Currencies under pressure

How currency fluctuations and climate risks impact debt sustainability in SIDS and LDCs

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ALL ACT

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About ALL ACT

ALL ACT is an initiative working to optimise existing finance, expertise and delivery mechanisms to support agile responses to loss and damage, led by communities made vulnerable by climate change.

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Small Island Developing States (SIDS) and least developed countries (LDCs) are facing growing debt burdens, as volatile exchange rates, amplified by climate shocks, inflate the cost of servicing external debt. These pressures are diverting critical resources away from development priorities and social protection, reinforcing cycles of vulnerability. This paper quantifies the economic impact and outlines practical solutions to mitigate debt distress and promote resilient, equitable growth. These solutions include debt restructuring, local currency financing and trade, and global financial reforms.

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Foreword by His Excellency Prime Minister Gaston Browne of Antigua and Barbuda

Small Island Developing States (SIDS) like ours are facing a perfect storm: worsening climate shocks, rising debt burdens and volatile currency markets we do not control. This paper makes clear that the hidden costs of repaying debt in foreign currencies, especially during times of crisis, is a silent drain on our economies. For every dollar lost to currency depreciation, there is a clinic not built, a road not repaired, a social protection programme left underfunded.

As Co-Chair of the Debt Sustainability Support Service (DSSS), I am committed to taking this issue to the highest levels of international decision making. The current global financial architecture places an unfair burden on the most vulnerable. It creates structural barriers to investment in resilience, adaptation and long-term development. This must change.

The analysis presented in this paper provides an urgent and credible foundation for action. From restructuring past debt to enabling lending in local currencies, we now have the evidence to advance reforms that are fair, feasible and necessary. I commend the authors for shining a light on this critical issue and call on our global partners to join us in reshaping the rules so they work for those who need them most.

Hon. Gaston Browne

Prime Minister of Antigua and Barbuda
Co-Chair, Debt Sustainability Support Service (DSSS)

Abbreviations

BIS	Bank for International Settlements
COP	Conference of Parties
DSSS	Debt Sustainability Support Service
ECLAC	United Nations Economic Commission for Latin America and the Caribbean
FAO	Food and Agriculture Organization of the United Nations
FDI	Foreign direct investment
FfD4	4th International Conference on Financing for Development
G20	Group of Twenty
GDP	Gross domestic product
IFC	International Finance Corporation
ILO	International Labour Organization
IMF	International Monetary Fund
IPCC	Intergovernmental Panel on Climate Change
LCU	Local currency unit
LDCs	Least developed countries
OECD	Organization for Economic Co-operation and Development
RBA	Reserve Bank of Australia
SDGs	Sustainable Development Goals
SDRs	Special Drawing Rights
SIDS	Small Island Developing States
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UNDRR	United Nations Office for Disaster Risk Reduction
UNFCCC	United Nations Framework Convention on Climate Change
UNWTO	United Nations World Tourism Organization

Summary

Currency, the medium that facilitates trade and measures economic value, has evolved from tangible commodities like gold and cowrie shells, valued for their scarcity and durability, to fiat money, backed not by physical assets but by governmental decree. Over time, this transformation paved the way for the United States dollar to emerge as the preeminent global currency, a status bolstered by the US's economic might, political stability and the petrodollar system, which links oil trade to dollars and forces nations to hold dollar reserves.

For the least developed countries (LDCs) and Small Island Developing States (SIDS), this reliance on US dollars for debt and trade is a critical vulnerability. Their fragile economies, often battered by climate disasters, suffer disproportionately from exchange rate volatility — fluctuations in currency value driven by global markets and local disruptions. This paper explores these dynamics, quantifying their economic consequences and proposing actionable strategies to mitigate heightened debt burdens.

Climate disasters as catalysts of currency instability

Climate disasters disproportionately impact SIDS and LDCs, with greater frequency and severity compared to developed countries, and this burden directly undermines their currency stability. Between 1990 and 2021, developed countries recorded an average disaster intensity of 0.34, measured on a scale reflecting disaster frequency and impact. This figure was far surpassed by SIDS and LDCs. During the same period, SIDS endured an average disaster intensity of 1.02 and LDCs 0.87. Climate disasters disrupt lives and economies on a massive scale, affecting 3.81% of SIDS' populations and 2.99% of LDCs' annually, compared to just 0.99% in other countries.

The annual economic damages from climate shocks average 1.81% of gross domestic product (GDP) in SIDS, against 0.24% in LDCs and 0.37% in other countries. There is a clear link between climate disasters and currency depreciation. A regression analysis across four SIDS and six LDCs from 1992 to 2020 further confirmed that higher climate vulnerability significantly drives depreciation, with a 1-unit increase in the ND-GAIN Vulnerability Index[1] associated with a 65% higher exchange rate.

Economic consequences of floating and pegged exchange rate systems

The economic fortunes of countries hinge on how they manage their currencies, with the two exchange rate systems, floating and pegged, presenting distinct challenges. In the floating exchange rate system, currency values fluctuate with market forces, shaped by trade balances, investment flows and external shocks like climate disasters, offering adaptability but exposing countries to volatility. For SIDS using this model, average exchange rates escalated 264.68% (from 31.64 to 115.38) between 1991 and 2022, while LDCs saw an average 366.36% rise (12.17 to 56.74), driving up the cost of servicing their debts. The pegged system, conversely, fixes a currency to a stable currency like the US dollar, requiring central banks to maintain large reserves and intervene by buying or selling dollars to ensure stability, which limits monetary flexibility but curbs wild swings. In the Bahamas, this approach saw debt climb 775% between 1991 and 2021, with reserves up 1,150% to defend a 1:1 US dollar peg. These contrasting systems create a shared struggle: whether through volatile depreciation under the floating system or the need to maintain reserves under the pegged system, SIDS and LDCs face mounting debt and constrained fiscal space, exacerbated by climate change pressures.

The financial toll of currency depreciation

Currency depreciation places a severe financial burden on SIDS and LDCs, with losses accumulating over decades and diverting critical resources. By 2022, SIDS faced average annual exchange-related losses of US$2.43 billion and LDCs saw average losses of

1 A country's ND-GAIN score is composed of a vulnerability score and a readiness score. While in the overall GAIN index, a higher value is better, for the vulnerability index, a lower value is better. Please refer to https://gain.nd.edu/our-work/country-index/methodology. We have used the vulnerability index for our analysis.

US$11.63 billion, amounting to US$27 billion per SIDS and US$68 billion per LDC over 1991–2022, totalling US$4,066 billion across 39 SIDS and 44 LDCs.

On debt servicing alone, SIDS incurred an average annual loss of US$682 million per country in 2022, while LDCs lost US$1.98 billion per country, totalling US$2.66 billion. Cumulative debt servicing losses reached US$10.25 billion per SIDS and US$9.98 billion per LDC by 2022.

LDCs' annual exchange loss as a percentage of GDP grew from 3.02% in 1992 to 27.1% in 2022, with debt servicing losses rising from 0.55% to 6.62%. For SIDS, this increased from 4.37% to 10.07%, with debt servicing losses growing from 2.4% to 3%.

Even a 5% depreciation adds US$14.8 million in annual debt servicing losses per SIDS and US$17.8 million per LDC, underscoring the significant impact of modest currency shifts. For example, Jamaica (SIDS) paid an additional US$900.23 million annually on debt, contributing to an 18.80% GDP loss, with cumulative losses of US$11,419.23 million over the period 1991–2022. Mozambique (LDC) paid US$5,716.52 million more yearly, adding to a 32.12% GDP loss, totalling US$10,047.63 million over the period 1991–2022.

The additional debt servicing costs due to currency fluctuations far exceed their social protection spending. Low-income countries, encompassing LDCs and most SIDS, allocate an average of just 1.1% of GDP to social protection compared to 16.4% in high-income countries (International Labour Organization (ILO), 2021). By redirecting the costs tied to currency depreciation, LDCs could increase their social protection spending to 7.7% of GDP and SIDS to 3.13%, strengthening safety nets and supporting progress toward the Sustainable Development Goals (SDGs) and climate resilience.

These figures reveal a systemic crisis, where depreciation diverts vast sums from critical investments to servicing external obligations.

Factors driving currency fluctuations

The drivers of this currency instability are rooted in structural vulnerabilities, as shown by the regression analysis we did for this study. In floating systems, where market-driven volatility prevails, key trends emerge: a 1% increase in spending on debt servicing amplifies exchange loss by 0.54%, a 1% rise in net imports by 0.74% and a 1-unit depreciation by 0.12%[2]. Modest GDP growth offers a slight buffer. In pegged systems, stability depends on reserves, with tourism receipts boosting them by 0.329 per million US dollars and debt stock by 0.0508[3], while trade balances and investment show minimal impact. These findings highlight a perilous cycle: dependence on US dollar debt and imports, intensified by reliance on climate-sensitive sectors, leaves SIDS and LDCs acutely exposed, with limited capacity to counteract pressures.

Strategies for mitigating currency risk and reforming international financial architecture

To address this crisis, we propose a comprehensive five-pronged strategy. Each recommendation addresses a specific dimension of the challenge:

- Expanding the Debt Sustainability Support Service (DSSS) and operationalising a holistic debt restructuring mechanism that accounts for the loss incurred by countries due to currency fluctuations.
- Promoting local currency lending by encouraging international financial institutions to offer loans in local currencies, shifting exchange rate risk to lenders and fostering domestic financial stability.
- Converting US dollar debt to local currencies by renegotiating existing US dollar-denominated debt into local currency obligations to safeguard countries from currency depreciation impacts and free up fiscal resources for development rather than repayment.
- Encouraging trade in local currencies through bilateral or regional trade agreements to settle transactions in local currencies, reducing US dollar reliance, cutting transaction costs and stabilising trade balances.
- Advocacy for global financial reform at forums such as the 4th International Conference on Financing for Development (FfD4), Group of Twenty (G20) and Conference of Parties (COP) of the United Nations Framework Convention on Climate Change (UNFCCC) for systemic changes, including a multidimensional vulnerability index for aid eligibility, increased Special Drawing Rights (SDRs)[4] allocations and fairer International Monetary Fund (IMF)/World Bank Group governance to address inequities.

These measures collectively aim to restore fiscal flexibility, reduce exposure to currency volatility and enhance resilience against climate and economic shocks. By implementing these strategies, SIDS and LDCs can shift from a cycle of debt and instability to one of resilience and progress, ensuring their economic future is not dictated by the whims of global markets or climate impacts.

2 $R^2 = 0.9635$

3 $R^2 = 0.6777$

4 The International Monetary Fund's SDRs are an international reserve asset created to supplement member countries' official reserves, helping to stabilise global liquidity. SDRs are not a currency but can be exchanged among IMF members for freely usable currencies in times of need.

1

Introduction

1.1 Understanding currency and its evolution

The evolution of currency over the centuries has progressed through distinct phases. Early societies used commodity money, like gold, silver or cowrie shells, valued for their inherent properties, such as scarcity and durability. As economies expanded by the Middle Ages, the inconvenience of transporting heavy metals and other commodities led to representative money, paper notes or coins redeemable for gold or silver held in reserve. This system persisted until the 20th century, when most currencies became 'fiat money', valued by government decree and public trust rather than physical backing (Mishkin, 2016). A US$10 note, for example, is legal tender because the US government declares it so, not because it can be swapped for gold. While modern alternatives like Bitcoin, a decentralised digital currency, have emerged, state-backed currencies remain dominant (Bank for International Settlements (BIS), 2021).

How is currency value determined and why does the US dollar dominate?

The value of a currency is established through exchange rates, which indicate the rate at which one currency can be traded for another, such as how many Euros equal one US dollar. This valuation occurs within the foreign exchange (forex) market, a vast global marketplace where banks, corporations and governments exchange currencies daily (Reserve Bank of Australia (RBA), no date). Exchange rates fluctuate based on the balance between demand for a currency and its available supply (RBA, no date). Historically, from the 1870s to the 1930s, many nations adhered to the gold standard, pegging their currency's value to a fixed quantity of gold. The United Kingdom, for instance, guaranteed that UK£1 corresponded to a specific gold weight, ensuring stable exchange rates between gold-based economies (Eichengreen, 2008). Following World War II, the Bretton Woods Agreement of 1944 transitioned currency valuation from a direct gold peg to a system where global currencies were pegged to the US dollar, itself tied to gold at US$35 per ounce, positioning the US dollar as the foundation for international finance (Bordo and Eichengreen, 1993). In 1971, during an event known as the Nixon Shock, the US dollar's direct link to gold was severed, allowing currencies to float freely based on market dynamics rather than fixed standards, marking the beginning of the modern era of currency valuation (Eichengreen, 2008).

Despite the collapse of Bretton Woods, the US dollar retained its global dominance. This was underpinned by the substantial economic weight of the US, which accounts for a significant share of global GDP, as well as by its political stability and highly developed financial markets, particularly those on Wall Street, where vast sums are traded in stocks, bonds and currencies (McCauley and Schenk, 2020). The US dollar's global influence is reinforced by the petrodollar system, under which oil prices are set in US dollars, compelling countries to hold dollars for energy transactions (Tran, 2024). The US dollar also functions as a 'safe haven' currency during crises. For example, during the 2008 financial downturn, investors turned to the US dollar for stability (McCauley and Schenk, 2020). As of 2021, a significant portion of global foreign exchange reserves — funds countries hold for economic security — were in US dollars, far surpassing other major currencies like the euro or Japanese yen (IMF, 2021a). In addition, the US dollar is the preferred currency for international debt and commodity transactions, cementing its central role in the global economic system (Gopinath and Stein, 2020).

1.2 Dynamics of exchange rates: mechanisms and country adaptations

Several factors drive the value of a country's currency in the international forex market. Higher interest rates in a country attract foreign investments from investors

seeking better returns. For instance, if Canada raises rates on its bonds, investors buy Canadian dollars to invest, increasing demand and the currency's value (Krugman and Obstfeld, 2009). Increased prices diminish a currency's purchasing power. If South Africa's inflation outpaces that of its trading partners, the rand weakens as it buys fewer goods abroad, raising import costs (RBA, no date). Strong economic performance, evidenced by rising production or employment, draws investment. South Korea's rapid industrialisation in the 1990s, for example, bolstered the Korean won as foreign firms funded its expansion (Kim and Hwang, 2000). A trade surplus generated by exporting more than importing, such as Norway's surplus due to its oil exports, increases demand for its currency, the krone, as buyers convert their money to pay Norwegian sellers, while a deficit exerts the opposite effect (Krugman and Obstfeld, 2009). Political and economic stability also play a role, with instability reducing investor confidence. For example, the political upheaval in Ukraine during 2021 lowered demand and devalued the hryvnia (IMF, 2021b).

Countries respond to these dynamics through two primary exchange rate systems. In a floating exchange rate regime, the currency's value is determined by market forces (RBA, no date). Alternatively, a fixed (pegged) exchange rate system anchors a currency to a more stable one, often the US dollar. Belize, for example, maintains a 2:1 peg to the US dollar while Qatar ties its riyal to the US dollar at the rate of 3.64:1 (IMF, 2024). Pegging fosters stability, aiding trade and investment predictability, but requires governments to maintain significant reserves of the anchor currency to defend the peg against market pressures, limiting monetary autonomy (RBA, no date). For example, Belize cannot freely adjust interest rates to curb inflation without aligning with US policy (RBA, no date). Many countries blend these approaches by using a managed float, whereby the currency floats but central banks intervene to temper extreme fluctuations. Thailand, for instance, has a floating currency, but its central bank might sell US dollar reserves to support the baht if a tourism slump threatens depreciation (Bank of Thailand, 2023). In pegged systems, intervention is equally critical. For example, if Qatar's riyal faces downward pressure from falling oil revenues, its central bank must buy riyals with US dollars to uphold the fixed rate (IMF, 2024).

1.3 How the unequal financial system challenges SIDS and LDCs

SIDS and LDCs face severe economic strain as a result of exchange rate volatility, worsened by US dollar-denominated debt and trade imbalances. Depreciation of currencies such as the Ethiopian birr or the Solomon Islands dollar inflates debt repayment costs, while the costs of imports (for example, petroleum) outstrip export earnings (for example, from cotton), deepening deficits (United Nations Conference on Trade and Development (UNCTAD), 2022a). Climate shocks force recovery spending, further depleting reserves and intensifying currency weakness (UNCTAD, 2022a). This vulnerability is rooted in structural inequalities in the global financial system that favour wealthier countries. Post-World War II institutions, notably the World Bank Group and IMF, are governed by a quota-based voting structure that disproportionately empowers wealthier nations. The US, for instance, holds 16.5% of IMF voting shares, while the 46 LDCs collectively have less than 4% of shares, skewing decision making toward creditor interests (IMF, no date). Debts, predominantly issued in US dollars, are priced and traded in financial centres like New York and London, where SIDS and LDCs lack influence (McCauley and Schenk, 2020). Interest rates on these loans, often significantly higher than those for advanced economies, reflect heightened risk perceptions and offer no leniency for external shocks (World Bank Group, no date-b). Trade frameworks, shaped by the World Trade Organization and bilateral agreements, reinforce this inequity by encouraging raw material exports (for example, bauxite from Guinea or fish from the Seychelles) from SIDS and LDCs while necessitating imports of high-value manufactured goods, perpetuating economic dependency and stifling industrial growth (UNCTAD, 2013).

Aims of this paper: Mitigating climate and currency risks for economic stability and equity

Given these compounding vulnerabilities, this paper examines how currency fluctuations and climate risks jointly impact sovereign debt repayment and broader economic stability in SIDS and LDCs. Specifically, this study aims to:

- Explore how climate risks exacerbate currency fluctuations, influencing currency values and intensifying vulnerabilities in debt repayment
- Quantify the additional debt servicing costs directly attributable to currency fluctuations
- Evaluate the effects of currency fluctuations on debt sustainability and GDP growth
- Demonstrate how increased expenditures on debt repayment, driven by currency volatility, negatively impact spending on vital services like education and health, undermining social protection systems critical for building resilience to climate impacts, and
- Recommend solutions to mitigate these risks, emphasising innovative financial instruments and debt relief mechanisms.

By providing an in-depth understanding of these interconnected risks, our analysis aims to provide a practical guide for policymakers and stakeholders within LDCs, SIDS and global financial institutions, enabling them to devise strategies that better manage currency volatility and climate vulnerabilities. The insights from this research will also contribute to ongoing debates about reforming the global financial architecture at the FfD4 conference, the World Bank Group/IMF annual meetings, the G20 discussions and the UNFCCC COP, advocating for more inclusive and equitable structures that address the systemic disadvantages faced by vulnerable economies. Through targeted recommendations, the study aims to facilitate policy dialogues aimed at creating a fairer, more equitable and more resilient global economic system.

2

Climate disaster trends and their correlation with exchange rate volatility

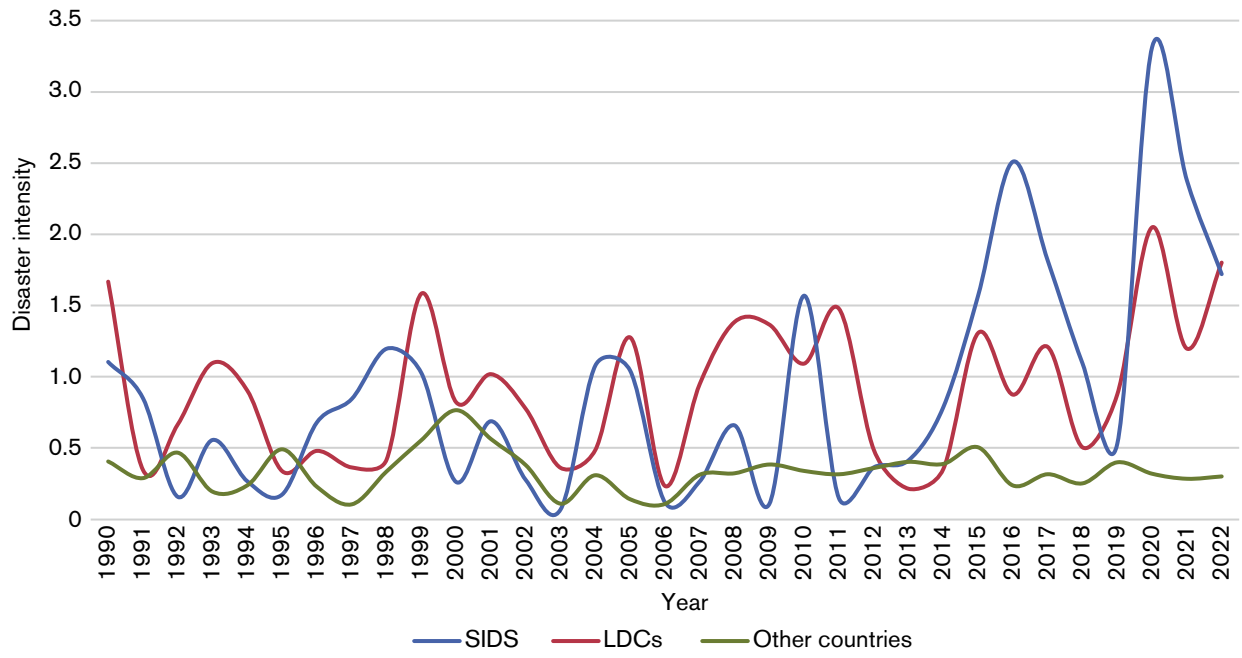
This section examines the escalating frequency and severity of climate disasters affecting SIDS and LDCs, alongside their interplay with currency exchange rate volatility and broader climate vulnerability. We have analysed the historical trends for events such as cyclones, floods and droughts, drawing on data to highlight their disproportionate impact on these countries' fragile economies. The analysis also explores how these disasters correlate with exchange rate fluctuations, exacerbating currency depreciation through disrupted trade, reduced reserves and heightened expenditure for disaster response and recovery. By establishing this nexus, this section sets the stage for quantifying the effect on debt repayment and economic stability in subsequent analyses, offering a foundation for understanding the compounding risks faced by SIDS and LDCs in a warming world.

2.1 Trends of climate disasters impacting SIDS and LDCs

The increasing frequency and intensity of climate disasters have imposed significant burdens on SIDS and LDCs, amplifying their economic vulnerabilities compared to other nations. Figure 1 illustrates the disaster intensity across SIDS, LDCs and other countries from 1990 to 2022, highlighting a pronounced disparity. SIDS exhibit high average disaster intensity over this period at 0.90, with notable peaks such as 3.31 in 2020 (Hurricane Maria in Dominica). LDCs also face elevated disaster intensity, averaging 0.91. In contrast, other countries, primarily developed nations, maintain a much lower average intensity of 0.34. This disparity underscores the findings of the Intergovernmental Panel on Climate Change (IPCC), which reports that SIDS and LDCs are three to five times more likely to experience extreme weather events due to their geographic exposure and lack of adaptive capacity (IPCC, 2023).

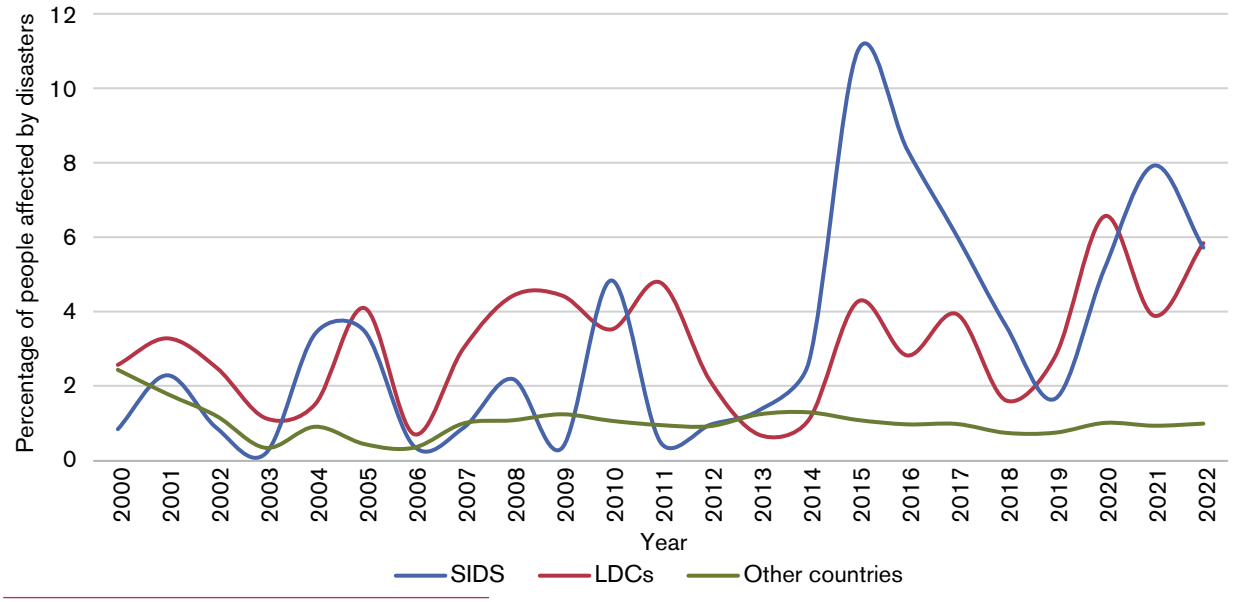
The high disaster intensity in SIDS and LDCs directly threatens their economic stability, particularly in climate-sensitive sectors. In SIDS, where tourism and agriculture often contribute 30–50% of GDP, extreme events have a devastating impact. For example, Cyclone Pam in Vanuatu in 2015 disrupted livelihoods for 60% of the population, leading to a 10% GDP contraction (World Bank Group, no date-b). LDCs, in which 60% of the workforce is employed in agriculture, face similar risks (United Nations Development Programme (UNDP), 2016). Climate shocks often necessitate external borrowing, predominantly in US dollars, which heightens exposure to exchange rate volatility as reserves are depleted to fund recovery.

Figure 1. Disaster intensity in SIDS, LDCs and other countries (1990–2022)



Source: Author assessment based on data from EM-DAT (EM-DAT, no date)

Figure 2. Percentage of the population affected by disasters in SIDS, LDCs and other countries (2000–2021)

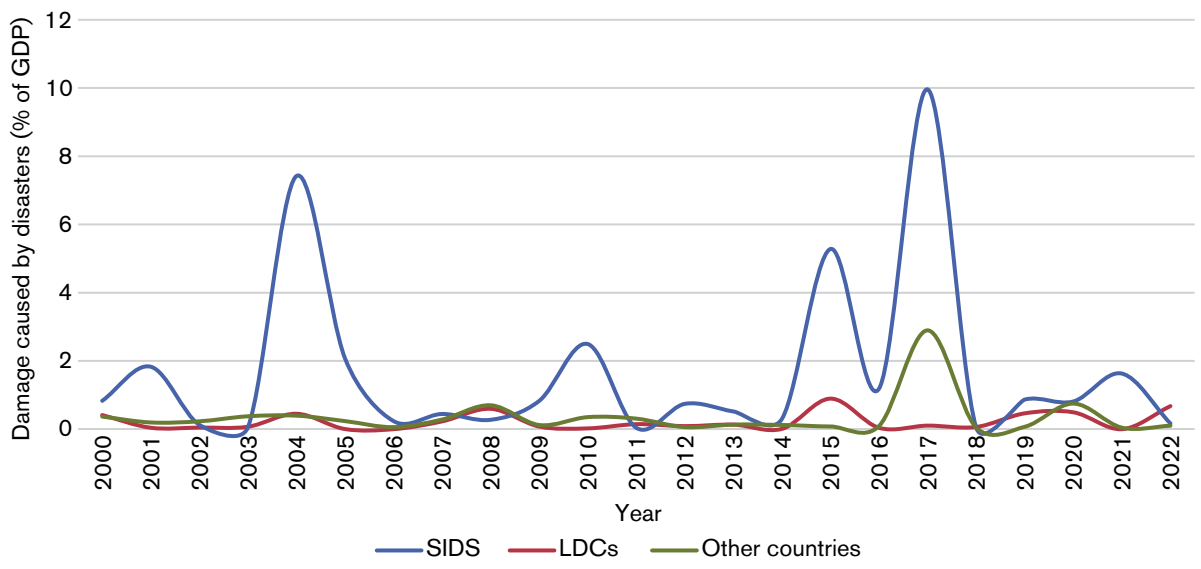


Source: Author assessment based on data from EM-DAT

In Figure 2, we have analysed the percentage of the population affected by disasters in SIDS, LDCs and other countries from 2000 to 2021, further illustrating the disproportionate impact on vulnerable countries. SIDS show the highest average impact at 3.13%. LDCs average 2.99%. Other countries, however, average just 1.03%, with a maximum of 1.29% in 2013. The stark contrast in SIDS is tied to their small population sizes. Hurricane Maria in 2017 affected 100% of Dominica's 71,000 residents, disrupting tourism, which accounts for 70% of jobs (Khonje and Mitchell, 2019).

The economic consequences of these disasters are further analysed in Figure 3, which shows damage caused by disasters as a percentage of GDP from 2000 to 2021. SIDS experience the most severe impacts, averaging 1.73% of GDP. LDCs average 0.20%, while other countries average 0.36%. For SIDS, these damages translate into substantial economic losses. The cyclone which hit Grenada in 2004 caused damages of 200% of GDP, necessitating a 40% increase in external

Figure 3. Damage caused by disasters as a percentage of GDP in SIDS, LDCs and other countries (2000–2021)



Source: Author assessment based on data from EM-DAT

borrowing (IMF, 2005). These fiscal pressures often lead to reserve depletion, as governments sell foreign currency to finance recovery, potentially triggering currency depreciation — a dynamic that underscores the vulnerability of SIDS and LDCs to exchange rate fluctuations.

Secondary sources reinforce these findings. The United Nations Office for Disaster Risk Reduction (UNDRR) estimates that SIDS' annual disaster losses are 20 times higher than those of developed nations due to their dependence on tourism and fisheries, which are highly susceptible to climate shocks (UNDRR, 2020). In LDCs, agriculture's exposure is equally critical, with droughts reducing yields by up to 30% in years like 2015, exacerbating food insecurity for 60% of the population (Food and Agriculture Organization of the United Nations (FAO), 2018). The disproportionate disaster intensity, effects on communities and economic damage highlight the acute vulnerability of SIDS and LDCs, impacting exchange rate volatility.

2.2 Association between currency exchange rate fluctuations and climate impacts

We examined the correlation between disaster intensity and currency exchange rate volatility to understand how climate impacts exacerbate economic vulnerabilities in SIDS and LDCs. The analysis draws on data from 1990 to 2022, covering seven SIDS, 16 LDCs and 21 developed countries. We were able to cover a limited number of countries in each country group because of a lack of consistent time series data on currency exchange rates.

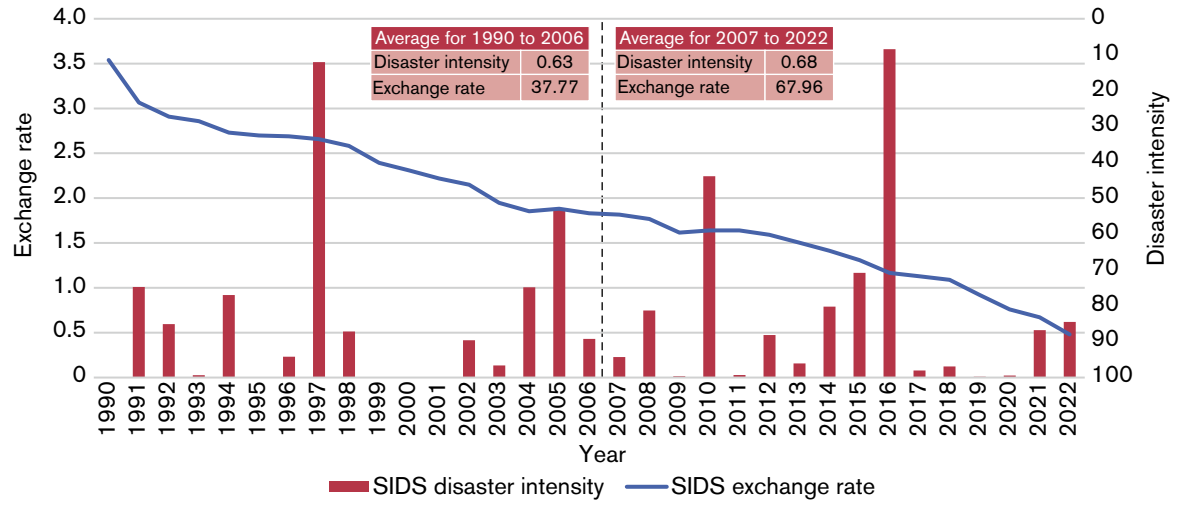
In Figure 4, we show the relationship between disaster intensity and exchange rates in SIDS from 1990 to 2022, showing a notable correlation. The average disaster intensity increased from 0.63 (1990–2006) to 0.68 (2007–2022), and during the same period, the average exchange rate increased from 37.77 to 67.96, indicating a 79.9% depreciation in SIDS' currencies against the US dollar. For instance, the 2010 Haiti disaster, which recorded a disaster intensity of 2.51, coincided with a 10% depreciation in the Haitian gourde, driven by a 30% drop in export revenues and a 15% increase in US dollar-denominated borrowing (IMF, 2011). This pattern suggests that climate shocks, by disrupting key sectors like tourism and agriculture, reduce foreign exchange earnings and strain reserves, leading to currency depreciation.

Figure 5 presents a similar analysis for LDCs, showing a stronger correlation between disaster intensity and exchange rate depreciation. Disaster intensity rose from an average of 0.99 (1990–2006) to 1.21 (2007–2022), while the exchange rate increased from 26.03 to 81.13, a 211.7% depreciation. Significant disaster intensity peaks, such as 1.31 in 2017, correspond to sharp exchange rate declines.

The 2017 Bangladesh floods, among the worst in recent decades, contributed to a 3.8% depreciation in the Bangladeshi taka (Bangladesh Bank, 2018), as recovery costs of approximately US$1.2 billion (0.4% of GDP) (Bangladesh Red Crescent, 2017; World Bank Group, no date-a) increased pressure on foreign exchange reserves, exacerbating economic vulnerabilities.

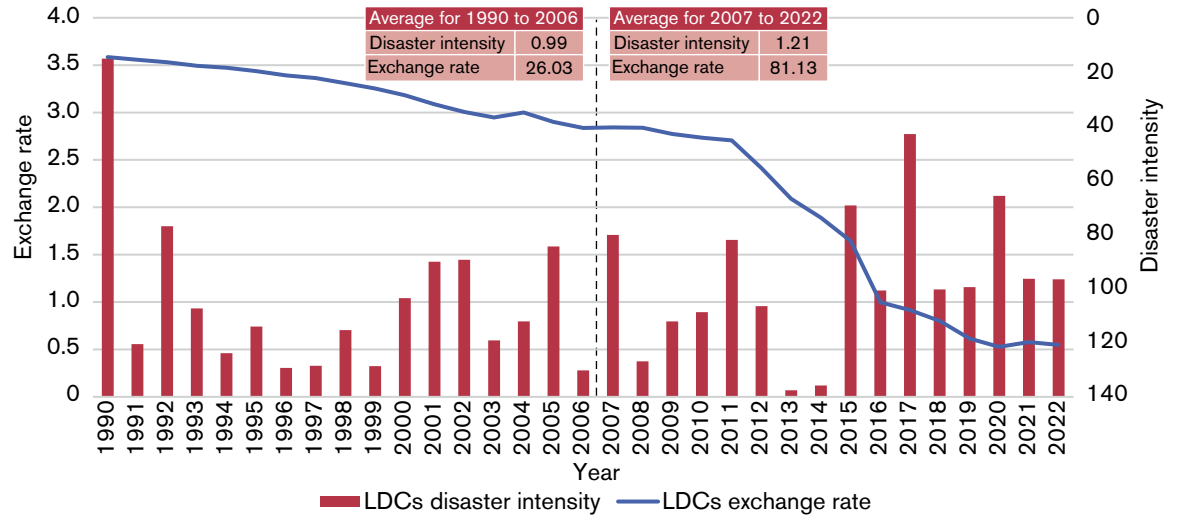
This aligns with findings from UNCTAD, which notes that climate shocks in LDCs often trigger a 15–20% annual increase in import costs, further pressuring exchange rates (UNCTAD, 2022a).

Figure 4. Disaster intensity and exchange rate in SIDS



Source: Authors' calculation based on data from EM-DAT and IMF International Financial Statistics (IFS)

Figure 5. Disaster intensity and exchange rate in LDCs

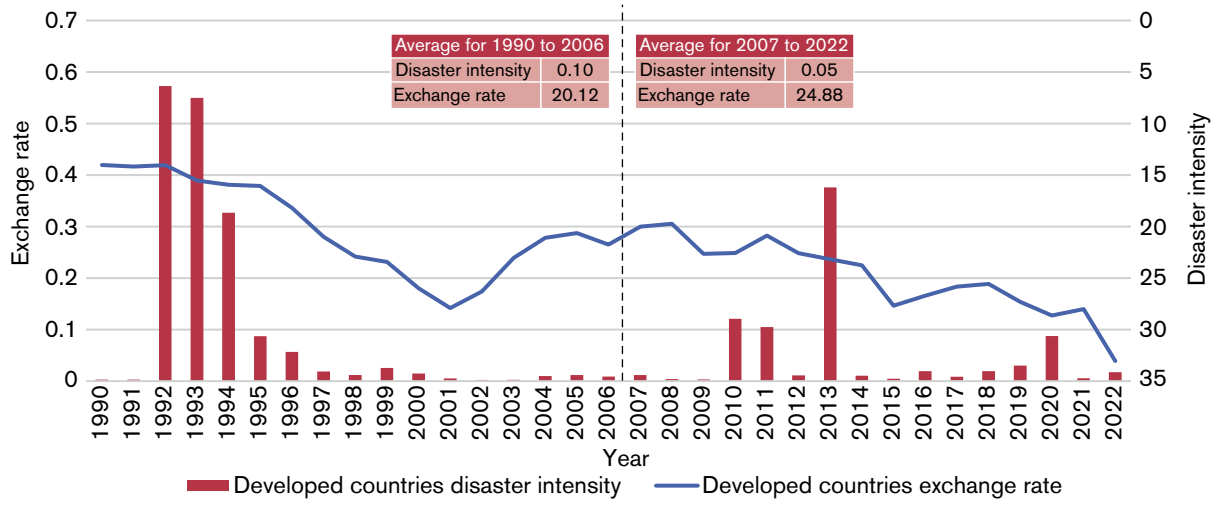


Source: Authors' calculation based on data from EM-DAT and IMF IFS

In contrast, Figure 6 shows developed countries' trend of disaster intensity and exchange rates. Their disaster intensity decreased from an average of 0.10 (1990–2006) to 0.05 (2007–2022), reflecting improved disaster preparedness and mitigation, while the exchange rate increased only modestly from 20.12 to 24.88, a 23.7% depreciation. This modest exchange rate increase, compared to the significant depreciation in SIDS (79.9%) and LDCs (211.7%), where disaster intensity trends are rising, underscores the economic resilience of developed nations. For instance, Japan's 2011 earthquake (disaster intensity 0.32) caused damages of US$210 billion but had little impact on the yen, as Japan's US$1.2 trillion in reserves cushioned the shock (IMF, 2012). This resilience highlights the structural advantages of developed economies, with larger reserve buffers and diversified export bases mitigating currency volatility.

We also analysed country-specific exchange rate trends to further understand the vulnerability of SIDS and LDCs. Among SIDS, Jamaica's rate rose from 41.30 to 111.37 (a 169.7% increase), reflecting fiscal pressures from cyclone-related damages. In contrast, the Seychelles saw a more modest rise from 5.31 to 13.11 (146.9%) due to a stronger tourism sector (World Bank Group, no date-b). In the LDCs, Ethiopia showed a dramatic increase from 6.84 to 23.17 (a 238.7% rise), exacerbated by droughts reducing agricultural exports by 25% in 2015 (FAO, 2018). Malawi's rate surged from 50.68 to 371.40 (632.8%), reflecting chronic climate shocks and a 30% reserve drop after the 2015 floods (IMF, 2015). However, developed countries showed overall stability. Japan's rate moved from 115.55 to 104.69 (a 9.4% decrease), while Canada's decreased from 1.36 to 1.18 (a 13.2% decrease), insulated by robust economic structures.

Figure 6. Disaster intensity and exchange rate in developed countries



Source: Authors' calculation based on data from EM-DAT and IMF IFS

2.3 Association between climate vulnerability and currency exchange rate

The ND-GAIN Vulnerability Index measures exposure, sensitivity and adaptive capacity to climate impacts (ND-GAIN, no date). In Figure 7, we analyse the association between climate vulnerability, as measured by the ND-GAIN Vulnerability Index 2021, and currency exchange rates across LDCs, SIDS and developed countries.

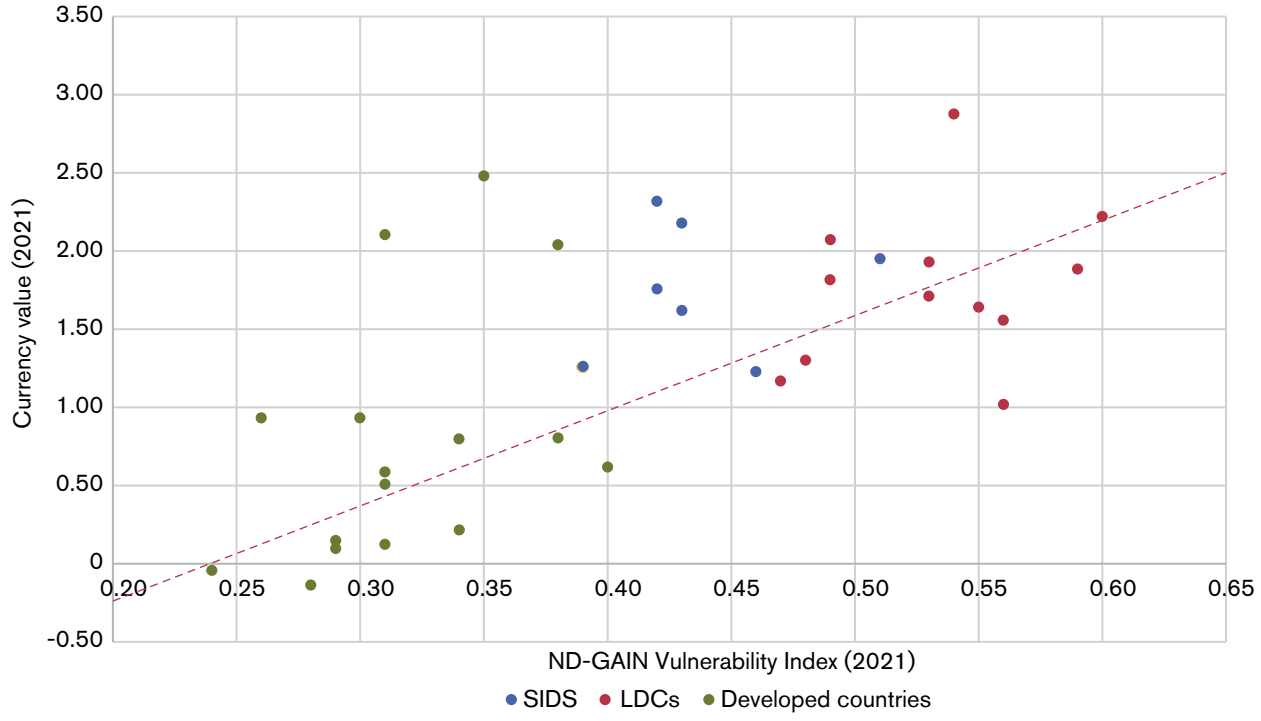
The figure shows a clear positive trend. Higher climate vulnerability is associated with greater currency depreciation. SIDS and LDCs cluster toward the higher end of the vulnerability index (0.39–0.60), with corresponding currency values ranging from 1 to 2.87, indicating weaker currencies. For instance, Mauritius (SIDS), with a vulnerability index of 0.43, has a currency value of 1.62, reflecting significant depreciation. Similarly, Ethiopia (LDC), at 0.55 vulnerability, has a currency value of 1.64. In contrast, developed countries cluster at the lower end of the vulnerability spectrum (0.24–0.40) with stronger currencies. Notably, Switzerland, with a vulnerability index of 0.24, has a currency value of -0.04, indicating a highly stable currency.

To further quantify this relationship, we conducted a regression analysis (see Box 1 for details about the regression model). The results confirm the positive association between climate vulnerability and currency depreciation. The model accounts for 17.49% of the variation in exchange rates (R-squared = 0.1749), with an adjusted R-squared of 0.1711, suggesting a moderate explanatory power after accounting for the number of variables. The F-statistic of 45.6943 (p = 0.0000) indicates that the model is statistically significant, meaning the relationships identified are unlikely to be due to chance. Key findings include:

- ND-GAIN Vulnerability Index: a coefficient of 65.33913 (p = 0.0166) shows that a one unit increase in the vulnerability index leads to a 65% higher exchange rate, reflecting significant currency depreciation. This confirms that greater climate vulnerability weakens currencies in SIDS and LDCs.
- Current account balance (% of GDP): a coefficient of -0.451581 (p = 0.0007) indicates that a 1% increase in the current account balance reduces the exchange rate by 0.45%, meaning a stronger trade surplus leads to currency appreciation and greater stability.
- GDP per capita: a coefficient of -0.000462 (p = 0.0007) suggests that a 1-unit increase in GDP per capita (in US$) decreases the exchange rate by 0.0005%, indicating slight currency appreciation. This reflects how economic growth enhances currency stability through increased investor confidence and productivity.
- Constant: a value of 5.0807533 represents the baseline exchange rate when all predictors are zero.

This association underscores the structural link between climate vulnerability and economic fragility in SIDS and LDCs. The ND-GAIN Vulnerability Index highlights that SIDS and LDCs face greater risks due to their geographic exposure and limited resources (ND-GAIN, no date). This disparity highlights the systemic disadvantage faced by SIDS and LDCs, where climate vulnerability amplifies currency depreciation, exacerbating debt burdens and economic instability.

Figure 7. Association between climate vulnerability and currency exchange rates



Source: Authors' calculation based on data from the ND-GAIN country index and IMF IFS

BOX 1. REGRESSION MODEL TO ASSESS THE LINK BETWEEN CLIMATE VULNERABILITY AND CURRENCY EXCHANGE RATE

To quantify the impact of climate vulnerability on currency exchange rates and understand its role relative to economic factors, we conducted a panel pooled ordinary least squares (POLS) regression analysis across ten countries (four SIDS and six LDCs) from 1992 to 2020 (29 years). This regression helps isolate the effect of climate vulnerability on exchange rates while controlling for economic variables, providing insights into how climate risks exacerbate currency depreciation in vulnerable economies. The model specification is as follows:

$EXRT_{it} = \beta_0 + \beta_1 NDGAIN_{it} + \beta_2 CAB_{it} + \beta_4 GDPPC_{it} + \epsilon_{it}$

Where:

$NDGAIN_{it}$ = NG-GAIN Vulnerability Index

CAB_{it} = Current account balance as a percentage of GDP

$GDPPC_{it}$ = GDP per capita in US$

i = Country index (ten countries: four SIDS, six LDCs)

t = Year index (1992–2020; 29 years)

EXRT = Currency exchange rate for country i in year t (dependent variable)

β_0 = Intercept term

$\beta_1, \beta_2, \beta_3$ = Estimated coefficients of independent variables

ϵ_{it} = Error term

3

Currency exchange rate and economic performance

This section analyses the impact of currency exchange rate fluctuations on the economic performance of SIDS and LDCs. The previous section showed how climate disasters exacerbate exchange rate volatility in these countries, leading to significant currency depreciation in SIDS and LDCs compared to developed countries. This section explores the broader economic consequences, including debt servicing, trade balances and other key indicators. We have presented our analysis under two exchange rate models: floating and pegged. Two different sets of countries were chosen, one for assessing the floating model and another for the pegged model. For the floating model, the analysis examines exchange rates, debt service, net imports, and their variations across low and high exchange rate periods, while the pegged model focuses on trends in debt, foreign direct investment and reserves.

3.1 Economic performance under the floating exchange rate model

A floating exchange rate model refers to a system where a country's currency value is determined by market forces of supply and demand in the foreign exchange market, without direct government or central bank intervention to fix its value. In this model, exchange rates fluctuate daily based on economic factors such as interest rates, inflation, trade balances and external shocks, including climate disasters. The floating system offers several advantages: it provides flexibility, allowing currencies to adjust automatically to economic conditions, such as a surge in exports strengthening the currency or a decline in foreign investment weakening it, thereby acting as a shock absorber for external imbalances (RBA, no date). It also grants monetary policy autonomy, enabling central banks to focus on domestic goals like controlling inflation without the need to maintain a fixed rate (Frieden, 2014). However, the model has drawbacks, particularly for vulnerable economies. It exposes countries to significant volatility, where sudden shifts, such as those triggered by climate disasters or capital outflows, can lead to sharp currency depreciation, increasing the cost of imports and debt servicing (Obstfeld and Rogoff, 1995). This volatility can also deter foreign investment due to exchange rate uncertainty, which can become a critical concern due to reduced investments for SIDS and LDCs with limited economic buffers (Calvo and Reinhart, 2002). Central banks occasionally intervene to stabilise extreme fluctuations, but the currency primarily reflects market dynamics, often amplifying economic instability in climate-vulnerable regions (RBA, no date).

To assess the impact of the floating exchange rate model on economic performance, we selected countries based on the availability of consistent time series data for currency conversion rates, as well as economic parameters such as debt servicing, trade data and other relevant indicators like inflation and external debt stock. There are limitations to the available data on floating exchange rates. We chose eight LDCs (Bangladesh, Ethiopia, Gambia, Lesotho, Mauritania, Mozambique, Nepal and Sierra Leone) and five SIDS (Dominican Republic, Guyana, Haiti, Jamaica and Mauritius) as sample countries to study the impacts of floating exchange rates. Our analysis included both country-

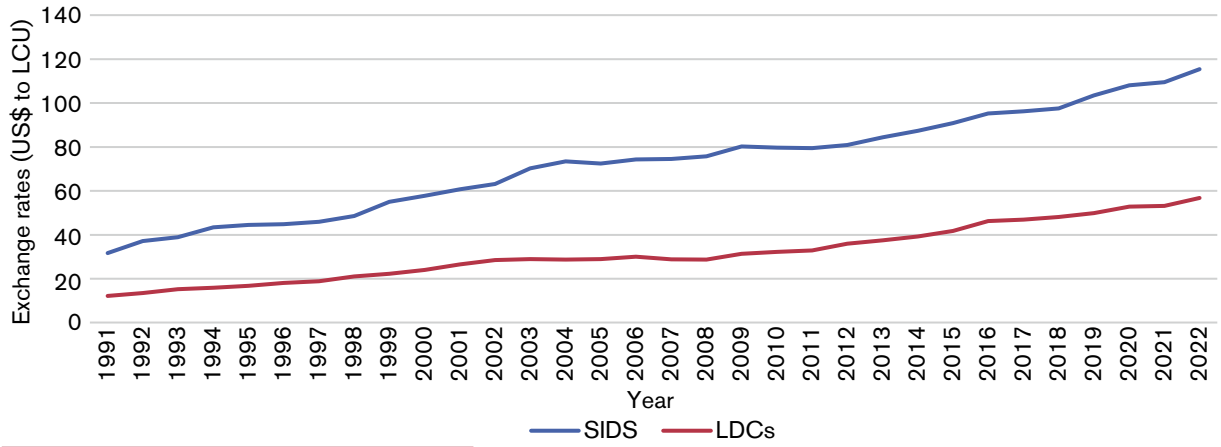
specific assessments to capture individual variations and average values for SIDS and LDCs, as the sample countries represent diverse economic profiles within these country groups while also sharing similar characteristics like dependence on climate-sensitive sectors, limited reserves and vulnerability to external shocks.

3.1.1 Exchange rates, debt service and net imports in SIDS and LDCs

Figure 8 shows the average exchange rates (US$1 to local currency unit, LCU) for the sample SIDS and LDCs from 1991 to 2022. The graph shows a consistent upward trend in both groups, indicating currency depreciation against the US dollar. For SIDS, the average exchange rate increased from 31.64 in 1991 to 115.38 in 2022, a 264.68% rise. LDCs exhibit a similar trend, with the exchange rate rising from 12.17 in 1991 to 56.74 in 2022, a 366.36% increase, though the growth is more gradual. The steeper depreciation in SIDS reflects their greater exposure to external shocks, such as climate disasters, which disrupt key sectors like tourism, a major source of foreign exchange (United Nations World Tourism Organization (UNWTO), 2014). In LDCs, the more moderate depreciation is tied to their reliance on agricultural exports, which face price volatility but are less immediately impacted by climate shocks than SIDS' tourism sector (FAO, 2018).

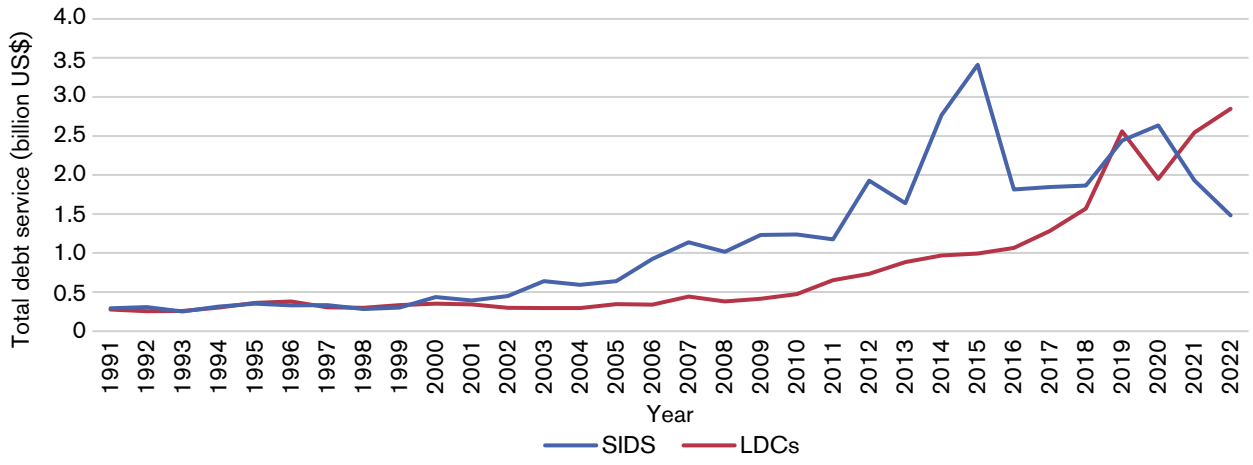
Figure 9 shows the total debt service, or principal and interest payments, in US dollars for SIDS and LDCs from 1991 to 2022, showing a rising trend in both groups, driven by increasing external debt and the need to service it in foreign currency amid currency depreciation. For SIDS, the total debt service increased from US$0.3 billion in 1991 to US$1.48 billion in 2022, reflecting the growing burden of US dollar-denominated debt. LDCs also show an upward trend, with total debt service rising from US$0.3 billion in 1991 to US$2.84 billion in 2022. The rise in both groups is also influenced by currency depreciation, as a weaker local currency increases the US dollar cost of servicing debt.

Figure 8. Exchange rate of sample SIDS and LDCs (1 US$ to LCU)



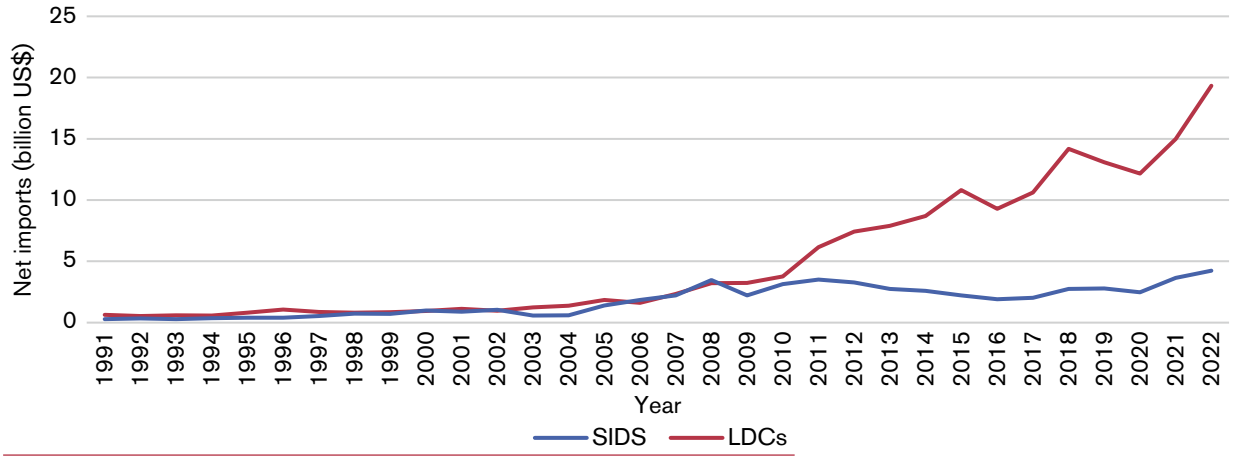
Source: Authors' calculation based on data from IMF IFS

Figure 9. Total debt service of sample SIDS and LDCs (US$)



Source: Authors' calculation based on data from World Bank Group International Debt Statistics

Figure 10. Net imports in sample SIDS and LDCs (US$)



Source: Authors' calculation based on data from World Bank Group International Debt Statistics

In Figure 10, we show net imports in US dollars in SIDS and LDCs from 1991 to 2022, showing a rising trend that underscores the economic strain of currency depreciation on trade balances. SIDS' net imports grew from US$0.3 billion in 1991 to US$4.22 billion in 2022. LDCs exhibit a more pronounced rise, from US$0.6 billion in 1991 to US$19.32 billion in 2022. Currency depreciation exacerbates this burden: as the local currency weakens, the US dollar cost of imports rises, widening trade deficits. For instance, in Mauritania, economic pressures after 2015 led to a spike in net imports, driven by a weaker currency (World Bank Group, 2020). Among SIDS, the Dominican Republic saw similar trends, with currency depreciation post-2010 increasing the cost of fuel imports, which constitute a significant portion of trade (United Nations Economic Commission for Latin America and the Caribbean (ECLAC), 2020). This growing import burden, fuelled by exchange rate depreciation, strains foreign reserves and deepens economic vulnerabilities in both SIDS and LDCs.

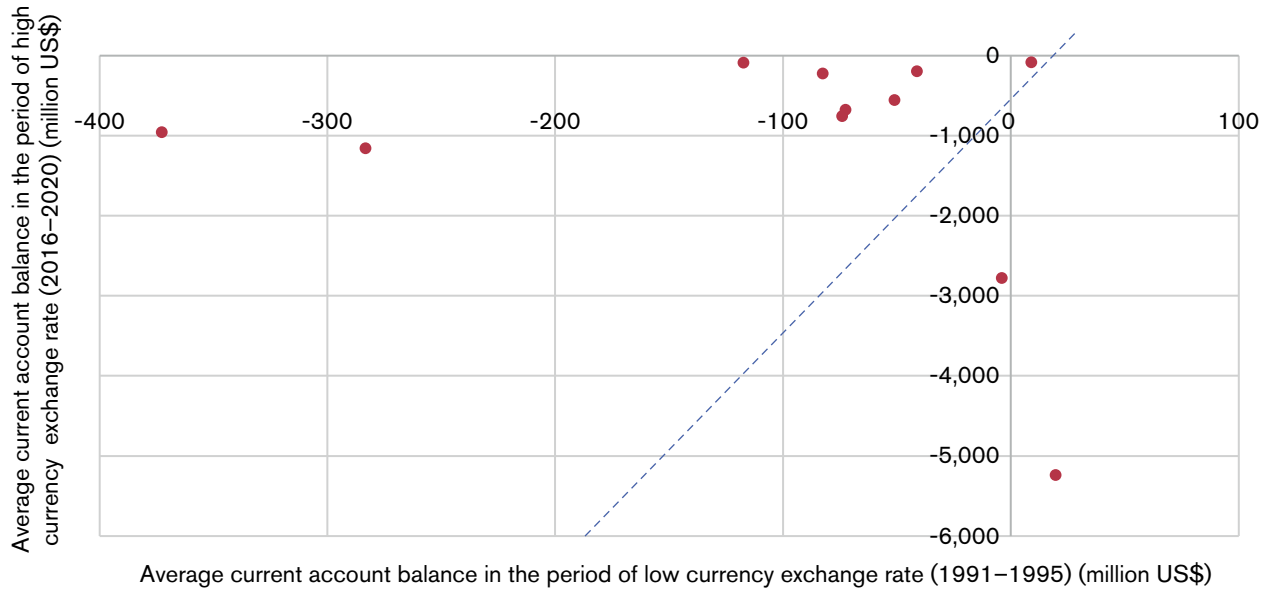
The trends in exchange rates, debt servicing and net imports highlight the interconnected challenges faced by SIDS and LDCs under the floating exchange rate model. The significant currency depreciation in both groups (more pronounced in SIDS) amplifies the US dollar cost of debt servicing and imports, exacerbating fiscal pressures and trade imbalances.

3.1.2 Economic performance across low and high exchange rate periods

Currency fluctuation dynamics, driven by the volatility inherent in the floating model and compounded by climate shocks, require a deeper analysis of economic performance across low and high exchange rate periods. To assess the economic performance of SIDS and LDCs under varying exchange rate conditions, we identified low and high currency exchange rate periods based on five-year average exchange rates. The periods were determined by comparing the average exchange rates across six five-year intervals (1991–1995, 1996–2000, 2001–2005, 2006–2010, 2011–2015, 2016–2020). For both SIDS and LDCs, the lowest average exchange rate occurred in 1991–1995 (SIDS: 28.69, LDCs: 17.58), representing the low exchange rate period, while the highest was in 2016–2020 (SIDS: 74.69, LDCs: 113.02), representing the high exchange rate period. These periods reflect the relative strength (low period) and weakness (high period) of local currencies against the US dollar, allowing for a comparative analysis of economic indicators such as current account balance, inflation, total debt service, net imports and external debt stock.

Current account balance: the current account balance, which measures a country's trade in goods, services and transfers, reflects the economic impact of exchange rate fluctuations (see Figure 11). In the low exchange rate period, SIDS recorded an average current account deficit of US$142.3 million, while LDCs had a smaller deficit of US$71.6 million. By the time of the high exchange rate period, SIDS' deficit had widened significantly to US$515.03 million, a 262% increase, driven by a decline in earnings from tourism, a sector contributing 40–60% of GDP in SIDS (UNWTO, 2014). For instance, the Dominican Republic's deficit grew from US$372.8 million to US$958.9 million, a 157.2% increase, as exchange rate depreciation raised the cost of imported goods, outweighing potential tourism revenue gains from a cheaper currency. LDCs experienced a more dramatic shift, moving from a deficit of US$71.6 million to US$1,524.3 million (a 2,030% increase) as imports of essentials like food and fuel surged, constituting 30–40% of total imports (UNCTAD, 2022a). Nepal's deficit, for example, ballooned from US$283.3 million to US$1,157.4 million, a 308.5% increase linked to flood-related import increases (United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP), 2019).

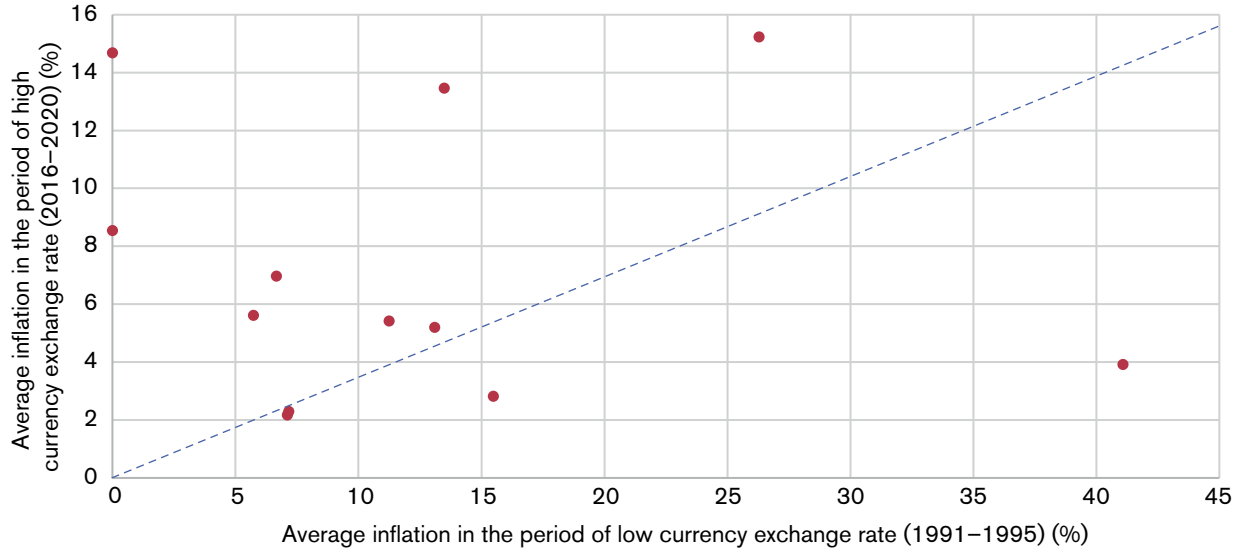
Figure 11. Current account balance in low and high currency rate fluctuation periods for SIDS and LDCs (million US$)



Source: Authors' calculation based on data from the World Bank Group, IMF Balance of Payments Statistics Yearbook and data files, and World Bank Group and Organization for Economic Co-operation and Development (OECD) GDP estimates.

Inflation: measured as the annual percentage change in consumer prices, inflation highlights the cost of living pressures under varying exchange rate conditions. Figure 12 compares average inflation in the low exchange rate period with the high exchange rate period, showing a clear upward trend. In the low exchange rate period, SIDS recorded an average inflation rate of 2.5%, with values ranging from 0% to 5%, reflecting relative price stability despite early 1990s economic challenges in countries such as Haiti and Jamaica. LDCs had a slightly higher average of 3.5%, with values also clustering between 0% and 5%, as seen in Ethiopia and Nepal, where moderate inflation was driven by domestic factors (UNESCAP, 2019). By the high exchange rate period, SIDS' average inflation had increased to 7.5%, a 200% rise, with some countries experiencing rates as high as 15% (for example, Haiti), due to import-driven price pressures from a weaker currency (ECLAC, 2020). LDCs saw inflation rise to 9.5%, a 171.4% increase, with rates reaching up to 16% in countries like Sierra Leone, reflecting the impact of currency depreciation on imported essentials like food and fuel (FAO, 2018). The upward trend indicates that higher exchange rates correlate with increased inflation as the cost of imports rises, exacerbating cost of living pressures in both SIDS and LDCs.

Figure 12. Inflation in low and high currency rate fluctuation periods for SIDS and LDCs (%)

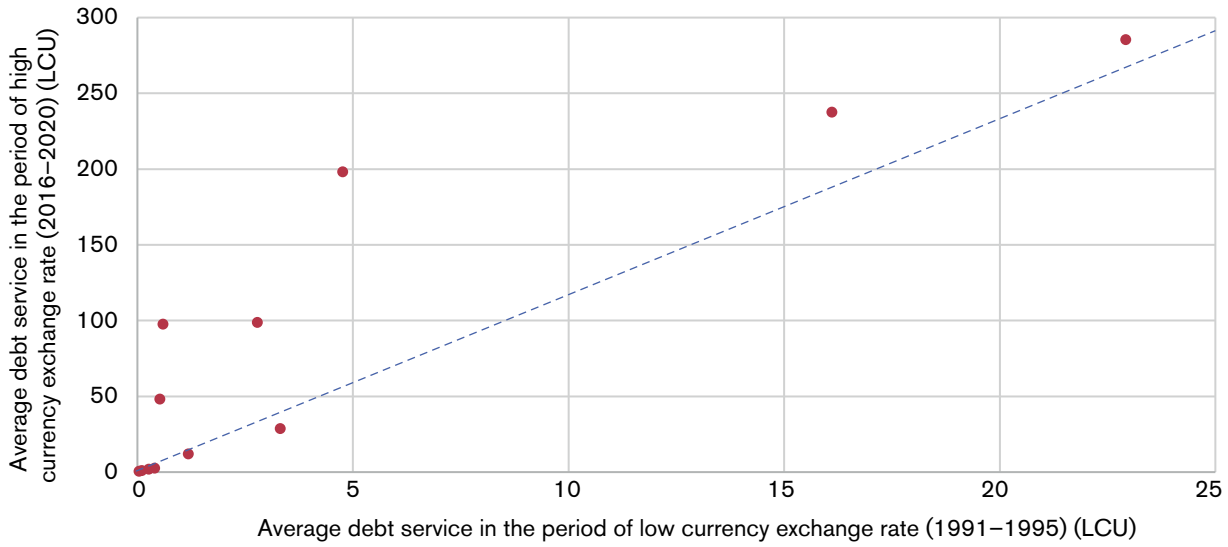


Source: Authors' calculation based on data from IMF IFS

Total debt service: total debt service, which includes principal and interest payments on external debt, underscores the fiscal burden of exchange rate depreciation. Figure 13 compares average total debt service in LCU during the low exchange rate period with the high exchange rate period, showing a steep upward trend. In the low exchange rate period, SIDS' average debt service was 6.02 billion LCU, while LDCs averaged 3.62 billion LCU. By the high exchange rate period, SIDS' debt service had surged to 134.18 billion LCU, a 2,130% increase, and LDCs' had risen to 59.37 billion LCU, a 1,540% increase. The sharper rise in SIDS aligns with their higher exchange rate depreciation (see Figure 8), increasing the LCU cost of US dollar-denominated debt. The Dominican Republic's debt service, for instance, grew from 4.8 billion LCU to 198.1 billion LCU (UNESCAP, 2019). Among LDCs, Mozambique, for example, saw debt service increase from 0.6 billion LCU to 97.5 billion LCU, reflecting a 16,109% rise, driven by flood-related borrowing (FAO, 2018). This escalation highlights how depreciation under the floating model amplifies debt burdens, diverting resources from development.

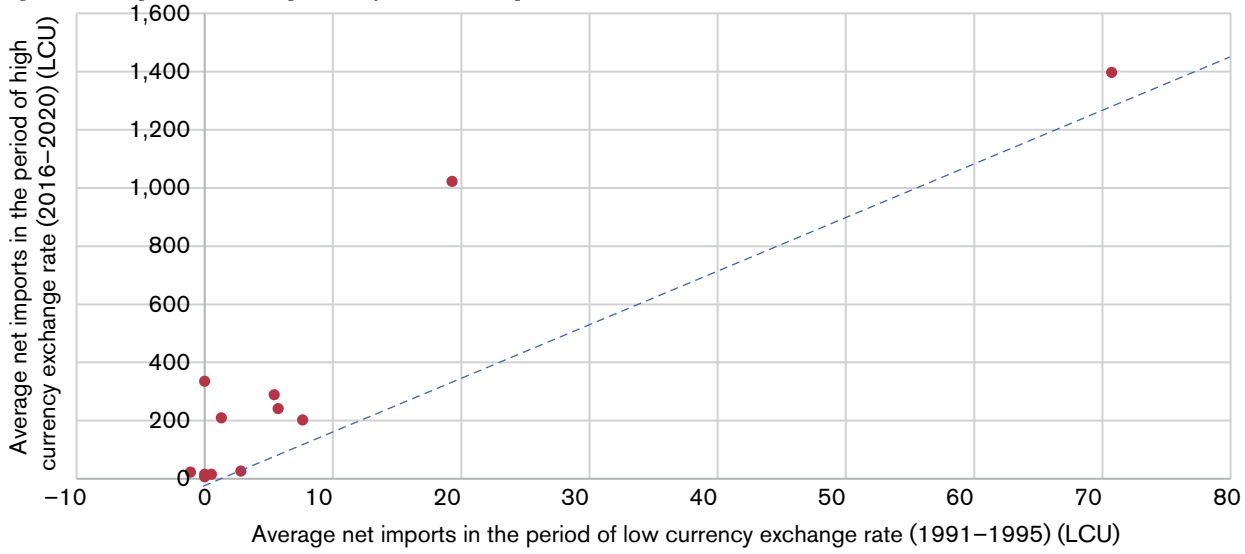
Net imports: representing the difference between imports and exports, net imports further illustrate the trade imbalances exacerbated by exchange rate depreciation. Figure 14 shows a significant upward trend in net imports in LCU from the low exchange rate period to the high exchange rate period. In the

Figure 13. Total debt service in low and high currency rate fluctuation periods for SIDS and LDCs (LCU)



Source: Authors' calculation based on data from World Bank Group International Debt Statistics

Figure 14. Net imports in low and high currency rate fluctuation periods for SIDS and LDCs (LCU)



Source: Authors' calculation based on data from World Bank Group International Debt Statistics, World Bank Group national accounts data and OECD National Accounts data files

low exchange rate period, SIDS' average net imports were 4.37 billion LCU, while LDCs averaged 11.86 billion LCU. By the high exchange rate period, SIDS' net imports rose to 170.71 billion LCU, a 3,805% increase, and LDCs' surged to 388.62 billion LCU, a 3,177% increase. The dramatic rise in the LDCs reflects their heavy reliance on imported essentials. Nepal's net imports grew from 19.3 billion LCU to 1,023.6 billion LCU, driven by a 308.5% increase in import costs after floods (UNESCAP, 2019). Among SIDS, Guyana, for example, saw net imports rise significantly, as depreciation inflated the cost of fuel imports, which account for 20% of total imports (ECLAC, 2020). These trends underscore how currency depreciation widens trade deficits, straining foreign reserves.

External debt stock: we also analysed the external debt stock as a percentage of GDP in 2021 to further understand the economic strain under the floating exchange rate model. Among the selected countries, Mozambique (LDC) exhibited the highest external debt stock at 398.18% of GDP, followed by Mauritius (SIDS) at 242.52% and Jamaica (SIDS) at 241.53%. These countries are pushing toward debt distress. The Dominican Republic (SIDS) and Lesotho (LDC) are highly indebted, with 92.76% and 76.58%, respectively, while Sierra Leone (LDC) and Gambia (LDC) are moderately indebted, with 57.73% and 52.67%, respectively. The high debt levels in Mozambique and SIDS like Mauritius and Jamaica reflect the cumulative impact of exchange rate depreciation and borrowings related to climate event-related reconstruction and recovery.

The combined effect of inflation, current account balance, net imports and total debt service significantly undermines debt sustainability in SIDS and LDCs.

3.2 Economic performance under the fixed (pegged) exchange rate model

A pegged exchange rate model, also known as a fixed exchange rate system, involves a country anchoring its currency's value to another currency, typically a stable one like the US dollar or a basket of currencies, with the central bank actively intervening to maintain the fixed rate. In this system, the exchange rate remains constant or fluctuates within a narrow band, providing predictability for trade and investment by reducing currency volatility (RBA, no date). To sustain the peg, the central bank must hold substantial foreign exchange reserves to buy or sell its currency in the market, ensuring the fixed rate is maintained against external pressures such as trade imbalances or capital flows (Frieden, 2014). While this model offers stability, benefiting SIDS and LDCs reliant on imports and external debt by minimising exchange rate risk, it limits monetary policy autonomy, as the central bank must align interest rates and money supply with the anchor currency's economy, often constraining responses to domestic economic shocks like inflation or climate disasters (Obstfeld and Rogoff, 1995).

To understand the impact of the pegged exchange rate model on economic performance, we selected countries based on the availability of comprehensive data for key economic indicators relevant to this system. Specifically, the analysis required consistent time series data on debt, foreign direct investment (FDI) and foreign exchange reserves, factors critical for assessing the sustainability of a pegged regime, as they reflect a country's ability to maintain the fixed rate and manage external economic pressures. We chose three countries where all the necessary data was available: the Bahamas, Barbados and Belize, allowing for trend analysis on all parameters relevant to the pegged model.

3.2.1 Trend analysis of debt, FDI and reserves in pegged model countries

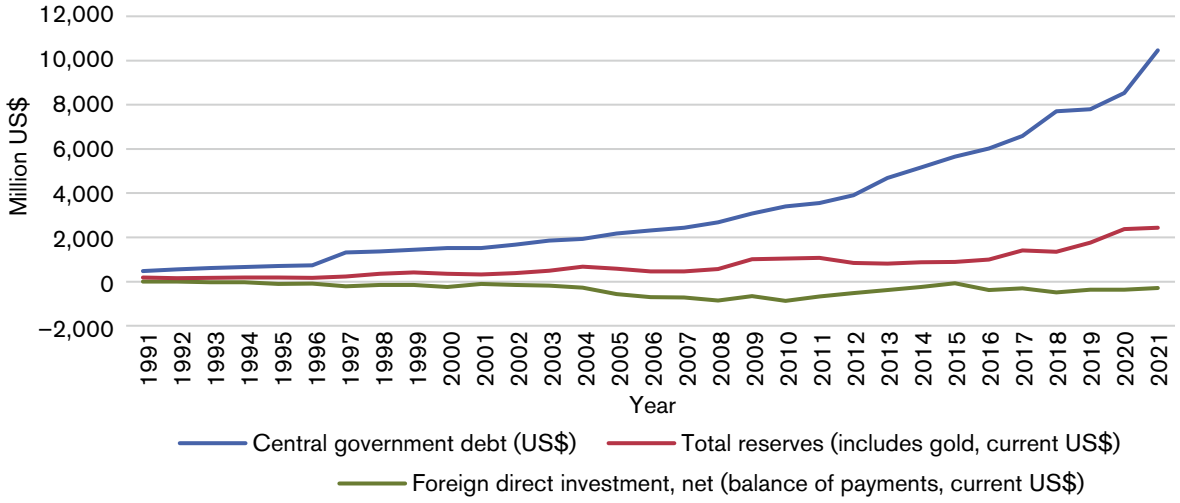
The Bahamas: Figure 15 illustrates the trends in central government debt, FDI and total reserves (including gold) for the Bahamas from 1991 to 2021, all measured in US dollars. Central government debt increased significantly, from US$479 million in 1991 to US$10,500 million in 2021, a 775% rise, with a sharp acceleration after 2010. This surge reflects the need for external debt to finance climate disaster recovery, as the country must preserve its reserves to maintain the 1:1 peg to the US dollar. For example, Hurricane Dorian in 2019 caused damages of US$3.4 billion, or 25% of GDP (ECLAC and Inter-American Development Bank, 2020), requiring the country to borrow money for recovery.

Total reserves grew from US$200 million in 1991 to US$2,500 million in 2021, a 1,150% increase, peaking at US$2,609 million in 2022, demonstrating the Bahamas' commitment to keeping reserves intact to sustain the peg, even during crises (IMF, 2022). FDI remained relatively stable, going down to minus US$500 million and a slight upward trend after 2015, indicating modest investor confidence in the stable exchange rate environment.

Barbados: Figure 16 shows the trends for Barbados over the same period. Central government debt rose from US$870 million in 1991 to US$6,900 million in 2021, a 650% increase, with a notable spike post-2015, reaching US$8,000 million in 2017.

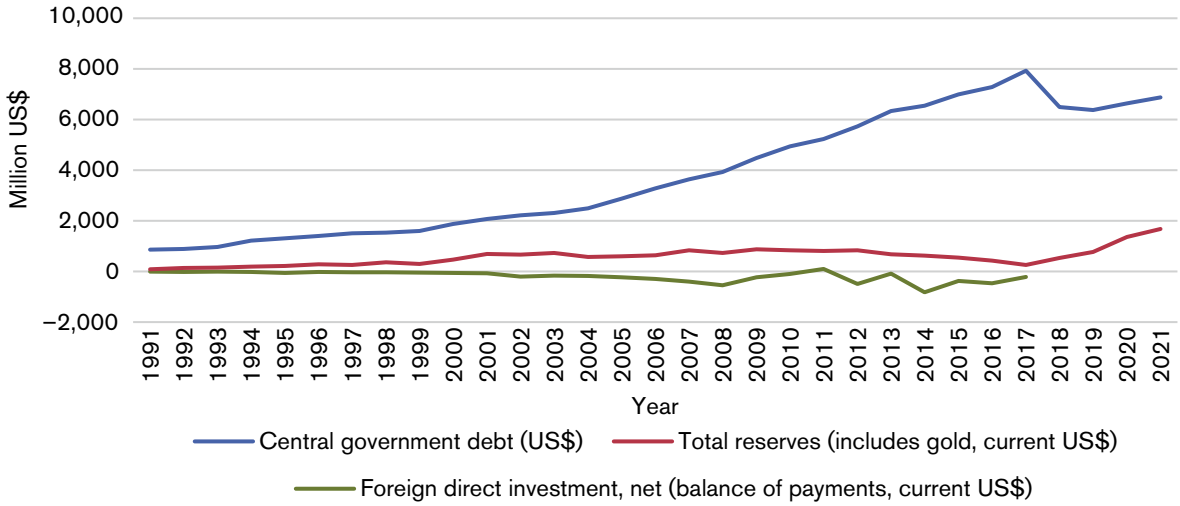
This increase was driven by borrowing to address climate events and economic downturns as Barbados prioritised maintaining its 2:1 peg to the US dollar, limiting reserve liquidation. This meant the government faced limited choices in the wake of Hurricane Maria in 2017, which severely impacted tourism, accounting for 40% of GDP (UNWTO, 2014).

Figure 15. Trends in debt, FDI and reserves for the Bahamas



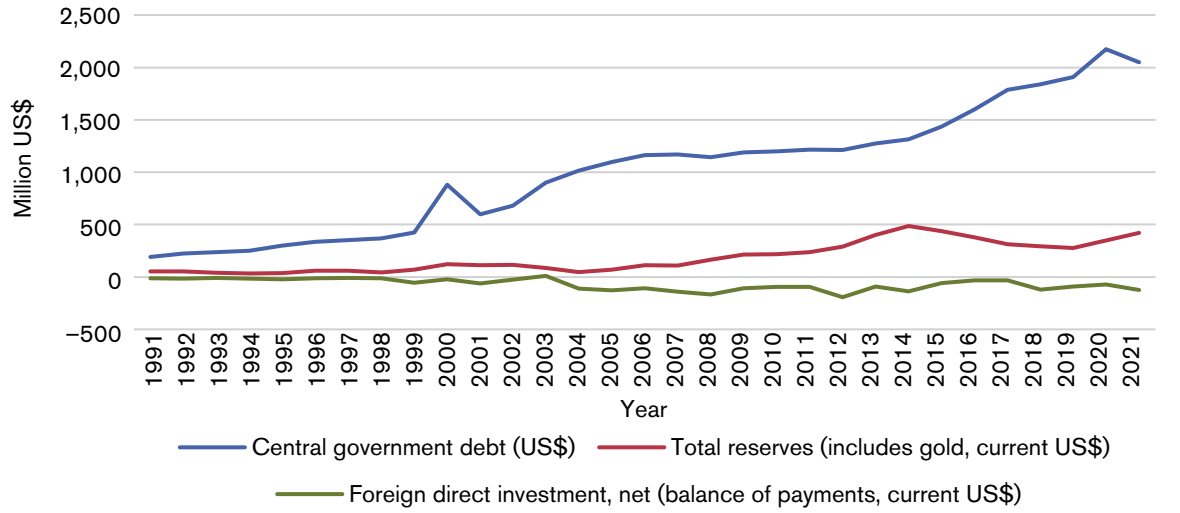
Source: Authors' calculation based on data from World Bank Group International Debt Statistics

Figure 16. Trends in debt, FDI and reserves for Barbados



Source: Authors' calculation based on data from World Bank Group International Debt Statistics

Figure 17. Trends in debt, FDI and reserves for Belize



Source: Authors' calculation based on data from World Bank Group International Debt Statistics

Total reserves increased from US$87 million in 1991 to US$1,520 million in 2021, a 400% rise, with a peak of US$2,200 million in 2020, indicating Barbados' efforts to keep reserves intact to sustain its peg, even when facing fiscal pressures from climate shocks (IMF, 2022). FDI fluctuated between minus US$821 million and US$101 million, showing a slight decline to minus US$200 million by 2017, reflecting investor caution amid rising debt levels despite the pegged exchange rate.

Belize: Figure 17 shows the trends for Belize from 1991 to 2021. Central government debt grew from US$191 million in 1991 to US$2,000 million in 2021, a 566.7% increase, with a significant rise after 2005, peaking at US$2,200 million in 2020. This rise reflects borrowing to address climate impacts. For example, Hurricane Dean in 2007 caused damages of US$100 million, or 8% of GDP (ECLAC and UNDP, 2007). As Belize could not draw down reserves to maintain its 2:1 peg to the US dollar, this necessitated external debt to fund recovery and infrastructure investments.

Total reserves increased from US$53 million in 1991 to US$474 million in 2021, a 500% rise, peaking at US$487 million in 2014. This indicates Belize's efforts to maintain its peg by keeping reserves intact, though the relatively low levels highlight vulnerability to external shocks (IMF, 2022). FDI remained volatile, ranging from minus US$200 million to US$11.28 million, suggesting limited investor confidence despite the pegged rate.

The pegged exchange rate model provides stability for SIDS like the Bahamas, Barbados and Belize, as evidenced by consistent FDI inflows and reserve accumulation, but it significantly increases debt levels due to the need to maintain reserves to sustain the peg. During climate disasters like Hurricane Dorian in the Bahamas or Hurricane Dean in Belize, or when investing in infrastructure and growth, these countries cannot liquidate reserves without risking the peg, forcing reliance on external debt, as seen in the sharp debt increases following disasters. This constraint, while ensuring exchange rate stability, limits fiscal flexibility and heightens debt sustainability risks, underscoring the need for alternative financial mechanisms to support climate-vulnerable economies.

4

Understanding the impacts and drivers of currency depreciation

This section examines the multifaceted impacts of currency depreciation and exchange rate fluctuations on the economic and social landscapes of SIDS and LDCs while also identifying the key drivers behind these fluctuations. Building on the findings from Section 3, which highlighted the significant economic challenges posed by exchange rate volatility under floating and pegged models, this analysis delves deeper into the consequences for debt, trade, overall economic performance and social sector investment. We have quantified the annual and cumulative exchange-related losses both for individual countries and for country groups, compared these losses to debt servicing, net import costs and social expenditures such as health and education, and assessed their broader economic toll as a percentage of GDP. We also provide a regression analysis to understand the determinants of exchange rate fluctuations under both floating and pegged models, providing insights into the structural and external factors driving currency depreciation in climate-vulnerable economies.

4.1 Analysing the impacts of currency depreciation on debt, trade, economies and social sector investment

This analysis is based on a set of assumptions and a structured methodology to ensure consistency and accuracy in quantifying exchange-related losses (see Box 2).

4.1.1 Analysis of exchange-related losses to SIDS and LDCs

Annual and cumulative exchange-related loss to a country: Figure 18 illustrates the annual exchange-related loss per country in US dollars, based on the assessment of sample SIDS and LDCs from 1991 to 2022, reflecting the additional financial burden on debt repayment and trade imports due to currency fluctuation. For SIDS, the average annual exchange loss per country increased to US$2.43 billion in 2022. In LDCs, the annual exchange loss per country rose more sharply, reaching US$11.63 billion in 2022. This escalation reflects the significant depreciation in LDCs, adding substantial costs to debt repayment and imports.

Debt servicing losses due to exchange rate fluctuations in 2022 averaged US$682 million annually per SIDS country and US$1,984 million per LDC country, totalling US$2,666 million across both groups.

> Our analysis shows that a 5% depreciation in currency would result in an additional annual loss of US$14.8 million per SIDS and US$17.8 million per LDC in debt servicing, highlighting the significant financial toll that even a modest depreciation imposes on debt servicing.
>
> This figure needs to be understood in the context that, for SIDS, the average exchange rate increased from 31.64 in 1991 to 115.38 in 2022, a 264.7% rise, and for LDCs, the exchange rate increased from 12.17 in 1991 to 56.74 in 2022, a 366.4% increase.

BOX 2. METHODOLOGY USED TO ASSESS THE IMPACTS OF CURRENCY FLUCTUATION

The period of analysis spans 1991 to 2022. We have taken the 1991 currency rate as the base rate for assessing losses due to debt servicing and net import payments in subsequent years. The exchange loss is expressed as a percentage of GDP in LCU.

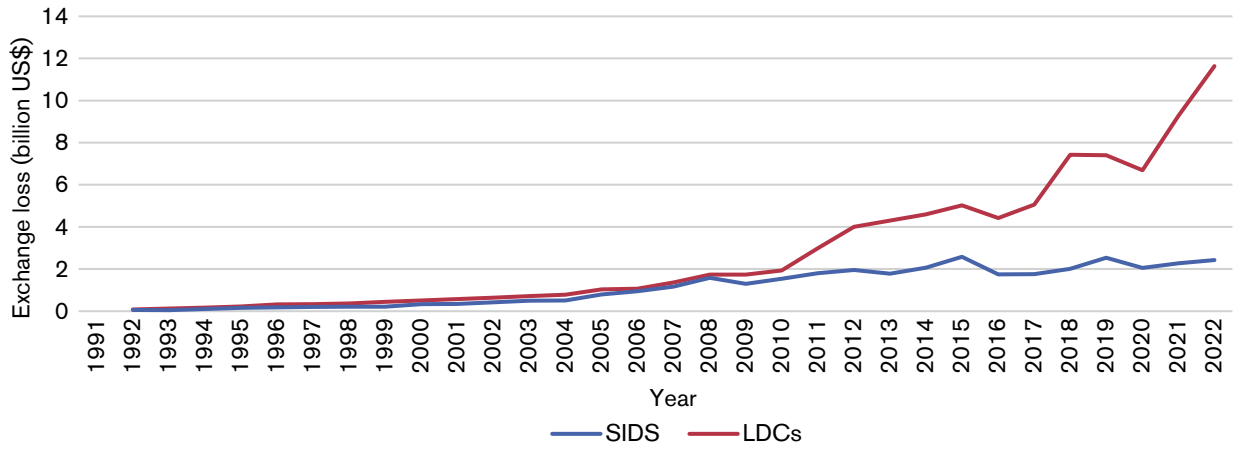
The methodology involves the following steps:

1. Organising time series data on currency exchange rates, debt servicing (US$), net import value (US$) and GDP (LCU)
2. Converting debt servicing and net import values from US$ to LCU using the actual currency exchange rate for each year (A)
3. Converting the same values using the base year's exchange rate (B)
4. Subtracting B from A to calculate the currency exchange loss
5. Expressing the loss as a percentage of GDP (LCU)
6. Comparing the loss with health and education expenditures
7. Calculating the cumulative exchange loss, and
8. Identifying factors attributable to the exchange loss (debt servicing, net imports, currency depreciation and GDP).

The sample countries used for this analysis are the same as those in Section 3: five SIDS: Dominican Republic, Guyana, Haiti, Jamaica and Mauritius; and eight LDCs: Bangladesh, Ethiopia, Gambia, Lesotho, Mauritania, Mozambique, Nepal and Sierra Leone. These countries were selected due to the availability of consistent time series data for currency conversion rates, debt servicing, trade and social expenditure indicators, ensuring a robust assessment of exchange rate impacts across diverse economic profiles within SIDS and LDCs.

Our analysis includes both country-specific assessments to capture individual variations and overall values for SIDS and LDCs. This is because the sample countries represent diverse economic profiles within these country groups while also sharing similar characteristics such as dependence on climate-sensitive sectors, limited reserves and vulnerability to external shocks.

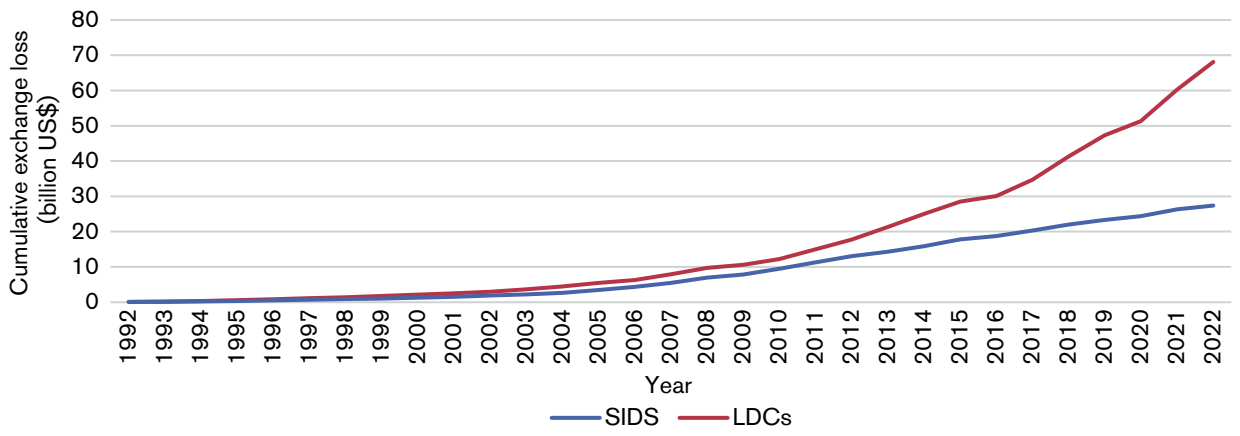
Figure 18. Annual exchange loss (billion US$) per country (SIDS and LDCs)



Source: Authors' calculation based on data from IMF IFS

Figure 19 shows the cumulative exchange-related loss per country in US$ between 1991–2022, highlighting the long-term additional burden on debt and trade. For SIDS, the cumulative loss per country grew to US$27 billion by 2022, with steady increases throughout. In LDCs, the cumulative loss per country rose more dramatically, reaching US$68 billion by 2022. In terms of debt servicing related losses, the cumulative loss per SIDS increased to US$10.25 billion by 2022 and in case of LDCs the cumulative loss grew to US$9.98 by 2022. These cumulative losses reflect the compounding effect of annual losses due to currency fluctuation.

Figure 19. Cumulative exchange loss (billion US$) per country (SIDS and LDCs)



Source: Authors' calculation based on data from IMF IFS

To explain how currency fluctuations impact a country, we have presented two country examples: Jamaica, representing SIDS, and Mozambique, representing LDCs, using data from 1991 to 2022.

Jamaica's exchange rate rose from 22.96 to 153.43 (568.25% increase) between 1992 and 2022, driving up total debt service from US$684.90 million to US$1,390.16 million (102.97% rise). Net imports surged from US$33.42 million to US$2,222.39 million (6,550.18% increase). The average annual exchange-related loss to GDP in 2022 was 18.80% (8.40% from debt servicing, 10.40% from net imports). In the same period, average education expenditure was 5.07% and health expenditure was 5.38% of GDP, reflecting the scale of social sector investment compared to currency fluctuation losses.

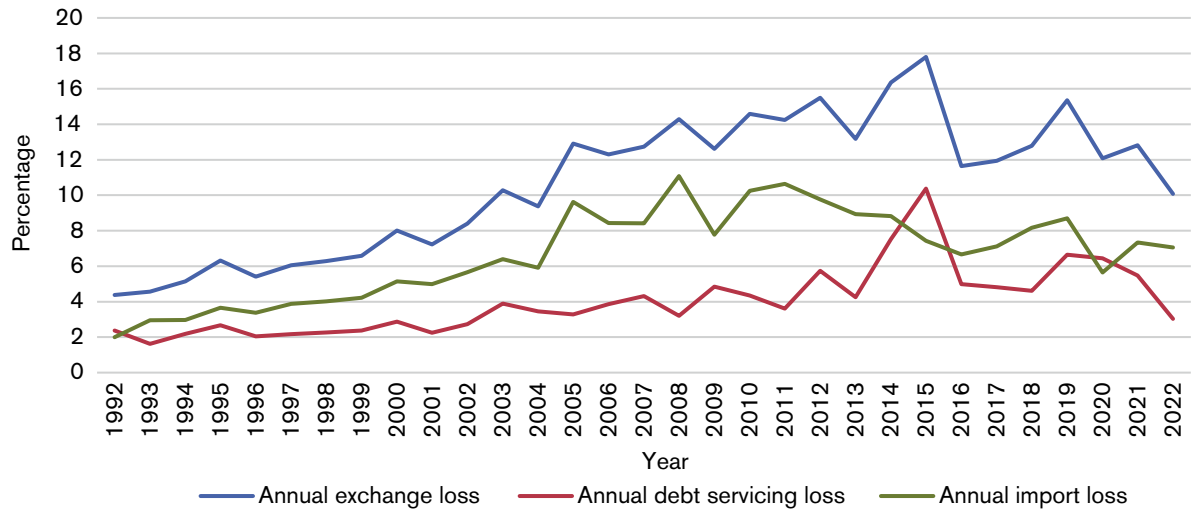
Mozambique's exchange rate increased from 2.52 to 63.85 (a 2,433.73% rise) from 1992 to 2022. Total debt service grew from US$82.71 million to US$6,040.66 million (a 7,203.53% increase). Net imports rose from US$1,148.42 million to US$4,856.56 million (a 322.89% increase). The annual exchange-related loss to GDP in 2022 was 32.12% (6.95% from debt servicing, 25.17% from net imports). The average expenditure on education was 5.17% of GDP and health was 5.45% of GDP in the same period, reflecting the scale of social spending compared to currency fluctuation losses.

Country-level assessment extrapolated to SIDS and LDCs: we also assessed the cumulative exchange-related loss for sample countries to extrapolate it to estimate the total annual and cumulative losses for all 39 countries in the SIDS group and all 46 countries in the LDCs group. The sample includes countries with diverse profiles, ensuring a balanced representation of countries with different economic profiles in each country group. In the extrapolation, we also assumed that all countries operate under a floating currency model, as actual data for pegged-model countries was unavailable (although Section 3 showed that pegged regimes also face debt accumulation despite stable exchange rates). Based on this, the estimated cumulative loss for 39 SIDS was assessed to be US$1,069 billion and for 46 LDCs it is US$3,128 billion, totalling US$4,197 billion by 2022. The annual loss in 2022 for SIDS is US$95 billion, while for LDCs, it is US$552 billion, totalling US$647 billion. These estimates could vary slightly if actual data for all 39 SIDS and 46 LDCs were available, but the figures reflect the significant additional cost of debt repayment and trade imports due to currency depreciation across these countries.

4.1.2 Analysis of exchange-related losses as a percentage of GDP

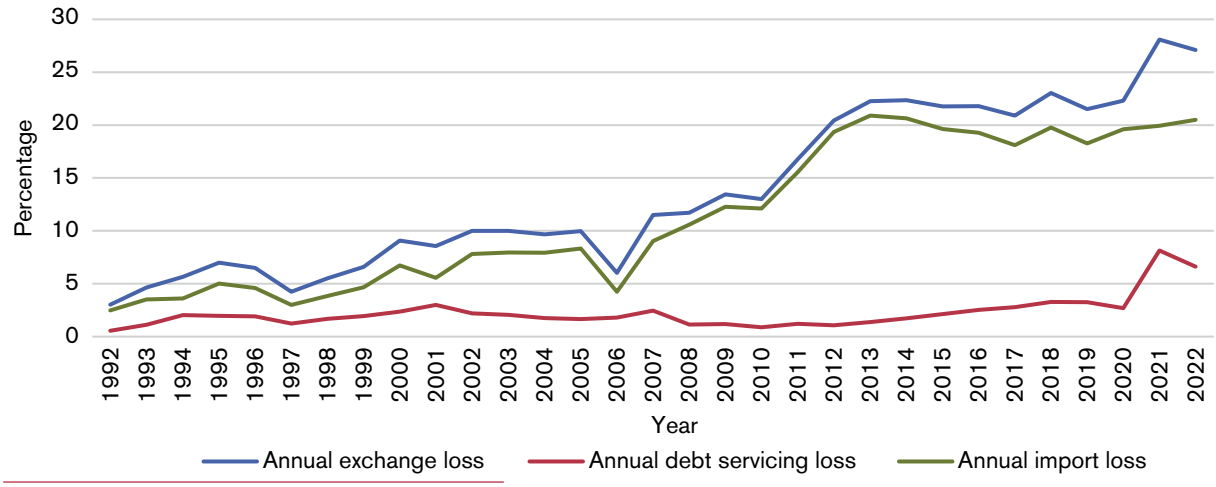
Annual percentage of exchange-related loss as a percentage of GDP compared with debt servicing and net import losses for SIDS: Figure 20 illustrates the annual percentage of exchange loss in LCU for SIDS, compared with the losses contributed by debt servicing and net import losses from 1992 to 2022, highlighting the additional burden on debt repayment due to currency fluctuation. The total annual exchange-related loss as a percentage of GDP increased from 4.37% in 1992 to 10.07% in 2022. Debt servicing losses rose from 2.4% in 1992 to 3% in 2022, reflecting the significant impact of currency depreciation on debt repayment costs. The higher contribution of net import losses compared to debt servicing aligns with SIDS' reliance on imports, but the notable debt servicing losses highlight the fiscal strain of currency depreciation on external debt, especially during climate shocks.

Figure 20. Annual percentage of exchange-related losses as a percentage of GDP and the contribution of debt servicing and import losses for SIDS



Source: Authors' calculation based on data from IMF IFS

Figure 21. Annual percentage of exchange-related losses as a percentage of GDP and the contribution of debt servicing and import losses for LDCs

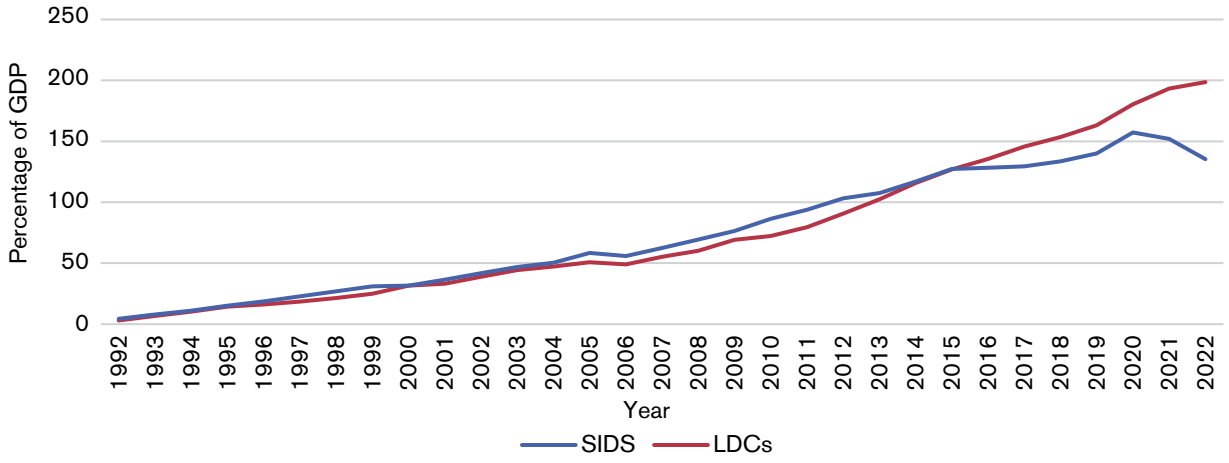


Source: Authors' calculation based on data from IMF IFS

Annual percentage of exchange-related loss compared with debt servicing and net import losses for LDCs: Figure 21 shows the annual percentage of exchange loss in LCU for LDCs, compared with debt servicing and net import losses over the same period. The total annual exchange loss as a percentage of GDP increased from 3.02% in 1992 to 27.1% in 2022. Debt servicing losses contributed significantly to this burden, rising from 0.55% in 1992 to 6.62% in 2022. This indicates that currency depreciation substantially increased the cost of debt repayment, adding a considerable financial strain. The higher contribution of net import losses compared to debt servicing reflects LDCs' growing reliance on imports.

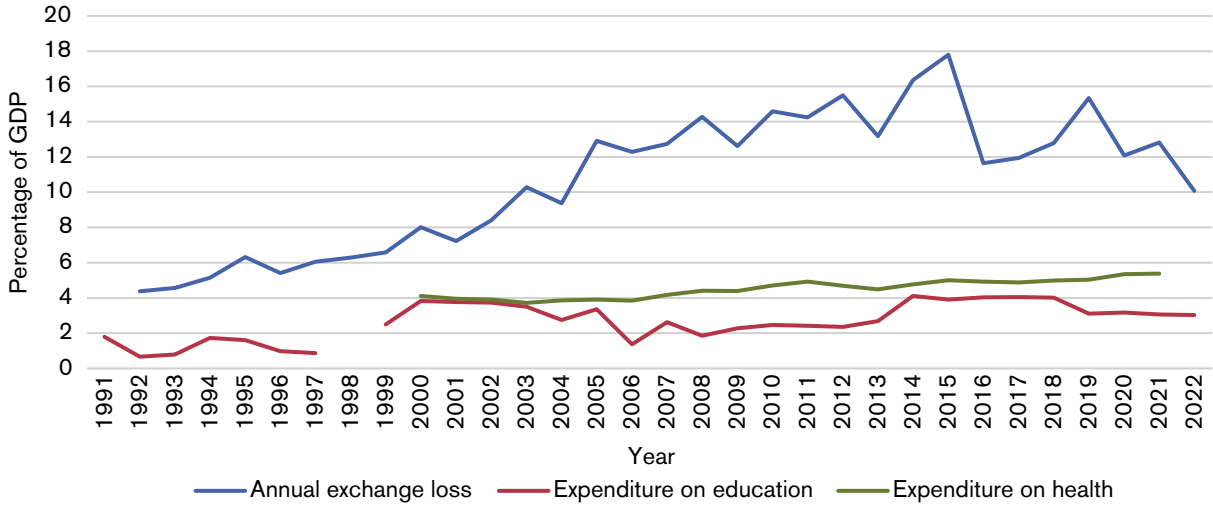
Cumulative exchange loss (% of GDP): Figure 22 illustrates the cumulative exchange loss as a percentage of GDP for SIDS and LDCs from 1992 to 2022, providing a long-term assessment of the economic toll of currency depreciation. For SIDS, the cumulative exchange loss increased to 130% of GDP by 2022, reflecting the compounding effect of annual losses. LDCs saw a more dramatic rise, reaching 200% of GDP by 2022, driven by greater import reliance. These figures highlight the severe economic burden of currency fluctuation. By 2022, the cumulative exchange loss in LDCs was equivalent to twice their annual GDP, diverting resources from development.

Figure 22. Cumulative exchange loss as a percentage of GDP due to currency fluctuation



Source: Authors' calculation based on data from IMF IFS

Figure 23. Exchange loss compared with health and education expenditure as a percentage of GDP in SIDS



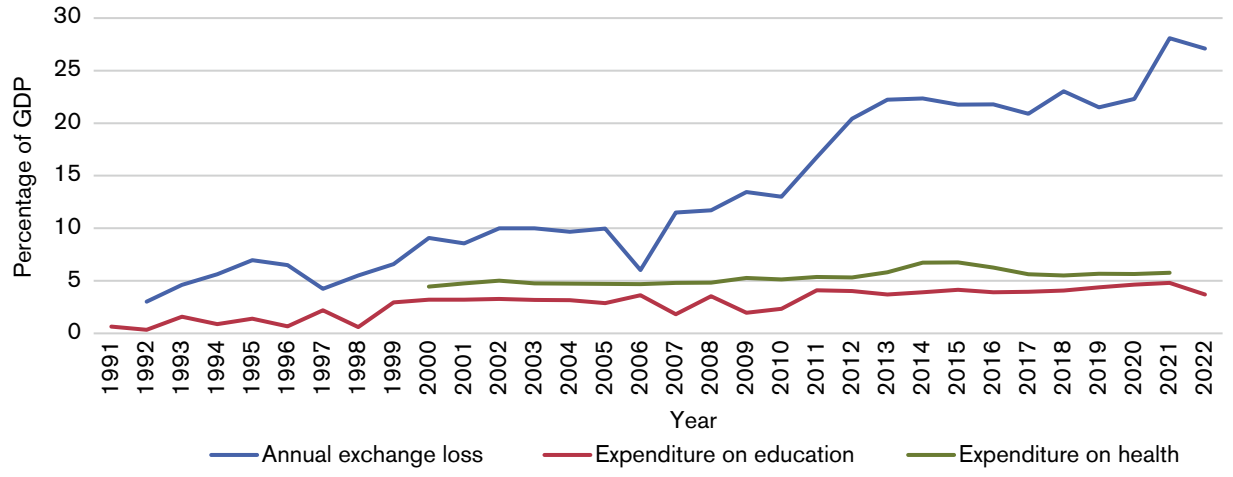
Source: Authors' calculation based on data from World Bank Group International Debt Statistics and IMF IFS

4.1.3 Analysis of exchange-related losses compared to social sector spending

Exchange loss compared with health and education expenditure in SIDS: Figure 23 compares the annual exchange loss in LCU as a percentage of GDP with health and education expenditures in SIDS from 1991 to 2022, illustrating the trade-off between currency depreciation costs and social sector investment. The annual exchange loss rose from 4.37% in 1992 to 10.07% in 2022. Education expenditure averaged 4% of GDP, reaching 3% by 2022, while health expenditure increased slowly, rising from 4% of GDP in 2000 to 5.38% of GDP in 2021. By 2022, the exchange loss (10.07%) was substantially higher than the combined health and education expenditure (approximately 7.7%), underscoring the significant trade-off, where resources used to cover exchange losses could have bolstered social investments.

Exchange loss compared with health and education expenditure in LDCs: Figure 24 presents the same comparison for LDCs, showing the annual exchange loss in LCU as a percentage of GDP alongside health and education expenditures from 1991 to 2022. The annual exchange loss increased from 3.02% in 1992 to 27.1% of GDP in 2022. In contrast, government expenditure on education remained relatively stable, averaging 3.5% of GDP, with a slight increase to 4.0% by 2022, while health expenditure averaged 2.0% of GDP, rising to 2.5% by 2022. The significant gap between the exchange loss and social expenditures by 2022 highlights the opportunity cost of currency depreciation. The exchange loss (27.1%) was nearly seven times the combined health and education expenditure (6.5%). This disparity indicates that resources diverted to cover exchange losses could have funded critical social services.

Figure 24. Exchange loss compared with health and education expenditure as a percentage of GDP in LDCs



Source: Authors' calculation based on data from World Bank Group International Debt Statistics and IMF IFS

The additional debt servicing costs due to currency fluctuations consume 6.62% of GDP annually for LDCs and 3% for SIDS. To understand the implication of these losses, if we look at social protection spending, low-income countries, encompassing LDCs and most SIDS, allocate an average of 1.1% of GDP, while high-income countries spend 16.4% of GDP (ILO, 2021). This gap is largely driven by low domestic resource mobilisation in SIDS and LDCs, where mounting debt servicing burdens divert funds from social protection programmes. Redirecting these GDP losses to social protection could increase spending to 7.72% for LDCs (6.62% + 1.1%) and 4.1% for SIDS (3% + 1.1%), significantly enhancing safety nets, advancing SDG achievement in areas like poverty reduction and health, and strengthening community resilience to climate impacts.

4.2 Understanding what drives currency fluctuation

In this section, we have used regression analysis to identify the key determinants of exchange rate loss in SIDS and LDCs, building on the findings from Section 4.1, which quantified the financial impact of currency depreciation on debt, trade and social sector investment. The regression analysis aims to capture the effects of key economic variables on exchange loss (floating model) and total reserves (pegged model), providing insights into the economic vulnerabilities of SIDS and LDCs and informing potential policy interventions to address these impacts.

4.2.1 Regression analysis for the floating model

The regression analysis for the floating model examines the determinants of exchange loss as a percentage of GDP (EXLOSS) using a panel fixed effects model, as detailed in Box 3. The model includes debt service as a percentage of GDP (DEBTSERVICE), net import value as a percentage of GDP (NETIMPORT), the annual average exchange rate (EXRT) and GDP in billion LCU as independent variables. The results show the model effectively captures exchange loss trends, with the independent variables accounting for 96.35% of its variation (R-squared = 0.9635). A robust test confirms its statistical reliability (F-statistic = 560.2631, p = 0.0000).

The regression coefficients reveal critical insights into the factors driving exchange rate losses:

- Debt service (% of GDP): a coefficient of 0.5366 indicates that a 1% increase in debt service as a percentage of GDP leads to a 0.54% increase in exchange loss.
- Net import value (% of GDP): a coefficient of 0.7356 shows that a 1% increase in net import value as a percentage of GDP results in a 0.74% increase in exchange loss.
- Exchange rate (annual average): a coefficient of 0.1221 indicates that a 1-unit depreciation in the exchange rate (weaker currency) leads to a 0.12% increase in exchange loss.
- GDP (in billion LCU): a coefficient of -0.000091 suggests that a 1 billion LCU increase in GDP reduces exchange loss by 0.000091%. While the effect is small, it indicates that economic growth can help mitigate exchange losses, by improving economic resilience and reducing reliance on foreign currency.

BOX 3. DESCRIPTION OF THE REGRESSION ANALYSIS USED TO ASSESS THE FLOATING MODEL

The regression analysis used a panel fixed effects model to examine the determinants of exchange loss in floating currency regimes. The model is specified as:

$$EXLOSS_{it} = \alpha_i + \beta_1 DEBTSERVICE_{it} + \beta_2 NETIMPORT_{it} + \beta_3 EXRT_{it} + \beta_4 GDP_{it} + \epsilon_{it}$$

Where:

- $DEBTSERVICE_{it}$ = Debt service as a percentage of GDP
- $NETIMPORT_{it}$ = Net import value as a percentage of GDP
- $EXRT_{it}$ = Exchange rate (annual average)
- GDP_{it} = GDP in billion LCU
- i = Country index (ten countries: four SIDS, six LDCs)
- t = Year index (1992–2020; 29 years)
- $EXLOSS_{it}$ = Exchange loss as a percentage of GDP for country i in year t (dependent variable)
- α_i = Country-specific fixed effect (captures unobserved heterogeneity across countries)
- β_1 β_2 β_3 β_4 = Estimated coefficients of independent variables
- ϵ_{it} = Error term

The regression was conducted to identify the key economic factors driving exchange rate losses in SIDS and LDCs with floating currencies, focusing on debt servicing, net imports, exchange rates and GDP. This analysis helped us understand the structural vulnerabilities that exacerbate currency fluctuation, providing a foundation for policy recommendations to mitigate these losses.

The findings illustrate the challenges faced by SIDS and LDCs with floating currencies. The significant coefficient on debt service underscores the precarious position of countries with high debt burdens, such as many LDCs, where the need to service external debt in foreign currency creates a vicious cycle of currency depreciation and increased exchange losses. This dynamic places immense strain on fiscal budgets, as governments must allocate more local currency to meet debt obligations, often at the expense of critical investments in infrastructure or social services.

Equally concerning is the strong effect of net import value, which reveals the vulnerability of import-dependent economies to exchange rate fluctuations. In SIDS like Guyana, where fuel imports constitute a significant portion of trade, the high coefficient on net imports indicates that large trade deficits amplify the demand for foreign currency, further weakening the local currency and driving up exchange losses (ECLAC, 2020). This import dependence not only increases the cost of essential goods but also deepens trade imbalances, making these economies highly susceptible to external shocks, such as global price volatility or climate disasters that disrupt export earnings (UNCTAD, 2022a).

The direct link between exchange rate depreciation and exchange loss further reinforces the exposure of SIDS and LDCs to external pressures. A weaker currency, often triggered by climate shocks or economic downturns, directly translates into higher exchange losses, as seen in the regression results. This vulnerability is particularly acute for countries with floating currencies, where exchange rates can fluctuate rapidly in response to market conditions, leaving little room for policy intervention to stabilise the currency.

On a more positive note, the small but significant negative coefficient on GDP suggests that economic growth can play a role in mitigating exchange losses. This finding points to the potential for growth-oriented policies to offset some of the adverse effects of currency depreciation, offering a pathway for SIDS and LDCs to build more sustainable economic structures.

Taken together, these findings highlight the need for a multifaceted policy approach to address the structural vulnerabilities driving exchange rate losses in SIDS and LDCs. Reducing debt burdens through debt relief or restructuring and converting debt into local currency, diversifying trade to lessen import dependence and promoting economic growth through targeted investments in productive sectors could help address the impact of currency fluctuation. Strengthening

resilience to external shocks, such as through climate adaptation measures, could reduce the frequency and severity of currency depreciation, offering a more stable economic environment for these vulnerable economies.

4.3 Regression analysis for the pegged model

The regression analysis for the pegged model examines the determinants of total reserves (including gold and foreign currency in million US$) for SIDS with pegged currencies, using a panel fixed effects model, as detailed in Box 4. The analysis covers the Bahamas and Barbados over the 1996–2016 period, with the model including central government debt stock (DEBTSTOCK), net exports (NETEXPORT), FDI, grants and aid received (GRANTS), and tourism receipts (TOURISM) as independent variables. The results indicate a strong model fit, with an R-squared of 0.6777, meaning 67.77% of the variation in total reserves is explained by the independent variables, and an F-statistic of 12.90 (p = 0.0000), confirming the model's statistical significance.

The regression coefficients provide the following insights into the factors influencing total reserves:

- Debt stock: a coefficient of 0.0508 (p = 0.0200) indicates that a US$1 million increase in central government debt stock leads to a US$0.0508 million increase in foreign reserves.
- Net exports: a coefficient of -0.161 (p = 0.1347) shows that net exports do not significantly influence foreign reserves.
- FDI: a coefficient of -0.051 (p = 0.7058) indicates that foreign direct investment does not significantly contribute to foreign reserves.
- Grants: a coefficient of 8.322 (p = 0.3382) suggests that grants and aid are not a stable source of foreign reserve accumulation.
- Tourism receipts: a coefficient of 0.329 (p = 0.0062) indicates that a US$1 million increase in tourism receipts leads to a US$0.329 million increase in foreign reserves.

The economic implications of these findings reveal the delicate balance that SIDS with pegged currencies maintain to sustain their fixed exchange rate regimes. The positive and significant coefficient on debt stock highlights a critical dynamic: countries like the Bahamas and Barbados, which peg their currencies to the US dollar, rely heavily on external borrowing to build the

BOX 4. DESCRIPTION OF THE REGRESSION ANALYSIS USED TO ASSESS THE PEGGED MODEL

The regression analysis used a panel fixed effects model to examine the determinants of total reserves in pegged currency regimes. The model is specified as:

$$RESERVES_{it} = \alpha_i + \beta_1 DEBTSTOCK_{it} + \beta_2 NETEXPORT_{it} + \beta_3 FDI_{it} + \beta_4 GRANTS_{it} + \beta_5 TOURISM_{it} + \epsilon_{it}$$

Where:

- $DEBTSTOCK_{it}$ = Central government debt in million US$
- $NETEXPORT_{it}$ = Net export value in million US$
- FDI_{it} = Foreign direct investment in million US$
- $GRANTS_{it}$ = Grants and aid received in million US$
- $TOURISM_{it}$ = Tourism receipts in million US$
- i = Country index (the Bahamas and Barbados)
- t = Year index (1996–2016; 21 years)
- $RESERVES_{it}$ = Total reserves including gold and foreign currency in million US$ (dependent variable)
- α_i = Country-specific fixed effect (captures unobserved heterogeneity across countries)
- β_1 β_2 β_3 β_4 β_5 = Estimated coefficients of independent variables
- ϵ_{it} = Error term

The regression for the pegged model was conducted to identify the key economic factors influencing total reserve accumulation in SIDS with pegged currencies, focusing on debt stock, net exports, FDI, grants and tourism receipts. This analysis helped us understand the dynamics of reserve management under a fixed exchange rate regime, providing insights into the factors that support or challenge the sustainability of the peg.

foreign reserves necessary to defend their exchange rate pegs. This reliance on debt, while effective in maintaining reserves, increases the countries' vulnerability to external shocks, as a high debt burden can exacerbate fiscal pressures and limit the ability to respond to crises. Continuous borrowing to sustain reserves can lead to a debt trap, particularly in the face of the climate-related disruptions that SIDS frequently encounter.

The significant role of tourism receipts in driving reserve accumulation tells a more optimistic story, showing the importance of the tourism sector as a lifeline for SIDS' economies. In countries like Barbados, where tourism accounts for a substantial portion of GDP, the strong positive effect of tourism receipts on reserves highlights the sector's role as a reliable source of foreign currency inflows. These inflows not only support reserve accumulation, but also provide a buffer against exchange rate pressures, allowing these countries to maintain their pegs even during economic downturns. However, the heavy reliance on tourism also introduces a vulnerability, as external shocks, such as global pandemics or natural disasters, can disrupt tourist arrivals, leading to a sharp decline in reserves and threatening the stability of the peg.

The lack of significant impact from net exports, FDI and grants further shapes the economic landscape for SIDS. The insignificant coefficient on net exports suggests that trade balances do not play a meaningful role in reserve accumulation, reflecting the structural trade deficits common in SIDS due to their import dependence. Similarly, the limited role of FDI indicates that foreign investment inflows are not a stable source of reserves, possibly due to the small market size and perceived risks in these economies. Grants and aid, while potentially beneficial, are also not a reliable source of reserve accumulation, as their availability can be inconsistent and subject to donor priorities. This leaves SIDS heavily reliant on debt and tourism to sustain their reserves, a precarious position that underscores the need for diversification and resilience-building measures.

5 Recommendations

Our research findings underscore the harsh economic reality faced by SIDS and LDCs, where currency fluctuations have trapped many nations in a cycle of mounting debt and underdevelopment. At the heart of this challenge lies the so-called 'original sin' (Eichengreen and Hausmann, 1999) — the structural inability of these countries to borrow internationally in their own currencies due to investor scepticism and weak financial infrastructure. As a result, they are often compelled to take on debt denominated in foreign currencies, particularly the US dollar, leaving them highly vulnerable to exchange rate volatility. As local currencies depreciate, the cost of servicing external debt escalates, pushing them to divert scarce public resources away from critical development priorities.

These economic pressures are further compounded by climate shocks. Our research shows that SIDS alone face average annual disaster damages amounting to 1.73% of their GDP. Such shocks frequently deplete foreign reserves in pegged regimes and trigger significant depreciation in floating regimes, further destabilising already fragile economies. Together, they create compounding vulnerability that demands urgent and targeted interventions to break the cycle of currency risk, debt distress and climate-induced fiscal instability.

The following recommendations present a comprehensive framework to address these interlinked challenges. They focus on immediate debt restructuring, long-term risk reduction through currency reforms and global financial architecture change. Taken together, these recommendations provide a practical roadmap for SIDS, LDCs and other climate-vulnerable countries to manage debt more sustainably, reduce exposure to currency volatility and build fiscal resilience.

5.1 Implement debt restructuring through the Debt Sustainability Support Service

Our analysis underscores how climate shocks and currency depreciation have contributed to growing debt distress in SIDS and LDCs, undermining economic stability and limiting fiscal space for development. The traditional fragmented approach to debt restructuring has proven inadequate, leaving these vulnerable economies repeatedly trapped in cycles of debt crises following climate-induced shocks. Consequently, we recommend operationalising and expanding the DSSS (Bharadwaj, 2024), a comprehensive international mechanism specifically designed to restructure and sustainably manage debt for climate-vulnerable countries, particularly SIDS and LDCs.

The DSSS represents an integrated, pre-emptive and holistic approach to debt restructuring and sustainability. Rather than merely reacting post crisis, it combines several debt management instruments, such as state contingent debt clauses (hurricane or disaster-linked clauses), parametric disaster insurance[5], concessional refinancing, debt restructuring and debt swaps, including a focus on resilience investment, to systematically address debt vulnerabilities. This structured framework ensures timely debt relief by automatically suspending or reducing debt service payments when countries experience predefined severe climate disasters. For example, hurricane clauses already incorporated into bond agreements in countries such as Barbados and Grenada have effectively

5 This is a type of insurance that will pay out when a loss-causing event meets a certain predefined threshold or parameter.

provided immediate relief after extreme weather events, demonstrating the viability of such contingent arrangements (IMF, 2021b).

Implementation of the DSSS would involve several clearly defined steps. Initially, debtor countries would collaborate closely with the DSSS to undertake comprehensive debt sustainability analyses that explicitly integrate climate vulnerability assessments. The debt sustainability assessment would determine the scale and type of restructuring required. Subsequently, the DSSS would coordinate collective negotiations among debtor governments, bilateral and multilateral creditors, and private sector creditors to achieve coherent restructuring packages. This could include extending maturities, interest rate reductions, incorporating contingent clauses to suspend repayments post-disaster, and strategically employing debt for climate or debt for nature swaps, as previously used in the Seychelles (2015) and Belize (2021) (The Nature Conservancy, 2022).

Evidence-based simulations underpinning the DSSS have demonstrated that its holistic restructuring approach can significantly reduce debt servicing burdens for climate-vulnerable countries. According to detailed analyses by the DSSS, applying a layered approach to debt relief can reduce cumulative debt service payments of 33 SIDS by nearly US$170 billion, simultaneously enhancing economic growth prospects by freeing resources previously earmarked for debt repayments.

However, to realise this potential, the DSSS will require coordinated and committed participation from several stakeholders for effective implementation. Debtor governments (SIDS and LDCs) must actively engage with the DSSS, implement necessary policy reforms to maintain long-term debt sustainability, and commit to using the fiscal space created by debt restructuring explicitly for resilience-building investments. Multilateral institutions, including the World Bank Group, IMF and regional development banks, must facilitate technical assistance, provide concessional refinancing mechanisms, and establish structured frameworks for integrating contingent clauses into debt contracts.

Bilateral creditors, especially through platforms such as the Paris Club, must align their debt relief and restructuring frameworks with DSSS principles to ensure coordinated and effective outcomes. Private creditors and investors must participate constructively, acknowledging that improved economic resilience in debtor countries ultimately supports repayment capacity and reduces future credit risks. Incentives or guarantees facilitated by international institutions can encourage private-sector participation.

5.2 Convert past debt contracts into local currencies and restructure legacy debt

In parallel with support from DSSS, it is critical to address the historical burden of foreign currency-denominated debt that has compounded fiscal challenges for SIDS and LDCs. Our research found that currency depreciation alone added an enormous additional burden to debt repayment. This legacy debt must be restructured to reflect the disproportionate impact of exchange rate volatility.

We recommend a systematic effort to convert existing foreign currency debt contracts into local-currency-denominated obligations and restructure terms to ease fiscal stress. This would involve renegotiating with multilateral, bilateral and private creditors to reduce exchange rate exposure, extend maturities and adjust interest rates, especially where climate-related shocks have undermined repayment capacity (Eichengreen and Hausmann, 1999; UNCTAD, 2021). Such restructuring would release significant fiscal resources, enabling governments to redirect funding toward critical social services, climate adaptation measures and sustainable economic development, breaking the cycle of debt crises and enhancing long-term resilience.

Precedents for debt conversions and restructurings exist. For example, Argentina's debt 'pesification' process in 2002 converted foreign-denominated debts into domestic currency obligations, significantly reducing the impact of currency volatility on fiscal stability (IMF, 2003). Similarly, the successful implementation of debt for climate swaps in the Seychelles in 2015 and debt for nature swaps in Belize in 2021 exemplify practical, innovative methods to convert external obligations into local currency financing for critical national investments, simultaneously reducing external debt burdens and enhancing climate resilience (Jiang and Cao, 2024; The Nature Conservancy, 2022).

Implementing this recommendation will require coordinated efforts from multiple stakeholders. Debtor countries must first conduct detailed debt audits and sustainability analyses clearly quantifying the additional debt burdens imposed by past currency depreciation. These analyses would provide the foundation for credible restructuring proposals. Debtor governments could then negotiate directly with bilateral and multilateral creditors, ideally through existing frameworks, such as the Paris Club or other multilateral forums like the G20, to agree on the terms for currency conversion and restructuring. For private sector creditors, debtor countries can utilise collective action clauses to ensure smooth negotiations and equitable burden-sharing among creditors, reducing

the likelihood of holdouts and ensuring coordinated participation (IMF, 2020).

Multilateral institutions such as the World Bank Group, IMF and regional development banks should support this conversion and restructuring process through advisory services, concessional refinancing facilities or by facilitating debt swap mechanisms. Specifically, the DSSS could play a central role in coordinating and streamlining these complex negotiations and providing standardised frameworks and support mechanisms, thereby ensuring timely and transparent restructurings aligned with resilience-building and sustainable development.

Developed countries, recognising their role in exacerbating climate vulnerabilities faced by SIDS and LDCs, should actively participate by providing financial incentives or guarantees that encourage creditors to participate willingly in debt conversions.

5.3 Promote lending in local currencies

To prevent the recurrence of currency-driven debt distress, international lending practices must evolve to support long-term financial stability. Promoting local currency lending is a key structural solution.

This entails international financial institutions, development banks and bilateral creditors offering loans denominated in the borrower's domestic currency. By shifting the exchange rate risk to lenders, countries can protect themselves from depreciation shocks that inflate repayment costs. Local currency lending also enhances monetary policy autonomy and promotes financial system development.

Precedents for such local currency lending already exist. For example, the International Finance Corporation (IFC) and other development finance institutions have successfully issued local currency bonds in countries such as Bhutan, Nigeria and Rwanda, raising funds domestically and lending to local projects directly in the local currency (IFC, 2017; World Bank Group, 2014). Specifically, the IFC issued a ₦8 billion (approximately US$50 million) bond in Nigeria to support the domestic capital market, and in Rwanda, IFC local currency bond issuance was explicitly aimed at enhancing the country's capital market development (World Bank Group, 2014; Yonga, 2013). These examples demonstrate that local currency lending is practical and viable and has the potential to be used as a risk mitigation tool for vulnerable economies.

In practical terms, establishing robust local currency lending markets will require coordinated actions from various stakeholders. International financial institutions, including the World Bank Group, IMF and regional development banks, should proactively support this transition. They can develop specialised lending windows and instruments denominated in local currencies, offer partial guarantees to attract international and domestic investors, and assist governments in building deeper and more resilient domestic bond markets. The central banks and finance ministries within SIDS and LDCs can play a critical role by promoting stable macroeconomic policies and regulatory frameworks that reassure investors and maintain currency stability (IMF, 2017; World Bank Group, 2014). Local governments need to ensure prudent fiscal management and transparent monetary policies, which will create the investor confidence necessary for the successful issuance and trading of local currency instruments.

Bilateral creditors and development partners should also actively transition their lending practices away from hard currency toward local currencies, especially for climate-related and resilience-focused financing. By doing so, they share the risks associated with currency fluctuations, thereby aligning their financial incentives with the borrower countries' long-term sustainability and resilience objectives. Private sector involvement will also be crucial. International and local banks, pension funds and institutional investors should be encouraged, possibly through credit enhancements or risk-sharing mechanisms provided by international financial institutions, to participate actively in local currency bond markets (IFC, 2017).

This shift, backed by coordinated actions from governments, international financial institutions, regional institutions and private sector stakeholders, would substantially improve debt sustainability and economic stability in vulnerable economies, ultimately supporting their long-term development and climate adaptation goals.

Forums such as FfD4, the G20 and COP can play a crucial role in fostering global consensus and aligning incentives for a shift to local currency financing. The long-term benefits of this transition, such as improved debt sustainability, reduced fiscal risk and stronger resilience, make it a vital component of global development cooperation.

5.4 Trade on the basis of agreed local currencies

The heavy reliance on US dollars and other reserve currencies for international trade has significantly contributed to currency instability in SIDS and LDCs. Our research found that currency depreciation has dramatically inflated the cost of imports, widening trade deficits and depleting foreign currency reserves. To address this, we recommend promoting trade settlement in mutually-agreed local or regional currencies.

This can be operationalised through bilateral or regional arrangements that allow countries to invoice and settle trade using local currencies. Such mechanisms reduce transaction costs, limit dependence on volatile exchange markets and increase regional trade resilience (UNCTAD, 2022b).

There are successful precedents for trade based on local currencies. For example, the Association of Southeast Asian Nations' local currency settlement framework has successfully facilitated regional trade using local currencies, significantly reducing reliance on US dollars, cutting transaction costs and increasing trade efficiency within Southeast Asia (Asian Development Bank, 2022). Similarly, the Pan-African Payment and Settlement System, established by the African Export-Import Bank, has successfully enabled African countries to settle trade in local currencies, drastically lowering transaction fees and dependency on external currencies (Pan-African Payment and Settlement System, no date). These examples clearly demonstrate the practicality and advantages of shifting trade transactions away from dominant foreign currencies.

Implementing local currency trading requires active coordination among multiple stakeholders. Central banks of participating countries must establish bilateral currency swap lines — arrangements allowing currency exchanges between countries — and agree stable or periodically-adjusted bilateral exchange rates to facilitate smooth transaction settlements. National ministries responsible for trade and finance will need to negotiate and formalise these bilateral or regional currency agreements and implement supportive regulatory frameworks. International finance institutions, regional development banks and regional economic blocs (such as the African Union, Caribbean Community or Pacific Islands Forum) can provide technical support, facilitate negotiations, and help establish regional clearing houses and digital payment infrastructures necessary for efficient local currency trading.

Over time, this shift will enable countries to retain more control over trade-related flows, reduce pressure on foreign exchange reserves and enhance the stability of domestic financial systems. It also complements efforts to shift debt and finance into local currency.

5.5 Advocate for global financial architecture reform at FfD4, the G20 and COP

The challenges related to currency fluctuations cannot be addressed without tackling the structural inequities of the international financial system. Our findings show how SIDS and LDCs suffer disproportionately from climate shocks and currency risks, yet face limited access to concessional finance, poor representation in global institutions and inadequate mechanisms for debt resolution. These systemic shortcomings must be addressed through coordinated global reform.

We recommend that SIDS and LDCs collectively advocate for comprehensive global financial architecture reform in key forums such as FfD4, G20 summits and COP negotiations. Their advocacy agenda should include:

- International finance institutions, notably the World Bank Group and IMF, should adopt the multidimensional vulnerability index when determining eligibility for concessional financing and debt relief. This would ensure highly vulnerable countries, especially SIDS that are classified as middle-income countries, receive necessary concessional financing and liquidity support.
- SIDS and LDCs should advocate for a robust international sovereign debt resolution mechanism to effectively address debt crises in a timely and coordinated manner. The existing DSSS could serve as a foundational framework for this comprehensive global mechanism, ensuring debt sustainability and climate resilience investments.
- Advocating for increased allocation and reallocation of SDRs — IMF assets providing debt-free liquidity — to vulnerable economies is crucial. A significant and targeted SDR reallocation, accompanied by supportive measures like dedicated trust funds or concessional liquidity facilities, could substantially enhance fiscal capacity and economic resilience in climate-affected SIDS and LDCs.
- SIDS and LDCs should advocate for improved governance structures within the World Bank Group and IMF to ensure fairer representation and decision making that more accurately reflect the interests of vulnerable developing countries. Adjustments to quota and voting rights, coupled with double majority voting systems, could help rebalance decision making and prioritise vulnerability as a core criterion in resource allocation decisions.

These reforms will require unified diplomatic strategies, alliance-building with supportive G20 members and development partners, and persistent civil society advocacy. The upcoming FfD4 presents a strategic opportunity to push for a more inclusive and responsive global financial system.

6

Conclusion

This paper has demonstrated how currency fluctuations, compounded by climate-related shocks, are deepening the debt burdens of SIDS and LDCs, threatening their fiscal stability and undermining their development prospects. Our analysis has shown that the structural reliance on foreign-currency-denominated debt and trade, combined with limited fiscal buffers and frequent climate disasters, creates a cycle of economic vulnerability. Exchange rate depreciation alone has added billions to debt servicing and import costs, draining resources that could otherwise strengthen social protection, build resilience and support sustainable growth.

Addressing this systemic challenge requires more than temporary relief. The five interlinked recommendations set out in this paper provide a comprehensive framework to break this cycle, starting with urgent debt restructuring through the DSSS, correcting historical imbalances through debt conversion, shifting new finance and trade toward local currencies, and ultimately reforming the global financial architecture to reflect the realities of vulnerability. If implemented collectively, these measures can unlock fiscal space, reduce volatility and support climate-resilient development pathways for SIDS and LDCs. The time to act is now: with decisive reforms, the global community can ensure that these countries are no longer forced to choose between repaying debt and investing in their futures.

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Small Island Developing States (SIDS) and least developed countries (LDCs) are facing growing debt burdens, as volatile exchange rates, amplified by climate shocks, inflate the cost of servicing external debt. These pressures are diverting critical resources away from development priorities and social protection, reinforcing cycles of vulnerability. This paper quantifies the economic impact and outlines practical solutions to mitigate debt distress and promote resilient, equitable growth. These solutions include debt restructuring, local currency financing and trade, and global financial reforms.

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