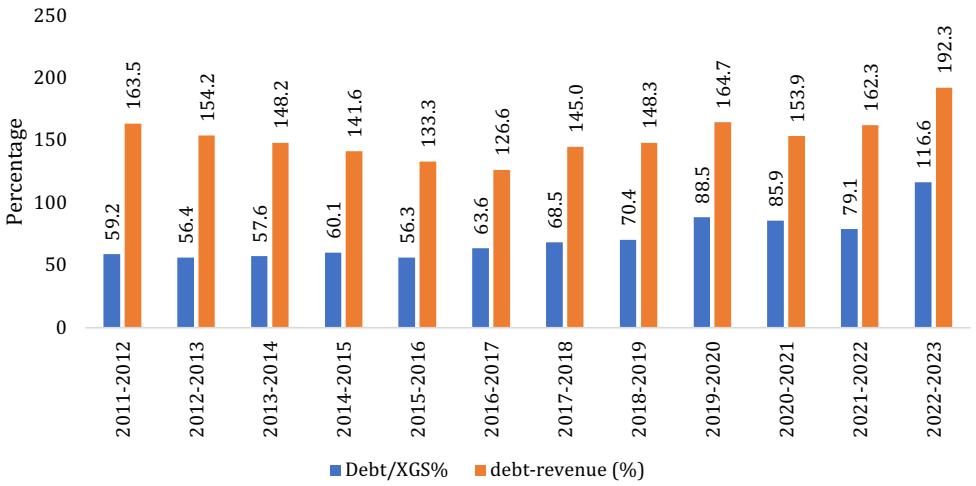


Source: Compiled by authors based on data from Flow of External Resources into Bangladesh (Economic Relations Division 2023).

Over the past 10 years, the ratio of external debt-to-exports has increased from 59 percent in FY2012 to nearly 117 percent in FY2023 (Figure 3). This indicates that the growth of exports has been lower than that of external loans, especially in recent years, which increases the risk of an overwhelming debt burden for the country. Increasing the ratio of external debt

to exports may be concerning, as Bangladesh may lack the resources to finance upcoming repayments. On the other hand, the ratio of external debt-to-revenue collection had initially decreased from 164 percent in FY2012 to about 127 percent in FY2017 before escalating again. In FY2023, the debt-to-revenue ratio peaked, accounting for about 192 percent. This indicates that even though the revenue generation was greater than the external debt accumulation in the initial years, recent developments show a declining trend in revenue generation as opposed to the stock of external debt. Hence, there is a genuine cause for concern.

FIGURE 3 External Debt-to-Exports and External Debt-to-Revenue Collection

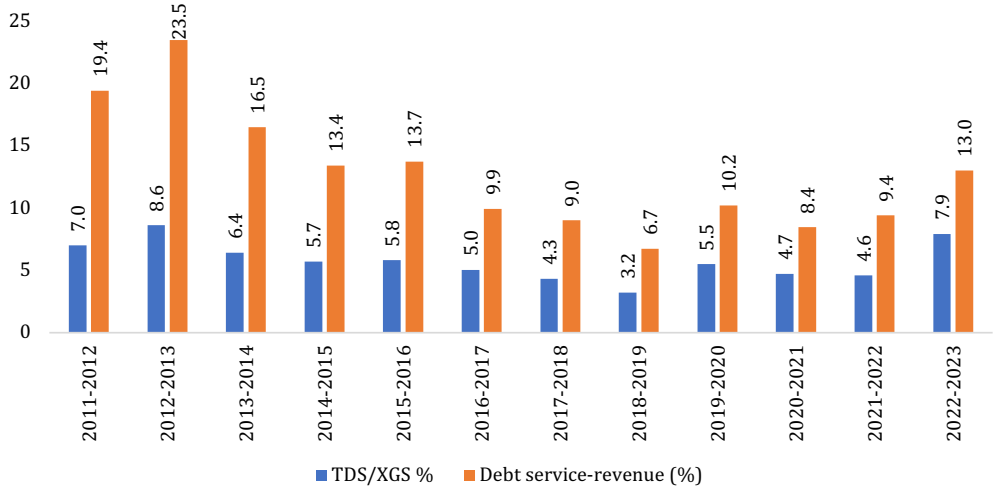


Source: Compiled by authors based on data from Flow of External Resources into Bangladesh (Economic Relations Division 2023).

Contrary to debt-to-exports and debt-to-revenue collection, external debt service-to-exports and external debt service-to-revenue collection provide a more optimistic perspective about Bangladesh's debt sustainability, at least until FY2022 (Figure 4). These ratios ensure liquidity of an economy, indicating its ability to service its debts in the short run. The total external debt service-to-exports ratio decreased from 7 percent in FY2012 to about 5 percent in FY2022 before peaking at around 8 percent in FY2023. On the other hand, the total debt service-to-revenue collection ratio significantly reduced from 19 percent in FY2012 to 9 percent in FY2022 before increasing to 13 percent in FY2023. Despite Bangladesh's liquidity ratios appearing favorable in previous years, the sudden increase in debt service-to-export and debt service-to-revenue in FY2023 indicates that repayments of external debt have surged substantially in comparison to the country's current receipts. Additionally, it should be mentioned that as of December 2023, the entire amount of external debt, including both public and private debt, was $100.64 billion (Bangladesh Bank 2023). This raises concerns since it demonstrates that Bangladesh's external debt is increasing at an exponential rate, raising the possibility that the debt may eventually become unmanageable.

In light of Bangladesh's transition to a middle-income country, there has been a significant rise in the interest rates on its foreign borrowings. There has also been a steady rise in the proportion of non-concessional loans in the portfolio. The conditions for borrowings are becoming more stringent, with reduced grace periods and maturity periods, along with

FIGURE 4 External Debt Service-to-Exports and External Debt Service-to-Revenue Collection



Source: Compiled by authors based on data from Flow of External Resources into Bangladesh (Economic Relations Division 2023).

extra fees and service charges. Furthermore, Bangladesh has acquired certain foreign loans with adjustable London Interbank Offered Rate (LIBOR) and Secured Overnight Financing Rate (SOFR) rates. Over the past few years, there has been a significant increase in LIBOR and SOFR rates. Hence, there are clear indications of a forthcoming rise in debt servicing liabilities in the near and medium term.

Moody's, a prominent credit rating agency, adjusted Bangladesh's rating from Ba3 to B1 on May 30, 2023 (Moody's 2023). The shift in rating reflects Moody's assessment that Bangladesh faces heightened external vulnerability and liquidity risks, and these challenges are anticipated to persist. The backdrop of institutional weaknesses raises concerns, with the agency expressing that the situation could deteriorate soon.

Similarly, Standard & Poor's (S&P) Global made a notable adjustment to Bangladesh's rating on July 30, 2024. S&P Global has downgraded Bangladesh's sovereign credit rating from BB- to B+ (S&P Global 2024). S&P's decision to downgrade is rooted in growing concerns regarding Bangladesh's external liquidity position, which is expected to worsen over the next year. Additionally, there are apprehensions about the sustained pressure on the country's forex reserves.

Fitch, another major credit rating agency, also changed Bangladesh's rating significantly on June 17, 2024 from BB- to B+ (Fitch Ratings 2024). Fitch attributes this decision to Bangladesh's diminishing reserves and tightening dollar liquidity. According to Fitch, these factors have increased the country's susceptibility to economic shocks.

In summary, all three credit rating agencies—Moody's, S&P and Fitch—have expressed concerns about Bangladesh's economic outlook, emphasizing factors such as external vulnerability, liquidity risks, deteriorating reserves and tightening dollar liquidity as critical

contributors to the downward adjustments in the country's credit ratings. These assessments collectively highlight Bangladesh's challenges in maintaining economic stability and resilience against potential shocks.

Bangladesh could encounter challenges in effectively managing its debt servicing in the upcoming years, particularly given the ongoing decline in forex reserves. The government must exercise caution and careful consideration when engaging in foreign borrowings. This can be accomplished by decreasing the dependence on loans with stringent conditions, prioritizing projects that heavily depend on foreign loans and ensuring efficient governance in implementing publicly funded projects. Improving negotiation skills is essential for effectively managing foreign borrowings. It is crucial to have a well-thought-out strategy for handling external borrowings and debt servicing to avoid future complications. Bangladesh must steer clear of getting trapped in a cycle of debt.

Bangladesh is not the first country to face challenges with its external debt. In the global economic landscape, debt crises have either caused or contributed to major economic downturns, reshaping the financial stability of economies. The concept of sovereign default has loomed over economies in Greece, Latin America, Asia and Europe. Such crises often arise from a confluence of factors, including political instability, excessive borrowing, inadequate fiscal measures and institutional weaknesses. The consequences of such crises not only affect the indebted economy but also expand to other countries. As a result, economies experience major economic downturns, ranging from contractions in economic growth, unemployment, unsustainable currency and social unrest. Analyzing countries that have experienced debt crises and examining their significant economic downturns can provide valuable insights into Bangladesh's current situation and the lessons that can be learned from these historical precedents (Box 1).

BOX 1 Comparative Analysis of Historical Macroeconomic Conditions Before and After a Debt Crisis and Their Similarities to Bangladesh

Country	Period	Conditions before the crisis	Conditions after the crisis	Comparison with Bangladesh
Venezuela	2010-present	Overdependence on oil export, pro-cyclical macroeconomic policies, macroeconomic mismanagement and hyperinflation (Weisbrot and Johnston 2012; Bull and Rosales 2020; Polga-Hecimovich 2019).	Unstable exchange rate, increase in external borrowings, hyperinflation and major economic downturns (Bull and Rosales 2020; Rosales 2016; Purcell and Martinez 2018).	Overdependence on readymade garments exports, increase in external borrowings, unstable exchange rate, high levels of inflation and inadequate macroeconomic policies.
Brazil	1980-1994	High inflation, balance of payments issues, high reliance on seigniorage revenues and large fiscal deficits (Ayres, Garcia, Guillen and Kehoe 2019).	High interest rates on external debt, loss in GDP, high inflation and constraints in public sector finance (Ayres, Garcia, Guillen and Kehoe 2019).	High inflation rate, balance of payment and fiscal deficits and high interest rate on some external debt.
Argentina	2002	Large government expenditures, persistent budget deficits, high levels of external debt, high interest rates and high pension reform costs (Braun 2006).	Debt defaults, hyperinflation, unstable exchange rates and monetary policies, currency devaluation and banking crises (Braun 2006).	Large government expenditures, persistent budget deficits, high levels of external debt, unstable exchange rate, currency devaluation and banking crises.



Country	Period	Conditions before the crisis	Conditions after the crisis	Comparison with Bangladesh
Mexico	1994-1995	High external debt, debt restructuring, political instability and currency devaluation (Cabral, del Castillo and Hernández-Trillo 2021; Trillo, Cayeros and González 2020).	Bailouts by the Central Bank of Mexico (Cabral, del Castillo and Hernández-Trillo 2021; Trillo, Cayeros and González 2020).	High external debt, political instability, currency devaluation and bailouts by Bangladesh Bank.
Greece	2009	Inadequate macroeconomic policies, fiscal deficit, increase in borrowing and high debt levels (Kouretas and Vlamis 2010; Makrydakis, Tzavalis and Balfoussias 1999).	Bailout programs, decreased confidence in financial institutions and higher interest rates on borrowings (Kouretas and Vlamis 2010; Makrydakis, Tzavalis and Balfoussias 1999).	Inadequate macroeconomic policies, fiscal deficit, increase in borrowing, high levels of debt and decreased confidence in financial institutions.
Thailand	1997-1998	Current account deficits, liberalization of financial institutions, real estate bubble, weak institutions and overvalued currency (Stiglitz 2002; Trillo, Cayeros and González 2020; Rasiah 1998; Rasiah 2000a; Rasiah 2000b).	Currency devaluation, GDP decline, unemployment and IMF intervention (Stiglitz 2002; Trillo, Cayeros and González 2020; Rasiah 1998; Rasiah 2000a; Rasiah 2000b).	Significant current account deficits, weak financial institutions, overvalued currency, currency devaluation, underemployment and IMF intervention.
South Korea	1997	Inadequately managed financial liberalization, poorly coordinated investments, high levels of corruption, mismanagement of the exchange rate and high volume of non-performing loans (Chang 1998).	Collapse in stock and bond markets, fall in exports and GDP, weakening financial institutions, IMF bailout, series of bankruptcies and unemployment (Chang 1998).	Mismanagement of exchange rate, periodic collapse of the stock market, weak financial institutions, unemployment, large volume of non-performing loans and high levels of corruption.
Indonesia	1997	Weak financial institutions, a large volume of external debt, a widening current account deficit, exchange rate mismanagement, political uncertainty and low confidence in governance (Nasution 1998).	Depreciating currency, decline in the stock price index, high interest rates on loans, high capital outflow, import restrictions, liquidity crunch, high unemployment and fall in GDP (Nasution 1998; Stiglitz 2002).	Weak financial institutions, large volume of external debt, widening current account deficit, exchange rate mismanagement, political uncertainty and low confidence in governance.
Malaysia	1997	Rising GDP growth rate, low inflation and unemployment, slight current account deficit and inadequate financing of capital-intensive projects (Hasan 2002).	Outflow of foreign investments impacts the exchange rate, high interest rate, fall in GDP, interruption in development projects and loss of migrating workers (Hasan 2002).	Compared to Bangladesh, Malaysia has a progressive economy with better macroeconomic performance, yet the economy still struggled during the Asian Financial Crisis. Bangladesh is at a much greater risk, given its high level of inflation and unemployment and widening current account deficit.
Philippines	1997	Financial market liberalization, shift in investments from productive manufacturing sector to stock market speculations , poor growth in GDP, high poverty rates, high-income inequality and weak institutions (Bello 1999; Yap, Reyes and Cuenca 2009).	Currency depreciation, deteriorating stock market, capital outflow, high interest rates, high import bills, high cost of servicing foreign debts, slow economic activity and series of bankruptcies (Bello 1999).	Weak institutions with high levels of income inequality and poverty.

Source: Compiled by authors.

Although the IMF asserts that Bangladesh faces limited vulnerability to debt distress, this assessment may be overly optimistic. Historical evidence shows that other countries with similar macroeconomic conditions to those of Bangladesh eventually succumbed to debt crises. Even Malaysia, which performed better than Bangladesh according to macroeconomic indicators, experienced a financial crisis. The IMF has historically struggled to predict a country's debt-carrying capacity accurately, and its policy interventions have often exacerbated macroeconomic instability in developing countries. Additionally, the IMF's tendency to apply a uniform approach to all economies is problematic, as the factors leading to debt distress vary across countries and require tailored solutions. This situation underscores the need for the IMF to reconsider and adapt its strategies for debt sustainability analysis.

CLIMATE FINANCE IN BANGLADESH

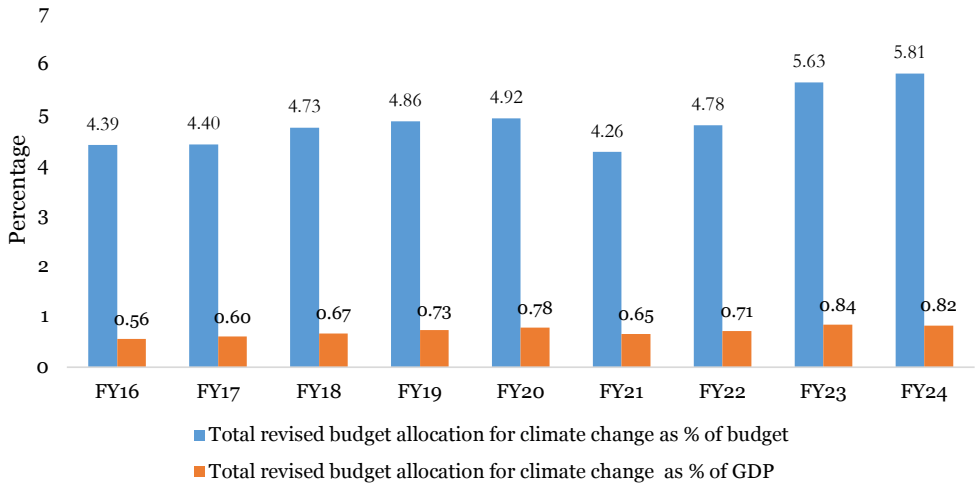
Climate budgeting in Bangladesh represents a significant stride in tackling the complex issues posed by climate change. Despite the increased funding for climate-related initiatives, the country's budget utilization is a cause for concern. Although there has been progress made by Bangladesh in developing a climate budget to tackle the issues caused by climate change, monitoring continues to be of primary importance. The success of climate finance allocation and the outcomes of climate-related projects depend on solid monitoring and evaluation systems. Tackling this challenge is crucial to ensure optimal funds utilization and monitor the country's progress towards its climate resilience and mitigation objectives.

In FY2016, the total revised budget allocation for climate change accounted for 4.39 percent of the total budget and 0.56 percent of the GDP (Figure 5). This implies that a significant portion of the government's budget was dedicated to addressing climate change concerns, representing a tangible commitment to environmental sustainability. The subsequent fiscal years show fluctuations in the percentages. FY2017 witnessed a slight increase in both categories, with the total revised budget allocation for climate change reaching 4.40 percent of the total budget and 0.60 percent of the GDP (MoF 2024). This upward trend continued in FY2018, where the percentages rose to 4.73 percent and 0.67 percent for the total budget and GDP, respectively (MoF 2024).

FY2019 demonstrated a further increase, with 4.86 percent of the total budget and 0.73 percent of the GDP allocated to climate change initiatives (MoF 2024). FY2020 continued this trend, reaching 4.92 percent of the total budget and 0.78 percent of the GDP (MoF 2024). These figures suggest a sustained effort to allocate significant resources to address climate change concerns. However, there is a dip in FY2021, with the percentages dropping to 4.26 percent of the total budget and 0.65 percent of the GDP (MoF 2024). This decrease could be attributed to shifting priorities or economic considerations, particularly during the COVID-19 pandemic. FY2022 saw a rebound, with percentages rising to 4.78 percent and 0.71 percent for the total budget and GDP, respectively (MoF 2024).

The trend peaked in FY2024, where the total revised budget allocation for climate change constituted 5.81 percent of the total budget and 0.82 percent of the GDP, a slight decrease since FY2023 (MoF 2024). This fiscal year reflects a heightened commitment to climate change initiatives.

FIGURE 5 Total Revised Budget Allocation for Climate Change as a Share of Total Budget and GDP



Source: Compiled by authors based on data from the Ministry of Finance (MoF 2024).

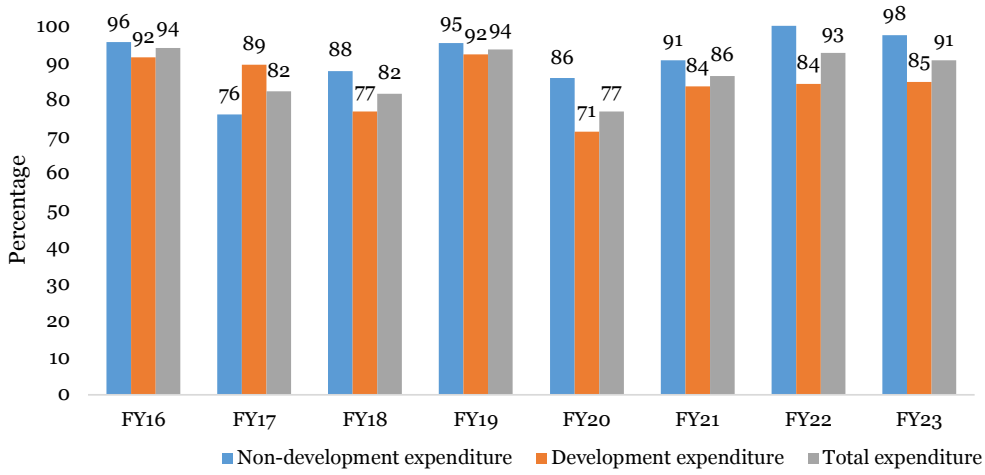
In FY2016, the actual expenditure for non-development expenditure reached 96 percent of the revised budget allocation, indicating a high utilization level in this category (Figure 6). Similarly, development expenditure and total expenditure were at 92 percent and 94 percent, respectively, demonstrating efficient utilization of the allocated resources for climate change initiatives during that fiscal year (MoF 2024). Moving to FY2017, there was a notable decrease in the utilization percentages across all categories. The actual expenditure for non-development, development and total expenditure stood at 76 percent, 89 percent and 82 percent, respectively (MoF 2024). This suggests that while the development expenditure was utilized effectively, there was underutilization in non-development expenditure, leading to a lower overall utilization rate.

FY2018 exhibited a mixed scenario, with non-development expenditure being utilized at 88 percent, development expenditure at 77 percent and total expenditure at 82 percent (MoF 2024). This indicates a varied efficiency level in using the allocated budget, with non-development expenditure being relatively better utilized than development expenditure. In FY2019, the utilization percentages for all categories increased, with non-development expenditure, development expenditure and total expenditure reaching 95 percent, 92 percent and 94 percent, respectively. This implies a more effective utilization of the climate change budget in that fiscal year (MoF 2024). FY2020 witnessed a decline in the utilization percentages across the board. Non-development expenditure, development expenditure and total expenditure were utilized at 86 percent, 71 percent and 77 percent, respectively (MoF 2024). This decline suggests potential challenges or changes in implementing climate change initiatives during a fiscal year struck by the COVID-19 pandemic.

In FY2021, there was an improvement in the utilization percentages. Non-development expenditure, development expenditure and total expenditure were utilized at 91 percent, 84 percent and 86 percent, respectively (MoF 2024). This suggests a more efficient allocation and utilization of resources for climate change initiatives. FY2022 presented a notable

increase in the utilization percentages, particularly in non-development expenditure, which reached 105 percent (MoF 2024). This indicates overspending, since actual non-development expenditure was higher than the revised budget allocation. Development expenditure and total expenditure were utilized at 84 percent and 93 percent, respectively (MoF 2024).

FIGURE 6 Climate Change Budget Utilization (Actual Expenditure as a Share of Revised Budget Allocation)



Source: Compiled by authors based on data from the Ministry of Finance (MoF 2024).

To effectively tackle the country's urgent climate change challenges, it is essential to improve the utilization of the development climate budget in Bangladesh. The improvement necessitates a comprehensive strategy encompassing project planning, skill development, efficient procedures, openness, community involvement, participation from the private sector, collaboration on a global scale and a well-rounded emphasis on adapting to and mitigating challenges. By implementing these strategies, Bangladesh can effectively tackle its climate vulnerabilities and develop resilience for a sustainable future.

Mobilizing funds to tackle the adverse impacts of climate change is one of the foremost development challenges for Bangladesh. Given Bangladesh's high vulnerability to climate change, the expenses associated with addressing its causes and adapting to its impacts will be substantial. Implementing Sustainable Development Goal (SDG) 13 (Climate Action) in Bangladesh will necessitate a significant investment of $121.53 billion at constant 2015-2016 prices (GED 2017b). This represents an enormous burden for Bangladesh, given that most climate finance sources provide funds for mitigation (Heinrich Böll Stiftung 2019), whereas Bangladesh requires funds for adaptation.

Capacity development plays a vital role in effectively designing projects to address the challenges of climate change in Bangladesh and mobilizing the necessary resources. Bangladesh's proactive pursuit of climate finance is highly commendable. However, to tackle climate change effectively and make the most of the resources, the country must focus on developing viable projects with expert guidance, allocating resources for capacity building and accelerating the mobilization of funds for its climate change trust fund. This collaborative

endeavour will strengthen Bangladesh's ability to withstand the impacts of climate change and establish it as a frontrunner in climate action among the Climate Vulnerable Forum (CVF) community.

LOSS AND DAMAGE DUE TO CLIMATE CHANGE

Bangladesh suffers from substantial loss and damage due to climate change. Table 1 provides a comprehensive overview of the total economic loss and damage due to climate change-induced natural disasters in Bangladesh, categorized by the type of disaster for 2009-2014 and 2015-2020. Examining the data, it is evident that there has been a substantial increase in total economic losses from BDT 184.2 billion in 2009-2014 (BBS 2016) to BDT 1792.0 billion in 2015-2020 (BBS 2022). This significant surge indicates a heightened impact of climate change-induced natural disasters on Bangladesh's economic landscape during the latter period.

TABLE 1 Total Economic Loss and Damage Due to Climate Change-Induced Natural Disasters by Type of Disaster, BDT million, 2009-2014 and 2015-2020

	2009-2014	2015-2020
Drought	10,569	27,344
Flood	42,807	1,010,882
Water Logging	16,062	93,860
Cyclone	28,385	255,382
Tornado	4,299	15,226
Storm and tidal surge	12,676	15,475
Thunderstorm	10,940	29,195
River and coastal erosion	36,409	268,703
Landslides	249	6,082
Salinity	6,073	20,756
Hailstorm	11,472	48,945
Other natural disasters*		136
All disasters	**184,247**	**1,791,988**

Source: Compiled by authors based on data from the Bangladesh Bureau of Statistics (BBS 2016; BBS 2022).
Note: Other natural disasters were not categorized in 2009-2014, so no data was available for 2009-2014.

Floods emerge as the most economically damaging disaster, with losses escalating from BDT 42.8 billion in 2009-2014 (BBS 2016) to a staggering BDT 1010.9 billion in 2015-2020 (BBS 2022). This highlights Bangladesh's vulnerability to flooding, which has severe repercussions on infrastructure, agriculture and overall economic productivity. Cyclones and river and coastal erosion also contribute substantially to economic losses. Cyclones, for instance, resulted in economic losses of BDT 28.4 billion in 2009-2014 (BBS 2016), which increased to BDT 255.4 billion in 2015-2020 (BBS 2022). Similarly, river and coastal erosion-induced

economic losses rose from BDT 36.4 billion (BBS 2016) to BDT 268.7 billion (BBS 2022) during the same period. These figures elucidate the multifaceted challenges posed by climate change, including extreme weather events and environmental degradation.

The impact of other natural disasters, although comparatively smaller in terms of economic losses, should not be overlooked. Hailstorms, water logging and salinity, among others, contribute to the overall economic burden. For instance, hailstorm-induced losses increased from BDT 11.5 billion (BBS 2016) to BDT 48.9 billion (BBS 2022) between the two periods. Examining the broader category of "All disasters," the table reveals a comprehensive picture of the cumulative economic losses. While the absolute figures are enormous, it is crucial to consider the broader implications of these losses, including their impact on livelihoods, poverty levels and overall economic stability.

These numbers manifest the severity of economic losses due to climate change-induced natural disasters in Bangladesh. The substantial increase in total economic losses over the two periods indicates the urgent need for comprehensive and resilient strategies to mitigate and adapt to the impacts of climate change, particularly in vulnerable regions like Bangladesh.

Table 2 provides a detailed breakdown of the loss and damage resulting from climate change-induced natural disasters in Bangladesh for 2009-2014 and 2015-2020.

TABLE 2 Loss and Damage Due to Climate Change-Induced Natural Disasters by Sector and Disaster Type, BDT billion, 2009-2014 and 2015-2020

	All sectors		Crops		Livestock		Poultry		Fishery		Land		Houses		Homestead & Forestry	
	2009–2014	2015–2020	2009–2014	2015–2020	2009–2014	2015–2020	2009–2014	2015–2020	2009–2014	2015–2020	2009–2014	2015–2020	2009–2014	2015–2020	2009–2014	2015–2020
All natural disasters	184	1,792	67	518	9	71	2	27	11	66	49	942	32	132	15	35
Drought	11	27	9	12	0	1	0	1	0	0	1	13	-	0	0	0
Flood	43	1,011	22	242	2	43	1	13	2	41	9	632	5	33	2	6
Water logging	16	94	9	27	1	2	0	2	2	6	2	54	2	2	1	1
Cyclone	28	255	4	154	3	13	1	5	2	12	-	-	11	52	7	19
Tornado	4	15	1	4	0	0	0	1	-	0	-	-	2	8	1	2
Storm and tidal surge	13	15	2	3	1	1	0	1	3	2	3	8	2	1	1	0
Thunder-storm	11	29	2	9	0	2	0	1	-	0	-	-	6	13	2	4
River and coastal erosion	36	269	1	27	1	7	0	3	0	2	32	220	2	8	0	2
Landslides	0	6	0	0	0	0	0	0	-	0	0	5	0	0	0	0
Salinity	6	21	2	6	0	1	0	1	-	2	3	11	0	0	1	0
Hailstorm	11	49	10	34	0	1	0	0	-	0	-	-	1	13	0	0
Other natural disasters	4	0	4	0	0	0	0	0	0	0	-	-	-	0	-	0

Source: Compiled by authors based on data from the Bangladesh Bureau of Statistics (BBS 2016; BBS 2022).

Note: All values are rounded to whole numbers and expressed in billion BDT.

The impact of flood is widespread, affecting crops, livestock, poultry, fisheries, land, houses and homestead sectors. Crop losses due to floods alone reached BDT 241.84 billion in 2015-2020 (BBS 2022), emphasizing the vulnerability of agriculture to flooding. Cyclones also play a substantial role in damaging crops, amounting to BDT 154 billion in 2015-2020 (BBS 2022), underlining the destructive force of these weather events.

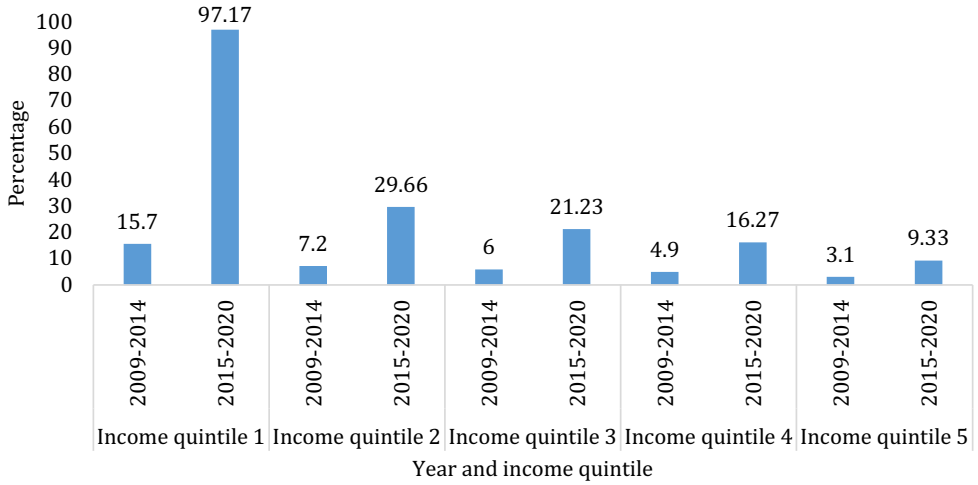
River and coastal erosion primarily affect land. Land losses due to erosion amounted to BDT 219.74 billion in 2015-2020 (BBS 2022), indicating the severe impact on Bangladesh's geographical landscape. Other disasters, including drought, tornadoes, waterlogging, landslides, salinity, hailstorms and miscellaneous events, also contributed to economic losses. Each type of disaster affected specific sectors, ranging from agriculture to housing and forestry. For instance, losses in the crop sector amounted to BDT 517.96 billion in 2015-2020 (BBS 2022), while the livestock sector experienced losses of BDT 71.37 billion in 2015-2020 (BBS 2022). The impact on houses was substantial, with losses reaching BDT 132.32 billion in 2015-2020 (BBS 2022).

Such loss and damage emphazises the diverse and severe impacts of climate change-induced natural disasters in Bangladesh. The escalating economic losses across various sectors over the specified periods underscore the urgent need for robust climate adaptation and mitigation strategies to address the increasing challenges posed by these events.

Figure 7 provides a detailed breakdown of data related to average annual household income, total economic loss to households due to climate change and the economic loss as a proportion of household income across different income quintiles from 2009-2014 and 2015-2020.

The figure shows variations across income quintiles and periods depending on the average annual household income. In the lowest income quintile (quintile 1), the average annual household income decreased from BDT 34,957 in 2009-2014 (BBS 2016) to BDT 31,001 in 2015-2020 (BBS 2022). Conversely, in the highest income quintile (quintile 5), there was

FIGURE 7 Economic Loss Due to Climate Change as a Proportion of Household Income



Source: Compiled by authors based on data from the Bangladesh Bureau of Statistics (BBS 2016; BBS 2022).

substantial growth from BDT 357,897 to BDT 722,903 during the same period (BBS 2016) (BBS 2022). Similar patterns of changes are observed in other income quintiles, reflecting shifts in income distribution over time.

Shifting the focus to total economic loss due to climate change, the data presents a stark contrast between income quintiles and periods. In quintile 1, the economic loss increased from BDT 5,471 in 2009-2014 (BBS 2016) to BDT 30,125 in 2015-2020 (BBS 2022). In quintile 5, the economic loss also rose significantly from BDT 11,121 (BBS 2016) to BDT 67,459 (BBS 2022) during the same period. The disparities in economic losses highlight the unequal impacts of climate change on different income groups.

Analyzing economic loss as a proportion of household income further emphasizes these disparities. In quintile 1, the poorest quintile, the proportion increased dramatically from 15.7 percent in 2009-2014 (BBS 2016) to 97.17 percent in 2015-2020 (BBS 2022). Similarly, in quintile 5, the richest quantile, the proportion increased from 3.1 percent to 9.33 percent (BBS 2022). These percentages illustrate that the economic losses due to climate change have a much more significant impact on the lower-income quintiles, where the proportion of losses relative to household income is substantially higher.

These findings underscore the critical importance of considering socioeconomic disparities when assessing the impacts of climate change. Lower-income households bear a disproportionate burden of economic losses, as evidenced by the higher percentages of economic losses relative to their annual incomes. Policymakers and researchers must consider these disparities to develop targeted and equitable climate change mitigation and adaptation strategies.

DEBT SUSTAINABILITY FRAMEWORK FOR LOW-INCOME COUNTRIES

The DSF for Low-Income Countries (LIC DSF) is a concerted initiative between the World Bank and the IMF. This differs from the framework used to assess market access countries (MAC), a tool developed by IMF staff to evaluate the debt burden of advanced or emerging economies. The LIC DSF is produced for economies that are eligible to receive funds from the Poverty Reduction and Growth Trust (PRGT) and have access to grants and resources provided by the International Development Association (IDA). The LIC DSF assesses debt distress, defined as the countries with significant outstanding debt requiring Paris Club debt refinancing or non-concessional loans from the IMF (Kraay and Nehru 2006). The framework also evaluates the debt-carrying capacity of low-income countries by assessing the country's forecasted debt burden under both baseline and shock scenarios, where the debt burden indicators are subjected to particular stress tests. A country's debt-carrying capacity is the highest amount of debt it can accumulate before its income and growth can no longer increase (Ebi and Imoke 2017). In other words, the debt-carrying capacity indicates the limit beyond which additional borrowing may result in a lack of finance to repay the loans. In addition, the debt burden is essentially the cost of funding debt obligations accrued by the country (IMF 2017).



LICs primarily rely on concessional loans and external borrowing from the public sector to finance investments. Therefore, the objective of this LIC DSF is to facilitate the LICs making informed decisions regarding their financing needs while accounting for calculated judgements about potential financing strategies and associated risks. This framework produces a historical dataset spanning over 10 years with a projection period of 21 years.

The LIC DSF assesses the risk of debt sustainability using five debt burden indicators. Since concessional loans have a lower interest rate than non-concessional loans, the DSF uses the present value (PV) of debt to assess the debt risk. The PV of debt is equivalent to adding all future debt service payments, discounted to the PV using a default discount rate of 5 percent. The discount rate is set using an average of the Commercial Interest Reference Rate (CIRR) in USD, spanning more than 10 years, in addition to an extra margin which accounts for the additional cost of loans with a greater maturity period as opposed to those used to calculate the CIRR from bond yields (IMF 2017). The CIRR in USD is the standardized lending rate established by the Organisation for Economic Co-operation and Development (OECD), based on US Treasury bond rates, and is subjected to monthly adjustment (OECD 2023a; OECD 2023b). If the discount rate and the interest rate of a concessional loan are equal, then the PV is equal to the face value. As such, the debt burden indicators include PV of Public and Publicly Guaranteed (PPG) external debt to GDP, PV of PPG external debt to exports, PPG external debt service to exports and PPG external debt service to revenue. The LIC DSF calculates a threshold for each debt burden indicator, a breach of which indicates a distress risk. These thresholds are contingent upon a country's capabilities to handle debt and are determined by the composite indicators (CI) formulated by the LIC DSF (IMF 2017).

Required Data

The framework requires a stocktaking of various macroeconomic variables, including a comprehensive compilation of PPG external debt. Afterwards, macroeconomic and financing projections for at least 20 years need to be produced, in addition to historical data spanning 10 years, for both external and domestic debt. Therefore, the macroeconomic framework, comprising key macroeconomic variables, is considered the "baseline scenario," which represents the most plausible scenario in the context of the current information available and should have a relatively balanced distribution of risk. Furthermore, the DSF also contains data on the existing debt and intended new borrowing, which needs to be done in tandem with public and external gross financing constraints as specified in the macroeconomic framework. As such, sources of external financing should include (i) multilateral, (ii) official bilateral classified into Paris Club members and Non-Paris Club members and (iii) commercial. On the other hand, sources of domestic financing are classified into advances made by the central bank, including short-term term, which is less than one year; medium and long-term (MLT), which is one to three years along with MLT of four to seven years; and long-term, which includes more than seven years.

However, it is important to underscore that the debt owed by the central bank and state-owned enterprises (SOEs) should be met with specific considerations. Central bank debt only includes any external debt incurred on behalf of the government, such as loans taken

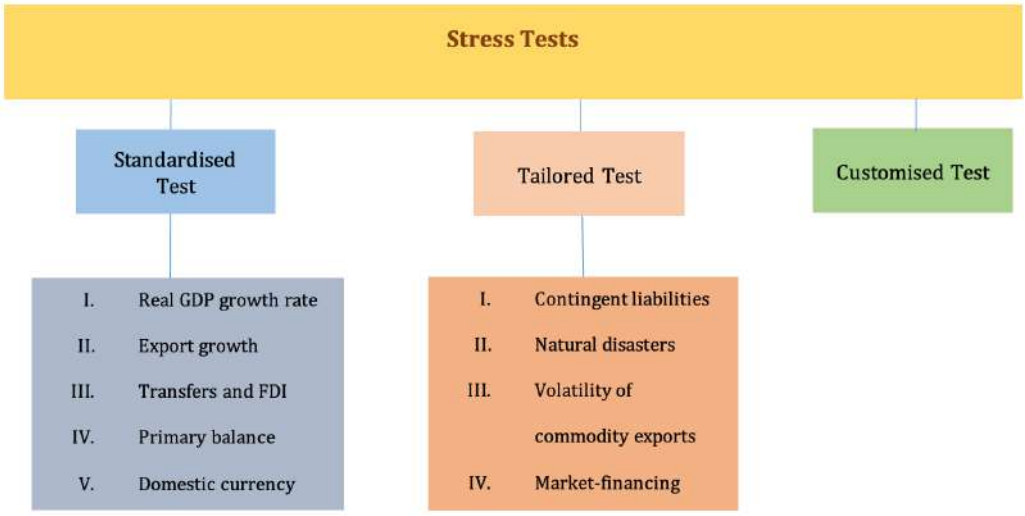
from the IMF. Therefore, any issuance of central bank debt or trade in foreign currency to manage reserves or monetary policy must be discounted. Additionally, the DSF requires compiling all debt accrued by all non-financial public enterprises, except enterprises that present controlled fiscal risks. This includes public enterprises that can borrow without government assurance, do not engage in non-budgetary activities, and have a history of generating substantial profits.

The analysis is performed on the premise of gross debt, as it helps measure the weight of servicing debt payments the government is burdened with. In the DSF, the stocktaking of public debt should be based on actual and expected debt outstanding and disbursed rather than commitments. Additionally, the DSF is meant to include external debt as per the residency of the creditor, including domestic debt denominated in local currency owed to non-residents. However, due to challenges of record maintenance and instances of insignificant participation of non-residents in the domestic debt market, a proxy for external debt, which is debt denominated in foreign currency, is used.

Stress Tests

Stress tests are shocks and assumptions introduced in the baseline scenario to comprehensively analyze a country's vulnerabilities to debt distress (Figure 8). For instance, considering the baseline scenario alone may not imply a violation of the debt burden threshold throughout the projection period. However, introducing a stress test scenario can demonstrate a varied outcome. The LIC DSF assesses the baseline scenario under three stress types: a standardized test, a tailored test and a customized test. Standardized tests apply to all countries. However, the tailored ones only apply to some countries exposed to particular risk factors like natural disasters, except for contingent liability tests. In contrast, customized tests only apply to specific countries to encapsulate unconventional risks such as civil war.

FIGURE 8 Stress Test Tools



Source: Compiled by authors based on the Guidance Note published by the IMF (IMF 2017).



There are six standardized stress tests which are automatically applied and include (i) real GDP growth rate, (ii) export growth, (iii) transfers and foreign direct investment (FDI), (iv) primary balance, (v) domestic currency depreciation and (vi) a combination of (i) through (v). The standardized stress test applies to external and public debt burden indicators. To use the stress test, the macro variable in question is first subjected to shock; afterwards, the post-shock values are then set to the baseline projection minus one standard deviation for the second and third year of projection. However, suppose the baseline projection is greater than the historical average. In that case, the post-shock values are then set to the historical average minus one standard deviation for the second and third years of projection. This process is repeated for all the variables under the standardized stress test tool except those involving domestic currency depreciation and a combination of the other stress tests. Each of the shocks pivots to some associations within the main macro variables, which are modeled based on postulations concerning their cross elasticities, improving the reasonable underpinnings of the scenarios. These interactions are summarized in Table 3.

TABLE 3 Temporary Shocks Under the Standardized Stress Tests

Variables	Shock interactions
Real GDP growth	• Decrease in inflation, derived from GDP deflator, with a 0.6* elasticity to real GDP growth.
Primary balance	• For LICs with domestic market borrowing, the shock will introduce an increase in domestic borrowing cost by 25 basis points (bps) per 1 percent of GDP. • External commercial borrowing cost will increase by 100bps or 400bps per 1 percent of GDP deterioration of the primary balance, whichever is lower for market access countries.*
Export growth	• Decrease in real GDP growth with a 0.8 elasticity.*
Domestic currency depreciation	• Either a one-time nominal domestic currency depreciation by 30 percent in the second projection year or the percentage required to narrow down the assessed overvaluation gap of the real exchange rate. • A rise in real net export as a percentage of GDP with 0.15 elasticity to real depreciation (IMF 2015).** • Changes in inflation with a 0.3 elasticity in the year when the shock is introduced.*
Combination	• Incorporates the interactions within the specific shock scenarios.

Source: Compiled by authors based on information from the IMF (IMF 2017).

Notes: *Based on IMF staff calculation. **A 10 percent depreciation in the real exchange rate indicates a 1.5 percent improvement in real net exports to GDP in the year following the shock among 60 developing and developed countries.

On the other hand, tailored tests involve (i) contingent liabilities, (ii) natural disasters, (iii) volatility of commodity exports and (iv) market-financing shocks. The contingent liability stress test entails a one-time increase in the debt-to-GDP ratio in the second projection year and concerns all countries. The shock is divided into two elements: a minimum of 5 percent of GDP as a starting value, reflecting the government's cost in cases of a financial crisis in an LIC since 1980 (Laeven and Valencia 2013), and a tailored value which represents any other possible shocks for the sections of the public sector that have not been accounted for



in the classification of public debt used in the DSF. It is important to note that the stress test should not include government liabilities already covered in the baseline projection. The DSF template provides a default setting for the tailored portion of the shock, which entails the 5 percent of GDP shock for the financial market, along with a default shock of zero percent of GDP to encompass the other portions of the general government, a shock of 2 percent of GDP for SOE debt and a default shock for public-private partnership (PPP) which is set at 35 percent of an economy's PPP capital stock and is triggered when the PPP stock is more than 3 percent of GDP. However, it is assumed that these default settings should be subject to change depending on the country's macroeconomic status.

The other tailored tests, however, are only applicable to the associated country-specific circumstances. For instance, the natural disaster shock is applied to small, vulnerable states with at least two natural disasters occurring every three years and a loss greater than 5 percent of GDP (IMF 2016). In such cases, the stress test will introduce a one-time shock of 10 percent of debt-to-GDP ratio in the second projection period, and this percentage will be derived using the Emergency Events (EM-DAT) database. According to the analysis made by the IMF, such a shock will reduce the real GDP growth and exports by 1.5 and 3.5 percent, respectively, in the year when the shock is introduced. The size of the shock is derived by assessing the average growth in the year of the natural disaster and the average growth of exports and real GDP 10 years before the event across an identical sample (IMF 2017).

Commodity price shock is only introduced for LICs, with commodity exports constituting at least 50 percent of their total exports spanning the preceding three years. A commodity price gap is expected to lead to a shock in commodity exports in the second projection year, and this gap is anticipated to narrow down over six years. The commodity price gap is the difference between the commodity price in the baseline projection in the second year and the lower tail of the 68 percent confidence interval. This is derived from the IMF's distribution of projected commodity prices for fuel and non-fuel commodities. It is assumed that a reduction in commodity prices by 10 percent should lead to a decrease of 0.5 percent in real GDP and 0.75 percent in fiscal revenues-to-GDP for every three years, followed by the second projection year. This deviation eventually aligns with the baseline over six years. The duration and the magnitude were derived from a thorough analysis of instances of a significant reduction in commodity prices among a sample selection of thirty-four LICs between 1990 and 2015 that are substantially dependent on commodities (IMF 2017).

Furthermore, market financing shock is only appropriate for LICs holding accrued Eurobonds or satisfying the conditions required to graduate to a MAC. The shock will introduce a consistent increase in the cost of new external borrowing by 400 bps, followed by the second projection year spanning over three years. Additionally, there is a decrease in new commercial external loans, with either a maturity of five years or two-thirds of the anticipated maturities, whichever is lower, and a one-time depreciation of 15 percent in the forex during the second year (IMF 2017). Lastly, customized tests include scenarios where the country may be experiencing political unrest or any other social unrest, including an epidemic or a public health crisis. For such cases, the shocks introduced are similar to those of the assumptions mentioned in the natural disaster stress tool.

Debt-Carrying Capacity

To assess the mechanical signal of the risk of debt distress, each forecasted debt burden indicator is contrasted against a threshold under both the baseline and stress test scenario. If the debt burden indicator is observed to be higher than the associated threshold, it signals a risk of debt distress. In general, the risk of debt distress has been analyzed based on a country's debt-to-GDP ratio. It is assumed that a country with a higher debt-to-GDP ratio has a higher risk of debt distress than other countries with a lower debt-to-GDP ratio. Yet, countries with a high debt-to-GDP ratio have often avoided debt distress, while countries with a moderate debt-to-GDP ratio have fallen into a debt crisis. Therefore, as part of the debt sustainability analysis, the DSF estimated the thresholds of the debt burden indicators according to the debt-carrying capacity of LICs. Countries with differentiated institutions, policies and macroeconomic structures have different abilities to absorb shocks and manage debt without incurring a crisis. In the LIC DSF, institutional strength is assessed by the World Bank's Country Policy and Institutional Assessment (CPIA) Rating. In addition, three other contributing indicators of debt-carrying capacity are considered: global economic growth or world GDP growth, the country's GDP growth and remittances and the stock of international reserves. These variables are then utilized to calculate the country's composite indicator (CI), which determines the country's ability to service debt repayments. The CI encompasses 10 years of data divided into five years of historical data and five years of projections. In addition, the recent value of the CPIA rating is considered for all the projections since there is no available forecasted data. After defining the average values of the economic indicators spanning over 10 years, IMF staff assigns specific weights to each indicator. These weights are derived using the mean estimated coefficients from a probit model for each indicator assigned to measure the debt burden (IMF 2017). The framework then compares the country's CI score to other LICs. The debt-carrying capacity is classified into three categories, summarized in Table 4.

TABLE 4 Country Classification of Debt-Carrying Capacity as per CI Score

CI score	Classification
CI < 2.69	Weak
2.69 ≤ CI ≤ 3.05	Medium
CI > 3.05	Strong

Source: Compiled by authors based on information from the IMF (IMF 2017).

A country's debt-carrying capacity ascertains the thresholds for each of the three debt burden indicators summarized in Table 5. A stronger CI score implies a higher threshold for each debt burden indicator. Additionally, the LIC DSF includes another debt burden indicator for total public debt to help identify risks originating from domestic public debt.

Utilizing the thresholds, the LIC DSF provides a mechanical risk rating regarding the risk of debt distress by comparing each debt burden indicator against the thresholds under both the baseline and stress test scenarios. These mechanical signals are based on the data compiled for the first 11 years of projection. The LIC DSF only considers the stress test

TABLE 5 Debt Burden Indicators

Thresholds (in per cent)					Country classification
Present value of debt-to-GDP	Present value of debt-to-exports	Debt service-to-revenue	Debt service-to-export	Present value of total public debt-to-GDP	
30	140	14	10	35	Weak
40	180	18	15	55	Medium
55	240	23	21	70	Strong

Source: Compiled by authors based on information from the IMF (IMF 2017).

scenario, which exhibits the most extreme shock within the 11-year projection. Suppose the forecasted values of the debt burden indicator do not exceed the associated threshold under the baseline or the most extreme stress test scenario. In that case, the country is said to have low risk of debt distress. If the forecasted values for the debt burden indicator breach the threshold under the stress test scenario but not the baseline scenario, then the country is said to have a moderate risk of debt distress. Lastly, suppose the projected debt burden indicator values exceed the baseline scenario's threshold, automatically indicating a breach in the stress test scenario. In that case, the country is said to have a high risk of debt distress.

METHODOLOGY

Usually, an analysis of a country's debt sustainability identifies that the debt-to-GDP ratio increases when the growth in real interest rate is more than the GDP growth, the exchange rate faces depreciation, and there is a deficit in the primary balance (Islam and Biswas 2005). Other notable methods include the incorporation of various macroeconomic indicators such as foreign currency-denominated public debt as a share of GDP, gross financing needs as a share of GDP and many more in addition to the nominal level of debt as a share of GDP and the net PV of debt as a share of GDP, while also emphasising the time frame over which the changes in debt sustainability are analyzed (Baldacci and Fletcher 2004). Another way of assessing whether public debt is sustainable is by first evaluating a unified and unvarying toolkit encompassing the overall public sector finance for a country, in addition to the approximation of a debt threshold and a method for computing the primary balance of a country required to meet the debt objectives (Di Bella 2008). Under more conventional methods, debt sustainability has continually been assessed under the pretext that the economy will not meet its debt targets if government policies fail to accumulate substantial primary balances to alleviate the debt-to-GDP ratio (Corsetti 2018). This implies that the government must maintain a sufficient balance to meet its debt targets.

This study, however, aims to build on the existing DSF established by the IMF to calibrate Bangladesh's debt sustainability and take it a step further by introducing various indicators that assess the economic and social loss induced by climate change and observe the dynamics of Bangladesh's current and anticipated debt sustainability.

Previously, a study was done by the Task Force on Climate, Development and the IMF, integrating climate risks into the DSF for two Andean countries – Colombia and Peru (Maldonao



and Gallagher 2022). The study utilized the DSF for MACs, which the IMF designed to model the adjusted debt sustainability analysis. In addition to the DSF for MACs, the IMF established the DSF for LICs. In another paper, the study incorporated climate change indicators into the MAC DSF specifically for Bangladesh (Kraemer and Volz 2022). However, MACs usually have significant access to international capital markets, while LICs mostly meet their external financing requirements through concessional resources (IMF 2021). As such, Bangladesh is categorized as an LIC under this framework.

The LIC DSF is a standardized analytical tool designed by the IMF and the World Bank to assess the risk of debt stress in a low-income country. The framework evaluates the capability of a country to manage its current debt efficiently. Also, it considers the probability of the country being able to handle the anticipated future debt under both a baseline scenario and unexpected adverse situations. The DSF uses five debt burden indicators, including the PV of external debt as a percentage of GDP, PV of external debt as a percentage of exports, external debt service as a percentage of exports, external debt service as a percentage of revenue and the PV of total public debt as a percentage of GDP, and categorizes countries into one of three debt burden thresholds (weak, medium and strong) (IMF 2018).

The incorporation of climate shocks into the debt sustainability framework has not been previously explored for LICs, particularly in Bangladesh. Thus, developing an LIC DSF methodology that considers climate risks for a country such as Bangladesh will be a helpful study that may serve as an essential reference for current and future policymakers.

The paper used the LIC DSF as a foundation to assess the present scenario of the debt burden indicators for Bangladesh. The study utilized the four external debt burden indicators, including PV of PPG external debt-to-GDP ratio, PV of PPG external debt-to-exports ratio, PPG external debt service-to-exports ratio and PPG of external debt service-to-revenue ratio. The debt burden indicators are essentially divided to assess the government's solvency, which includes the PV of PPG external debt-to-GDP ratio and the PV of PPG external debt-to-exports ratio, as well as the government's liquidity, which thus includes PPG external debt service-to-exports ratio and PPG of external debt service-to-revenue ratio. While solvency ensures long-term debt sustainability, liquidity ascertains short-term ability to service debt repayments.

To calculate the ratios involving the PV of PPG external debt as the numerator, this paper utilized the data for active loans disbursed provided by the Economic Relations Division (ERD) of the Ministry of Finance of the Government of Bangladesh. Furthermore, the data for the GDP was taken from the Bangladesh Economic Review report and Bangladesh Bank, while total government revenue and the exports of goods and services were sourced from the ERD. Development partners, including bilateral and multilateral development partners and regional development banks, were included in the time series data for active loans. The PV for each active loan was evaluated separately and thus consolidated afterwards in chronological order, starting from 1972 until 2023. The interest rates attributed to each of the active loans, however, varied and consisted of different international rates such as the LIBOR, SOFR, swap rates and the Euro Interbank Offered Rate (EURIBOR), depending on the factors agreed upon during the signing of the loan. It was important to combine

the interest rates to calculate the PV of each loan. As such, the interest rates were aggregated using the yearly averages of the mentioned international rates. Several active loans had to be omitted from the assessment due to the unavailability of SOFR and swap rates. However, these loans comprised less than 5 percent of the total loans and, therefore, will have negligible statistical implications for the overall debt sustainability analysis. The debt obligations to the IMF were later aggregated separately from the PV of external debt due to the unavailability of interest rates and maturity periods at the time of the evaluation for the loans provided by the IMF.

In addition to the debt sustainability analysis based on the LIC DSF, we use the DSPBA to analyze Bangladesh's debt sustainability under both the baseline and the stress test scenario induced by climate change. A nation's ability to service its debt is contingent upon its government maintaining a substantial primary balance surplus to repay or raise the likelihood of sustaining the debt and mitigate the impact of various shocks like climate change (Wyplosz 2005). The two components that influence the evolution of the debt-to-GDP ratio are the primary deficit, which represents government expenditures, transfer payments and tax revenue, and the product of the ratio of accumulated debt-to-GDP times the difference between the real interest rate and the growth rate, which represents the impact of debt accumulated in the past (Blanchard, Chouraqui, Hagemann and Sartor 1990).

The evolution of debt levels is demonstrated through the debt accumulation identity:

$$b_t - b_{t-1} = (r - g)b_{t-1} - primary\ balance$$

$Where,$
$b = Debt\ to\ GDP\ Ratio$
$r = Real\ Interest\ Rate$
$g = GDP\ Growth\ Rate$

The DSPBA approach calculates the primary balance, or the difference between government revenue and expenditures, excluding interest payments on debt, which would preserve the current debt-to-GDP ratio's constant value indefinitely (Bhattacharya and Ashraf 2018). The primary balance gap is then determined by deducting the debt-stabilizing primary budget balance from the actual primary budget balance (Bhattacharya and Ashraf 2018). A positive gap indicates that the actual primary budget balance is fairly below the debt-stabilizing value and that fiscal consolidation initiatives are required to stop the debt-to-GDP ratio from rising and causing public debt to reach unsustainable levels. A negative gap, on the other hand, suggests that the actual primary budget balance exceeds the debt-stabilizing level, and hence, the debt is manageable, and the debt-to-GDP ratio will fall even if fiscal consolidation policies are not implemented.

To assess Bangladesh's debt sustainability under the stress test scenario, the study incorporated the adverse economic impact of climate change by adding the sum of the total economic loss and damage of different natural disasters (extreme temperature, flood, storm and mass movement) to the government expenditure using data from the EM-DAT (EM-DAT 2023). As a result of this inclusion, the primary budget balance worsened, thereby widening the primary balance gap.



We computed the interest rate using the interest paid and the principal amount, assuming that the amount borrowed over time, over which the interest is calculated, remains constant and that the interest is paid at a single point in time rather than at intervals. We also assume that no additional borrowings or repayments are anticipated, and the principal amount remains unchanged. The formula used is as follows:

$$Interest\ rate = \left(\frac{Interest\ paid}{Principal\ amount}\right) * 100$$

FINDINGS FROM THE DEBT SUSTAINABILITY ANALYSIS BASED ON THE DEBT SUSTAINABILITY FRAMEWORK FOR LOW-INCOME COUNTRIES

After compiling the required data, the four debt burden indicators were calculated from 1994 to 2023. This was considered the baseline scenario that most closely represented the current status of Bangladesh's economy. The baseline and stress test scenarios were compared against a threshold of debt-carrying capacity. The threshold for Bangladesh was assumed to be medium. This intuition aligned with Bangladesh's debt-carrying capacity, which is deemed medium as per the debt sustainability analysis conducted by the IMF in 2024 (IMF 2024).

Scenario 1: Economic Loss and Damage Due to Climate Change Applied as a Stress Test

Bangladesh is a climate-vulnerable country often subjected to floods, cyclones, earthquakes and storms. As a result, the economy is subjected to loss and damage, making the government liable to bear additional financing to implement various adaptation and mitigation measures. Such measures may require additional funding not covered by the government's budget and may necessitate further external loans, increasing external debt. This will not only increase the debt burden but may also exhaust resources. Such expenditures may add to the flow of debt service payments, limiting the government's liquidity. Therefore, it is crucial to assess Bangladesh's debt sustainability by subjecting the baseline scenario to adverse shocks directly linked to climate change indicators. As such, the first test scenario includes assessing Bangladesh's debt sustainability by accounting for the value of total loss and damage incurred from floods, landslides or mudslides and storms including cyclones, tornadoes and heavy lightning from 1994 to 2023. The data for the total loss and damage incurred due to climate change was acquired from the EM-DAT, an international disaster database constituting data for over 26,000 mass disasters from the 1900s through the present day (EM-DAT 2023).

Climate change-induced natural disasters are frequent in Bangladesh, especially in coastal areas. The government incurs added expenditures owing to financial protection, disaster risk financing and other adaptation measures. According to the ADB, natural disasters have created an economic impact of more than $10 billion between 2000 and 2013 (Ozaki 2016).

Furthermore, it is expected that, due to the repeated frequency of floods and cyclones, Bangladesh may incur a loss of 2.2 percent of its GDP every year, equivalent to about $3.2 billion (Ozaki 2016). It is important to underscore that the government has yet to spare sufficient finance for adaptation and mitigation measures. Despite incurring such high economic loss, the government spent only about $2 billion on rehabilitation instruments from 2000 to 2013 (Ozaki 2016). As such, accommodating the additional costs required for climate action may also spell an additional debt burden for the government. Therefore, it is assumed that such economic impact due to climate change will further increase the debt burden for the government and endanger its ability to pay back future loans. Hence, the economic impact represented by the total loss and damage incurred was added to the PV of external debt as well as the debt service payments, representing the adverse shock, and the new debt burden ratios were calculated. This hypothesis stems from two assumptions: i) the government may attempt to borrow more from development partners to account for climate change, further increasing the amount of debt owed to international organizations, and ii) the expenditure

FIGURES 9–12 Effects of Economic Loss and Damage (L&D) Due to Climate Change on Debt Burden Indicators

Figure 9: PV of PPG external debt-to-GDP with the loss and damage from all disasters

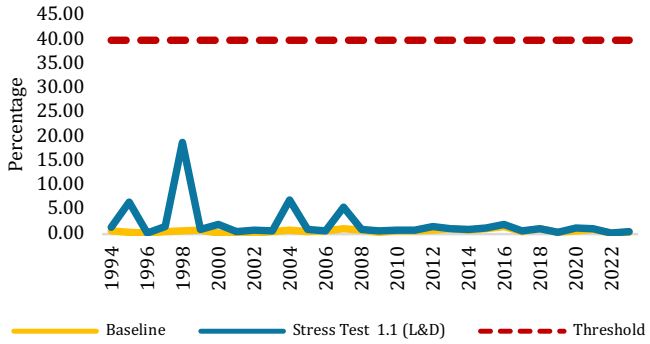


Figure 10: PV of PPG external debt-to-exports with the loss and damage from all disasters

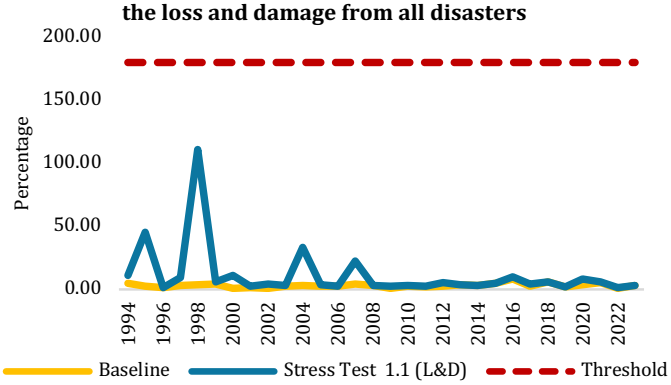


Figure 11: PPG external debt service-to-exports with the loss and damage from all disasters

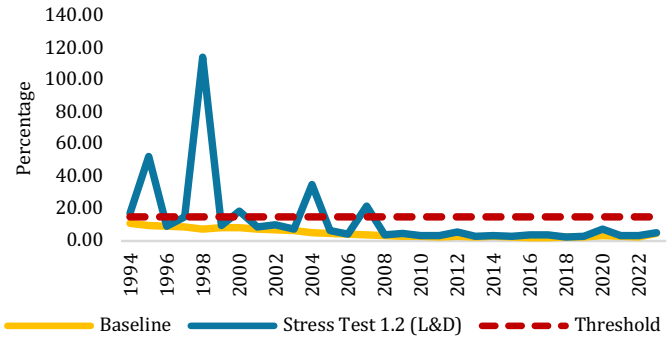
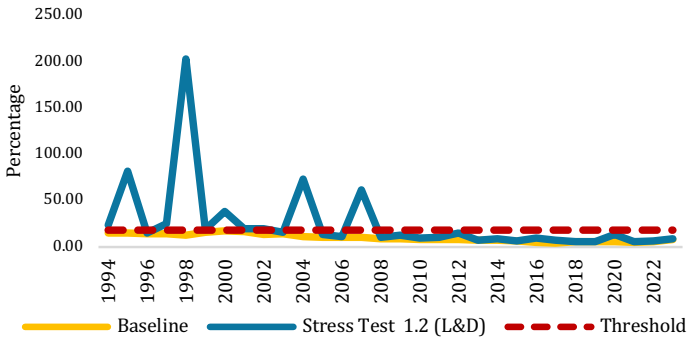


Figure 12: PPG external debt service-to-revenue with the loss and damage from all disasters



Source: Compiled by authors based on data from the EM-DAT, Economic Relations Division (ERD) and Bangladesh Economic Review (EM-DAT 2023; ERD 2023; MoF 2023).



for climate action is an additive expenditure along with the debt service payments that the government is obligated to meet.

Stress Test 1.1, integrated to calculate the new ratios for the debt burden indicators, involves the total loss and damage incurred due to all kinds of natural disasters. As observed in Figure 9, between 1994 and 2023, the PV of PPG external debt-to-GDP ratio in both baseline level and under Stress Test 1.1 has not breached the threshold. The ratios in both scenarios are substantially lower than the designated threshold. Additionally, the ratio for PV of PPG external debt-to-exports does not breach the threshold between 1994 and 2023 in both the baseline and stress test levels (Figure 10). This is indicative of low debt risk for both the debt burden indicators. This suggests that Bangladesh is at low risk of debt burden regarding its solvency ratios. It can adequately manage its long-term debts even when accounting for the economic loss and damage incurred due to climate change.

According to Figure 11, the baseline curve for the PPG debt service-to-export ratio is positioned slightly below the debt-carrying capacity threshold from 1994 to 2023. This portrays a somewhat optimistic scenario regarding Bangladesh's ability to sustain timely external debt and debt service obligations. This also suggests that the export earnings are somewhat sufficient to maintain foreign reserves and accommodate the required debt obligations to international creditors. However, the debt service-to-export ratio curve under Stress Test 1.2 does breach the debt-carrying capacity threshold by a large margin, especially in 1998. This indicates a moderate risk of debt distress for Bangladesh. This also suggests that Bangladesh may experience an unsustainable debt burden due to economic loss and damage caused by climate change.

In Figure 12, the debt-carrying capacity threshold for the PPG external debt service-to-revenue ratio is breached in the baseline and under Stress Test 1.2. However, the stress test curve breach has a higher margin than in the baseline scenario. This indicates a high debt risk for Bangladesh and suggests the government may lack substantial revenue to accommodate debt service payments if subjected to adverse shocks due to climate change. In such cases, Bangladesh may be at risk of default on future repayments.

While Bangladesh might be in a favorable position to manage its external debt in the long run even after addressing the risks of climate change, in the short run, the country might face a liquidity crisis resulting in reduced ability to service its debt payments. As a result, Bangladesh's economy can potentially be subjected to high levels of debt risk due to climate change. This is suggested by the two debt burden indicators that assess the country's liquidity, which denote high levels of risk to sustain debt for Bangladesh's economy.

To summarize, the first scenario incorporates the total damage from natural disasters and illustrates that Bangladesh's PV of PPG external debt-to-GDP and PV of PPG external debt-to-exports ratios remained well below the threshold in both baseline and stress test scenarios. This suggests that Bangladesh is in a favorable position to manage its long-term debt obligation. However, fluctuations can be observed for the liquidity ratios as the threshold is breached under the stress test scenarios. This highlights significant concerns as it may imply Bangladesh's inability to effectively service its debt payments in the short run if climate change is accounted for. Table 6 further simplifies the aforementioned analysis.

TABLE 6 Summary Table for Scenario 1

Scenario 1 A hypothetical setting that postulates a possible increase in external debt burden and external debt service payments owing to climate change.		
Debt Burden Indicators	**Stress Tests**	**Findings**
PV of PPG external debt-to-GDP	*Stress Test 1.1:* An increase in external debt owing to the added burden of economic loss and damage from climate change.	The ratio of external debt-to-GDP does not breach the threshold at the baseline level and under Stress Test 1.1, indicating a low debt risk for Bangladesh.
PV of PPG external debt-to-exports		The ratio of external debt-to-exports does not breach the threshold at the baseline level and under Stress Test 1.1, indicating a low debt risk for Bangladesh.
External debt service-to-exports	*Stress Test 1.2:* An increase in external debt service owing to the added burden of economic loss and damage from climate change.	The ratio for external debt service-to-exports breaches the threshold under Stress Test 1.2 but not at the baseline level, indicating a moderate debt risk for Bangladesh.
External debt service-to-revenue		The ratio for external debt service-to-revenue breaches the threshold at baseline and under Stress Test 1.2, indicating a high debt risk for Bangladesh.

Source: Compiled by authors.

Scenario 2: A Hypothetical Setting Where Climate Change-Related Loans are Transformed into Grants

The first scenario has raised significant concerns as the data for the liquidity ratios suggests that economic loss and damage due to climate-induced disasters may exceed Bangladesh's ability to accumulate the required finance to service future debts. This further establishes the rationale for the second scenario, which investigates Bangladesh's debt sustainability if the current loans provided to finance projects as part of climate change mitigation and adaptation measures are given as grants.

In the second scenario, we treat loans for projects related to adaptation and mitigation measures for climate change as grants and further evaluate the country's debt distress risk. Bangladesh requires an exorbitant amount of climate finance to effectively address the vulnerabilities induced by climate change. Leveraging external loans to fund climate finance may worsen Bangladesh's debt burden and reduce its debt-servicing capabilities. Therefore, if such loans were provided as grants, Bangladesh might be able to reduce its debt burden, especially in the long run.

As defined by the United Nations Framework Convention on Climate Change (UNFCCC), climate finance constitutes regional, domestic and international funding, sourced from either public, private or other alternative financial channels which attempt to facilitate mitigation and adaptation initiatives to address the risks of climate change (Hong, Karolyi and Scheinkman

2020). These investments are designed to build resilience, reduce greenhouse gas (GHG) emissions and help countries transition to a low-carbon economy. Therefore, loans provided to strengthen mitigation and adaptation measures due to climate change, including projects related to improving agriculture, ensuring food security, improving irrigation facilities and financing a nuclear plant that will produce clean energy, were all posited as grants.

The second scenario includes a stress test applied to debt burden indicators that involves reclassifying climate loans as grants and deducting these loans from the total external debt volume. These stress tests are defined as Stress Test 2.1 when the reclassified climate loans are deducted from the external debt and Stress Test 2.2 when the climate loans treated as grants are deducted from external debt service payments. The years observed were between 1994 and 2023. Figure 13 assesses the PV of PPG external debt-to-GDP ratio and observes no evident breach of the debt-carrying capacity threshold in both the baseline and under Stress Test 2.1. A similar phenomenon is observed in Figure 14, which assesses the PV of PPG external debt-to-exports ratio. This suggests that reclassifying climate loans as grants results in a relatively low debt risk for Bangladesh.

FIGURES 13–16 Effects of Climate Change Loans Reclassified as Grants on Debt Burden Indicators

Figure 13: PV of PPG external debt-to-GDP after reclassifying climate loans as grants

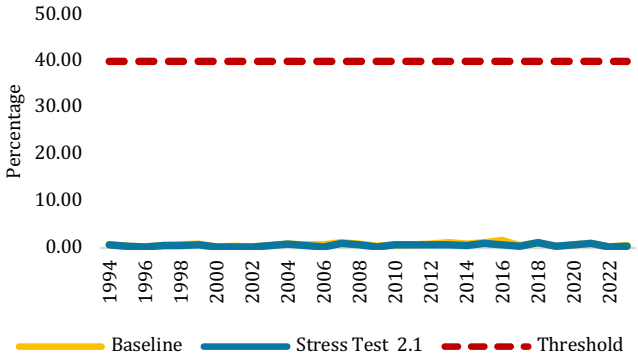


Figure 14: PV of PPG external debt-to-exports after reclassifying climate loans as grants

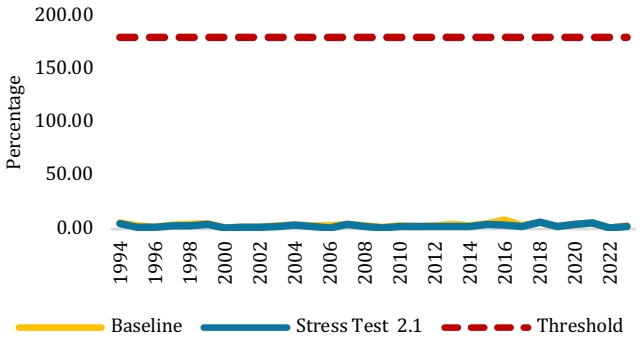


Figure 15: PPG external debt service-to-exports after reclassifying climate loans as grants

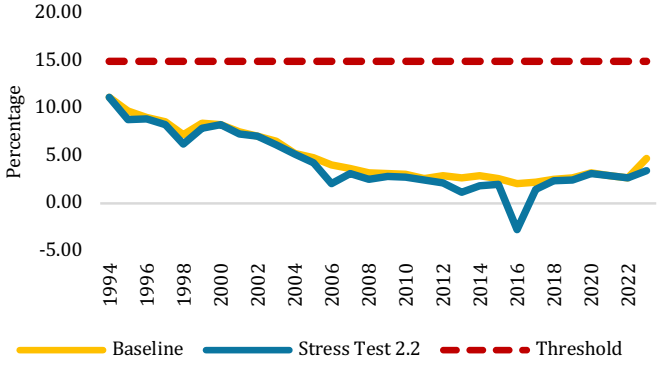
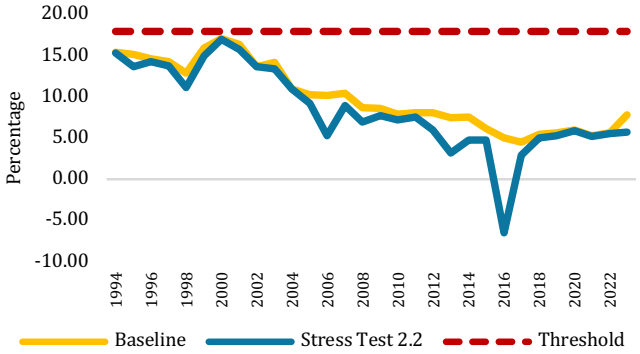


Figure 16: PPG external debt service-to-revenue after reclassifying climate loans as grants



Source: Compiled by authors based on data from the Economic Relations Division (ERD) and Bangladesh Economic Review (ERD 2023; MoF 2023).



According to Figure 15, the baseline scenario appears optimistic for the PPG debt service-to-exports ratio as the curve is well below the threshold. This indicates that Bangladesh is not currently under significant debt risk and thus has sufficient export revenues to meet its current debt obligations. Furthermore, it can also be noted that when loans provided for climate change are treated as grants, the new curve for the debt service-to-exports, defined as Stress Test 2.2, falls significantly below the threshold and slightly behind the curve for the baseline level. Notably, in 2016, the ratio under the stress test falls to a negative scale, indicating not only an inflated increase in export revenue but also suggesting an accrued amount payable to Bangladesh. This further rationalizes the initial hypothesis of the study that reclassifying climate loans into grants might place Bangladesh in a favorable position to manage its debt sustainability.

Similarly, in Figure 16, which assesses the PPG external debt-service-to-revenue ratio, it is observed that the baseline scenario is optimistic as it does not breach the threshold. In addition, after reclassifying climate loans as grants, the curve under Stress Test 2.2 falls well below the threshold. This also suggests that reclassifying climate loans into grants might allow Bangladesh greater bandwidth to utilize the substantial revenue earned and meet its debt service obligations. This also ensures debt sustainability in the short term for Bangladesh, in addition to equipping the country with sufficient climate finance to support mitigation and adaptation measures, putting the economy at a low risk of debt distress.

Bangladesh needs to address its frequent exposure to climate change and implement effective measures to mitigate the loss and damage incurred by the economy. However, in doing so, Bangladesh may experience a high external debt burden as a trade-off. However,

TABLE 7 Summary Table for Scenario 2

Scenario 2 A hypothetical setting where climate-related loans are transformed into grants.		
Debt Burden Indicators	**Stress Tests**	**Findings**
PV of PPG external debt-to-GDP	*Stress Test 2.1:* A decrease in external debt owing to the reclassification of climate loans as grants.	Bangladesh's external debt-to-GDP falls below the threshold at baseline and under Stress Test 2.1, which implies a low risk of debt unsustainability for Bangladesh.
PV of PPG external debt-to-exports		External debt-to-exports falls below the threshold at baseline and under Stress Test 2.1, which implies a low risk of debt unsustainability for Bangladesh.
External debt service-to-exports	*Stress Test 2.2:* A decrease in external debt service owing to the reclassification of climate loans as grants.	External debt service-to-exports falls below the threshold at baseline and under Stress Test 2.2, which implies a low risk of debt unsustainability for Bangladesh.
External debt service-to-revenue		External debt service-to-revenue falls below the threshold at baseline and under Stress Test 2.2, which implies a low risk of debt unsustainability for Bangladesh.

Source: Compiled by authors.



it is important to note that these circumstances are based on the current economic status according to the available data at the time of writing this paper. Therefore, making projections using a forecasting model may provide a further understanding of what climate change may entail for Bangladesh's ability to service future loans. Moreover, this paper accommodates all kinds of adverse shocks instead of highlighting the most extreme adverse stress owing to climate change. Therefore, Bangladesh needs to implement a better financing strategy to manage future debts that may surface due to climate-related challenges.

On the other hand, an optimistic scenario is created where climate loans are treated as grants, substantiating the intuition that if loans for adaptation and mitigation measures were provided as grants, Bangladesh would be in a favorable position to manage its debt burden. As such, the above analysis is further summarized in Table 7.

Scenario 3: A Hypothetical Setting Where GDP, Revenue and Exports Fall Due to the Introduction of the European Union's Carbon Border Adjustment Mechanism

In addition to the scenarios mentioned above, it is also important to underscore that Bangladesh might face significant challenges owing to the Carbon Border Adjustment Mechanism (CBAM), an initiative to be implemented by the European Union (EU). The CBAM is a policy tool introduced by the EU to mitigate the adverse effects of climate change through international trade policy. Currently, the CBAM is in a transitional phase from 2023 to 2026. Initially, the CBAM will be applied to only six sectors for which the production of goods is stated to be carbon intensive. Eventually, the CBAM is intended to be applied to all sectors, including the ready-made garments sector (RMG). After the transitional phase, the CBAM will be completely operational, acting as a tool to appropriately price carbon emissions generated from producing carbon-intensive goods entering the EU market. This initiative aims to foster cleaner industrial practices in countries outside of the EU while guaranteeing that imported goods consider domestic production's carbon price (EU 2023). While this initiative aims to raise awareness and hold countries accountable for activities resulting in elevated climate change risk, it might spell substantial macroeconomic instability for Bangladesh. The EU represents the largest market for Bangladesh's ready-made garments (RMG), constituting a significant portion of the country's export basket. Implementing such international policy measures will increase the cost of all exports from Bangladesh to the EU, particularly affecting RMG exports. This will result in a loss of export revenue, thereby impairing Bangladesh's capacity to generate sufficient revenue to meet its debt obligations in the short and long term. Considering this, it is essential to design an additional set of stress tests that examine the potential reduction in export volume and its impact on Bangladesh's debt sustainability.

This paper assumes that under the CBAM policy, Bangladesh's exports might decline by 5 percent. As such, the new ratios for debt burden indicators are subsequently recalculated based on this assumption. This percentage is then incrementally increased by 5 percent intervals to determine the approximate value at which the debt burden indicators surpass the debt sustainability threshold, indicating a risk of debt distress. Recognizing the interrelated nature of macroeconomic variables, the paper also assumes that nominal GDP and current

revenue receipts will decline by the same percentage as export volume. This is because a fall in export revenues will lead to a decrease in GDP, assuming that all the other components of GDP remain unchanged, resulting in lower tax revenues for the government. Additionally, we consider the effects of climate change manifested through economic loss and damage following the reduction in the specified macroeconomic variables due to the likelihood of CBAM implementation. The rationale for this approach is that economic shocks and vulnerabilities can arise from multiple sources. Therefore, to build a more realistic scenario and conduct an analysis that closely parallels reality, it is assumed that Bangladesh may face a dual challenge, which includes the risk of climate change coupled with reduced exports, GDP and revenue due to the CBAM. Therefore, the paper recalculates the ratios for debt burden indicators, accounting for the total loss and damage incurred due to climate change and observe Bangladesh's ability to manage its debts under such stress tests.

Through incremental decreases in GDP, it was observed that even if GDP decreases by 50 percent due to the CBAM, the ratio of the PV of PPG external debt-to-GDP does not significantly deviate from the baseline scenario and remains well below the threshold by a considerable margin (Figure 17). In this scenario, this curve is represented under Stress

FIGURES 17–19 Effects of Possible CBAM on PV of PPG External Debt-to-GDP Indicator

Figure 17: PV of PPG external debt-to-GDP when GDP is reduced by 50 per cent

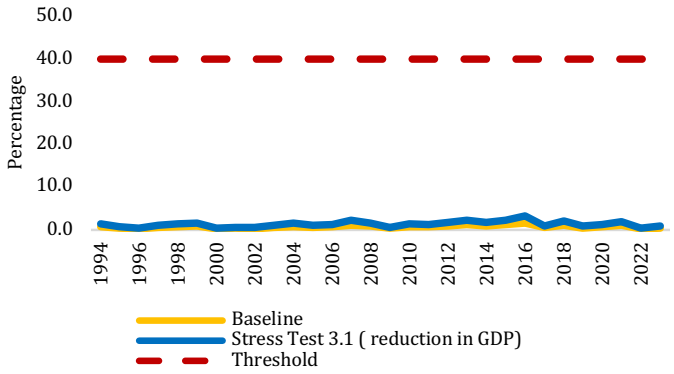


Figure 18: PV of PPG external debt-to-GDP when GDP is reduced by 50 per cent compared with the scenario 1

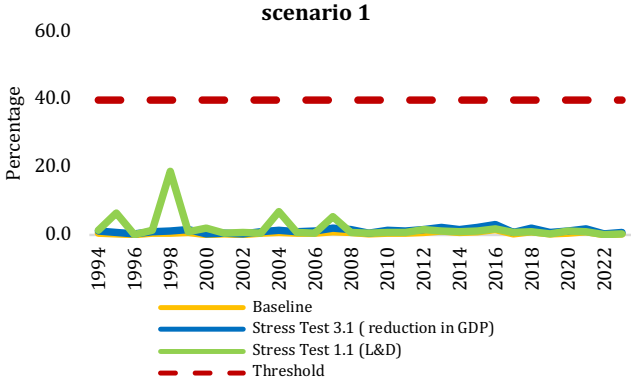
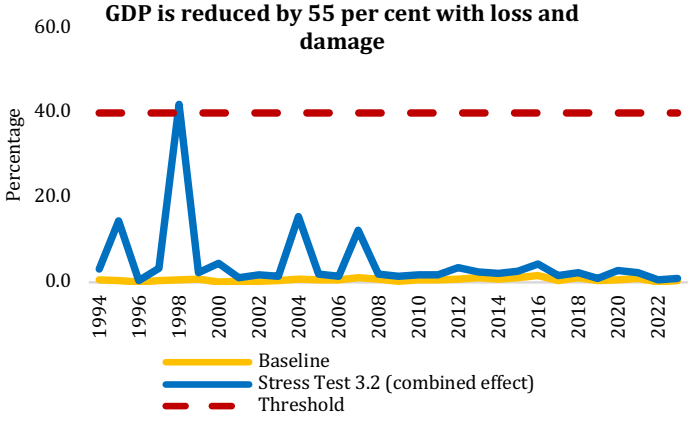


Figure 19: PV of PPG external debt-to-GDP when GDP is reduced by 55 per cent with loss and damage



Source: Compiled by authors based on data from the Economic Relations Division (ERD) and Bangladesh Economic Review (ERD 2023; MoF 2023).



Test 3.1, which depicts the impact on the PV of PPG external debt-to-GDP ratio if the GDP is reduced by 50 percent under the third scenario. This suggests that observing the effect of the CBAM on the GDP alone does not reflect any significant risks concerning the PV of PPG external debt-to-GDP ratio. In addition, when evaluating the impact of the CBAM compared to economic loss and damage, it is evident that the PV of PPG external debt-to-GDP ratio demonstrates greater volatility (Figure 18). This curve is represented by Stress Test 1.1, previously highlighted as the first stress test under the first scenario. It is also observed that the PV of PPG external debt-to-GDP ratio under Stress Test 1.1 deviates far more from the baseline level than the curve from Stress Test 3.1. Furthermore, the curve under Stress Test 1.1 exhibits greater peaks, approaching the threshold of unsustainable debt. This indicates that treating these two effects in isolation and exclusive to each other and observing their impacts on the PV of PPG debt-to-GDP ratio does not seem to reflect a high risk of Bangladesh experiencing unsustainable debt levels.

Therefore, it is essential to evaluate their combined effects on the PV of PPG external debt-to-GDP ratio, as, in practice, the impacts on GDP and economic damage due to climate change are likely to occur concurrently and cannot be considered independently of each other. Thus, in this regard, recalculating the PV of PPG external debt-to-GDP ratio to account for both the economic loss and damage from climate change, coupled with a possible reduction in GDP owing to the CBAM, offers significant insights into the possible unpredictability and variability of these factors on the debt burden indicator. Through this exercise, it was observed that GDP would have to decrease by 55 percent to exhibit a substantial effect on the PV of PPG external debt-to-GDP ratio while accounting for economic loss and damage from climate change. The ratio surpasses the threshold, which presents a worrisome circumstance for Bangladesh (Figure 19). This is suggested by the curve under Stress Test 3.2 and indicates that, in the long run, if GDP is significantly impacted by the CBAM, in addition to loss and damage induced by climate change, Bangladesh may face a medium risk of debt distress.

A comparable observation can be drawn for the PV of PPG external debt-to-exports ratio. In coherence with the PV of PPG external debt-to-GDP ratio, even if revenue earned from exports decreases by 50 percent, the curve for the external debt-to-exports does not seem to deviate much from the baseline level (Figure 20). This curve, highlighted as Stress Test 3.3, also tends to remain well below the threshold beyond which external debt becomes unsustainable in relation to the PV of PPG external debt-to-exports ratio. This indicates a low debt risk for Bangladesh. It also suggests that the PV of PPG external debt-to-exports ratio will be significantly impacted if exports decline substantially once the CBAM is fully operational.

To gain greater insight, Figure 21 compares the impact on the PV of PPG external debt-to-exports ratio observed under Stress Test 3.3 with Stress Test 1.1. Once again, it is evident that, compared to Stress Test 3.3, the PV of PPG external debt-to-exports ratio exhibits greater volatility when it accounts for the economic loss and damage as part of Stress Test 1.1. Furthermore, the curve under Stress Test 1.1 deviates more from the baseline level than the curve under Stress Test 3.2. When considering economic loss and damage instead of the impacts of the CBAM on exports, it is found that the PV of PPG external debt-to-exports

FIGURES 20–22 Effects of CBAM on PV of PPG External Debt-to-Exports Indicator

Figure 20: PV of PPG external debt-to-exports when exports are reduced by 50 percent

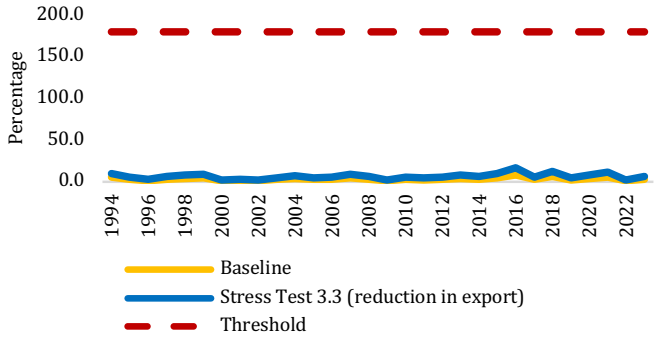


Figure 21: PV of PPG external debt-to-exports when exports are reduced by 50 percent compared to scenario 1

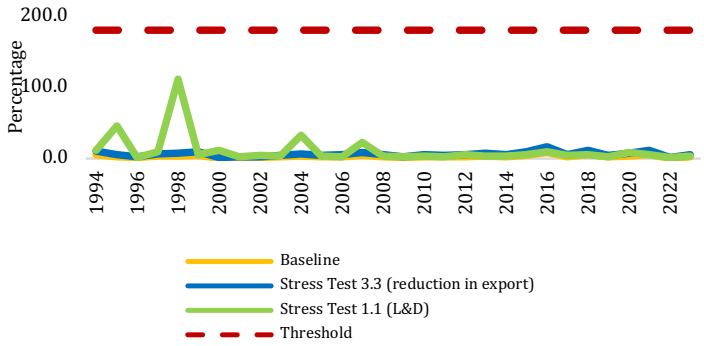
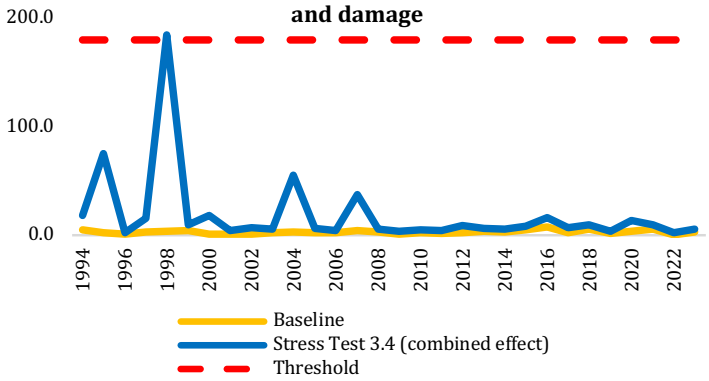


Figure 22: PV of PPG external debt-to-exports when exports are reduced by 40 percent with loss and damage



Source: Compiled by authors based on data from the Economic Relations Division (ERD) and Bangladesh Economic Review (ERD 2023; MoF 2023).

ratio reaches significantly closer to the threshold in certain years. Despite such observations, since the PV of PPG external debt-to-exports ratio does not breach the threshold in terms of both baseline level and the other two stress tests, it can be concluded that only considering these two effects exclusively puts Bangladesh in an unlikely position of harboring unsustainable debt.

Therefore, it is crucial to evaluate the combined effects of a reduction in exports, economic loss and damage on the PV of PPG external debt-to-exports ratio to achieve a more pragmatic analysis. It was observed that if the receipts from exports decrease by 40 percent, the curve for the PV of PPG external debt-to-exports, which also accounts for loss and damage, will surpass the threshold (Figure 22). This is highlighted as Stress Test 3.4. However, the ratio for PV of PPG external debt-to-exports does not breach the threshold at the baseline level. This suggests that if the CBAM significantly reduces exports, at least by 40 percent, Bangladesh may face a medium risk of debt distress when combined with the impacts of loss and damage.

Compared with the solvency indicators, which include PV of PPG external debt-to-GDP and PV of PPG external debt-to-exports ratios, indicators reflecting the liquidity of an economy exhibit more volatility. For instance, if exports are reduced by only 25 percent, the ratio for PPG external debt service-to-exports breaches the threshold in 1994 (Figure 23). This curve is highlighted by Stress Test 3.3 and suggests that a less substantial reduction in exports due to the CBAM being operational might leave Bangladesh at medium level of debt becoming unsustainable.

Remaining consistent with the analysis conducted using the solvency indicators, the impact of the CBAM on exports as a stress test was also compared with Stress Test 1.2, which assesses the effects on debt sustainability while accounting for economic loss and damage from climate change. It was observed that under Stress Test 1.2, the curve for external debt service-to-exports demonstrated greater fluctuations than its performance under Stress Test 3.3 (Figure 24). Furthermore, the debt service-to-exports breaches the threshold of

FIGURES 23–25 Effects of CBAM on PPG External Debt Service-to-Exports Indicator

Figure 23: PPG external debt service-to-exports when exports are reduced by 25 percent

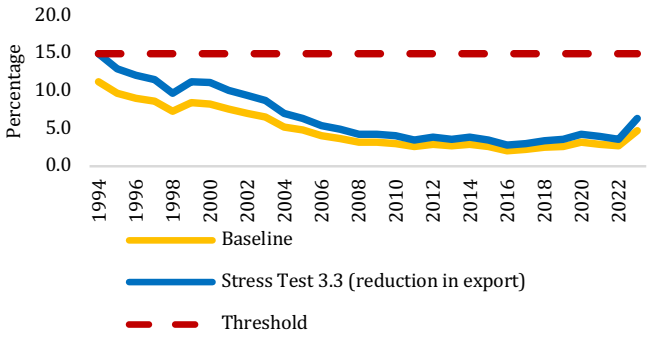


Figure 24: PPG external debt service-to-exports when exports are reduced by 25 percent compared with scenario 1

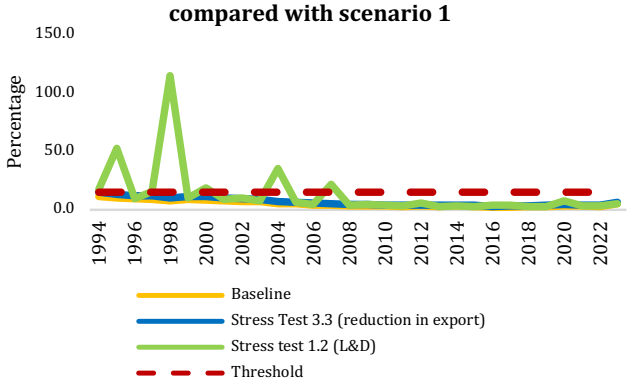
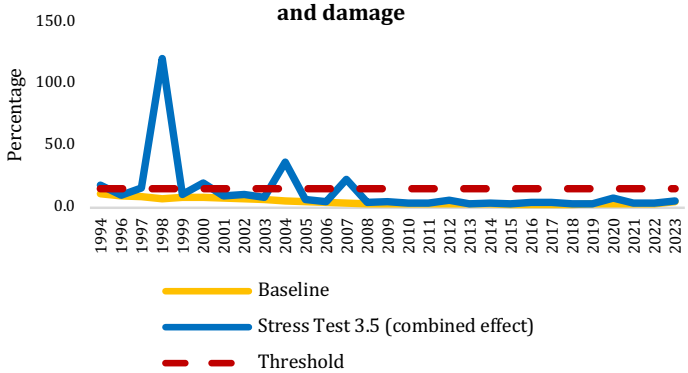


Figure 25: PPG external debt service-to-exports when exports are reduced by five percent with loss and damage



Source: Compiled by authors based on data from the Economic Relations Division (ERD) and Bangladesh Economic Review (ERD 2023; MoF 2023).

sustainable debt by a greater margin when loss and damage owing to climate change are accounted for, compared to the possible impact on exports due to the CBAM.

Therefore, based on the previous rationale, where the impacts of the CBAM and the consequences of climate change might affect Bangladesh simultaneously, a new PPG external debt service-to-exports ratio was calculated. This new ratio reflects the combined effects of the CBAM on exports and climate change on external debt service payments and is represented as Stress Test 3.5. Suppose exports are reduced by only 5 percent as a possible consequence of the CBAM combined with the effects of economic loss and damage from climate change. In that case, the PPG external debt service-to-exports ratio becomes more volatile, crossing the threshold of sustainable debt by a large margin (Figure 25). However, the PPG external debt service-to-exports at baseline does not breach the threshold. This indicates that when accounting for the combined impact of the CBAM and loss and damage, Bangladesh might experience a medium risk of debt unsustainability. Thus, the effects of loss and damage due to climate change are much more likely to exacerbate Bangladesh's capacity to service its external debts.

Compared to the PPG external debt service-to-exports, the ratio for PPG external debt service-to-revenue exhibits an even greater unpredictable tendency when accounting for the possible effects of the CBAM. It was observed that if total government revenue decreases by even 5 percent as a potential effect of the CBAM, the recalculated PPG external debt service-to-revenue tends to breach the threshold of sustainable debt by a slight margin (Figure 26). This is represented as Stress Test 3.6. It is also important to underscore that the curve for PPG external debt service-to-revenue at baseline is also positioned very close to the threshold. This suggests that if total government revenue falls even by a slight percentage owing to the impact of the CBAM, Bangladesh might experience a medium risk of debt unsustainability.

Furthermore, when comparing Stress Test 3.6 and Stress Test 1.2, which only observes the effects of economic loss and damage from climate change on the PPG external debt service-to-revenue ratio, it can be concluded that the curve under Stress Test 1.2 deviates much further than either the baseline or Stress Test 3.6 (Figure 27). Furthermore, the ratio under Stress Test 1.2 breaches the threshold of sustainable debt by a greater margin than the ratio under Stress Test 3.6.

The unpredictability of the debt service-to-revenue ratio in the context of economic loss and damage due to climate change delivers a premise for examining the combined effects of such loss and damage and the potential decline in revenue resulting from the CBAM. The new ratio is represented as Stress Test 3.7. As predicted, considering the combined effect of the CBAM and economic loss and damage, the debt service-to-revenue curve deviates from the baseline level and breaches the threshold by a considerable margin (Figure 28). It is important to highlight that the ratio at the baseline level also breaches the threshold. This further helps to deduce that in light of the CBAM becoming operational, Bangladesh might experience a high risk of debt unsustainability, especially when accounting for the damages incurred due to climate change.

FIGURES 26–28 Effects of CBAM on PPG External Debt Service-to-Revenue Indicator

Figure 26: PPG external debt service-to-revenue when exports are reduced by five percent

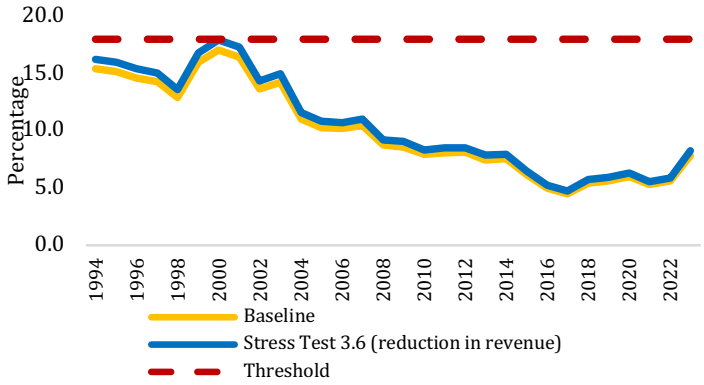


Figure 27: PPG external debt service-to-revenue when exports are reduced by five percent compared to scenario 1

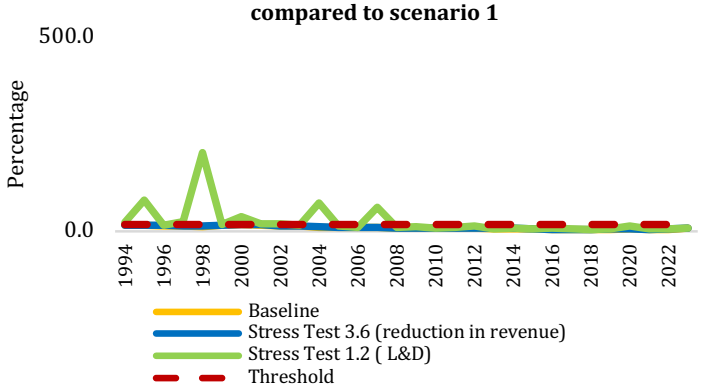
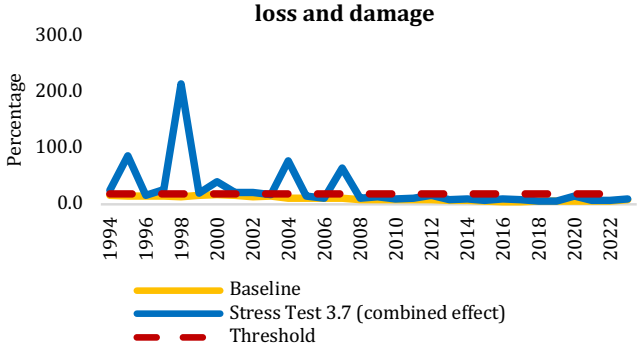


Figure 28: PPG external debt service-to-revenue when exports are reduced by five percent with loss and damage



Source: Compiled by authors based on data from the Economic Relations Division (ERD) and Bangladesh Economic Review (ERD 2023; MoF 2023).

Therefore, it can be concluded that if the CBAM becomes operational, the solvency ratios of the debt burden indicators will remain unaffected in the immediate term. This stability implies that a substantial reduction in export revenues and overall nominal GDP would be necessary to impact these ratios under all stress test scenarios. However, varied observations emerge when analyzing liquidity ratios. The liquidity ratios, which include external debt service-to-exports and external debt service-to-revenue, indicate that even a modest reduction in export earnings and tax revenues will significantly affect the ratios. This impact is particularly pronounced considering climate change's compounded effects of loss and damage. The sensitivity of the liquidity ratios to these decreases shows the economy's susceptibility to many external shocks, underscoring the necessity of preserving stable income sources to avert potential financial instability.

Table 8 summarizes the applied scenario and the consecutive stress tests.

TABLE 8 Summary Table for Scenario 3

Scenario 3 A hypothetical setting that postulates a possible reduction of GDP, export earnings and total government revenue when the CBAM becomes operational.		
Debt Burden Indicators	**Stress Tests**	**Findings**
PV of PPG external debt-to-GDP	*Stress Test 3.1:* A reduction in GDP owing to the effects of the CBAM.	The ratio of external debt-to-GDP does not breach the threshold at the baseline level and under Stress Test 3.1, indicating a low risk of debt for Bangladesh.
	Stress Test 3.2: This combined effect includes a reduction in GDP due to the CBAM and an increase in debt burden owing to L&D from climate change.	The ratio of external debt-to-GDP breaches the threshold under Stress Test 3.2 but is not at the baseline level, indicating a moderate risk of debt for Bangladesh.
PV of PPG external debt-to-exports	*Stress Test 3.3:* A reduction in export revenue owing to the effects of the CBAM.	The ratio of external debt-to-exports does not breach the threshold at the baseline level and under Stress Test 3.3, indicating a low risk of debt for Bangladesh.
	Stress Test 3.4: This combined effect includes a reduction in export revenue due to the CBAM and an increase in debt burden owing to L&D from climate change.	The ratio of external debt-to-exports breaches the threshold under Stress Test 3.4 but is not at the baseline level, indicating a moderate risk of debt for Bangladesh.
External debt service-to-exports	*Stress Test 3.3:* A reduction in export revenue owing to the effects of the CBAM.	The ratio for external debt service-to-exports breaches the threshold under Stress Test 3.3 but not at the baseline level, indicating a moderate risk of debt for Bangladesh.
	Stress Test 3.5: This combined effect includes a reduction in export revenue due to the CBAM and an increase in debt service owing to L&D from climate change.	The ratio for external debt service-to-exports breaches the threshold under Stress Test 3.5 but is not at the baseline level, indicating a moderate risk of debt for Bangladesh.
External debt service-to-revenue	*Stress Test 3.6:* A reduction in total government revenue owing to the effects of the CBAM.	The ratio for external debt service-to-revenue breaches the threshold under Stress Test 3.6 but is not at the baseline level, indicating a moderate risk of debt for Bangladesh.
	Stress Test 3.7: This combined effect includes a reduction in total government revenue due to the CBAM and an increase in debt service owing to L&D from climate change.	The ratio for external debt service-to-revenue breaches the threshold at both the baseline level and under Stress Test 3.7, indicating a high debt risk for Bangladesh.

Source: Compiled by authors.

Scenario 4: A Hypothetical Setting Where Variable Interest Rates on Loans Taken in the Past Increase

Over the years, Bangladesh has received substantial financial aid through loans and grants for its diverse development projects. These funds, provided by various development partners including bilateral and multilateral institutions and regional development banks, have played a pivotal role in shaping the country's economic landscape. Some loans are subject to variable international interest rates, such as the LIBOR, EURIBOR and SOFR. The impact of these variable interest rates on Bangladesh's debt sustainability is a topic of significant interest and importance.

The SOFR is an average interest rate for secured loans denominated in US dollars with a maturity of one day (overnight) published by the Federal Reserve Bank of New York (Global Rates 2024). On the other hand, the average interest rate that a group of banks (referred to as the panel banks) charge each other for unsecured loans issued in euros is known as EURIBOR (Global Rates 2024). In 1999, the launch of the euro was accompanied by the creation of the EURIBOR interest rates, which are considered a benchmark when it comes to short-term loans denominated in euros and a base rate for several financial products, including swaps, options and futures (Global Rates 2024). When determining the interest rates on loans, savings accounts and mortgages, banks frequently utilize the EURIBOR interest rates as their base rate (Global Rates 2024). Lastly, the LIBOR rate measures the average interest rate at which several banks were willing to lend each other unsecured sums on the London money market (Global Rates 2024).

Since these interest rates tend to float and are variable throughout the debt obligation period, a fourth scenario is considered in which the impact of different changes in the interest rates on the amount of external debt is examined to determine whether Bangladesh can service and sustain its debt. A rise in the interest rate on debt increases the debt financing cost and debt burden of the country, making it more challenging to sustain the debt. We shed light on how debt burden indicators respond to such a shock.

In this stress test, the aforementioned variable interest rates for each loan from the different development partners between 1994 and 2023 were increased by 0.5 percent at regular intervals, starting at 0.5 percent and ending at 2.5 percent. Subsequently, the new PV of PPG external debt was calculated for all the years, and the values were then used to compute the new ratios of the debt burden indicators, particularly PV of PPG external debt-to-GDP and PV of PPG external debt-to-exports. Additionally, for the liquidity indicators, the study assumed a proportional increase in debt service alongside debt under the rationale that debt service is essentially the money required to repay the interest and principal amount on debt obligations. Thus, a higher interest rate would naturally push the cost of servicing the debt upward. Therefore, the debt service levels were also raised incrementally, beginning at 0.5 percent and ending at 2.5 percent. It should be noted that the interest rates for loans with a constant interest rate were not changed in this scenario.

After increasing the interest rates by 0.5 percent, represented by the graph under Stress Test 4.1, it can be seen that the PV of PPG external debt-to-GDP ratio did not react much to

FIGURES 29–31 Effects of Increase in Variable Interest Rates on PV of PPG External Debt-to-GDP Indicator

Figure 29: PV of PPG external debt-to-GDP under 0.5 percent interest rate increase

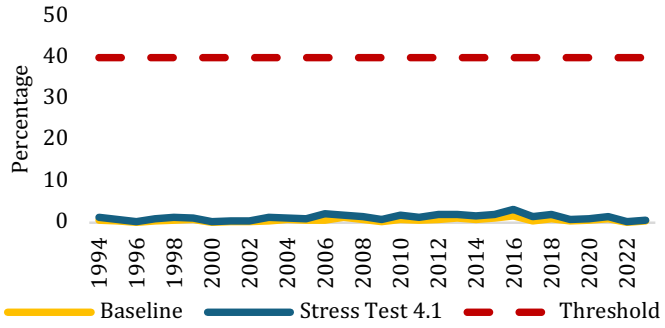


Figure 30: PV of PPG external debt-to-GDP under 0.5 percent interest rate increase compared with scenario 1

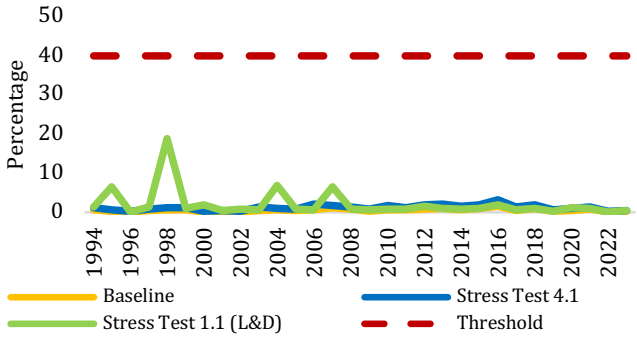
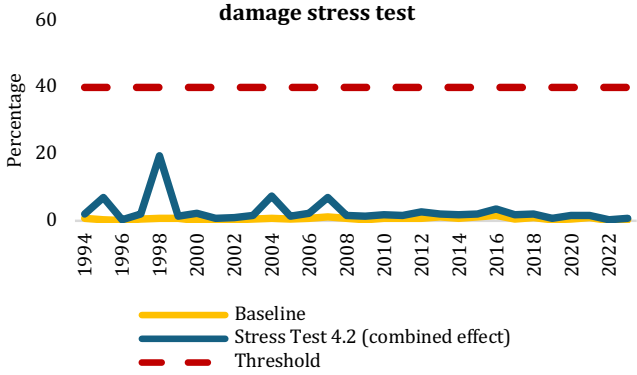


Figure 31: PV of PPG external debt-to-GDP under 0.5 percent interest rate increase and loss and damage stress test



Source: Compiled by authors based on data from the Economic Relations Division (ERD) and Bangladesh Economic Review (ERD 2023; MoF 2023).

this shock (Figure 29). The curve followed a similar path to the curve at the baseline level, converging during some periods and rising slightly above during the other periods. A greater shock was applied to substantiate this finding by introducing a 5 percent increase in the interest rates. However, the PV of PPG external debt-to-GDP ratio still did not diverge much from the levels in the baseline. This suggests that interest rates would have to vary substantially to cause any significant impact on the PV of PPG external debt-to-GDP ratio, reflecting a low risk of Bangladesh experiencing unsustainable debt. Furthermore, a comparison was made between the effect of an increased interest rate against the effect of loss and damage of a climate change shock from Stress Test 1.1 (Figure 30). It is evident that the impact of natural disasters on the debt burden indicator was larger and far more volatile than in Stress Test 4.1. The peaks of the curve reached greater levels, but they still did not exceed the threshold. Although the impact did subside in recent years, it does not negate the possibility of the country experiencing such distress again in the future.

Hence, it is essential to combine these two shocks and apply them together, as treating them separately does not provide a true picture of the looming risk in Bangladesh. To construct



a more realistic scenario, the shock induced by climate change was incorporated in Stress Test 4.2 in addition to the possible increase in variable interest rate (Figure 31). This was done on the premise that shocks disturbing a country's macroeconomic or fiscal stability can simultaneously be triggered by multiple sources. The primary aim was to assess the vulnerability of Bangladesh's debt situation to various natural disasters. Hence, introducing an extra shock, such as that of raised interest rates, will provide more insights into how an already financially fragile nation can experience a challenge when dealing with several other disruptions. The total economic loss and damage due to natural disasters have been accounted for by adding it to the amount of external debt (adjusted for increased interest rates) under the assumption that the government would bear the cost of recovering from such shock in terms of additional borrowings from development partners.

Figure 31 demonstrates the impact of a 0.5 percent rise in interest rates, together with the economic loss and damage triggered by natural catastrophes, on the PV of PPG's external debt-to-GDP ratio between 1994 and 2023. It can be observed that this ratio did not surpass or even reach the threshold. However, the level of debt did oscillate more frequently and reached higher points under Stress Test 4.2 compared to the baseline level. The debt burden indicator maintained an almost steady trend at the baseline level. This discrepancy can be explained by the cost incurred due to the climate change shock and the increased interest rates. The cost of financing the escalated debt obligations due to the added interest payments and the cost associated with the post-disaster recovery plan deteriorates the PV of PPG external debt-to-GDP ratio. Nevertheless, the debt level is still sustainable, which puts the country at low risk of falling into an unmanageable debt whirlpool.

An analogous observation can be made from Figure 32 for the impact of a 0.5 percent increase in interest rates on the PV of PPG external debt-to-exports ratio. Not only does the graph not deviate much from the curve at the baseline level, but it also does not surpass the threshold. The debt burden indicator is far below the threshold, indicating that Bangladesh is at low risk of experiencing debt distress. Even after pushing the interest rates further up by 5 percent, the ratio still does not change much. Thus, the interest rates would have to increase by a significant amount to have a noticeable impact on the PV of PPG external debt-to-exports ratio of Bangladesh.

To effectively contrast the effects of the interest rate shock with those of the climate change shock, the respective curves were analyzed and compared, as illustrated in Figure 33. This time, the debt burden indicator under Stress Test 1.1 oscillates more and surpasses the levels under Stress Test 4.1, but it does not breach the threshold. This suggests that considering the impact of raised interest rates exclusively will not drive Bangladesh towards a debt whirlpool. The cost of recovering from damages caused by natural catastrophes will, on the other hand, worsen the debt-to-exports ratio and force Bangladesh into a vicious cycle of unsustainable debt.

Once again, to understand the combined effect of two shocks acting simultaneously and to build a more practical scenario, their impacts were integrated into the PV of PPG external debt-to-exports ratio. As seen with the previous indicator, the PV of PPG external debt-to-exports ratio does not seem to breach the threshold (Figure 34). This curve is reflected

FIGURES 32–34 Effects of Increase in Variable Interest Rates on PV of PPG External Debt-to-Exports Indicator

Figure 32: PV of PPG external debt-to-exports under 0.5 percent interest rate increase

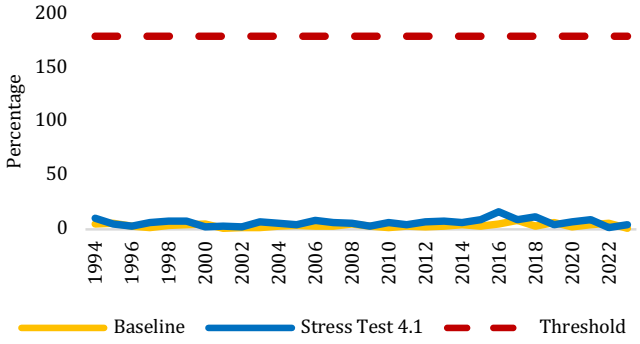


Figure 33: PV of PPG external debt-to-exports under 0.5 percent interest rate increase compared with scenario 1

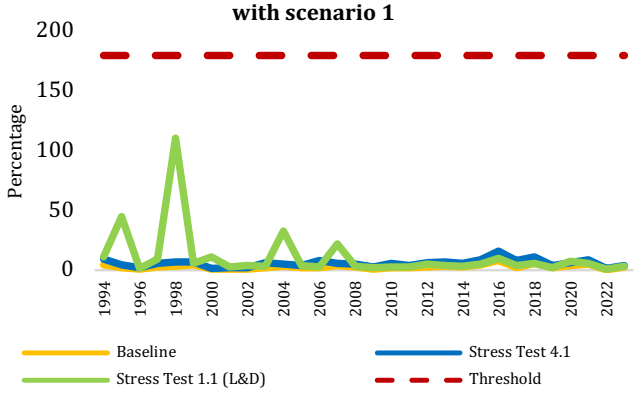
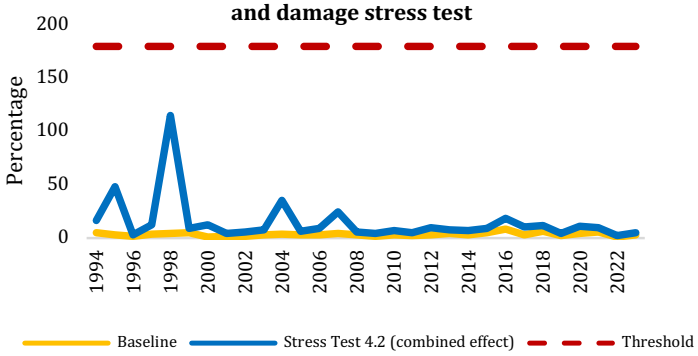


Figure 34: PV of PPG external debt-to-exports under 0.5 percent interest rate increase and loss and damage stress test



Source: Compiled by authors based on data from the Economic Relations Division (ERD) and Bangladesh Economic Review (ERD 2023; MoF 2023).

under Stress Test 4.2. However, the ratio under this stress test deviates significantly in relevance to the baseline level. Hence, it can be assumed that the rise in the ratio, well above the ratio under the baseline scenario in some periods, is attributable to the fiscal damage engendered by the climate change shock and raised interest rates. This highlights the additional stress caused by natural catastrophes and mounting interest rates on Bangladesh's debt levels. However, unlike the PV of PPG external debt-to-GDP ratio, when the interest rates were increased by 5 percent and the loss and damage from climate change were accounted for, the combined effect caused the PV of PPG external debt-to-exports ratio to be above the admissible level. Despite incorporating the climate change and interest rate shocks, the impact on the solvency indicators measuring the country's debt burden was not that striking. Therefore, Bangladesh is currently at a low risk of experiencing debt distress as neither the curve at the baseline level nor the one under Stress Test 4.2 breaches the threshold. However, the economic loss and damage caused by climate change can vary depending on the intensity and frequency of the disaster. Hence, to ensure debt sustainability, the country must have robust contingency plans and alternate approaches to deal with shocks and lower its debt load.

FIGURES 35–37 Effects of Increase in Variable Interest Rates on PPG External Debt Service-to-Exports Indicator

Figure 35: PPG external debt service-to-exports under 0.5 percent interest rate increase

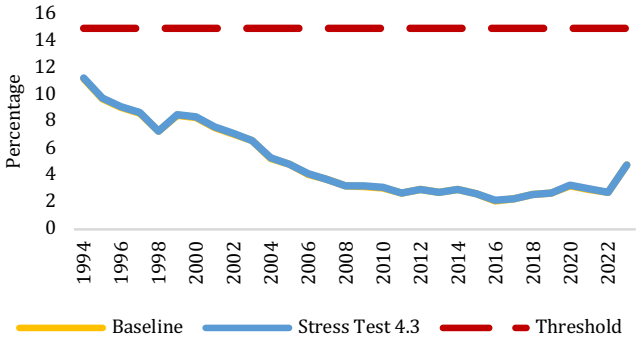


Figure 36: PPG external debt service-to-exports under 0.5 percent interest rate increase compared with scenario 1

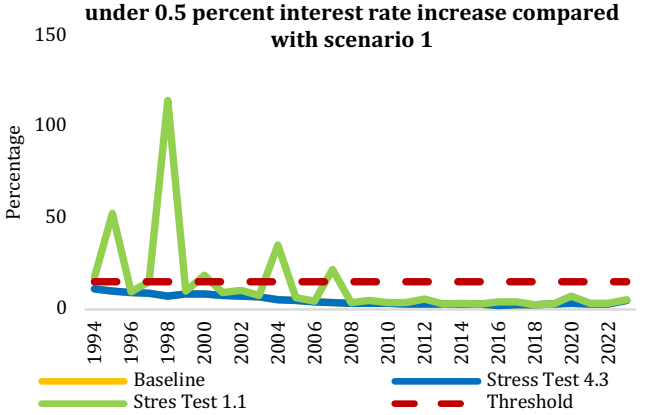
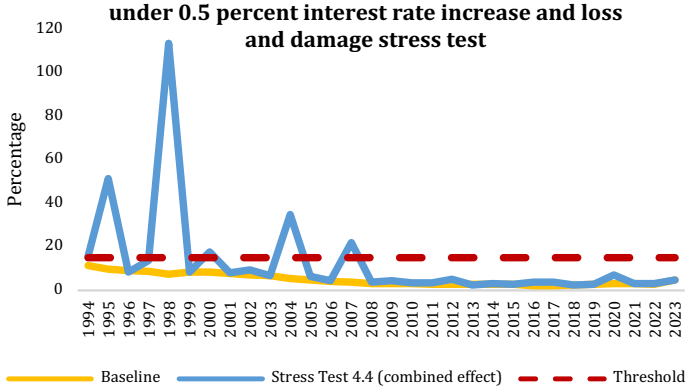


Figure 37: PPG external debt service-to-exports under 0.5 percent interest rate increase and loss and damage stress test



Source: Compiled by authors based on data from the Economic Relations Division (ERD) and Bangladesh Economic Review (ERD 2023; MoF 2023).

Compared to the solvency indicators, the liquidity indicators responded more dramatically to the shocks. However, the PPG external debt service-to-exports ratio does not deviate from the baseline level curve (Figure 35). Furthermore, the PPG external debt service-to-exports ratio does not cross the threshold under Stress Test 4.3, where a 0.5 percent rise in the interest rates was introduced. Strikingly, the curves maintain an almost identical trajectory, overlapping during most periods. Increasing the shock by raising the interest rates by 5 percent does not drive the values higher than those under the baseline scenario. Although negligible, the ratios are larger for the stress test than those in the baseline scenario. The PPG external debt service-to-exports ratios have fallen since 1994 and have moved below the threshold. Thereafter, they have been on the rise yet again since 2022. This is quite concerning since, even without a shock, Bangladesh struggles to manage and reduce its debt load and prevent its economy from collapsing.

To stay aligned with the analysis conducted using the solvency indicators, the effect of an interest rate shock on the PPG external debt service-to-exports ratios was compared with the effect of a climate change shock. The cost of covering losses and damages from natural calamities has a drastic impact on the debt burden indicator under Stress Test 1.1, as shown

in Figure 36. Not only did the values surpass the threshold, but they also did so by exceedingly larger margins. In contrast to Stress Test 4.3, the debt service-to-exports ratio in this stress test exhibits greater variations and consistently breaches the threshold.

As a result, grounded in earlier reasoning that shocks are likely to occur simultaneously, the paper examined the impact of raised interest rates, along with the economic consequences of climate change, to investigate Bangladesh's debt situation more pragmatically. The impact of interest rate and climate change shocks was particularly notable among the liquidity indicators. Figure 37 illustrates how PPG's external debt service-to-exports ratio exceeded the acceptable level and surpassed it substantially under Stress Test 4.4. This sharp rise can be attributed to the increased financing or servicing costs of debt resulting from the surge in interest rates and the cost of financing post-disaster mitigation. On the other hand, overall, the ratios under the baseline scenario did not exceed the threshold and were slightly below the acceptable level. Finally, it can be established that Bangladesh is at medium risk of accumulating unsustainable debt obligations. A slight increase in interest rates, while accounting for loss and damage from climate change, drives up the PPG external debt service-to-exports ratio further past the threshold and generates greater risks for the

FIGURES 38–40 Effect of Increase in Variable Interest Rates on PPG External Debt Service-to-Revenue Indicator

Figure 38: PPG external debt service-to-revenue under 0.5 percent interest rate increase

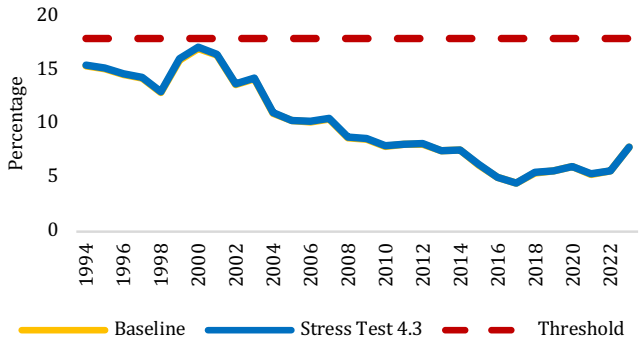


Figure 39: PPG external debt service-to-revenue under 0.5 percent interest rate increase compared with scenario 1

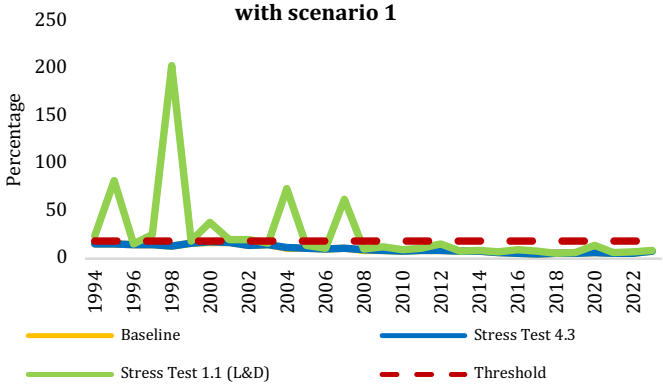
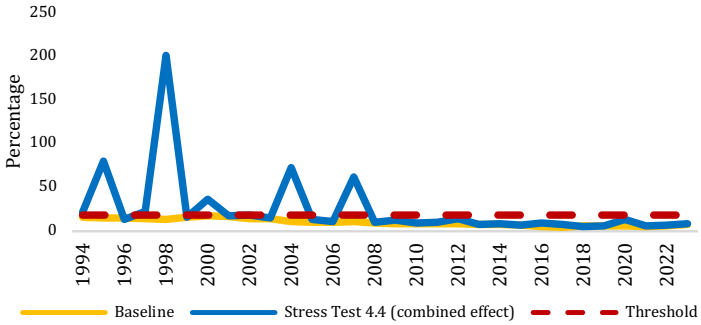


Figure 40: PPG external debt service-to-revenue under 0.5 percent interest rate increase and loss and damage stress test



Source: Compiled by authors based on data from the Economic Relations Division (ERD) and Bangladesh Economic Review (ERD 2023; MoF 2023).

country. Thus, a climate change shock will worsen the PPG external debt service-to-exports ratio and pull the country into a debt crisis.

The observation drawn from Figure 38 depicts that increasing the interest rate by 0.5 percent does not cause the ratio for PPG external debt service-to-revenue to breach the threshold. This is suggested by the curve under Stress Test 4.3. Furthermore, the values of the ratio under the stress test diverge slightly from the curve at the baseline level, which is why the curves intersect more or less at various points. It should also be noted that the curve at the baseline also does not cross the threshold. Like the PPG external debt service-to-exports ratio, this ratio also experienced a gradual decrease and then started climbing up in recent years. This leaves Bangladesh at a low debt risk. However, an impending debt crisis might still be a potential threat if appropriate measures are not employed.

To anticipate the possible risk of debt, the results from Stress Test 1.1 and Stress Test 4.3 for the PPG external debt service-to-revenue ratio have once again been compared, as done for all the other debt burden indicators. The effect of economic loss and damage generated by natural disasters worsens the PPG external debt service-to-revenue ratio significantly, causing it to rise exponentially to greater heights, as witnessed in Figure 39. The graph under Stress Test 1.1 experiences greater volatility when compared to the Stress Test 4.3 graph in Figure 36. Moreover, it crosses the threshold at almost every point in time. In years where it did not surpass the limit, it did, however, nearly converge with the threshold.

Much like all the other debt burden indicators, the erratic nature of the debt service-to-revenue ratio concerning economic loss and damage due to climate change creates a foundation for examining the combined effects of such loss and damage and raised interest rates. Figure 40 shows that the PPG external debt service-to-revenue ratio went beyond the sustainable level by a significant degree under Stress Test 4.4. This can be ascribed to the total loss and damage caused by natural calamities and the cost of tackling burgeoning interest rates. The ratio at the baseline level also went over the manageable level at specific points. However, the peaks were relatively negligible. Nevertheless, the ratio at the baseline did move close to the threshold in certain instances. Thus, it can be concluded that a simple nudge to the interest rate can drive the PPG external debt service-to-revenue ratio up to undesirable levels, given that the economic loss and damage owing to climate change is also accounted for. In addition, this reveals how vulnerable Bangladesh is regarding sustaining its external debt. It also emphasizes how an extra shock, such as climate change, can aggravate the situation and contribute to a higher debt burden, eventually becoming unsustainable for the country.

Nevertheless, it can be established that raising interest rates as high as 5 percent will not have a noteworthy impact on the solvency indicators of debt burden. However, if we factor in the consequences of a climate change shock, it will aggravate the ratios and might even force them to exceed the threshold, as in the case of the PV of PPG external debt-to-exports ratio. Likewise, the liquidity indicators of debt burden will remain almost unchanged when interest rates are increased. Unlike the solvency indicators, the liquidity indicators will have a more pronounced effect even at the baseline level. In addition to rising interest rates, incorporating climate change's economic loss and damage will drive both liquidity indicators past their threshold. Therefore, Bangladesh must improve and enhance its exports and government revenue. The government should develop better debt management strategies

to minimize the possibility of being dragged into a debt trap and prevent any imminent economic crisis. A summary of the findings above for Scenario 4 is provided in Table 9.

TABLE 9 Summary Table for Scenario 4

Scenario 4 A hypothetical setting that postulates a possible increase in external debt burden and external debt service payments owing to an increase in variable interest rates.		
Debt Burden Indicators	**Stress Tests**	**Findings**
PV of PPG external debt-to-GDP	*Stress Test 4.1:* An increase in external debt owing to the rise in variable interest rates on external debt.	Bangladesh's external debt-to-GDP ratio does not breach the threshold at either the baseline level or under Stress Test 4.1, indicating a low debt risk.
	Stress Test 4.2: The combined effect of an increase in external debt owing to the rise in variable interest rates and total damage incurred due to climate change.	Bangladesh's external debt-to-GDP ratio does not breach the threshold at either the baseline level or under Stress Test 4.2, indicating a low debt risk.
PV of PPG external debt-to-exports	*Stress Test 4.1:* An increase in external debt owing to the rise in variable interest rates on external debt.	Bangladesh's external debt-to-exports ratio does not breach the threshold at either the baseline level or under Stress Test 4.1, indicating a low debt risk.
	Stress Test 4.2: The combined effect of an increase in external debt owing to the rise in variable interest rates and total damage incurred due to climate change.	Bangladesh's external debt-to-exports ratio does not breach the threshold at either the baseline level or under Stress Test 4.2, indicating a low debt risk.
External debt service-to-exports	*Stress Test 4.3:* An increase in external debt service in proportion to the increase in variable interest rates.	The external debt service-to-exports ratio does not breach the threshold at either the baseline level or under Stress Test 4.3, indicating a low debt risk for Bangladesh.
	Stress Test 4.4: The combined effect of an increase in external debt service in proportion to the increase in variable interest rates and total damage incurred due to climate change.	The external debt service-to-exports ratio breaches the threshold under Stress Test 4.4 but not at the baseline level, indicating a medium debt risk for Bangladesh.
External debt service-to-revenue	*Stress Test 4.3:* An increase in external debt service in proportion to the increase in variable interest rates.	The external debt service-to-revenue ratio does not breach the threshold at either the baseline level or under Stress Test 4.3, indicating a low debt risk for Bangladesh.
	Stress Test 4.4: The combined effect of an increase in external debt service in proportion to the increase in variable interest rates and total damage incurred due to climate change.	The external debt service-to-revenue ratio breaches the threshold under Stress Test 4.4 but not at the baseline level, indicating a medium debt risk for Bangladesh.

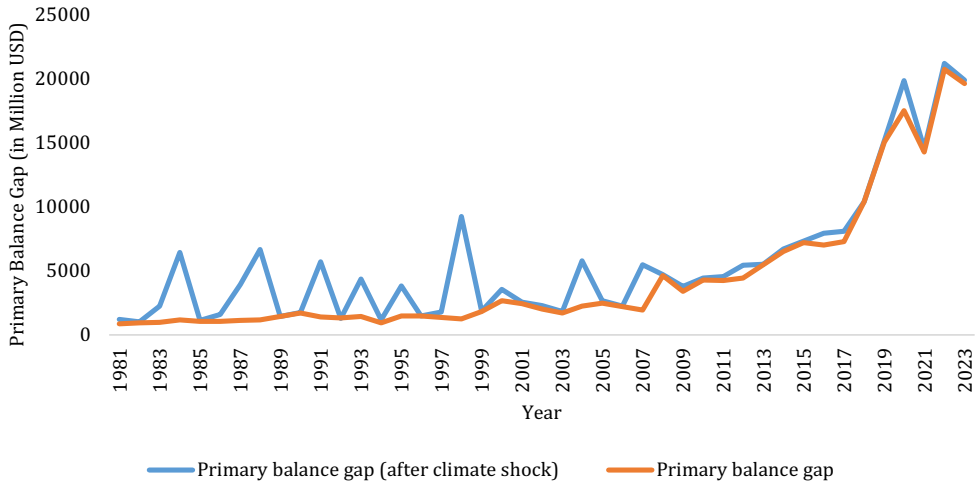
Source: Compiled by authors.

SUPPLEMENTARY FINDINGS FROM DEBT SUSTAINABILITY ANALYSIS USING DEBT STABILIZING PRIMARY BALANCE APPROACH

In order to evaluate Bangladesh's ability to manage its debt and minimize the consequences of climate change-induced natural catastrophes, the primary budget balance was calculated, which stabilizes debt, for the years 1981 to 2023. The government must maintain a primary balance surplus to pay off the debt or at least preserve a constant debt-to-GDP ratio over time, for a country to be able to service the debt. To ascertain whether the gap was positive, signaling an imminent debt crisis and demanding the prompt implementation of suitable policies, or negative, implying an economy with manageable levels of debt, the actual primary balance of the country was determined and compared with the debt-stabilizing level.

Figure 41 illustrates the primary balance gap of Bangladesh under the baseline scenario and the stress test scenario between the fiscal years 1981 and 2023. The peaks in the graph representing the primary balance gap followed by a shock highlight the impact of natural disasters on the fiscal outcomes. The gap widens as the government experiences a deteriorating primary budget balance or declining surplus that could be used to finance and sustain the debt incurred due to the shock. In comparison, the primary balance gap is less positive or smaller in the baseline scenario when no shocks were introduced since the government does not face any additional cost to relieve itself of the burden of newly accumulated debt due to any natural disaster related to loss and damage.

FIGURE 41 Primary Balance Gap, USD million

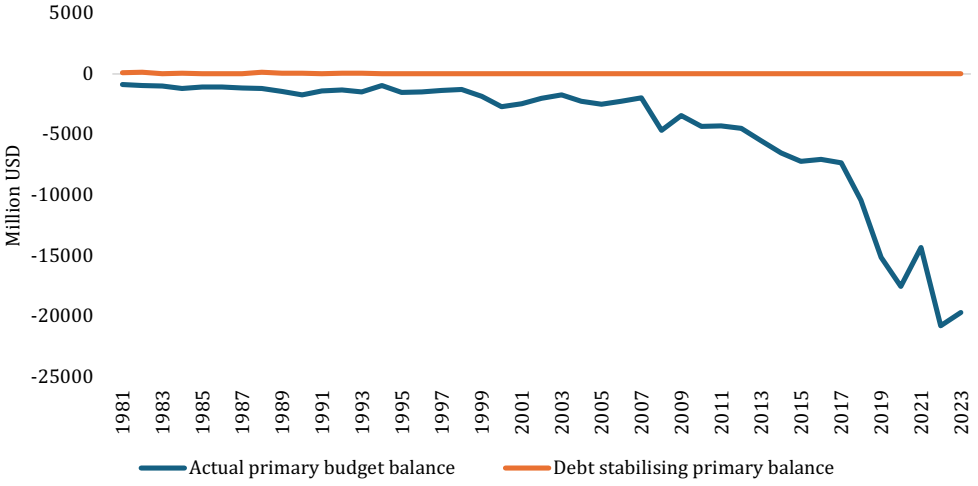


Source: Compiled by authors based on data from the Economic Relations Division (ERD) and Bangladesh Economic Review (ERD 2023; MoF 2023) and the International Monetary Fund Data Mapper (IMF 2021b).

Overall, the primary balance gap after the shock induced by climate change is greater than the gap under the baseline scenario. The economic damage and loss caused by climate change, the loans given to help with this damage and loss and the cost of paying for this debt all add to government spending, which makes the primary budget deficit bigger. As a

result, the actual primary budget balance drops below the debt-stabilizing balance, thereby expanding the primary balance gap or making it more positive. Nevertheless, while the primary balance gap remains almost constant under the baseline scenario between 1981 and 2007, the exponential growth in the primary balance gap under both the baseline and climate change shock scenarios between 2008 and 2023 is rather alarming. The sharp rise suggests that the primary budget balance is falling well below the debt-stabilizing level, indicating that it will become increasingly difficult for Bangladesh to sustain its debt, given its primary budget deficit is on the rise.

FIGURE 42 Primary Budget Balance, USD million, 1981-2023

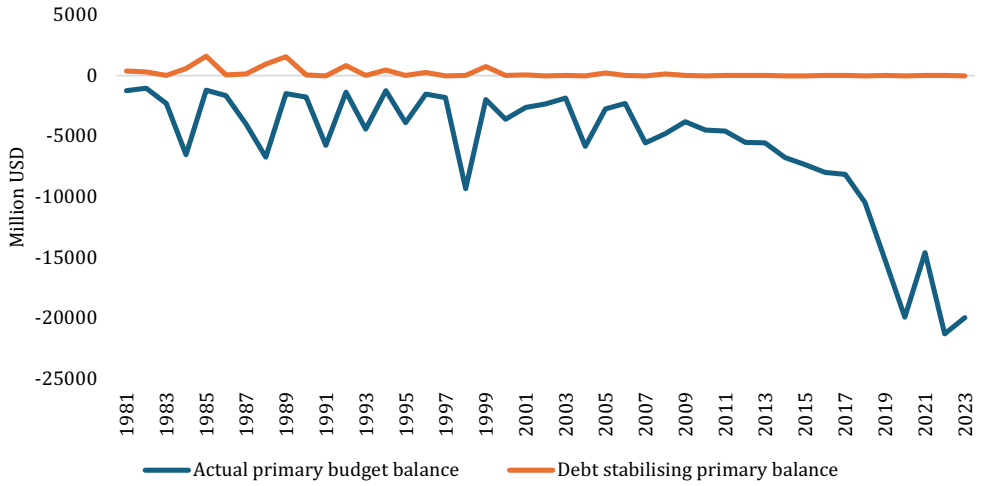


Source: Compiled by authors based on data from the Economic Relations Division (ERD) and Bangladesh Economic Review (ERD 2023; MoF 2023) and the International Monetary Fund Data Mapper (IMF 2021b).

Figure 42 captures the characteristics and state of Bangladesh's primary budget balance between 1981 and 2023. The graph also compares the actual primary budget balance with the debt-stabilizing primary balance to evaluate the country's debt sustainability. It can be observed that the actual primary balance has always been fairly below the debt-stabilizing primary balance. Additionally, it has always been negative, denoting a budget deficit. This deficit and the gap between the debt-stabilizing and the actual primary budget balance are anticipated to widen even further. This is alarming since the primary balance required to stabilize and sustain the debt must be in excess. Only a government that earns more than it spends can afford to pay off its debt without external assistance or incurring more debt. Even more concerning is that the actual primary balance underwent an exponential fall in 2009, which persisted for the next decade and plummeted to as low as -$20.8 billion in 2022.

A country grappling with a budget deficit faces a daunting challenge in financing or servicing its debt. Therefore, it must explore alternative strategies to alleviate its debt burden. The government may be relying on revenues from exports and remittances or seeking additional foreign and domestic aid to repay the debt. However, a country that relies solely on foreign borrowing risks becoming entangled in the vicious cycle of unsustainable debt. This underscores the gravity of the situation and the urgent need for action.

FIGURE 43 Primary Budget Balance After Climate Change Shock, USD million, 1981-2023



Source: Compiled by authors based on data from the Economic Relations Division (ERD) and Bangladesh Economic Review (ERD 2023; MoF 2023) and the International Monetary Fund Data Mapper (IMF 2021b).

Both the debt-stabilizing primary balance and the actual primary balance exhibit an almost identical trajectory after factoring in the shock triggered by climate change (Figure 43). Unlike the baseline scenario, there were more fluctuations in the actual primary balance in the shock scenario. This discrepancy can be explained by the economic loss and damage brought on by climate change. Government spending was raised to mitigate and recover from the loss and damage, thereby worsening the primary balance. Overall, the primary balances in both scenarios in recent years have fallen significantly short of the debt stabilizing level. This highlights the impracticality of Bangladesh settling its debt with the aid of its primary balance and reveals Bangladesh's vulnerability to climate change shocks. While the country cannot solely rely on its revenue to pay off its debt, Bangladesh cannot count on its primary balance in the current scenario. Therefore, the government must improve its primary balance to escape the spiralling debt burden.

DEBT SUSTAINABILITY ANALYSIS USING SUSTAINABLE TAX RATE

To maintain long-term debt sustainability, it is imperative to incorporate the concepts of a sustainable primary balance and sustainable tax rate. These macroeconomic factors are not only interrelated and mutually dependent on each other, but also influence and assist in identifying the sustainability level of the other. Repayment of a country's debt and increasing the probability of debt sustainability depend on its government's capacity to maintain a sizable primary balance surplus. Previously, it was observed how a debt-stabilizing primary balance was computed to determine the primary balance gap. Subsequently, the primary balance gap revealed whether the actual primary balance could maintain the current debt-to-GDP ratio's constant value indefinitely. Therefore, to minimize this gap and obtain the required primary balance, it is essential first to ascertain a tax rate that will facilitate the

generation of sufficient revenue. This, in turn, will enable the government to cover its expenditures and prevent the nation from falling into a budget deficit. This is primarily how these fiscal indicators are interconnected and work simultaneously to avoid debt accumulation.

The sustainable tax rate can be derived from the debt accumulation identity used in the DSPBA, which was given by,

$$b_t - b_{t-1} = (r - \theta)b_{t-1} - primary\ balance \quad (1)$$

$Where,$
$b = Debt\ to\ GDP\ Ratio$
$r = Real\ Interest\ Rate$
$\theta = GDP\ Growth\ Rate$

$$Primary\ balance = T - G - H \quad (2)$$

$Where,$
$T = Tax\ Revenue$
$G = Government\ Expenditure$
$H = Transfer\ Payments$

Dividing both sides of equation (2) by GDP to express each of the variables as a ratio of GDP provides equation (3),

$$Primary\ balance = t - g - h \quad (3)$$

$Where,$
$t = Current\ Tax\ Rate$
$g = Government\ Expenditure\ to\ GDP\ Ratio$
$h = Transfer\ Payments\ to\ GDP\ Ratio$

Incorporating equation (3) into equation (1) gives us equation (4),

$$\Delta b = (r - \theta)b - (t - g - h) \quad (4)$$

$Where,$
$\Delta b = Differnce\ between\ Debt\ to\ GDP\ Ratio\ in\ years\ t\ and\ t-1$

The sustainable tax rate is calculated by adding the primary balance to the product of the debt-to-GDP ratio and the difference between the ex-ante interest rate and growth rate, as shown in equation (5).

$$t^* - t_n = g + h - t + (r - \theta)b = d + (r - \theta)b \quad (5)$$

$where,$
$t^* = Sustainable\ Tax\ Rate$
$t_n = Tax\ Rate\ in\ Year\ n$
$t = Current\ Tax\ Rate$
$d = Primary\ Balance$

A fiscal policy is deemed sustainable if it leads to a gradual convergence of the debt-to-GDP ratio to its initial value (Blanchard et al. 1990). Therefore, it can be assumed that the difference between the debt-to-GDP ratios, Δb, gradually and eventually goes to zero as t moves toward infinity. Similarly, as n approaches infinity, t_n conv erges to t*.

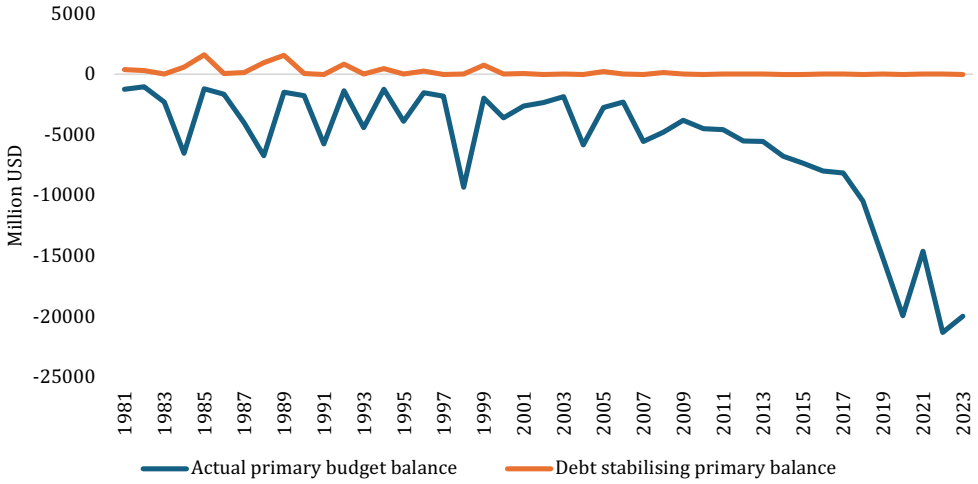
An unreasonably low level of tax revenue compared to expenditures may trigger deficits and growing debt. On the other hand, fairly high tax rates might hinder an economy's growth and efficiency by reducing investment and consumption and giving rise to tax evasion and capital flight. The optimum tax rate in Figure 44 is noticeably lower than the sustainable tax rate, hinting at a potential debt crisis in the future. Higher government spending compared to the limited tax revenue generated would result in budget deficits and rising debt.

While a tax rate gap is concerning, the degree of the consequences and the urgency of a correction plan varies with the level of t. Depending on the starting level of t, what a positive $t^* - t_n$ denotes will differ between countries (Blanchard, Chouraqui, Hagemann and Sartor 1990). A positive difference between t^* and t_n in a country with a small value of t will demand an adjustment at some point in time, whereas an already large value will hint at an impending crisis and pressure to monetize the debt and consider several repudiation possibilities (Blanchard, Chouraqui, Hagemann and Sartor 1990).

Tax revenues must be raised and expenditures will eventually be cut if the sustainable tax rate surpasses the existing tax rate. Governments must implement their fiscal policies in a way that guarantees a tax rate that supports the attainment of a debt-stabilizing and sustainable primary balance. By reconciling revenue and expenditures, debt obligations and ensuring sufficient finances, a government can alleviate its debt burden and afford to service its debt.

Figure 44 illustrates and compares the sustainable tax rates as well as the actual tax rates in Bangladesh over the years between 1980 and 2023. In contrast to the relatively steady trajectory of the actual tax rate, the sustainable tax rate exhibits recurrent fluctuations. These variations underscore the significance of different tax rates required to complement the fiscal conditions that are unique to each period. They highlight how the tax rates must adjust and align with the corresponding government expenditures, interest rates and debt-to-GDP

FIGURE 44 Tax Rate (Tax Revenue as a Percentage of GDP), 1980-2023



Source: Compiled by authors based on data from the Economic Relations Division (ERD) and Bangladesh Economic Review (ERD 2023; MoF 2023) and the International Monetary Fund Data Mapper (IMF 2021b).

ratios growing at the rate of $(r - \theta)$. Only then will the nation be able to climb out of a debt trap and sustain its debt levels. Bangladesh has been facing a great ordeal in maintaining a sustainable tax rate. The actual tax rates were noticeably lower than the sustainable rates and were hardly ever at the desirable levels. Furthermore, it can be noted that the gap between the tax rates has been widening even further in recent years, between 2022 and 2023. The prevailing tax rates will lead to inadequate revenue generation and make it more difficult for the government to cover its expenses. As a result, the primary balance will exacerbate and deepen the budget deficit. Finally, the nation will struggle with mounting debt that will become challenging to minimize or sustain.

This finding is consistent with what we have witnessed in the DSPBA and explains why the primary balance gap is rising. The fairly low tax rate, considerably below the sustainable amount, is unable to gather enough revenue to meet government expenditures. Thus, the primary balance is deteriorating and dramatically falling under the debt-stabilizing value. These findings warrant increased tax rates and/or reduced government spending to pull the country out of the budget deficit and halt the country's escalating external debt.

CONCLUSION AND RECOMMENDATIONS

Growing external debt significantly contributes to an economy's macroeconomic instability, with loans provided at variable interest rates posing a particularly substantial challenge. Over the last several years, there have been notable changes in Bangladesh's borrowing situation. There has been a transition from loans with concessional terms to loans with standard commercial terms. The major lending sources have shifted from multilateral to bilateral agreements. Furthermore, there has been a significant transition toward utilizing suppliers' credit. The proportion of variable interest rate loans, such as those linked to SOFR, EURIBOR and LIBOR, has been increasing. Moreover, there has been a transition towards stricter term loans, distinguished by shorter grace and maturity periods.

While an LDC such as Bangladesh is often compelled to go for foreign borrowing to finance its development needs, Bangladesh's ability to service its rapidly growing external debt is severely compromised by its low tax-GDP ratio. As a result, the government must use a substantial portion of its meager revenue to service its external debt, diverting funding from sectors that can enhance economic growth and human welfare, such as education, health and social protection. Thus, myopic and misguided external borrowing, combined with overall macroeconomic mismanagement, is pushing the country over the precipice of stability and into the dungeon of debt distress.

Bangladesh's debt sustainability issue is multifaceted. The country faces low foreign reserves and an adverse balance of payments situation, raising concerns regarding its ability to repay the large external debt accumulated in recent years. Although Bangladesh's debt sustainability has been considered manageable thus far, this perception may be tested as the repayment period for many of the accrued loans commences.

In addition, the threat of climate change poses numerous challenges. Bangladesh is susceptible to natural disasters, which have become more frequent and damaging due to climate



change. These calamities lead to significant economic loss, including loss of income and capital, especially for individuals residing in the most vulnerable segments of the population. Subsequently, this imposes an additional burden on the government, necessitating increased expenditure on the provision of resources to facilitate those affected by climate change, along with expenditure on adaptation and mitigation measures to enhance resilience against climate change. It is also important to underscore that there remains a substantial financing gap for climate change, which can only be met through increased external loans from bilateral and multilateral partners, increasing the country's debt distress in the long run. In this context, the paper emphasizes the following recommendations for policymakers:

(i) Enhanced methodologies are necessary to systematically collect consistent data on climate change's loss, damage and economic impact. Such data is crucial for making pragmatic assessments of the true economic effects of climate change, thereby aiding in the development of comprehensive policy toolkits. Additionally, this data is essential for effectively managing climate finance, ensuring that funds are appropriately disbursed to the most vulnerable and affected areas. Proper management of climate finance is crucial to ensure that external loans are utilized effectively to build resilience to climate change, reducing the need for additional borrowing. This will assist in maintaining financial stability for Bangladesh, potentially resulting in climate finance being provided on more concessional terms and thereby reducing the risk of debt distress.

(ii) Climate change indicators, especially those that include a valuation of total damage incurred due to climate change, must be incorporated when making projections about Bangladesh's debt sustainability. Such assessment will facilitate the construction of Bangladesh's profile of current and future risk of debt distress, closely mirroring the actual economic scenario. This will assist policymakers in formulating more effective debt management strategies, strengthening infrastructure and building institutional capacities to mitigate further incremental economic loss, ensuring Bangladesh's long-term economic and financial stability.

(iii) Economic loss and damage due to climate change puts Bangladesh at risk of failing to service its external debt obligations in the event of a large climate change-induced natural disaster, which requires immediate and substantial government funding support. Hence, Bangladesh should actively seek support from the Loss and Damage Fund, announced at the 28th UN Climate Change Conference (COP28). Furthermore, borrowings intended to mitigate environmental damage must be prudently managed to take advantage of the Loss and Damage Fund.

(iv) Climate finance should be provided as grants rather than loans. The findings from this study show that reclassifying climate loans as grants reduces the risk of debt distress for Bangladesh. Considering Bangladesh's substantial need for climate finance to effectively implement mitigation and adaptation measures, securing adequate funding through domestic resources is not feasible. As such, Bangladesh must rely on external loans. Providing these loans as grants would significantly reduce Bangladesh's debt burden while aiding the economy in addressing climate change risks. Even if exports decline due to the CBAM, debt burden indicators remain stable if climate loans are

converted into grants. Reclassifying climate loans as grants would enhance the country's preparedness for future shocks while ensuring financial stability.

(v) Full implementation of the CBAM by the EU may pose significant threats to Bangladesh's debt sustainability in the coming days. Urgent and proactive steps are required to reduce emissions and ensure the resilience of Bangladesh's exports in the face of the CBAM. To prepare for the imposition of the CBAM and similar measures from other trading partners, the government must formulate national emissions measurement, reporting and verification policies for every sector. Such policies should include quantitative mitigation targets for each industry so that environmental responsibility and adherence to international standards enable exporters to preserve their competitive advantage.

(vi) Variable interest rate loans in Bangladesh's external borrowing portfolio pose an exceptionally high risk for the country. This study's findings show that even a 0.5 percent increase in the interest rate on these loans could create serious liquidity problems for Bangladesh, especially when juxtaposed with economic loss and damage due to climate change-induced natural disasters. To avoid such risks escalating further, Bangladesh must refrain from taking any more external loans with variable interest rates attached.

(vii) Bangladesh's poor domestic resource mobilization record implies its primary budget deficit is rising, making it increasingly challenging to service future external debt repayments without taking on new external debt. Bangladesh must urgently and vigorously increase its tax revenue collection, expand its tax base, improve tax compliance and reduce illicit financial outflows to prevent falling into debt traps and vicious cycles of perpetual indebtedness.



REFERENCES

Ayres, Joao, Marcio Garcia, Diogo Guillen and Patrick Kehoe. 2019. *The Monetary and Fiscal History of Brazil, 1960-2016*. Inter-American Development Bank (IDB). doi:10.18235/0001672

Baldacci, Emanuele and Kevin Fletcher. 2004. "A Framework for Fiscal Debt Sustainability Analysis in Low-Income Countries." In *Helping Countries Develop: The Role of Fiscal Policy*. International Monetary Fund (IMF). https://www.imf.org/external/pubs/nft/2004/hcd/index.htm

Bangladesh Bank. 2023. *Foreign Direct Investment and External Debt*. https://www.bb.org.bd//pub/halfyearly/fdisurvey/fdisurveyjuldec2023.pdf

Bangladesh Bank. 2023. https://www.bb.org.bd/en/index.php/econdata/index

Bangladesh Bureau of Statistics (BBS). 2016. *Bangladesh Disaster-related Statistics 2015: Climate Change and Natural Disaster Perspectives.* Dhaka: Bangladesh Bureau of Statistics. http://nsds.bbs.gov.bd/en/posts/184/Bangladesh%20Disaster-related%20Statistics%202015:%20Climate%20Change%20and%20Natural%20Disaster%20Perspectives

BBS. 2022. *Bangladesh Disaster-related Statistics 2021: Climate Change and Natural Disaster Perspectives.* Dhaka: Bangladesh Bureau of Statistics (BBS). http://nsds.bbs.gov.bd/en/posts/98/Bangladesh%20Disaster-related%20Statistics%20BDRS%202021%20Climate%20Change%20and%20Natural%20Disaster%20Perspectives

Bello, Walden. 1999. "The Asian financial crisis: Causes, dynamics, prospects." *Journal of the Asia Pacific Economy* 4(1): 33-55. doi:10.1080/13547869908724669

Bhattacharya, Debapriya and Zeeshan Ashraf. 2018. "Is Bangladesh Rolling towards Debt Stress? An Exploration of Debt Sustainability in the Context of Recent External Financial Flows." *South Asian Journal of Macroeconomics and Public Finance* 7(2): 137-173. doi:https://doi.org/10.1177/2277978718795755

Blanchard, Olivier J., Jean-Claude Chouraqui, Robert Hagemann and Nicola Sartor. 1991. "The Sustainability of Fiscal Policy: New Answers to an Old Question." NBER Working Paper No. R1547. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=227461

Blanchard, Olivier J., Jean-Claude Chouraqui, Robert Hagemann and Nicola Sartor. 1990. "The sustainability of fiscal policy: New answers to an old question." *OECD Economic Studies* 30. https://www.oecd.org/tax/public-finance/34288870.pdf

Braun, Miguel. 2006. "The Political Economy of Debt in Argentina, or Why History Repeats Itself." https://www.semanticscholar.org/paper/The-Political-Economy-of-Debt-in-Argentina-%2C-or-Why-Braun/3148be887f4a6eae0d9794e32384763754ed54da

Buiter, W. H., T. Persson and P. Minford. 1985. "A guide to public debts and deficits." *Economic Policy* 1(1): 13-79. https://doi.org/10.2307/1344612

Bull, Benedicte and Antulio Rosales. 2020. "The crisis in Venezuela: Drivers, transitions, and pathways." *European Review of Latin American and Caribbean Studies* 109: 1-20. doi:10.2307/26936900

Cabral, René, Ernesto del Castillo and Fausto Hernández-Trillo. 2021. "The sustainability of subnational public debt: Evidence from Mexican states." *Regional & Federal Studies* 32(5): 593-615. doi:10.1080/13597566.2021.1912739

Ha-Joon Chang. 1998. "Korea: The misunderstood crisis." *World Development* 26(8): 1555-1561. doi:10.1016/S0305-750X(98)00057-6

Corsetti, Giancarlo. 2018. *Debt Sustainability Assessments: The state of the art.* European Union. https://www.europarl.europa.eu/RegData/etudes/STUD/2018/624430/IPOL_STU(2018)624430_EN.pdf

Dey, Sima Rani and Mohammad Tareque. 2020. "External debt and growth: role of stable macroeconomic policies." *Journal of Economics, Finance and Administrative Science* 25(50): 185-204. https://doi.org/10.1108/JEFAS-05-2019-0069

Di Bella, Gabriel. 2008. "A Stochastic Framework for Public Debt Sustainability Analysis." IMF Working Paper No. 2008/058. https://www.imf.org/en/Publications/WP/Issues/2016/12/31/A-Stochastic-Framework-for-Public-Debt-Sustainability-Analysis-21763

Ebi, Bassey Okon and Imoke Douglas Imoke. 2017. "Public Debt Carrying Capacity and Debt Transmission Channels: The Nigerian Experience." *International Journal of Economics and Financial Issues* 7(5): 41-52. https://www.econjournals.com/index.php/ijefi/article/view/5293

Eckstein, David, Vera Künzel and Laura Schäfer. 2021. *Who suffers Most from Extreme Weather Events? Weather-related Loss Events in 2019 and 2000 to 2019.* GermanWatch. https://www.germanwatch.org/sites/default/files/Global%20Climate%20Risk%20Index%202021_2.pdf

Economic Relations Division. 2023. *Flow of External Resources into Bangladesh.* Ministry of Finance. http://www.erd.gov.bd/site/page/01eb3c58-af92-400d-98f0-f8737d386a65

EM-DAT. 2023. *EM-DAT: The International Disaster Database*. https://www.emdat.be/

EU. 2023. *Regulation (EU) 2023/956 of the European Parliament and of the council.* Official Journal of the European Union. http://data.europa.eu/eli/reg/2023/956/oj

Fitch Ratings. 2024. *Rating Report: Bangladesh*. https://www.fitchratings.com/research/sovereigns/bangladesh-17-06-2024#:~:text=Ratings%20Downgraded%2C%20Outlook%20Stable:%20The%20downgrade%20to,Bangladesh's%20external%20buffers%2C%20which%20could%20prove%20chall

General Economics Division (GED), Bangladesh Planning Commission. 2017b. *SDGs Financing Strategy: Bangladesh Perspective.* https://pksf.org.bd/wp-content/uploads/2018/11/2.-SDGs-Financing-Strategy-Bangladesh-Perspective.pdf

Global Rates. 2024. *LIBOR Interest Rates*. https://www.global-rates.com/en/interest-rates/libor/

Hasan, Zubair. 2002. "The 1997-98 Financial Crisis in Malaysia: Causes, Response, and Results." *Islamic Economic Studies* 9(2). https://ssrn.com/abstract=3164245

Heinrich Böll Stiftung. 2019. *Climate Funds Update: Data Dashboard*. https://climatefundsupdate.org/data-dashboard/

Hong, Harrison, G. Andrew Karolyi and José A Scheinkman. 2020. "Climate Finance." *The Review of Financial Studies* 33(3): 1011–1023. doi:10.1093/rfs/hhz146

IMF. 2015. "Exchange Rates and Trade Flows: Disconnected?" In *World Economic Outlook: Adjusting to Lower Commodity Prices.* https://www.imf.org/en/Publications/WEO/Issues/2016/12/31/Adjusting-to-Lower-Commodity-Prices

IMF. 2017. *Guidance note on the bank-fund debt sustainibility framework for low income countries.* https://www.imf.org/en/Publications/Policy-Papers/Issues/2018/02/14/pp122617guidance-note-on-lic-dsf

IMF. 2017. *Review of the Debt Sustainability Framework for Low Income Countries: Proposed Reforms.* https://www.imf.org/en/Publications/Policy-Papers/Issues/2017/10/02/pp082217LIC-DSF



IMF. 2018. *Guidance Note on the Bank-Fund Debt Sustainability Framework for Low Income Countries.* https://www.imf.org/en/Publications/Policy-Papers/Issues/2018/02/14/pp122617guidance-note-on-lic-dsf

IMF. 2021a. *Debt Sustainability Analysis for Market-Access Countries.* https://www.imf.org/external/pubs/ft/dsa/mac.htm

IMF. 2021b. *IMF Data Mapper*. https://www.imf.org/external/datamapper/profile/BGD

IMF. 2024. *Country Report No. 2024/186.* https://www.imf.org/en/Publications/CR/Issues/2024/06/24/Bangladesh-Second-Reviews-Under-the-Extended-Credit-Facility-Arrangement-and-the-550944

Islam, Md. Ezazul and Bishnu Pada Biswas. 2005. "Public Debt Management and Debt Sustainability in Bangladesh." *The Bangladesh Development Studies* 31(1/2): 79-102. https://www.jstor.org/stable/40795703

Kouretas, Georgios P. and Prodromos Vlamis. 2010. "The Greek Crisis: Causes and Implications." *Panoeconomicus* 57(4). doi:10.2298/PAN1004391K

Kraay, Aart and Vikram Nehru. 2006. "When Is External Debt Sustainable?" *The World Bank Economic Review* 20(3): 341–365. doi:10.1093/wber/lhl006

Kraemer, Moritz and Ulrich Volz. 2022. *Integrating Nature into Debt Sustainability Analysis.* Finance for Biodiversity and SOAS Centre for Sustainable Finance. https://eprints.soas.ac.uk/37715/1/NatureDSA.pdf

Laeven, Luc and Fabián Valencia. 2013. "Systemic Banking Crises Database." *IMF Economic Review* 61(2): 225–270. https://link.springer.com/article/10.1057/imfer.2013.12

Makrydakis, Stelios, Elias Tzavalis and Athanassios Balfoussias. 1999. "Policy regime changes and the long-run sustainability of fiscal policy: an application to Greece." *Economic Modelling* 16(1): 71-86. doi:10.1016/S0264-9993(98)00026-1

Maldonao, Franco and Kevin P. Gallagher. 2022. *Climate Change and IMF Debt Sustainability Analysis.* Boston University Global Development Policy Center. https://www.bu.edu/gdp/files/2022/02/TF_WP_005_FIN.pdf

Ministry of Finance (MoF), Bangladesh. 2024. *Budget*. https://mof.gov.bd/site/view/budget_mof/%E0%A7%A8%E0%A7%A6%E0%A7%A8%E0%A7%A9-%E0%A7%A8%E0%A7%AA/%E0%A6%AC%E0%A6%BE%E0%A6%9C%E0%A7%87%E0%A6%9F%E0%A7%87%E0%A6%B0%20%E0%A6%B8%E0%A6%82%E0%A6%95%E0%A7%8D%E0%A6%B7%E0%A6%BF%E0%A6%AA%E0%A7%8D%E0%A6%A4%E0%A6%B8%E0

Moody's. 2023. "Moody's downgrades Bangladesh's ratings to B1, outlook stable." https://www.moodys.com/research/Moodys-downgrades-Bangladeshs-ratings-to-B1-outlook-stable-Rating-Action--PR_475907#Read-Next

Nasution, Anwar. 1998. "The Meltdown of the Indonesian Economy in 1997-1998: Causes and Responses." *Journal of Economics* 11(4): 447-482. https://hdl.handle.net/10371/1143

OECD. 2023a. *Arrangement on Officially Supported Export Credits.* https://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-5005#relatedInstruments

OECD. 2023b. *Commercial Interest Reference Rates (CIRRs).* https://www.oecd.org/trade/topics/export-credits/documents/cirrs.pdf

Ozaki, Mayumi. 2016. "Disaster Risk Financing in Bangladesh." Asian Development Bank (ADB) South Asia Working Paper Series No. 46. https://www.adb.org/sites/default/files/publication/198561/sawp-046.pdf

Polga-Hecimovich, John. 2019. "Bureaucratic politicization, partisan attachments, and the limits of public agency legitimacy: The Venezuelan armed forces under chavismo." *Latin American Research Review* 54(2): 476–498. doi:10.25222/larr.142

Purcell, Thomas F. and Estefania Martinez. 2018. "Post-neoliberal energy modernity and the political economy of the landlord state in Ecuador." *Energy Research & Social Science* 41: 12-21. doi:10.1016/j.erss.2018.04.003

Rasiah, Rajah. 1998. "The Malaysian financial crisis: Capital expansion, cronyism and contraction." *Journal of the Asia Pacific Economy* 30(3): 358–378. doi:10.1080/1354786980

Rasiah, Rajah. 2000a. *From dragons to dwarfs: Reexamining neo-liberal explanations of the Southeast Asian financial crisis.* Institut for Historie, Internationale Studier og Samfundsforhold, Aalborg Universitet. https://vbn.aau.dk/ws/files/33248801/workingpaper_84.pdf

Rasiah, Rajah. 2000b. "International portfolio equity flows and the financial crisis in Malaysia." *Journal of Contemporary Asia* 30(3): 369–401. doi:10.1080/00472330080000281

Rosales, Antulio. 2016. "Deepening extractivism and rentierism: China's role in Venezuela's Bolivarian developmental model." *Canadian Journal of Development Studies* 37(4): 1-18. doi:10.1080/02255189.2016.1208605

S&P Global. 2024. *Bangladesh Long-Term Ratings Lowered To 'B+' On Elevated External Vulnerabilities; Outlook Stable*. https://disclosure.spglobal.com/ratings/en/regulatory/article/-/view/type/HTML/id/3222184

Stiglitz, Joseph E. 2002. "The East Asia Crisis: How IMF Policies Brought the World to the Verge of a Global Meltdown." In *Globalization and Its Discontents.* doi:ISBN 0-393-05124-2

Trillo, Fausto Hernández, Cayeros, Alberto Díaz and Rafael Gamboa González. 2020. *Fiscal Decentralization in Mexico: The Bailout Problem.* Inter-American Development Bank (IDB). https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1814706

Weisbrot, Mark and Jake Johnston. 2012. *Venezuela's Economic Recovery: Is it Sustainable?* Center for Economic and Policy Research (CEPR). https://cepr.net/report/venezuelas-economic-recovery-is-it-sustainable/#:~:text=Venezuela's%20current%20growth%20is%20generally,and%20balance%20of%20payments%20crises

Wyplosz, Charles. 2005. "Debt Sustainability Assessment: The IMF Approach and Alternatives." *Graduate Institute of International Studies* 35. https://repec.graduateinstitute.ch/pdfs/Working_papers/HEIWP03-2007.pdf

Wyplosz, Charles. 2007. "Debt Sustainability Assessment: The IMF Approach and Alternatives." Graduate Institute of International Studies IHEID Working Paper 03/2007. https://repec.graduateinstitute.ch/pdfs/Working_papers/HEIWP03-2007.pdf

Yap, Josef T., Janet S. Cuenca and Cecilia M. Reyes. 2009. "Impact of the Global Financial and Economic Crisis on the Philippines." Philippine Institute for Development Studies (PIDS) Discussion Paper Series No. 2009-30. https://www.econstor.eu/handle/10419/126792



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