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The macroeconomic effects of the insurance climate protection gap*

Linda Fache Rousová Margherita Giuzio Sujit Kapadia
Hradayesh Kumar Luisa Mazzotta Miles Parker Dimitris Zafeiris

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Abstract

We examine the role of insurance in mitigating the long-term macroeconomic effects and welfare impact of catastrophes, and the interplay between climate change and insurance coverage. We focus on the impact of more frequent and severe natural disasters as well as gradual changes in climate variables on physical capital. First, we develop a theoretical model of insurance, climate change, catastrophes and the macroeconomy as a basis for the analysis. We show that insurance helps mitigate the impact of catastrophes, but insurance coverage may fall due to climate change. We test empirically these predictions on over 5,000 disaster events across 47 countries between 1980 and 2010. Finally, we use the empirical results to explore the potential future impact of catastrophes using a range of climate-change related scenarios.

JEL classification: G22, G52, Q51, Q54

Key words: insurance services; re-insurance; global warming; climate risk; climate adaptation

*Author information: Linda Fache Rousová, European Central Bank, linda.fache_rousova(at)ecb.europa.eu; Margherita Giuzio, European Central Bank, margherita.giuzio(at)ecb.europa.eu; Sujit Kapadia, European Central Bank, sujit.kapadia(at)ecb.europa.eu; Hradayesh Kumar, European Insurance and Occupational Pensions Authority, hradayesh.kumar(at)eiopa.europa.eu; Luisa Mazzotta, European Insurance and Occupational Pensions Authority, luisa.mazzotta(at)eiopa.europa.eu; Miles Parker, European Central Bank, Miles.Parker(at)ecb.europa.eu; Dimitris Zafeiris, European Insurance and Occupational Pensions Authority, dimitris.zafeiris(at)eiopa.europa.eu.

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Disclaimer: This paper should not be reported as representing the views of the European Insurance and Occupational Pensions Authority (EIOPA) or of the European Central Bank. The views expressed are those of the authors and do not necessarily reflect those of EIOPA or of the European Central Bank. A shorter version of this work has been published as a thematic article "Climate change, catastrophes and the macroeconomic benefits of insurance" in the July 2021 EIOPA Financial Stability Report (Fache Rousová et al., 2021).

Non-technical summary

There is little natural about natural catastrophes. The underlying peril is certainly natural, such as extremes of temperature, precipitation or wind, although even here the impact of humankind on climate is making an increasing contribution. Yet the impact of a catastrophe is ultimately determined by how exposed people and economic activity are to the peril, their vulnerability and which actions are taken beforehand and afterwards to mitigate the impact. Long-term drought in the middle of the Sahara has markedly less economic impact than lack of rainfall would in Saxony or Sardinia: little economic activity takes place there, and the inhabitants have adapted to the conditions.

Natural catastrophes, in short, are substantially man-made. Assessing their impact can only be effectively undertaken by considering exposure and mitigating actions taken to bolster resilience. This paper considers one facet of that assessment: the protective role that insurance can play in mitigating the negative macroeconomic and welfare impact of catastrophes, and the interplay between climate change and insurance coverage.

Climate change is likely to bring about an increase in the frequency and magnitude of natural perils (Intergovernmental Panel on Climate Change, 2021). Insurance can play an important role in helping to mitigate the impact of that greater risk, but at the same time insurance coverage may fall due to climate change. The future impact of catastrophes may consequently be greater than similar events in the past, and economic models which fail to account for this mechanism may underestimate the full magnitude of the costs of climate change.

We present here a new theoretical model that links insurance to macroeconomic performance in the short and long run, accounting for changes in the distribution of climatic conditions. The model provides three main conclusions: insurance can help mitigate the macroeconomic and welfare impact of catastrophes, climate change is likely to have an increasingly negative impact on welfare and that impact is likely to be magnified by a reduction in insurance coverage.

Those theoretical findings are supported by an empirical estimation of the macroeconomic impact of past natural catastrophes across developed and middle income countries, which demonstrates the beneficial role of insurance. A catastrophe causing 1% of GDP worth of damage is estimated to reduce GDP growth by around 0.2pp in the quarter of impact. However, if a high share of damages are covered by insurance, the initial fall in GDP may be averted. Projecting those estimates forward to the end of the present century using different global warming scenarios demonstrates that output losses from disasters could increase substantially, in particular should insurance coverage retreat from current levels. These findings further reinforce the necessity of meeting the Paris Agreement targets for limiting global warming.

While this paper provides new insights into the interplay between climate change, insurance, the protection gap and economic output, it also highlights the need for further research. In particular, the role of governments and the potential complementary role of the private sector are key issues with practical relevance, and possible policy implications which should be further explored. While substantial fiscal resources put towards reconstruction can help, this needs to be balanced against the possible effects of creating potentially large contingent liabilities on the balance sheet of fiscal authorities. Also, while this paper focuses on the reconstruction effect that shows up in measured GDP, further work would be necessary to fully understand the effects on welfare. Finally, the theoretical model and empirical analyses could be extended by including dynamic adaptation and mitigation measures that can help limit the macroeconomic impact of climate change, as well as by exploring the role of heterogeneous characteristics that may drive a different impact of climate change across region.

The potential policy implications of this work also warrant further exploration. The cross-border nature and possible systemic implications of climate change related risks could, for instance, warrant a concerted response at the European level. Knowledge-sharing at European level could enhance risk management and modelling capabilities for natural catastrophes and foster more efficient capital allocation. Risk pooling at regional or European level could potentially improve insurability and affordability. Finally, the penetration of climate risk related insurance could be improved by pairing them with other common or mandatory insurance products.

1 Introduction

There is little natural about natural catastrophes. The underlying peril is certainly natural, such as extremes of temperature, precipitation or wind, although even here the impact of humankind on climate is making an increasing contribution. Yet the impact of a catastrophe is ultimately determined by how exposed people and economic activity are to the peril, their vulnerability and which actions are taken beforehand and afterwards to mitigate the impact. Long-term drought in the middle of the Sahara has markedly less economic impact than lack of rainfall would in Saxony or Sardinia: little economic activity takes place there, and the inhabitants have adapted to the conditions.

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To better understand how insurance can help mitigate the impact of catastrophes, it is useful to first consider how catastrophes affect the economy. When catastrophes strike, they damage capital, crops, livestock, lives and livelihoods. This destruction reduces both wealth and productive capacity. Dependent on the type of natural peril, there can be continued physical disruption – for example until floodwaters recede – as well as economic disruption through supply chains and damaged infrastructure that can far exceed the initial area of impact. Notable examples include the March 2011 earthquake and tsunami in Japan that affected automobile production nationwide (Matsuo, 2015), the 2018 drought in Germany where low river levels disrupted transport of oil and other commodities, and the Covid-19 pandemic.

The initial phase of the disaster is usually followed by a period of rehabilitation as disruption wanes and eventually by reconstruction, which can take years to complete. In short, the overall economic impact of catastrophes extends beyond the initial direct damage (often described as "economic damage" in the insurance literature). The lost output in the months and years before full reconstruction, assuming it occurs, can far exceed the value of the initial direct damage and can negatively affect fiscal and financial stability.

Lis and Nickel (2009) and Gagliardi et al. (2022) show that large scale extreme weather events can reduce public budgets and may pose risks to debt sustainability in the future, also in the EU and under standard global warming scenarios. This can quickly spillover to financial markets, as shown for example by Auh et al. (2006) for uninsured US municipal bond returns. Natural disasters can also affect the cost of credit for firms and households in high-risk areas. Correa et al. (2022) show that, following climate change-related events, US banks charge higher spreads on loans to at-risk, yet unaffected borrowers. Weaker borrowers with the most extreme exposure to these disasters suffer the highest increase in spreads. Interestingly, there is no such effect from disasters that are not aggravated by climate change.

Estimates of the welfare consequences of catastrophes have typically focused on GDP growth as a way of capturing both direct and indirect impacts (see, for example, Noy (2009); Felbermayr and Gröschl (2014); Fomby et al. (2013); Klomp and Valckx (2014). But this is an imperfect measure, since it mostly captures changes to the flow of activity rather than changes to the stock of wealth. Moreover, reconstruction activity is recorded as positive in GDP numbers, while in reality it does not represent an increase in welfare relative to the counterfactual of no catastrophe since it diverts resources that could otherwise be used for productive investment, for improving the current housing stock, or for consumption (see Hallegatte and Przyluski (2010) for a more detailed description of estimating the costs of catastrophes).

Therefore, the aggregate welfare cost depends not just on the severity of the initial damage, but also on how swiftly reconstruction can be completed. Yet there is evidence that this phase can be prolonged and may even be incomplete in the absence of sufficient resources. Poverty traps can occur, where poorer households lack sufficient funds to cope with the disruption caused by catastrophes and end up in a permanently weaker financial situation (e.g. Carter et al. (2007); Nazrul Islam and Winkel (2017)). Broadly speaking, the paradox is that reconstruction requires funds, just at a time when economic activity, profitability and wealth may be depressed. The literature points to a substantial role for external financial support for activity and reconstruction – be it from international aid or domestic fiscal transfers – in reducing the overall impact of catastrophes (McDermott et al., 2014).

This is also why insurance can play a protective role. Insurance payouts can help households and businesses better endure the post-catastrophe disruption and underpin the reconstruction phase. Von Peter et al. (2012) find that the recovery from catastrophes is faster and more complete when the share of damages covered by insurance is higher. Indeed, aggregate GDP losses appear related to the uninsured component of damages rather than to the total amount. And firm-level evidence also demonstrates the protective value of insurance (Poontirakul and Noy, 2017).

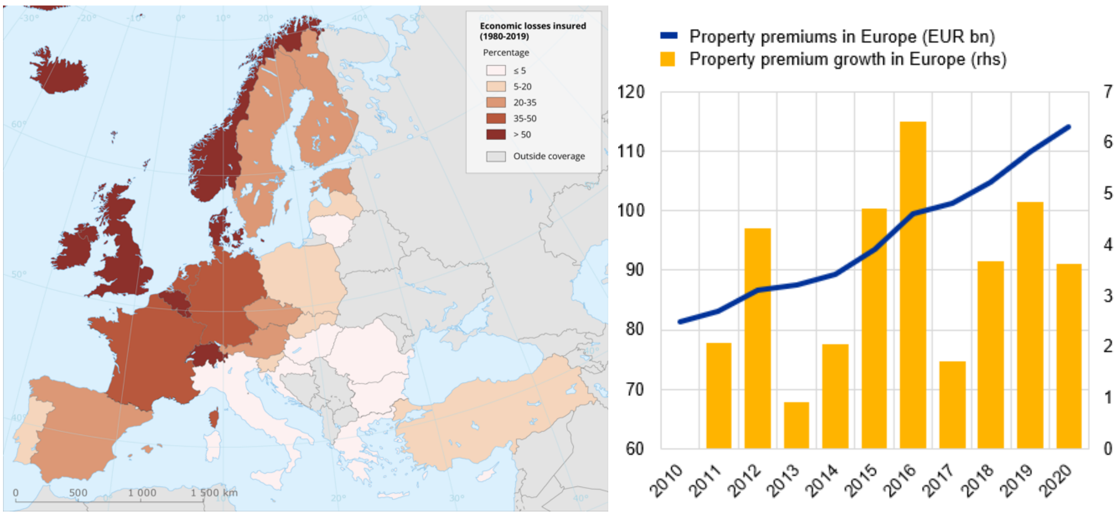
While insurance has proven effective in some past episodes, coverage for catastrophes is patchy and there is currently a substantial protection gap (see Figure 1, left panel). According to EIOPA estimates,[1] only 56% of damage caused by meteorological events (e.g. hurricanes and storm surges) in Europe is currently insured. For hydrological events (e.g. landslides and floods), the coverage falls to 28% and for climatological events (e.g. extreme

[1]Based on EIOPA pilot dashboard, MunichRe and SwissRe historical data (1980-2018 and 1970-2019, respectively). NatCatService data from MunichRe were taken from MunichRe's website in April 2020.

temperatures, droughts and wildfires) just 7%. In a few countries, financial instruments other than private insurance are in place to mitigate the impact of disasters. For example, the Insurance Compensation Consortium in Spain is a public institution that covers losses arising from extraordinary risks, such as natural catastrophes and terroristic attacks, by charging an extra-premium on any private insurance contract. This mechanism provides insurance if damages are not covered by private policies. In France, a compensation scheme (CRR) in the form of a public-private partnership provides state-guaranteed unlimited reinsurance coverage against natural disasters and uninsurable risks.

Figure 1: Average share of insured economic losses and property premiums in Europe

Notes: Left panel: The chart show the average share of insured economic losses over the period 1980-2019. *Source:* European Environment Agency, NatCatSERVICE and EUROSTAT. Right panel: Total gross written property premiums (growth) in Europe over the period 2010-2020, in Euro billion (percentage). *Source:* Insurance Europe.



Reducing the insurance protection gap could provide substantial welfare benefits and help reduce the social, economic and financial impact of catastrophes. Closing the gap becomes even more important in the context of the expected increase in catastrophes brought about by climate change in the coming decades, an increase that will be particularly acute if the Paris Agreement targets are not met (Intergovernmental Panel on Climate Change, 2018, 2021). As reported by the International Association of Insurance Supervisors (IAIS) and Sustainable Insurance Forum (SIF), rising natural catastrophes are already resulting in increased claims, affecting the premiums and availability of non-life insurance, e.g. in property, transport and liability insurance (see Figure 1, right panel).[2]

These developments also highlight how material climate change may widen the insurance protection gap, amplifying the impact of extreme weather events on fiscal and financial stability (Lis and Nickel, 2009; Gagliardi et al., 2022; ECB/ESRB Project Team on climate risk monitoring, 2022). By affecting the frequency and intensity of compound events (multi-hazards), climate change poses risks for insurance reserves and capitalisation and, ultimately, for insurance supply, that can lead to non-linear amplifications of costs

[2]See "Draft Application Paper on the Supervision of Climate-related Risks in the Insurance Sector", (October 2020).

(Ibragimov et al., 2009). Under severe scenarios, it is possible that the insurance market for certain climate-related events becomes unviable if the willingness or ability of households and businesses to pay for insurance is lower than the premium for which insurers are willing to (or able to) accept the risk transfer. For example, recent devastating wildfires in California and Australia have resulted in widespread reports of difficulties with insurance renewal. A survey of Australian businesses in 2020 found that more than half reported difficulties in obtaining insurance over the previous year, citing high growth in premiums, coverage being too limited, or not being available at all (Reed et al., 2020). And a study of major New Zealand cities found that even a small rise in sea levels could substantially increase flood risk and that at least partial insurance retreat was likely within the coming decade (Storey et al., 2020).

The following sections present in turn a theoretical model of insurance, climate and the macroeconomy, empirical evidence of how insurance has in the past mitigated the impact of catastrophes, and an illustration of the potential future impact of catastrophes using different of global warming scenarios.

2 A theoretical model of the macroeconomic impact of climate change and insurance

The environmental economics literature provides extensive evidence that climate change affects the level of output and the economy's ability to grow in the long-term. In this section, we model the role of insurance in mitigating the macroeconomic costs of climate change by distinguishing the long-term effect of gradual but persistent changes in climate variables, such as temperature and precipitation (chronic physical risks), from the short-term effect of more frequent and severe extreme weather events, such as floods, storms, droughts and wildfires (acute physical risks).

We show that insurance is beneficial to the economy, as it mitigates losses when disasters occur and reduces the recovery period by facilitating investment. But changes in climate variables as well as more frequent and severe natural catastrophes may reduce the supply of insurance and increase its costs. In particular, the model shows that the macroeconomic and welfare costs of climate change are likely to be greater than they would otherwise be because of this potentially growing insurance protection gap. We start with a baseline growth model that incorporates disaster risk in the presence of insurance but abstracts from climate change (Section 2.1). Then we turn to the impact of climate change via a gradual increase in temperatures and more frequent natural hazards that affect the insurance market (Section 2.2).

2.1 Modelling output in the face of natural disasters

Consider an economy in which aggregate production is described by the following production function, where L and K are labour and capital inputs, and Λ is labour productivity:

$$Y_t = F(\Lambda_t L_t, K_t) \tag{1}$$

We start by focusing on modelling the impact of natural disasters on output growth through capital, in the presence of insurance. The model assumes diminishing returns on capital, such that $dY/dK > 0$,and $d^2Y/dK < 0$. When disasters occur, total capital is reduced as a part of it would be destroyed or damaged. We map changes in capital to three variables: the total amount of capital in the absence of disasters K, the amount of damaged capital upon a disaster K_d and the insurance payout K_i as shown in Equation (2). Although a share of the capital (K_d) gets damaged by the disaster regardless of insurance, we assume that the insured damaged capital (K_i) gets rebuilt immediately, reducing the impact of the event on output. In the absence of disasters, output is given by the long-term production function in Equation (1). Output growth is constrained following a disaster because both the available capital stock decreases, and because resources are reallocated away from the optimum to invest in reconstruction activities (see also Hallegatte and Vogt-Schilb (2019)):

$$Y = \left(1 - \left(\frac{K_d - K_i}{K}\right)\right) F(\Lambda L, K) \tag{2}$$

In this model, lost capital has a productivity equal to the average productivity of the capital in the economy. Then changes in output are

$$\Delta Y(t_0) = \mu \Delta K \tag{3}$$

with μ equal to the average productivity of capital $F(\Lambda L, K)/K$. We assume that assets that were not directly damaged by the disaster continue producing with an unchanged productivity, although in reality their productivity could be reduced due to indirect effects, e.g. on the supply chain. The overall impact of a disaster on output is the sum of a reduction in the stock of capital and a misallocation of the residual stock compared to optimal. Equation (3) can be used then to capture both the urgency to reconstruct and recover from an event, and the choice between investing in capital (or labor) over the long term (Hallegatte and Vogt-Schilb, 2019).

2.1.1 The impact of natural disasters and insurance on capital and economic growth

We assume that disasters occur as discrete downward jumps to the capital stock and can be modelled as Poisson arrivals with a mean arrival rate π. Here we assume this probability to be fixed, at least in the short-term, but in Section 2.2 we will allow π to vary as a function of climate change. K_d denotes the amount of damaged capital, $K_d = (1 - Z)K$, where Z is the undamaged share of capital or remaining fraction of capital. For simplicity, we assume here that the loss given event is independent from risk adaptation, i.e. households and firms cannot reduce the damage.[3] $K_i = WK_d$ is the insurance payout in the event of a disaster and is equal to the total amount of insured capital that is damaged, where W indicates the share of damaged capital covered by the insurance. K_i gets rebuilt immediately after the event, thanks to the prompt liquidity provided by insurance. The insurance payout K_i cannot be larger than the damaged capital K_d, therefore $W \leq 1$. Abstracting from labour, output can be written as:

$$\begin{aligned} Y = F(K, K_d, K_i) &= K - K_d + K_i \\ &= K - (1 - W)(1 - Z)K \end{aligned} \tag{4}$$

where $(1 - W)(1 - Z)K$ is the uninsured damage. This expression defines the insurance protection gap. The protection gap increases as either Z falls for a given level of W (e.g. a bigger disaster that affects a larger share of capital), or as W decreases for a given level of Z (a smaller share of capital is insured). If there is no disaster, i.e. $K_d = 0$ and $Z = 1$, changes in output depend only on changes in capital. In the presence of full insurance, i.e. $K_i = K_d$ and $W = 1$, changes in output also depend on capital only, independently from damages, as insured damaged capital gets immediately rebuilt. In the complete absence of insurance activity, i.e. $W = 0$, changes in output depend on changes in capital and the severity of damages, $Y = ZK$, for a given level of disaster probability π.

In each period, aggregate output can be spent in consumption C, investment I and insurance premiums P, as shown in Equation (5). These insurance premiums determine the degree of insurance coverage which, as modelled in Equation (4), reduces damages upon a catastrophe event by shortening the recovery period. We do not distinguish here between public and private investments and we abstract from other mitigation spending that may reduce the damage from disasters, e.g. seawalls or land-use zoning (Hong et al., 2020). The uninsured damages at time t depend on pre-disaster insurance spending.

$$Y = C + (I + \Phi) + P \tag{5}$$

Investments are adjusted by a cost function $\Phi(I, K)$ that captures effects of depreciation and costs of installing capital (see Pindyck and Wang (2013)):

$$\Phi(I, K) = \phi(i)K \tag{6}$$

where i is the investment-capital ratio, $i = I/K$, and $\phi(i)$ is increasing and concave.

[3] Alternatively, the loss could be modelled as a function of adaptation as in Fried (2021), $K_d = (1 - Z)KF(a)$, where a denotes the adaptation capacity.

This implies that, in the presence of adjustment costs, the capital is not perfectly liquid and cannot be used for consumption without incurring some costs, i.e. consumption and investment are not perfectly substitutable.

After a disaster, damaged assets are replaced or repaired by reducing consumption and regular investment. Following Hallegatte et al. (2007), we define two types of investments, as shown in Equation (7): investment towards reconstruction of the damaged capital, I_R, that increases the residual capital remaining after disasters, and investment into new capital, I_N, that would regularly increase the production capacity K (i.e. independent of disasters).

$$I = I_R + I_N \tag{7}$$

The marginal return on reconstruction is higher than the marginal return on new capital, consistent with empirical evidence: e.g. following disasters, the construction of new buildings and infrastructure would be postponed to rebuild the damaged ones. Therefore, when capital is destroyed in a catastrophe, investment is first devoted to replacing the destroyed capital.

The time it takes to rebuild destroyed capital depends not only on the extent of the losses, but also on the cost and availability of financial tools for households and firms (Hallegatte et al., 2007). In practice, the pace of reconstruction, I_R, can be limited by a lack of savings or borrowing capacity, for example, or by limited production capacity in certain sectors, such as construction. This leads to consumption losses since C would be reduced in favor of I and reconstruction periods would be much longer than what the initial amount of damage would suggest. Insurance can relax these financial constraints by quickly repaying insured damages and reducing consumption losses. To capture these constraints, I_R is bounded by f_{max}, the fraction of total investment that reconstruction investments can mobilize:

$$I_R = \begin{cases} min\,(f_{max}I, (1-W)(1-Z)K) & Z < 1 \\ 0 & Z = 1 \end{cases} \tag{8}$$

We assume that all investment is devoted to reconstruction because of the higher return of I_R with respect to I_N, and that output losses are reduced to zero exponentially with a characteristic time of reconstruction R. This implies that the economy returns to its pre-disaster state, although in practice some activities could be permanently destroyed. Output losses after t_0 are then given by:

$$\Delta Y(t) = \mu \Delta K e^{-\frac{t-t_0}{R}} \tag{9}$$

The duration of the reconstruction phase therefore determines the macroeconomic cost of natural disasters. If damages can be repaired immediately, output losses will be zero, but consumption will be reduced to reconstruct (i.e. $\Delta C = \Delta K$). By contrast, if there is no reconstruction, output losses will be permanent ($R = \infty$) and will be absorbed by consumption (i.e. $\Delta C = \Delta Y = \mu \Delta K$). Assuming that the productivity of destroyed capital is equal to the average pre-disaster productivity of capital, the model therefore implies that the net present value of consumption losses is larger than direct losses when reconstruction takes some time, as $\mu \Delta K > \Delta K$. In other words, consumption and welfare losses are magnified when reconstruction is delayed or slowed down.

We can also translate the model to determine what it implies for the economy's growth rate by augmenting a standard specification of capital stock evolution in the presence of disasters (Barro, 2006; Pindyck and Wang, 2013; Hong et al., 2020) to incorporate the effects of insurance. The capital stock is subject to stochastic fluctuations and jumps, and evolves as follows:

$$dK_t = \Phi(I_{t-}, K_{t-})dt + \sigma K_{t-} d\mathcal{B}_t - (1-W)(1-Z)K_{t-} d\mathcal{J}_t \tag{10}$$

The first term is investment, adjusted for depreciation and costs of installing capital, as defined in Equation (6) (Pindyck and Wang, 2013). The second term captures continuous shocks to capital that are standard in macroeconomic models, where $\mathcal{B}_t$ is a standard Brownian motion and the parameter σ is the diffusion volatility of the capital stock growth. The third term represents the effect of disasters.

$\mathcal{J}$ is a jump process reflecting the probability of a natural catastrophe with a fixed but unknown arrival rate, π. $t-$ denotes the pre-jump time. When the jump arrives, it destroys K_d, which is a fraction $(1 - Z)$ of capital K. The novelty of our model is that in the presence of insurance, this fraction is reduced by $(1 - W)$ times, as also shown in Equation (4). If the catastrophe does not arrive, the third term of Equation (10) is zero. The higher the arrival rate π, for example due to climate change, the more likely that the capital stock will be hit by a disaster. Substituting the expression for depreciation and installation costs (6) into (10) and taking the first derivative of capital stock K_t, we can see that

$$dK_t/K_t = \phi(i^*)dt + \sigma d\mathcal{B}_t - (1-W)(1-Z)d\mathcal{J}_t \tag{11}$$

where i^* is the optimal investment-capital ratio, constant in equilibrium. The expected growth rate, denoted by $\bar{g}$, is then

$$\bar{g} = \phi(i^*)dt - \pi E(1-W)(1-Z) \tag{12}$$

where the second term is the expected percentage decline of the capital stock due to catastrophes. Equation (12) shows that, while insurance may crowd out investment, it enhances long-run growth by reducing the expected loss due to catastrophes $E(1–W)(1–Z)$.

Insurance premiums p_{t-1} mitigate the effect of disasters by ensuring a share W of damages, so that the remaining share of capital after disaster conditional on the event arrival at time t, i.e. $(1–W)(1–Z) = Z + W(1–Z)$, depends on pre-disaster insurance spending P_{t-1}:

$$W_t(1 - Z_t) = p_{t-1} \tag{13}$$

where $W_t(1 - Z_t)$ is the share of insured damages and p_{t-1} is the pre-disaster unit cost of insurance. If insurance spending P_t increases, then the benefit increases as well, but less than proportionally, i.e. insurance has decreasing returns to scale. In the next section, we therefore consider the determinants of insurance cost.

2.1.2 The cost of insurance

For a given probability of an adverse event, π, insurance is beneficial in expectation, with the benefits deriving from the reduction of (uninsured) damage after disasters. The price of insurance claims is modelled as follows:

$$p(W, Z) = \alpha\pi(1 - Z)W \tag{14}$$

where α reflects the insurance risk premium and depends on the risk aversion of insurance capital providers, $\pi(1 - Z)$ is the damage of a disaster and $\pi(1 - Z)W$ is the amount of damage insured. If the policyholder insures the whole capital at risk, $p(W, Z) = p(Z)$. Should the shock arrive, the policyholder would receive a lump-sum payoff of one unit of consumption. If the disaster probability (arrival rate) π increases, the insurance premium would increase too, as insurers will pay more claims. At the same time, for a given Z, the insured share W would decrease. This allows us to model the insurance cost endogenously. Lane and Mahul (2008) show empirically that the price of a catastrophe bond can be modelled as a multiple of expected loss, as in Equation (14). The risk charge reflects the cumulative feature of disaster risks that affect many policyholders at the same time. The higher is α and the bigger the loss, the higher the insurance premium, as the ability of insurers to diversify their portfolio and pool risks together decreases. Carayannopoulos et al. (2020) and Dieckmann (2010) suggest that risk aversion among insurance capital providers can increase the value of the insurance risk premium α, for example after major natural disasters. For simplicity, we abstract here from the distinction between insurance and reinsurance providers.

We assume that if the probability of a catastrophe, π, increases, the demand for insurance K_i will also increase as the benefit of insurance will be larger other things being equal. But insurance supply is limited to a quantity, M, with $K_i \leq M$, which depends on insurers' risk aversion. If the buyer of insurance knows the capital at risk and is strictly risk averse, then he will completely insure against the event, i.e. $W = 1$. In this model, we assume that the buyer cannot influence the probability or severity of a natural event. Otherwise, the insurer will offer only partial insurance, $W < 1$, so that the buyer has incentives to reduce risk/losses. If the policyholder could influence the probability or severity of disasters in our model, then the level of insurance would depend on such adaptation capacity, because a consumer with high adaptation capacity suffers lower damage and therefore chooses to insure less, i.e. lower W.

The insurance protection gap can widen for several reasons that relate both to insurance supply and demand. Insurers' risk aversion typically increases after large natural disasters. Also, a lack of awareness or willingness to buy insurance cover even when it is affordable and accessible, is not uncommon in many developed countries.[4] But the protection gap may also widen from the rising price or the unavailability of certain types of insurance coverage, especially due to risk factors related to climate change. If the frequency or severity of disasters rises globally, this may increase the insurance risk premium and reduce its risk pooling benefit. In this situation, buyers are aware and willing to buy insurance cover but are unable to do so due to unaffordability or insufficient availability.

2.2 Incorporating the impact of gradual changes in climate variables on capital

Thus far, we have abstracted from the impact of climate change in the model. Climate change can affect output both via a gradual change in climate-related variables and more frequent natural hazards. In the next step, we consider only the direct effects of gradual global warming on capital, that affect neither the probability nor the severity of an adverse natural event and that cannot therefore be mitigated by insurance. In Section 2.2.1, we introduce the impact of more frequent disasters on insurance activity, i.e. on the insurance protection gap, and therefore on output.

We start by modelling the impact of gradual changes in climate-related variables, such as temperature, T, and precipitation, on capital by exploiting the approach of Kahn et al. (2021). In particular, we consider the deviations from the historical norms of climate variables.[5] In contrast to Kahn et al. (2021), we focus here on the impact of global warming, based on warming trend (i.e. changes in T), on output growth, via gradual losses of physical capital related, for example, to land desertification or sea level rise, and we abstract from the impact on labour productivity. Gradual warming could also reduce the productivity and availability of natural resources as well as negatively affect certain aspects of the capital stock. For example, some machinery and equipment may not be able to operate as effectively above certain temperatures, or higher temperatures may accelerate the rate of depreciation of the capital stock. We abstract here from the development of new technologies that could mitigate these effects over time.

The historical norms are regarded as capital neutral, in the sense that if climate

[4] Aon Benfield's "Reinsurance Market Outlook," published in July 2019, said, "Even in developed countries with the most mature insurance markets in place, there are several perils and sub-perils of events that remain highly uninsured."

[5] An alternative to deviations from historical norms $(T - T^*)$, we could consider weather anomalies, i.e. extreme events $(T - T^*)/\sigma_T$.

variables remain close to their historical norms, they are not expected to have any gradual long-term effects on capital. In this step, we also assume that K_d and K_i are not affected by gradual changes in climate related variables.

Specifically, we consider the following specification for changes in capital due to temperature:

$$K(x_t) = K_t \omega_0 exp(-\omega x_t) \tag{15}$$

where $x_t = (T - T^*_{t-1})$, ω_0 is a positive constant and the exponential function is a multiplicative shifter of capital, with ω being the sensitivity of physical capital to climate change, and also assumed to be positive, so that climate change adversely affects the capital stock. The historical norms T^* are assumed to be fixed to reflect the average temperature. By substituting Equation (15) into (4), we obtain the following

$$Y_t = F(K_t, K_{dt}, K_{it}, x_t) = K_t \omega_0 exp(-\omega x_t) - [1 - (1 - W)(1 - Z)] \tag{16}$$

Equation (16) shows that if there is no deviation of temperatures from historical norms (so that $x_t = 0$), output would be the same as in Equation (4). But if changes in temperature directly affect capital, without changing the probability of a disaster, then the output in Equation (16) is smaller than in Equation (4) substituting $exp(-\omega x_t) < 1$. In short, regardless of the provision of insurance, output and welfare are likely to be lower in the presence of climate change.

2.2.1 The impact of changes in climate variables on capital through disaster insurance

Global warming is also likely to affect output by making adverse natural events more frequent or more severe. This affects output directly by increasing losses from disasters, and indirectly via the widening protection gap. The direct effect can occur even if the protection gap does not widen. In this section, we focus on the indirect effect of an increase in disaster probability, π, on insurance coverage. As an alternative, we could also consider the effect of an increase in severity, Z. As shown in Equation (14), insurance premiums would increase as a consequence of increased disaster risk and insurance coverage would decline, a process called insurance retreat in the literature. Alternatively, insurers could introduce terms in insurance policies that transfer part of the risk to the policy holder (partial retreat) (Storey et al., 2020).

We modify Equation (14) to account for changes in insurance premiums due to climate variables:

$$p(W, Z, x) = \alpha\pi(1 - Z)W exp(-\psi x_t) \tag{17}$$

where ψ is the sensitivity of disaster probability to climate change, reflecting changes in frequency of extreme events under climate change. If there is no deviation of climate variables from historical norms ($x = 0$), insurance on physical capital will depend on the insurance risk premium and expected damages as in Equation (14), and the output model collapses to equation (4). If climate change increases insurance costs, a positive ψ would be associated to higher premiums and therefore lower insurance coverage, i.e. a higher protection gap.

$$Y_t = F(K_t, K_{dt}, K_{it}, x_t) = K_t \omega_0 exp(-\omega x_t) - [1 - (1 - W exp(-\psi x_t))(1 - Z)] \tag{18}$$

Given the inverse relationship between insurance cost and coverage, the sensitivity of the disaster probability enters the expression with a negative sign. As above, the historical norms are regarded as insurance neutral, in the sense that if climate variables remain close to their historical norms, they are not expected to have any effects on the probability of the adverse natural event and therefore on insurance. If insurance coverage is negatively affected by climate change, the output in Equation (16) is larger than in Equation (18) because $exp(-_t) < 1$ if $\psi > 0$. If there is no insurance, equations (16) and (18) are equivalent.

Overall, the theoretical model presented here provides several important conclusions. First, disasters are costly and influence output through their increasing frequency. Insurance can help mitigate the impact of disasters by relaxing financial constraints and accelerating the rebuild, thereby reducing the overall welfare loss. Second, the gradual increase in temperatures above historic norms can result in lower productivity and lower output overall, for which insurance can offer little protection. Finally, an increase in the probability of natural hazards can result in a widening of the insurance protection gap, which exacerbates the detrimental effect of increasing climate-related catastrophes on capital, output, growth and welfare.

3 Empirical evidence of the impact of the protection gap

In this section, we empirically test some of the predictions from the theoretical model, specifically the growth Equation (12). Abstracting from the stochastic properties of that equation, it implies that the growth rate of an economy is adversely affected by damage from natural disasters, but insurance can play a role in mitigating their impact. More formally, for a given period t, Equation (12) can be rewritten as:

$$g_t = \phi_t - E(1 - W_t)(1 - Z_t) = \phi_t - E(1 - W_t) + EW_t(1 - Z_t) \tag{19}$$

where ϕ_t is a growth rate in period t without any disaster damage (i.e. when $Z_t = 1$), $(1{-}Z_t)$ is the share of capital damaged by a disaster (or a set of disasters) occurring in period t, W_t is the share of the damaged capital covered by insurance and E is a non-linear function. Using Taylor's theorem, we obtain the linear approximation of this function from the first order Taylor polynomial and approximate the growth rate of a country c in period t as follows:

$$g_{c,t} = \phi_{c,t} + \beta_1(1 - Z_{c,t}) + \beta_2 W_{c,t}(1 - Z_{c,t}) \tag{20}$$

Furthermore, decomposing $\phi_{c,t}$ into a country fixed effect α_c, a time fixed effect θ_t and a random error term $\epsilon_{c,t}$, we derive the following empirical specification:

$$g_{c,t} = \beta_1(1 - Z_{c,t}) + \beta_2 W_{c,t}(1 - Z_{c,t}) + \alpha_c + \theta_t + \epsilon_{c,t} \tag{21}$$

In line with our model, we expect $\beta_1 < 0$ and $\beta_2 > 0$. To account for the non-linearities in the theoretical model, we also derive a complementary empirical specification from Equation (21) by transforming the continuous variables $1 - Z_{c,t}$ and $W_{c,t}$ into dummy variables to distinguish between large-scale natural disasters with low and high shares of insured losses. The coefficient for large-scale natural disasters with a low share of insured losses is then expected to be negative (as in the case of β_1) and the coefficient for large-scale natural disasters with a high share of insured losses is expected to be higher than this (derived from $\beta_1 + \beta_2$).

3.1 Data

For the dependent variable, we use quarterly data on real GDP growth rates from Eurostat and complement them with data from the OECD, which provides us with a sample of 47 countries. This naturally skews the sample towards more developed economies. The sample does also include some emerging market economies (including Brazil, India, Indonesia, Russia and South Africa), but no country classified as low income by the World Bank is present. By focusing on GDP growth rates, our empirical analysis follows the theoretical model and the approach of most other studies in this field (e.g., Noy (2009); Felbermayr and Gröschl (2014); Fomby et al. (2013); Klomp and Valckx (2014)). Yet GDP growth is only an imperfect proxy for capturing the overall welfare consequences of catastrophes, since it captures changes to the flow of activity rather than changes to the stock of wealth.

To proxy the share of capital damaged by natural disasters and the share of damaged capital covered by insurance, we use EMDAT, an international disasters database collected by Centre for Research on the Epidemiology of Disasters.[6] The EMDAT database contains

[6]Available under www.emdat.be.

information about individual disaster events across the globe since 1980. Owing to a somewhat lower coverage in early years, we drop events before 1996.

We focus on four types of natural disasters: climatological (411 events), geophysical (521 events), hydrological (2,275 events) and meteorological (1,995 events) (see Table 1).[7] The most common events are floods (38% of all events) and storms (31%). A typical drought (climatological disaster) results in the largest damages (median around \$860mn), followed by an extreme temperature event (median ~\$300mn), a storm (median ~\$180mn) and a wildfire (median ~\$140mn). While earthquakes display a relatively limited median damage (around \$90mn), the distribution is highly skewed to the right by events with exceptionally large damages, resulting in the largest mean among all types of events (around \$2,630 mn).[8] Although geophysical disasters such as earthquakes are independent of climate change, we include them in our analysis to increase the sample size, especially in relation to very large disasters.

Table 1: Type of disasters (monetary values in constant 2010 USD)

Event type	Number of events	Percent	Damage: mean	Damage: median
Climatological	**411 (194)**	**7.9**	**\$1,126 mn**	**\$244 mn**
Drought	149 (78)	2.9	\$1,465 mn	\$863 mn
Wildfire	262 (116)	5.0	\$899 mn	\$140 mn
Geophysical	**521 (229)**	**10.2**	**\$2444 mn**	**\$93 mn**
Earthquake	431 (212)	8.3	\$2,632 mn	\$94 mn
Mass movement (dry)	8 (1)	0.2	\$7 mn	\$7 mn
Volcanic activity	82 (16)	1.6	\$115 mn	\$66 mn
Hydrological	**2,275 (856)**	**43.7**	**\$784 mn**	**\$107 mn**
Flood	1,995 (814)	38.4	\$817 mn	\$118 mn
Landslide	280 (42)	5.4	\$147 mn	\$25 mn
Meteorological	**1,995 (1,032)**	**38.4**	**\$1226 mn**	**\$181 mn**
Extreme temperature	367 (37)	7.1	\$1435 mn	\$303 mn
Storm	1,628 (995)	31.3	\$1218 mn	\$177 mn

Sources: EMDAT and authors' calculations.
Notes: The figures in parentheses refer to the number of events, for which data on total damage are available.

While the database includes over 5,000 disaster events across the globe for the period of our analysis, information on financial damages is only available for about 2,300 disasters. Within those, a split between insured and uninsured losses is available only for around 650 events (see Table 2), with both the mean and median share of insured losses being around 40%. But those disasters with the split are in general much larger, which are likely to be more relevant in terms of macroeconomic impact. In particular, the average financial damage for disasters where insured losses are available is \$3.2 billion, almost ten

[7]These are the disaster types most studied in the literature. Excluded types include technological disasters, which are typically factory and transport accidents and therefore generally small and localised, biological disasters, which in general have smaller initial impact on capital (although as the current pandemic shows there can be substantial indirect impacts) and extra-terrestrial (a meteor strike in Russia).

[8]All values are in this paragraph are in constant 2010 USD.

times higher than the average damage of disasters where the split between insured and uninsured damages is unavailable.

To increase the number of events for our empirical analysis, we impute insured and uninsured losses for most events where data on total damages are available. The values are imputed based on a country-specific regression models, where the dependent variable is the share of insured losses in total damages and the explanatory variables include the log of total damage and dummies for nine different types of disaster (drought, earthquake, extreme temperature, flood, landslide, mass movement, storms, volcanic activity, wildfire; see also Table 1) to the extent applicable for a given country. For some countries, the model cannot be estimated owing to a low number of observations, resulting in around 250 events with damage data but no imputed values for insured/uninsured losses. In the empirical exercises in Section 3.2, we present results based on both the smaller sample where insured and uninsured losses are split in the data and the wider sample which exploits the imputed split.

Table 2: Results of data imputation for insured and uninsured losses after data cleaning (monetary values in constant 2010 USD)

	Damages	**Insured**	**Uninsured**	**# events**
Original dataset				
Information on (un)insured losses	\$2.1 tr	\$0.7 tr	\$1.4 tr	657
Information on total damage only	\$0.6 tr	-	-	1654
No information on damage	-	-	-	2891
Total				5202
Dataset with imputed values				
Information on (un)insured losses	\$2.7 tr	\$0.9 tr	\$1.8 tr	2066
Information on total damage only	<\$0.1 tr			245

Sources: EMDAT and authors' calculations.
Notes: We undertake two cleaning steps in the original dataset. First, for 45 events, for which insured losses are available (amounting to around \$15 bn) but total damage data are missing, we set insured losses to missing values. Second, for 23 events, for which insured losses exceed total damage, we set total damage equal to insured losses if this access is smaller than 25% of total damage (11 events) and we set both insured losses and total damage to missing values otherwise (12 events). In addition, if the imputed value of the share of insured losses is below zero (55 events) or above one (98 events), we set it to missing.

We proxy the share of capital damaged by disasters in country c and quarter t by the share of financial damages from (all) disasters in that quarter and country relative to country GDP lagged by one year. We obtain the GDP level data from the World Development Indicators (WDI) and use constant 2010 USD for the calculation. The mean (median) disaster cost per quarter is 0.25% (0.029%) of GDP in the full EMDAT sample, which declines to 0.16% (0.028%) of GDP for our sample of countries where quarterly GDP data are available (see Table 7 in Annex A). The lower mean impact reflects the fact that quarterly GDP data are mainly available for developed countries, where natural disasters have typically had a smaller impact relative to GDP in the past. In this smaller sample, the disaster damage exceeds 1% of GDP for only 19 observations. The share of the damaged capital covered by insurance ($1–Z_{c,t}$) is then proxied as the share of insured financial losses per quarter in total disaster damages per quarter. The share of insured losses per quarter is somewhat higher in the sample with quarterly GDP data (median at 47%) as compared to the world-wide EMDAT sample (median at 41%). And overall, it displays a large heterogeneity across countries, ranging from below 5% (e.g. Colombia, Croatia, Greece, Indonesia, Korea) to over 65% (e.g. Denmark, France, Luxembourg).

3.2 Empirical results

Using a panel regression with standard errors clustered by country, we estimate Equation (21) and report the results in Table 3. We start by focusing in column (1) on the sample for which insured and uninsured losses are split in the underlying dataset. The sign of the coefficients is as expected, with greater damages from disasters being associated with a lower growth rate but with this effect being mitigated by a higher share of insured losses. The statistical significance of both coefficients improves when we use the larger sample with imputed data in column (2), while the size of the coefficients remains almost unchanged.

Table 3: Panel estimates with the share of insured losses

Dependent variable	**quarterly GDP growth rate (in %)**					
Sample	**(1) Original**	**(2) Imputed**	**(3) Original**	**(4) Imputed**	**(5) Original**	**(6) Imputed**
Damages as a share of GDP (%)	-0.24*	-0.23*	-0.25**	-0.24**	-0.22*	-0.18
	(0.07)	(0.05)	(0.01)	(0.02)	(0.08)	(0.11)
Damages as a share of GDP (%) * Share of insured losses (%)	0.0036*	0.0037**	0.0039**	0.0038**	0.0034**	0.0027*
	(0.06)	(0.04)	(0.01)	(0.01)	(0.04)	(0.08)
Lag of GDP growth (%)					-0.042	-0.015
					(0.68)	(0.88)
Country fixed-effects	Y	Y	Y	Y	N	N
Quarterly fixed-effects	Y	Y	N	N	Y	Y
Quarterly-country groups fixed-effects	N	N	Y	Y	N	N
Observations	3,100	3,595	3,100	3,595	3,064	3,552
R-squared	0.207	0.192	0.314	0.296	0.202	0.186

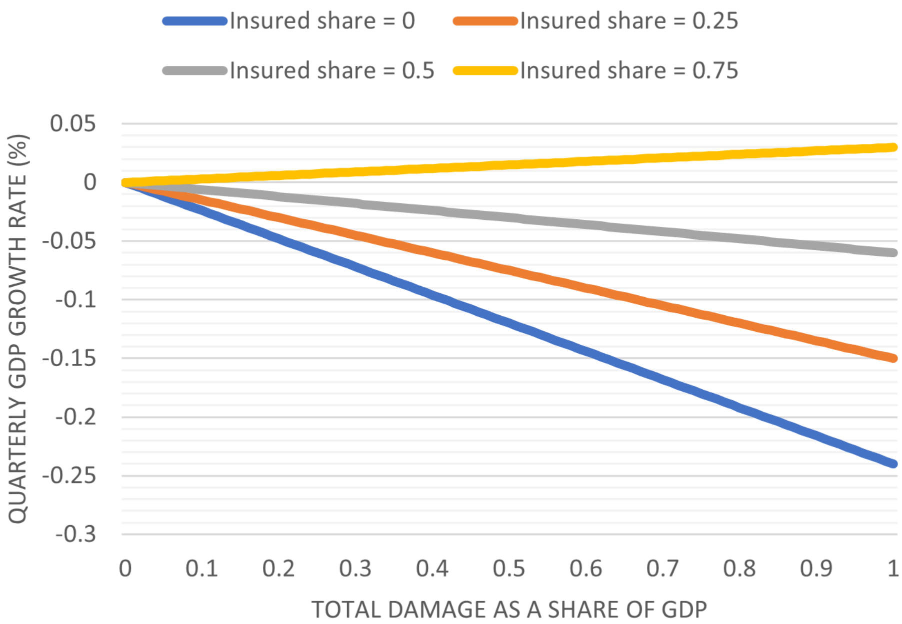
Notes: Panel regression using standard errors clustered by country. *, **, *** denote significance at 10, 5 and 1% confidence level. P-values are reported in parentheses. In columns (3) and (4), the following country groups (defined in line with country groups in IMF's World Economic Outlook database) are used: (i) the euro area, (ii) other advanced Europe (Czech Republic, Denmark, Iceland, Norway, Sweden, Switzerland, United Kingdom), (iii) other other advanced economies (Australia, Canada , Israel, Japan, Korea, New Zealand, United States), (iv) emerging and developing Europe (Bulgaria, Croatia, Hungary, Poland, Romania, Russian Federation, Turkey) and (v) other emerging and developing countries (Brazil, Chile, Colombia, Costa Rica, India, Indonesia, Mexico, South Africa).

Since the general macroeconomic environment can differ significantly across the globe, quarterly fixed effects might not be fully sufficient to control for the variation in GDP growth rates over time. Therefore, we allow the quarterly fixed effects to vary across five country groups and report the results in columns (3) and (4). Using these more granular quarterly fixed effects, the significance of the coefficients of interest increase in both the original and the imputed samples, while their size changes only slightly. To further check the robustness of the results, we include the lagged dependent variable in columns (5) and (6), while excluding the country fixed-effects to avoid obtaining a biased fixed-effects estimator. For both variables of interest, we obtain coefficients whose size and significance slightly decrease compared to the baseline model in columns (1) and (2). At the same time, the estimates further confirm the mitigating effect of the higher share of insured losses on GDP growth rate, when a disaster hits.

Turning to the interpretation of the coefficients, the estimates in column (1) suggest that if a large disaster of 1% of GDP hits a country, the quarterly GDP growth rate declines by 0.24 percentage points in case of no insurance coverage (e.g. from the median of 0.72% in our sample to 0.48%; see Figure 2). However, if 25% of the losses are insured, the GDP growth rate is estimated to only decline by around 0.15 percentage points. The effect is even smaller, around 0.06 percentage points, if half of the losses are insured. For unusually high shares of insured losses – e.g. a 75% insured share corresponding to the 90th percentile of the distribution – our empirical model even suggests an almost immediate (within quarter) rebound in GDP growth.

Figure 2: The estimated impact of natural disasters on quarterly GDP growth rate by size of damage and insured share.

Notes: Based on estimates in column (1) of Table 3



To further investigate such potential rebound effects, we test the effect of lagged disaster damage and insurance coverage on the quarterly GDP growth rate in Table 4. Across almost all model specifications, the results suggest that, on average, there is a rebound in GDP growth one quarter after a disaster happens (coefficients of further lags are estimated as insignificant). However, while reconstruction activity is recorded as positive in GDP growth numbers, in reality it does not represent a gain to welfare since it takes away available output that could otherwise be used for improving the current capital stock, or for consumption (see Hallegatte and Przyluski (2010) for a more detailed description of estimating the costs of catastrophes).

Table 4: Panel estimates with the share of insured losses - rebound effects

Dependent variable	**quarterly GDP growth rate (in %)**					
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Sample	**Original**	**Imputed**	**Original**	**Imputed**	**Original**	**Imputed**
Damages as a share of GDP (%)	-0.25*	-0.24*	-0.26**	-0.23**	-0.23*	-0.20*
	(0.08)	(0.06)	(0.04)	(0.03)	(0.09)	(0.08)
→ Lag 1	0.28***	0.18*	0.23***	0.18	0.29***	0.23**
	(0.00)	(0.05)	(0.00)	(0.13)	(0.00)	(0.02)
Damages as a share of GDP (%) * Share of insured losses (%)	0.0041**	0.0039**	0.0046**	0.0037**	0.0036*	0.0031*
	(0.05)	(0.04)	(0.01)	(0.02)	(0.05)	(0.05)
→ Lag 1	-0.0044***	-0.0025	-0.0026***	-0.0018	-0.0043***	-0.0032**
	(0.00)	(0.12)	(0.01)	(0.35)	(0.00)	(0.04)
Lag of GDP growth (%)					-0.090	-0.040
					(0.38)	(0.70)
Country fixed-effects	Y	Y	Y	Y	N	N
Quarterly fixed-effects	Y	Y	N	N	Y	Y
Quarterly-country groups fixed-effects	N	N	Y	Y	N	N
Observations	2,352	2,967	2,352	2,967	2,342	2,950
R-squared	0.227	0.210	0.339	0.323	0.229	0.205

Notes: Panel regression using standard errors clustered by country. *, **, *** denote significance at 10, 5 and 1% confidence level. P-values are reported in parentheses. For country groups used in columns (3) and (4), see Table 3.

To account for the non-linearities in the theoretical model, we estimate an alternative empirical specification using two dummy variables to capture large-scale natural disasters with high and low shares of insured losses respectively. In view of the relatively high volatility of quarterly GDP data, we use as the dependent variable the annual GDP growth rate in each quarter (calculated as the year-on-year difference in the log of GDP) and include up to three lags of the two dummy variables. The results presented in the Table 5 confirm the adverse effect on the GDP growth rate from large-scale natural disasters when insurance coverage is low. In the larger sample with imputed values, this adverse effect is then estimated to drag on the annual GDP growth rate for up to three quarters after the disaster.[9] Figure 3 shows that, for large-scale disasters with a high share of insured losses, the GDP growth rate is estimated to be higher and does not deviate significantly from its long-term trend, in line with the theoretical model. This suggests that insurance supports GDP growth after disasters, likely as insurance payouts can support reconstruction.

[9]This is consistent with the rebound in the quarterly GDP growth rate estimated in Table 4.

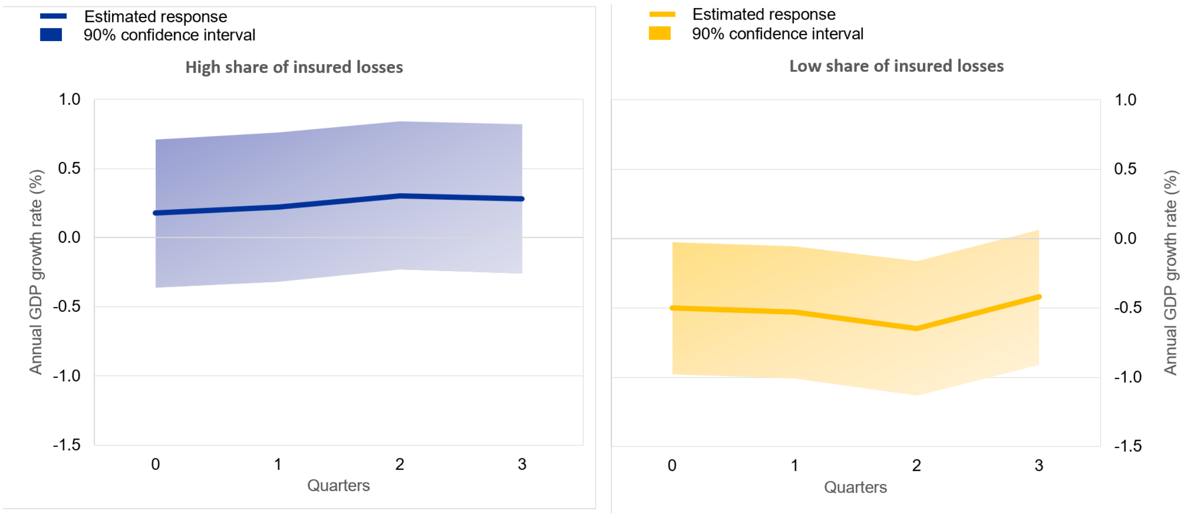
Table 5: Panel estimates for large-scale disasters with low and high shares of insured losses

Dep. var.				annual GDP growth rate (in %)				
Sample	**(1) Original**	**(2) Imputed**	**(3) Original**	**(4) Imputed**	**(5) Original**	**(6) Imputed**	**(7) Original**	**(8) Imputed**
Large scale disaster with a high share of insured losses								
→ Lag 0	-0.38	0.12	-0.34	0.12	-0.35	0.16	-0.39	0.18
	(0.43)	(0.72)	(0.52)	(0.71)	(0.52)	(0.62)	(0.50)	(0.58)
→ Lag 1			-0.58	0.19	-0.48	0.18	-0.38	0.22
			(0.26)	(0.55)	(0.38)	(0.57)	(0.50)	(0.50)
→ Lag 2					-0.12	0.35	-0.069	0.30
					(0.82)	(0.27)	(0.90)	(0.35)
→ Lag 3							0.15	0.28
							(0.79)	(0.40)
Large scale disaster with a low share of insured losses								
→ Lag 0	-0.65*	-0.49*	-0.65	-0.48*	-0.73	-0.48*	-0.81	-0.50*
	(0.10)	(0.09)	(0.14)	(0.10)	(0.12)	(0.10)	(0.11)	(0.08)
→ Lag 1			-0.17	-0.53*	-0.22	-0.54*	-0.17	-0.53*
			(0.71)	(0.07)	(0.66)	(0.06)	(0.75)	(0.07)
→ Lag 2					0.20	-0.64**	0.27	-0.65**
					(0.71)	(0.03)	(0.63)	(0.03)
→ Lag 3							0.73	-0.42
							(0.24)	(0.15)
Country FE	Y	Y	Y	Y	Y	Y	Y	Y
Quarterly FE	Y	Y	Y	Y	Y	Y	Y	Y
Observations	3,823	4,302	3,381	4,170	3,047	4,057	2,774	3,950
R-squared	0.355	0.341	0.380	0.353	0.393	0.361	0.402	0.366

Notes: Panel regression using standard errors clustered by country. *, **, *** denote significance at 10, 5 and 1% confidence level. P-values are reported in parentheses. Large-scale natural disasters refer to disasters with total damage larger than 75th percentile of the distribution of total damage data (0.11% of GDP). In the original sample, the share of insured losses is high (low) if it is above 40% (below 40%). In the imputed sample, the share of insured losses is high (low), if it is above 35% (below 35%). The thresholds of 40% and 35% broadly correspond to the median share of insured losses in the respective samples.

Figure 3: The impact of large-scale natural disasters with low and high shares of insured losses on annual GDP growth rate.

Notes: Based on estimates in column (8) of Table 5. For the quarter including the date(s) of the disaster (t=0) and the three subsequent quarters, the y-axis measures the percentage point impact of the disaster on the year-on-year annual growth rate at the end of that quarter.



4 The potential impact of different climate change and protection gap scenarios on the macroeconomy

In this section, we link the findings of the theoretical model and empirical results to the possible evolution of key climate-change related perils under different warming scenarios. The analysis starts by taking various Representative Concentration Pathways (RCP) developed by the Intergovernmental Panel on Climate Change to give different global warming scenarios. Assuming that no adaptation or mitigation measures will be introduced to limit the impact of climate change, the potential future financial damages due to natural disasters in a European context are then mapped on to GDP, under different protection gaps and warming scenarios, using the empirical results from the previous section.

The RCP pathways underpin the analysis carried out in the PESETA IV report (Joint Research Centre, 2020), which calculates for the EU and the UK estimated annual damages and GDP losses arising from climate-related catastrophes, based on granular regional and sectoral models and assuming no adaptation or mitigation measures. Table 6 presents the expected annual damages for key perils.[10]

We aggregate these expected damages across all the considered perils and calculate the total as share of the projected GDP based on the future socioeconomic conditions set out in the Commission's ECFIN 2015 Ageing report (see last row of Table 6) (European Commission, 2015). Expected annual damages are estimated to increase from the baseline of 0.17% of GDP to 0.21% in 2050 under the moderate scenario and 0.29% in the severe scenario. By 2100 these losses are projected to increase to 0.41% of GDP and 0.76% of GDP respectively. In other words, expected annual GDP losses from natural perils are projected to increase by between 2.5 and 4.5 times by the end of the current century. Looking at the expected annual damages by mid- and end-century under the same warming scenario, the expected annual damages as share of GDP may seem lower in 2100 than in 2050, but this can be explained by the fact that these figures are linked to different RCP pathways. For example, under the "moderate" warming scenario the mean global temperature is expected to increase by approximately 1.5°C by 2050, however under the same pathway the temperature would increase by almost 2°C by 2100. In other words, the expected results under the 2050 (1.5°C) should be compared with the foreseen results in 2100 in a 2°C warming scenario.

We combine the PESETA IV damage estimates with data from EIOPA's insurance protection gap dashboard to generate six scenarios.[11] We take two potential warming paths – RCP4.5 (labelled here as moderate) and RCP8.5 (labelled here as severe) and

[10] These estimates include the annual GDP loss in the EU and the UK, arising from climate-related catastrophes, based on granular regional and sectoral models. The perils were selected on the basis on data availability and comparability with the modelling framework. The full results of PESETA IV can be found on the JRC website.

[11] For further information please visit the EIOPA website.

Table 6: Expected annual damages in the EU and the UK from climate-related catastrophes without adaptation and mitigation measures (monetary values in 2015 EUR million)

	Baseline	2050		2100		
	1981-2010	1.5° C Moderate	2° C Severe	1.5° C	2° C Moderate	3° C Severe
Windstorm	4,594	6,829	6,913	11,260	11,393	11,422
Droughts	9,048	12,354	15,475	24,723	31,457	45,380
River flood	7,809	15,609	21,268	24,072	33,081	47,824
Costal flood	1,400	10,900	14,100	10,900	110,600	239,400
Total	22,851	45,692	57,756	70,955	186,531	344,026
Total as % of GDP	0.17%	0.21%	0.29%	0.19%	0.41%	0.76%

Sources: Joint Research Centre (2020), European Commission (2015) and authors' calculations.
Notes: The 1.5° C figure for coastal flood is not included in the PESETA IV report and is estimated for the purposes of this paper. The Peseta IV report focuses on the 1.5°C and 2°C warming levels in 2050 as 3°C warming by mid-century is not considered a realistic scenario.

their associated expected annual damages from Table 6. For each of these paths we consider three potential degrees of insurance coverage: current, which corresponds to the share of losses that are covered today (insured share of 30%), zero insurance coverage and full coverage.

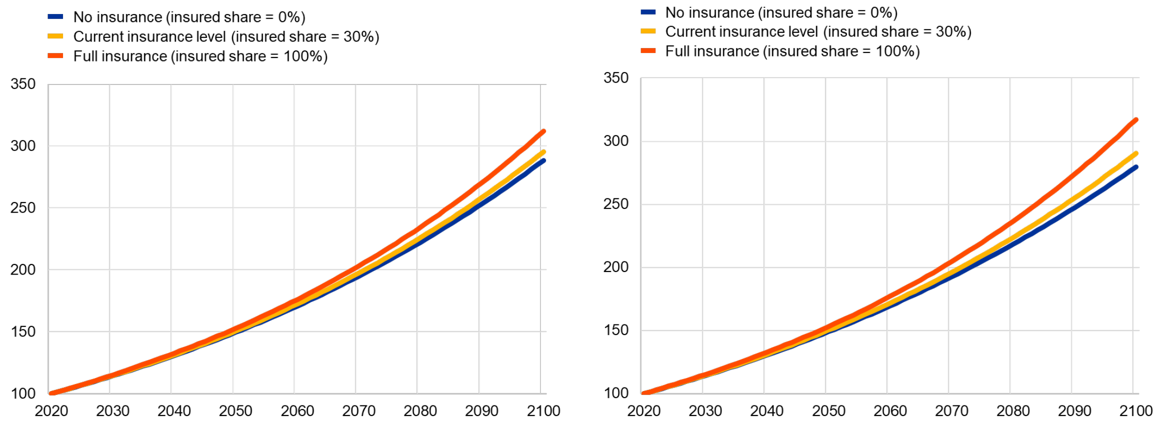
Finally, we exploit the empirical estimates presented in Section 3 (Table 3, column 1) to give an indicative comparison of the evolution of GDP under the six scenarios (Figure 4). Naturally, the uncertainty around estimates 30-80 years into the future is substantial due to material uncertainties in the climate and economic projections. In particular, these results assume that no action would be taken to counteract the increasing risk related to climate change through mitigation or adaptation measures. In this context, the results show that under both the RCP4.5 and RCP8.5 paths, differences in insurance coverage could have economically material effects on GDP. The difference between the GDP level assuming full and no insurance is around 2% under RCP4.5 and around 3% under RCP8.5 in 2050. By the end of this century, the difference widens to around 8% and 14% respectively.

5 Conclusions and policy implications

Climate change, even under moderate scenarios, is likely to bring about a marked increase in natural perils both in Europe and globally. The theoretical and empirical results presented in this feature demonstrate that the aggregate welfare impact of that increase is not pre-determined. Setting aside the actions that can be taken to transition to a carbon neutral economy and thereby limit the extent of warming, insurance has a key role to play in mitigating the impact of future catastrophes. By accelerating reconstruction and limiting the period of lower output, insurance can help reduce the overall welfare loss.

Yet the insurance protection gap in Europe is already substantial, and there are sev-

Figure 4: GDP level under moderate (left panel) and severe (right panel) climate scenarios for different insurance levels



Notes: The moderate (left panel) and severe (right panel) scenarios correspond to an increase in temperature by 2 and 3 degrees by 2100, respectively, and reflect two Representative Concentration Pathways (RCP) developed by the Intergovernmental Panel on Climate Change (IPCC). The GDP level is indexed to 100 in 2020. The annual GDP growth rate without damages from climate-related catastrophes is assumed to equal 1.4% (similarly as in The 2021 Ageing Report). The estimated annual damages from climate-related catastrophes in Europe are based on PESETA IV report, which estimates these damages for different RCP pathways using granular regional and sectoral models. No adaptation or mitigation measures are considered. The estimated impact of these damages on the GDP growth rate with different shares of insured losses is based on estimates in column (1) of Table 3.

eral reasons to suspect it may widen as a result of climate change. More frequent and more severe disasters may act to reduce the supply of private insurance, whilst simultaneously making insurance more valuable from a welfare perspective. Policies aimed at enhancing both adaptation and mitigation of climate-related events are needed to increase the resilience of the economy to climate change. Addressing the structural causes of the protection gap now and in the future has the potential to provide substantial welfare benefits.

While this paper provides new insights into the interplay between climate change, insurance, the protection gap and economic output, it also highlights the need for further research. In particular, the role of governments and the potential complementary role of the private sector are key issues with practical relevance, and possible policy implications which should be further explored. While substantial fiscal resources put towards reconstruction can help, this needs to be balanced against the possible effects of creating potentially large contingent liabilities on the balance sheet of fiscal authorities (Lis and Nickel, 2009; Gagliardi et al., 2022). Also, while this paper focuses on the reconstruction effect that shows up in measured GDP, further work would be necessary to fully understand the effects on welfare. Finally, the theoretical model and empirical analyses could be extended by including dynamic adaptation and mitigation measures that can help limit the macroeconomic impact of climate change, as well as by exploring the role of heterogeneous characteristics that may drive a different impact of climate change across region.

The potential policy implications of this work also warrant further exploration.[12] The cross-border nature and possible systemic implications of climate change related risks could, for instance, warrant a concerted response at the European level. Knowledge-sharing at European level could enhance risk management and modelling capabilities for natural catastrophes and foster more efficient capital allocation. Risk pooling at regional or European level could potentially improve insurability and affordability. Finally, the penetration of climate risk related insurance could be improved by pairing them with other common or mandatory insurance products.

[12]See for example the Eurosystem reply to the European Commission's public consultations on the Renewed Sustainable Finance Strategy and the revision of the Non Financial Reporting Directive, EIOPA (2019) and ECB/ESRB Project Team on climate risk monitoring (2022).

A Annex

Table 7: Total damage and share of insured losses by country

Countries with quarterly GDP	**Number of quarters with total damage (with insured losses)**	**Total damage (% of GDP)**		**Share of insured losses (%)**	
		mean	**median**	**mean**	**median**
Australia	51 (28)	0.08	0.040	58.5	56.2
Austria	14 (4)	0.14	0.088	30.9	21.0
Belgium	9 (4)	0.03	0.017	35.6	35.0
Brazil	27 (3)	0.03	0.008	22.8	5.0
Bulgaria	10 (1)	0.30	0.019	13.4	13.4
Canada	24 (15)	0.06	0.017	43.6	45.5
Chile	20 (6)	0.86	0.106	26.9	28.3
Colombia	15 (3)	0.16	0.005	3.6	4.0
Costa Rica	12 (2)	0.45	0.205	60.6	60.6
Croatia	6 (1)	0.23	0.233	3.7	3.7
Cyprus	1 (1)	0.04	0.043	60.0	60.0
Czech Republic	13 (8)	0.34	0.072	37.8	40.6
Denmark	3 (2)	0.57	0.466	74.9	74.9
Estonia	1 (1)	0.79	0.795	20.0	20.0
Finland	0 (0)	0	0	–	–
France	26 (15)	0.06	0.010	63.8	67.3
Germany	30 (23)	0.05	0.013	48.9	56.7
Greece	11 (1)	0.37	0.136	4.5	4.5
Hungary	10 (2)	0.10	0.055	29.3	29.3
Iceland	2 (0)	0.29	0.289	NA	NA
India	61 (18)	0.10	0.049	14.8	8.2
Indonesia	50 (10)	0.13	0.009	15.1	4.8
Ireland	5 (2)	0.06	0.083	48.9	48.9
Israel	5 (1)	0.08	0.062	6.3	6.3
Italy	34 (14)	0.08	0.023	18.8	9.3
Japan	46 (29)	0.15	0.012	41.9	39.2
Korea, Rep.	23 (3)	0.10	0.021	5.2	4.0
Latvia	2 (1)	0.83	0.825	12.3	12.3
Lithuania	3 (1)	0.27	0.103	20.0	20.0
Luxembourg	1 (1)	0.06	0.061	67.7	67.7
Mexico	43 (20)	0.10	0.028	34.0	35.4
Netherlands	9 (6)	0.04	0.014	55.2	63.4
New Zealand	22 (8)	0.90	0.038	60.9	63.2
Norway	1 (1)	0.04	0.036	30.8	30.8
Poland	11 (3)	0.26	0.023	39.0	12.9
Portugal	11 (5)	0.32	0.089	24.6	8.6
Romania	14 (0)	0.21	0.095	NA	NA
Russian Federation	39 (3)	0.02	0.007	12.7	5.0
Slovak Republic	8 (2)	0.20	0.139	49.2	49.2
Slovenia	6 (1)	0.28	0.234	10.0	10.0
South Africa	24 (5)	0.05	0.023	51.6	49.1
Spain	26 (11)	0.05	0.009	38.3	40.3
Sweden	3 (2)	0.26	0.058	49.1	49.1
Switzerland	15 (10)	0.11	0.067	53.7	51.7
Turkey	13 (6)	0.49	0.048	19.0	8.0
United Kingdom	25 (15)	0.06	0.026	58.6	64.0
United States	94 (82)	0.07	0.029	55.6	60.8
All countries with quarterly GDP	874 (379)	**0.16**	**0.028**	**43.5**	**47.4**
All countries in EMDAT	1,190 (423)	**0.25**	**0.029**	**40.2**	**40.6**

Sources: EMDAT, WDI and authors' calculations.
Notes: The figures in parentheses refer to the number of quarters, for which data on the share of insured losses are available. The mean and medium of total damage refers to all total damage data available (i.e. not only to total damage, for which insured losses are available.

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Annex 597

“Protecting against sovereign debt defaults under growing climate impacts – Role for parametric insurance”, Working Paper, *The International Institute for Environment and Development*, April 2023

Protecting against sovereign debt defaults under growing climate impacts

Role for parametric insurance

Ritu Bharadwaj, Tom Mitchell and N Karthikeyan

Working Paper
April 2023

Climate change; Social protection

Keywords:
Climate resilience, climate finance, debt management and swaps, climate change justice

About the authors

Ritu Bharadwaj is a principal researcher in IIED's Climate Change Group (ritu.bharadwaj@iied.org).

Dr Tom Mitchell is IIED's executive director (tom.mitchell@iied.org)

N Karthikeyan is a development economist who focuses on climate change, natural resource management, safe drinking water, sanitation, elderly care and microfinance.

Produced by IIED's Climate Change Group

The Climate Change Group works with partners to help secure fair and equitable solutions to climate change by combining appropriate support for adaptation by the poor in low- and middle-income countries, with ambitious and practical mitigation targets. The work of the Climate Change Group focuses on achieving the following objectives:

- Supporting public planning processes in delivering climate-resilient development outcomes for the poorest
- Supporting climate change negotiators from poor and vulnerable countries for equitable, balanced and multilateral solutions to climate change
- Building capacity to act on the implications of changing ecology and economics for equitable and climate-resilient development in the drylands.

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International Institute for Environment and Development
Third Floor, 235 High Holborn, London WC1V 7DN, UK
Tel: +44 (0)20 3463 7399
www.iied.org

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The climate crisis is pushing Least Developed Countries into over-indebtedness, amplifying their disparity with developed countries. Fundamental changes are needed to re-engineer, regulate, and equalise global debt and growth. Parametric insurance for sovereign debt can be one of the sustainable options for resolving the debt crisis. Insurance could cover debt repayment on behalf of the country during the period of climate crisis, helping them to focus their budget on relief and recovery, with the provision of a global fund to cover the insurance premiums.

Contents

Summary

Rising sea levels have submerged many coastal areas; floods are increasing in magnitude and breaching barriers, destroying lives, livestock and property; and more intense and frequent cyclones are leaving communities unable to protect themselves. This loss and damage, driven by climate change, is often felt most acutely by Least Developed Countries (LDCs) and Small Island Developing States (SIDS). Yet such countries have limited capacity, resources and infrastructure to invest in climate resilience. This paper provides evidence that climate impacts are pushing LDCs and SIDS into over-indebtedness, undermining their ability to deal with climate impacts and focus on long-term resilience. It suggests parametric insurance of sovereign debts as one of the practical and viable options to manage the debt crisis.

Key findings

LDCs are more vulnerable to the effects of climate change due to their low levels of development, weak infrastructure, and reliance on agriculture and natural resources for income. As the intensity and frequency of extreme events keeps increasing, these countries are more exposed to them every year. Each time, their response creates more debt, undermining capacity for the next crisis. They thus become trapped in an unsustainable debt cycle.

Our analysis shows that countries with a higher Hazard and Exposure Index are likely to have a higher sovereign default to debt ratio. The average default to debt ratio of 30 LDCs considered for analysis is 3.45 with an average Hazard and Exposure index of 4.16. The predicted values of regression modelling shows that a Hazard and Exposure Index of 10 can increase the chances of debt default for LDCs to 11.07 with countries like Niger, Myanmar, Sudan, Mozambique, and Mali most at risk. This is higher for LDCs compared to developed and developing countries.

Climate vulnerability also has significant implications for sovereign borrowing costs. For credit-rating agencies, higher climate risks create a greater risk of default. This raises the cost of capital for climate-vulnerable countries and threatens debt sustainability. Consequently, poorer countries exposed to climate impacts have to bear the additional burden of higher interest rates.

This financial burden exacerbates the present-day economic challenges of poorer countries. The magnitude of this burden is expected to at least double over the next decade. These credit-rating downgrades can be expected to increase the cost of public borrowing, making it more expensive to make investments in recovery or building resilience for future impacts.

The increased public default to debt ratios undermine the ability of LDCs to finance investments in social protection programmes such as poverty reduction, livelihood security, food, nutrition, health and education. Resources needed to respond to the climate crisis, the COVID-19 pandemic and other national needs are increasingly being diverted to debt repayments.

Our analysis shows that countries with a higher sovereign default to debt ratio are likely to spend less on social assistance. The 27 LDCs considered for this analysis have an average default to debt ratio of 3.53 with average social assistance spending of 0.82% of GDP. In the case of LDCs, the projected regression value shows that social assistance spending decreases to 0.14% of GDP when the sovereign default to debt ratio is 10. The degree of negative association is particularly stark in the case of LDCs compared to developed and developing countries.

These diversions can have social impacts: without strong safety nets, the most vulnerable may not have adequate mechanisms to cope. LDCs already have lower ratings on human development, and economic and environmental vulnerability. They represent around 90% of the countries with poverty rates higher than 40% in 2021. Further reductions in social spending can thus have long-term negative impacts on human development indicators in LDCs, such as poverty, education and health outcomes.

Debt restructuring efforts are limited, postponing rather than cancelling debt payments, and making future recovery even more difficult for these countries. The role of climate finance is also under question. In 2020, out of US$68.3 billion of climate finance provided by developed countries, 71% or US$48.6 billion was in the form of loans (including both concessional and non-concessional).

Around half of climate finance provided to SIDS in 2017–2018 took the form of loans, which added still more debt. Furthermore, all SIDS received a combined US$1.5 billion in climate finance between 2016 and 2020. But in the same period, 22 SIDS paid more than US$26.6 billion to their external creditors — almost 18 times as much as they received in loans.

What can be done to ensure sustainable debt servicing.

High sovereign debts can lead to reduced investment in social protection and resilience building. This, in turn, can lead to an even larger adaptation gap. It can prevent countries from breaking out of the downward spiral of multiple disasters that generates loss and damage and further debt.

Parametric insurance for sovereign debt can offer a sustainable option for moving from a vicious to a virtuous cycle and resolving the risks of a debt fallout for LDCs. This insurance would cover a country's debt repayment during a climate crisis, allowing them time to recover without repaying debt during that period. While parametric insurance may not be suited to all types of hazards, it is considered effective for diverse climate risks from loss and damage.

Parametric insurance for sovereign debts can help LDCs better manage the twin challenges of debt and climate crisis. It can act as a safeguard, provide immediate liquidity, reduce transaction costs, stabilise credit markets and attract private investments. Such a model has four essential elements:

- A mechanism to provide anticipatory support once the 'trigger' has been reached, regardless of losses.
- A risk-pooling approach that ensures premiums are affordable and coverage and duration of debt relief meet country requirements.
- Location-specific and comprehensive climate risk modelling to define triggers and thresholds for insurance pay-outs from a full range of events.
- A commitment from climate and other sources of finance to cover insurance premiums.

The trade-offs between fiscal costs and risk to growth, debt default and costs of debt restructuring would need to be weighed carefully. The ex post benefits of covering the insurance premium for debt relief can far exceed the investment in premiums. Direct support to LDCs for insurance costs would alleviate the financial constraints and help countries scale up financial resilience. It would also stabilise their growth, reduce poverty and allow them to invest in social protection.

A coordinated effort with support from G20 governments, other major developed countries and key institutions will be needed to operationalise parametric insurance for sovereign debts. This should cover the points below.

Establish a global fund to enable risk pooling of all LDCs and SIDS and offer a more diversified portfolio to insurance companies. In addition to covering premiums and guarantees for sovereign debts, the global fund can support longer-term adaptation and resilience building in LDCs. This would support risk reduction and therefore help reduce the magnitude of future losses and bring down the cost of premiums in the long run.

Undertake comprehensive risk modelling and data analytics to help in pricing, designing trigger thresholds and structuring the provision of adequate insurance coverage. Improved measurement will also help lower insurance costs.

Establish collaboration between multiple stakeholders, including LDC governments, major public and private sector lenders, Paris Club creditors, International Monetary Fund, World Bank and other international and regional development banks; the insurance and reinsurance industry; national technical agencies, data providers and the risk modelling community; and academia, centres of excellence and nongovernmental organisations.

1

Climate change and financial stability of LDCs

Loss and damage concerns are urgent, driven by the increasingly harmful effects of climate change. Many countries are facing new types and forms of climate impact with higher intensity, which they are not equipped to handle. With global temperatures increasing due to climate change, many of these impacts are already 'locked in' and unavoidable. Rising sea levels have submerged many coastal areas; floods are increasing in magnitude and breaching the existing barriers, destroying lives, livestock and property; and more intense and frequent cyclones are leaving communities unable to protect themselves.

This loss and damage, which can exceed annual gross domestic product (GDP), is often felt most acutely by Least Developed Countries (LDCs) (Heinrich Boll Stiftung et al., 2021). LDCs and Small Island Developing States (SIDS) have limited capacity, resources and infrastructure to invest in climate resilience. This leaves them unable to recover from loss and damage in the same way as developed countries, exacerbating their indebtedness. The Emergency Events Database (EM-DAT), for example, recorded US$2.97 trillion in losses from disasters between 2000 and 2019. As a percentage of GDP, losses to LDCs were three times greater than in high-income countries (CRED, 2020). Countries in the global South have seen their debts increase by 120% between 2010 and 2021, reaching their highest level since 2001 (Jones, 2022).

What this paper is trying to achieve

The analysis presented in this paper has two aims:

First, it demonstrates how climate impacts are driving up sovereign debts in LDCs compared to other countries. It also illustrates how higher sovereign debts are having an impact on GDP and social spending of LDCs. This is compromising previous development efforts and undermining those to come, enhancing vulnerability. This co-relation helps make the case for providing vulnerable countries with the debt relief necessary to adapt to climate change impacts.

Second, it suggests practical solutions for managing the debt crisis in LDCs through parametric insurance of sovereign debts. To date, many solutions[1] have been proposed to help LDCs manage debt, but the role of parametric insurance for helping LDCs manage sovereign debt payment during crisis, has not been explored. In our paper we propose it as one of the viable options to consider along with others, so the LDCs are not forced into more debt for a crisis they did not create. This paper proposes establishing and delivering a new global financing facility to service parametric insurance for sovereign debts.

[1] Other existing and emerging instruments include nature for debt swaps (see more details at www.iied.org/tackling-debt-climate-nature-crises-together)

BOX 1. WHY THIS ANALYSIS IS NEEDED NOW

The 'Summit for a new Global Financing Pact' proposed in June 2023 has the mandate for increasing access to financing for countries more exposed to shocks and/or facing debt vulnerabilities. Similarly, the Transitional Committee created under the United Nations Framework Convention on Climate Change is looking at establishing the modalities, structure and governance of a climate change loss and damage fund. This paper provides evidence for LDCs and SIDS to present a stronger case on how climate impacts are pushing them into over-indebtedness undermining ability to deal with climate impacts — and to push for creation of a separate global fund (with additional, adequate funding, commensurate to LDC needs) for dealing with debt issues. It also presents practical solutions for the Summit, Transitional Committee, governments of the G20 and key institutions such as the International Monetary Fund and World Bank to consider for dealing with debt issues through parametric insurance.

2

How climate change is affecting levels of debt, growth and development in LDCs

Climate change is disrupting environmental, economic, institutional and social systems in LDCs. These disruptions are undermining poverty reduction efforts and food security, damaging infrastructure and jobs, and harming human health. But these impacts are unevenly distributed, with some countries facing far greater risks than others.

LDCs are more vulnerable to the effects of climate change due to their low levels of development, weak infrastructure, and reliance on agriculture and natural resources for income. They are more likely to face significant and long-lasting impacts of climate change on economic growth and development.

This section presents how climate change is increasing sovereign debts and risks of debt default in LDCs. These impacts, in turn, are reducing social spending, undermining countries' ability to cope and recover.

Risks of climate impacts and sovereign debt default for LDCs

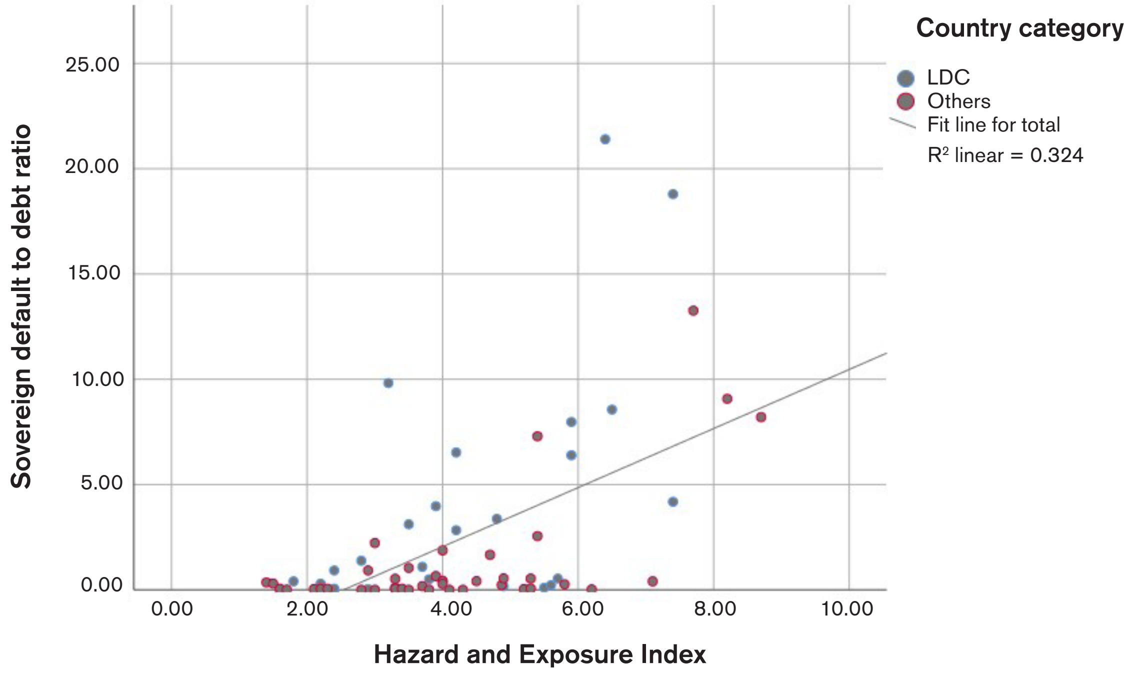
Recurring and high-intensity climate disasters can lead to a shortfall in government revenue and tax collections due to disrupted economic activities. But government spending may also increase due to a sudden and significant increase in demand for its services. For example, government may need to fund an emergency response and invest in rebuilding and recovery. Consequently, to bridge this gap and continue to provide essential services and support to their citizens, governments may need to borrow money.

Figure 1 presents the association between the Hazard and Exposure Index and sovereign default to debt ratio. The Pearson's correlation coefficient values for the variables analysed are presented in Table 1.

The analysis shows that countries with a higher Hazard and Exposure Index are likely to have a higher sovereign default to debt ratio. The average default to debt ratio of 30 LDCs considered for this analysis is 3.45 with an average Hazard and Exposure Index of 4.16. The predicted values of regression modelling between these two variables are higher for LDCs than for the other countries. In the case of LDCs, a Hazard and Exposure Index of 10 can increase the chances of debt default[2] to 11.07 with countries including Niger, Myanmar, Sudan, Mozambique and Mali most at risk. Other countries have a debt default risk of 7.66. This finding resonates with findings by IMF (Cevik and Jalles, 2020). According to this study, the number of countries in the global South unable to pay their debts or at high risk

[2] Default risk: "Sovereign default risk represents the likelihood that a particular sovereign will default on its debt. While most debt defaults involve foreign debt, sovereigns may also default on domestic debt denominated in the national currency." www.investopedia.com/terms/s/sovereign-default.asp

Figure 1. Relationship between Hazard and Exposure Index to sovereign debt default



Notes: The sovereign default to debt ratio has been calculated as average sovereign default to loans from 2016–2020/sovereign debt in 2021 (Source: International Monetary Fund's Global Debt Database). The Hazard and Exposure index is calculated based on time series data from INFORM Risk database 2021.

Table 1. Correlation coefficients of Hazard and Exposure Index and sovereign default to debt ratio

DEVELOPMENT CATEGORY	CORRELATION COEFFICIENT	SIG.
All countries (N=71)	0.569	p=0.000
LDCs (N=30)	0.601	p=0.000
Other countries (N=41)	0.646	p=0.000

of default increased from 17 to 39 between 2013 and 2021, while the number of countries at low risk fell from 21 to just 7.

Climate impacts forcing LDCs and SIDS to layer debt on debt

When a disaster strikes, LDCs and SIDS have to borrow additional money on top of the country's pre-existing debt load, which further increases their risk of over-indebtedness. It normally takes many years for LDCs and SIDS to recover from an extreme event. As the intensity and frequency of extreme events keeps increasing, these countries are more exposed to them every year. Each time, their response creates more debt, undermining capacity for the next crisis. They thus become trapped in an unsustainable debt cycle. For example, in Dominica, Tropical Storm Erika caused damages equivalent to 96% of GDP in 2015, which increased the country's external debt. Two years later, while the country was still recovering from Erika, Hurricane Maria caused US$1.3 billion in damages. This was equivalent to 226% of its GDP, resulting in declining fiscal performance and increased expenditure on recovery (Thomas and Theokritoff, 2021). Dominica had to take on more debt not just to service previous debts but also to spend on recovery from the hurricane.

Across Caribbean SIDS, extreme weather events resulted in average losses of 109% per unit GDP in 2019 (Thomas and Theokritoff, 2021). These losses pushed the countries into a vicious cycle of indebtedness with potential longer-term consequences on their ability to continue servicing or repaying additional debts. Meanwhile, without support from climate finance, sub-Saharan countries might be forced to take on almost US$1 trillion in debt in the next decade (Woolfenden, 2022).

Rising cost of capital for climate-vulnerable countries threatens debt sustainability

Climate vulnerability also has significant implications for sovereign borrowing costs. For credit-rating agencies, higher climate risks create a greater risk of default. This raises the cost of capital for climate-vulnerable countries and threatens debt sustainability. Consequently, poorer countries exposed to climate impacts have to bear the additional burden of higher interest rates. An assessment (Buhr et al., 2018) for the members of the Climate Vulnerable Forum[3] shows that for every US$10 paid in interest by developing countries, an additional dollar will be spent due to climate vulnerability. This has also added more than US$40 billion to the debt interest paid by the 40 most vulnerable nations between 2007 and 2016. Higher interest rates based on climate vulnerability are predicted to cost the most vulnerable countries US$168 billion over the next decade. One study (Mohaddes et al., 2021) shows that 63 sovereigns may see their credit ratings downgraded by 2030 due to climate change. This could add more than US$200 billion to their annual interest payments on public debt. An increasing proportion of global South debt is owed to private creditors, who tend to charge much higher interest rates than other lenders. Almost half of external debt and interest payments by low- and lower middle-income countries are to private lenders (Jones, 2022).

BOX 2. WHY SUSTAINABLE DEBT SERVICING IS IMPORTANT

For countries, sovereign debt, or public debt, is an important way to finance investments in growth and development. But governments must also continue paying or servicing their debt and this debt burden must remain sustainable. In other words, debt payments must be in tune with growth projections and revenue mobilisation. This includes social spending needs and exposure to economic/climate shocks. Unsustainable debt burden can lead to debt distress, leaving a country unable to repay or service its debts.

Debt distress can be precarious for countries and threaten their macro-economic stability, setting back their development for years. It can also curtail public spending on basic services and social protection, resulting in increased poverty and vulnerability.

This financial burden exacerbates the present-day economic challenges of poorer countries (see Box 2). The magnitude of this burden is expected to at least double over the next decade. These credit-rating downgrades can be expected to increase the cost of public borrowing, making it more expensive to make investments in recovery or building resilience for future impacts. The rising cost of capital is expected to push LDCs into debt distress.[4]

Impact of sovereign debt default on social spending of LDCs

The increased public default to debt ratios undermine the ability of LDCs to finance investments in social protection programmes such as poverty reduction, livelihood security, food, nutrition, health and education. Many of these investments are crucial to enhancing climate resilience in vulnerable communities. Resources needed to respond to the climate crisis, the COVID-19 pandemic and other national needs are increasingly being diverted to debt repayments. These diversions can have social impacts: without strong safety nets, the most vulnerable may not have adequate mechanisms to cope with climate crisis.

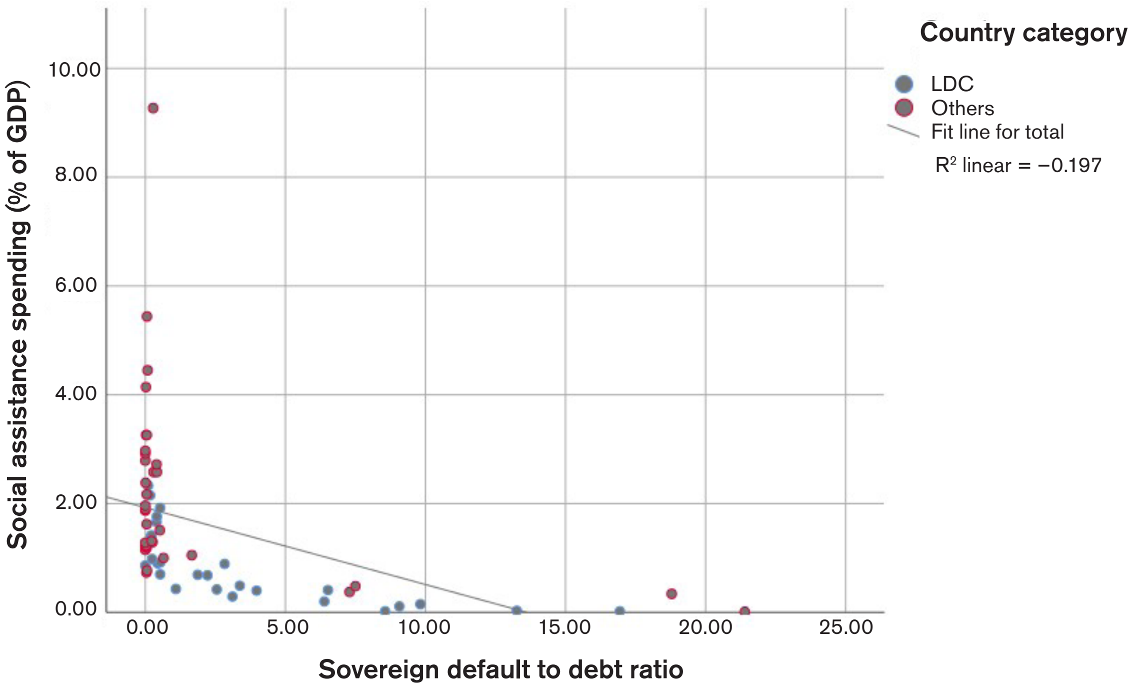
Figure 2 analyses the relationship between sovereign default to debt ratio and social assistance spending. Pearson's correlation coefficient values of these two variables are presented in Table 2.

The correlation analysis shows that countries with a higher sovereign default to debt ratio are likely to spend less on social assistance. The degree of negative association is particularly stark in the case of LDCs. The Pearson's correlation coefficient value for LDCs (–0.697) is significantly higher than the value for developed and developing countries (–0.366). The projected values based on the regression modelling confirms this pattern. The 27 LDCs considered for this analysis have an average default to debt ratio of 3.53 with average social assistance spending of 0.82% of GDP. In the case of LDCs, the projected value of social assistance spending decreases to 0.14% of GDP when the sovereign default to debt ratio is 10. For the same default to debt ratio, the projected social assistance spending is 1.08% for developed and developing countries. This projection based on the regression modelling lists Guinea-Bissau, Cambodia, Tanzania, Togo and Myanmar (all LDCs) as the countries most vulnerable to reducing their spending on social assistance.

[3] The Climate Vulnerable Forum is an international partnership of countries highly vulnerable to a warming planet. The Forum serves as a South–South platform for participating governments to act together on global climate change. https://thecvf.org/

[4] "Unsustainable debt can lead to debt distress — where a country is unable to fulfil its financial obligations and debt restructuring is required. Defaults can cause borrowing countries to lose market access and suffer higher borrowing costs, in addition to harming growth and investment." www.imf.org/en/Publications/fandd/issues/2020/09/what-is-debt-sustainability-basics

Figure 2. Relationship between sovereign default to debt ratio and social assistance spending



Note: Data on social spending were drawn from the World Bank's ASPIRE (The Atlas of Social Protection Indicators) database for the year 2021.

Table 2. Correlation coefficients of sovereign default to debt ratio and social assistance spending

DEVELOPMENT CATEGORY	CORRELATION COEFFICIENT	SIG.
All countries (N=61)	−0.443	p=0.000
LDCs (N=27)	−0.697	p=0.000
Other countries (N=34)	−0.366	p=0.033

This finding is in line with experience from the COVID-19 pandemic, which shows that governments have differing capacity and fiscal space to respond to crises. In all cases, social spending is the first to take the hit, contributing to a more protracted crisis in the case of LDCs. For example, developed countries, backstopped by their central banks, came up with huge fiscal response packages. These amounted to 18% of their GDP and that too at low interest rates (UN Inter-agency Task Force on Financing for Development, 2022). Availability of fiscal space enabled them to not only roll out measures immediately but also channel resources towards strengthening social protection. But developing countries, especially LDCs, were constrained in their social spending (Debrun, 2020).

LDCs already have lower ratings on human development, and economic and environmental vulnerability. They represent around 90% of the countries with poverty rates higher than 40% in 2021 (Development Initiatives, 2021). Further reductions in social spending can thus have long-term negative impacts on human development indicators in LDCs, such as poverty, education and health outcomes.

Links between debt levels, debt default and multidimensional vulnerability in LDCs

Poorer and marginalised groups that depend on primary sector livelihoods such as fishing and agriculture are the most affected by natural disasters. Yet these are the very communities with the least capacity to cope. Fishers, for example, are most likely to lose their livelihood resource base because of disasters and cannot adapt as quickly to changing conditions. Similarly, as climate change affects agricultural yields and productivity, it will increase food prices. This, in turn, can increase poverty in LDCs. For example, in Malawi, households spend on average 63% of their income on food and beverages. Even a small increase in food price can throw them into deeper poverty. Exposure to cyclones, floods and other extreme events, for example, will lead to health shocks because of increased diarrhoeal diseases and displacements (Hallegate and Walsh, 2020).

Similarly, certain communities, social groups and Indigenous Peoples may be at a higher risk of adverse consequences of climate impacts. Jafino et al. (2020) show that climate change will push 132 million people into extreme poverty by 2030. Factors such as poverty, marginalisation and lack of access to essential services may limit their capacity to cope with climate impacts, amplifying the impact of loss and damage.

Figure 3 analyses the relationship between sovereign default to debt ratio and multidimensional risk. Pearson's correlation coefficient values of these two variables are presented in Table 3.

The correlation analysis presented in Table 3 shows that countries with higher sovereign debt are likely to have a higher multidimensional risk index value. The projection analysis of regression modelling between these two variables shows that the multidimensional risk index value is higher for LDCs than for developed and developing countries. The projected multidimensional index is 5.77 in the case of LDCs when the sovereign default to debt ratio is kept at 10. The same projected value is 4.83 at a sovereign default to debt ratio of 10 for developed and developing countries.

The regression analysis presented in Figure 3 shows that countries with a higher sovereign default to debt ratio are likely to have a higher multidimensional risk value. In the case of LDCs, the multidimensional risks are expected to increase by 5.77% for a debt default ratio of 10 compared to 4.83% in other countries.

Figure 4 further unpacks multidimensional risks of LDCs compared to other developing countries and developed countries. It aggregates 54 core indicators across environmental, human, socioeconomic, institutional and infrastructure categories. These indicators envisage three dimensions of risk: hazards and exposure, vulnerability and lack of coping capacity.

Results from Figure 3 and 4 clearly show that social, environmental, institutional, infrastructural and economic development deficits in LDCs are more complex than in other developing countries and developed countries. Climate change and associated debt levels are acting as stress multipliers, compounding these deficits. This makes it difficult for these countries to anticipate, respond to and recover from climate impacts resulting in loss and damage.

Table 3. Correlation coefficient of sovereign default to debt ratio and multidimensional risk index

DEVELOPMENT CATEGORY	CORRELATION COEFFICIENT	SIG.
All countries (N=61)	0.611	p=0.000
LDCs (N=27)	0.645	p=0.000
Other countries (N=34)	0.644	p=0.000

Figure 3. Sovereign default to debt ratio and multidimensional risk

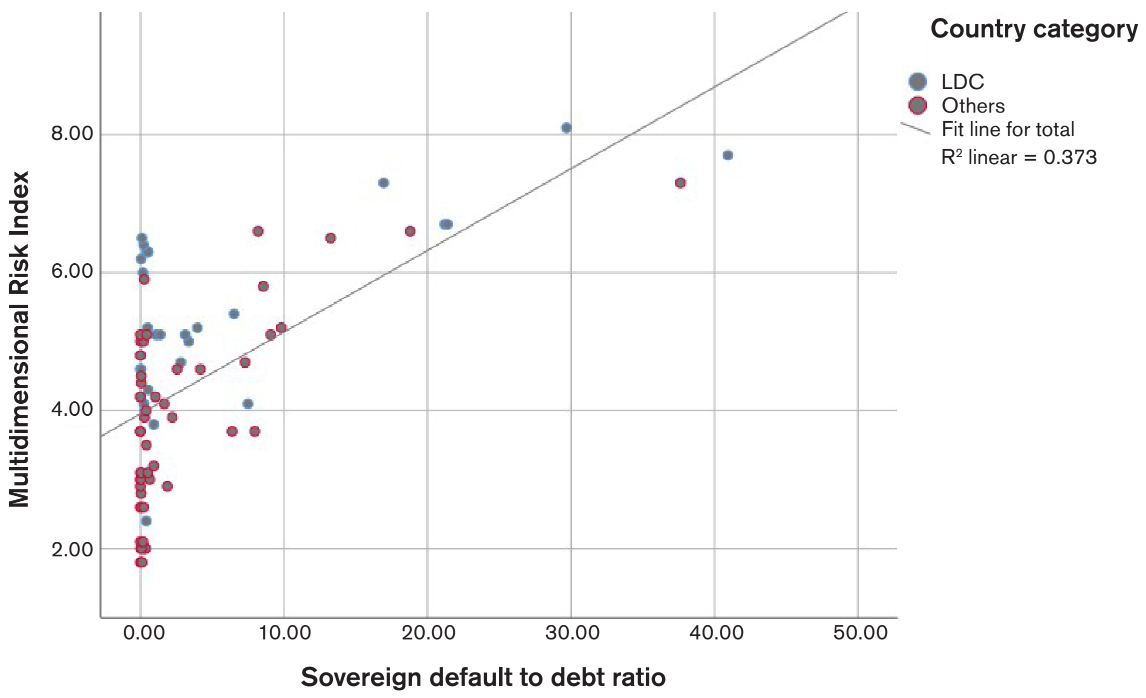
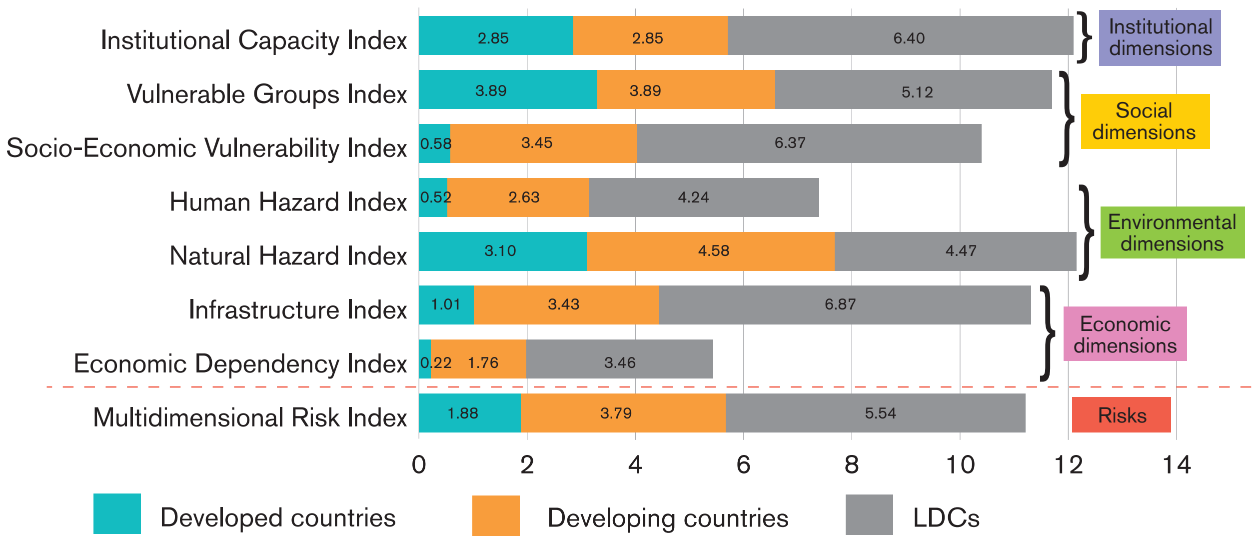


Figure 4. Multidimensional risks of LDCs compared to other developing countries and developed countries



Countries with debt defaults also experience more political instability as citizens lose faith in their government's ability to manage the economy or with cuts in social spending. Sri Lanka and Pakistan are recent examples of this phenomenon. Even in countries that are not LDCs, climate disaster, debt and fragility can prove to be a volatile combination. Together, they can lead to protests, civil unrest and even regime change, all of which can further hinder economic development.

The International Monetary Fund (IMF) classifies more than 40 economies as fragile and conflict affected. Fragile states are home to nearly 1 billion people and are on course to house 60% of the world's poor by 2030 (Corral, 2020). These countries have reduced institutional capacity and can provide limited services for the population during future crises. In these vulnerable economies, per capita GDP contracted 7.5% in 2021, while public debt rose by 17 percentage points to 78% of GDP in 2020 (Bousquet, 2022). In all, 22 or 45% of fragile states are LDCs, which are expected to be the worst affected by the triple crisis of disaster, debt and fragility.

Increasing debt crisis and problems with debt restructuring

Debt restructuring efforts are limited and not fit for purpose. In response to the COVID-19 pandemic, the IMF offered support through the Catastrophe Containment and Relief Trust, while the G20 created the Debt Service Suspension Initiative (DSSI). DSSI postponed rather than cancelling debt payments, making future recovery even more difficult for these countries. In November 2020, the G20 and the Paris Club[5] set up the Common Framework for Debt Treatments (MEF, n.d.). This sought to restructure sovereign debt according to traditional Paris Club terms (going beyond the postponement of debt payments under DSSI). But uptake of the Common Framework has been limited, with only three countries (Chad, Ethiopia and Zambia) seeking relief as it lacks clear steps and timelines for bringing the parties of debt restructuring together (Aboneaaj et al., 2022). As a result, debt relief has also failed due to the lack of consensus between the main creditors. This is especially true of private creditors, who own the bulk of the debts. Without this group at the table, debt relief would only be limited.

Here, the role of climate finance is also under question. In 2020, out of US$68.3 billion of climate finance provided by developed countries, 71% or US$48.6 billion was in the form of loans (including both concessional and non-concessional) (OECD, 2022). Around half of climate finance provided to SIDS in 2017–2018 was in the form of loans, which added more debt. Furthermore, all SIDS received a combined US$1.5 billion in climate finance between 2016 and 2020. But in the same period, 22 SIDS paid more than US$26.6 billion to their external creditors — almost 18 times as much as they received in loans (Fresnillo and Crotti, 2022).

[5] The Paris Club is an informal group of creditor countries whose objective is to find sustainable solutions to sovereign debt payment difficulties. It operates according to six foundational principles: solidarity, consensus, information sharing, case-by-case, conditionality and comparability of treatment.

3

Parametric insurance for sovereign debt

Analysis in the previous section illustrates how high sovereign debts can lead to reduced investment in social protection and resilience building. This, in turn, can lead to an even larger adaptation gap. It can prevent countries from breaking out of the downward spiral of multiple disasters that causes loss and damage and further debt. To break this cycle, sufficient government budgets need to be freed to allow them to invest in rebuilding after a disaster, enhancing long-term resilience, and thereby reducing vulnerability, limiting loss and regaining debt sustainability.

Parametric insurance for sovereign debt can offer a sustainable option for moving from this vicious to a virtuous cycle and resolving the risks of a debt fallout for LDCs. This would involve providing parametric insurance cover for debt undertaken by a country. Where the insurance would cover debt repayment on behalf of the country during the period of climate crisis, allowing countries time to recover, without worrying about debt repayment during that period. While parametric insurance may not be suited to all types of hazards, it is considered effective for diverse climate risks from loss and damage (see Box 3). Loss and damage can be applied to climate events even without a sufficient history of losses captured as insurance-readable data (Unnava, 2020).

BOX 3. PARAMETRIC VERSUS TRADITIONAL INSURANCE

Parametric, or index-based, insurance, is a non-traditional insurance that provides pay-outs based on a trigger event. Trigger events can include environmental parameters such as wind speed or rainfall measurements. Once parameters are reached, the pay-out is processed without the need to verify losses. In comparison, traditional indemnity insurance reimburses for the total value of the loss after an event like a flood or storm. To quantify loss, a representative from the insurance company assesses the damage.

Parametric insurance is suited for hard-to-model, low-frequency but high-intensity losses. These include catastrophic perils, weather-related risks or economic activities. They can also cover risks that lack a sufficient history of losses captured as insurance-readable data.

Such an approach will go far beyond a debt moratorium, where the debt remains and accumulates. Here, debt repayment would continue as usual through the insurance mechanism. The countries would be freed from that burden during the crisis, helping them to focus on relief and recovery. The period of repayment coverage through insurance can be predefined. It would be based on the nature and intensity of the climate crisis and the time needed by the country to recover and start repayment.

Post-disaster financial needs typically have three phases: immediate relief and support; recovery; and rehabilitation and resilience building. A country needs funding for all three phases. In the relief and support phase, it will require immediate access to funds for urgent rescue, shelter, food and clean water for those affected or displaced. Early recovery will require funding, within weeks, to restore livelihoods and help communities return to some level of normality and restart their economic activities. Reconstruction and resilience building will require mobilising more substantial funds for repairing and rebuilding damaged assets such as homes and infrastructure.

Different types of funding support will be needed on different timescales. The parametric insurance support can help countries use their budget for the first two phases of support without diverting their budgets for debt payment. This is vital because delays in relief and recovery in the early phase can negatively impact the population and the economy.

Support from parametric insurance pay-out can create a certain level of liquidity. In this way, debt repayment will not push countries into a negative spiral that undermines their capacity to recover and makes them less creditworthy. With a more stable economy after disaster, countries can focus more effectively on longer-term rehabilitation and resilience building through access to climate funds, bilateral aid and so on.

While parametric insurance for sovereign debt relief may only work for certain hazards, there is value in considering it as part of the risk layering approach alongside other risk mitigation and support mechanisms to create more fiscal flexibility and less indebtedness through the disaster cycle. Even with insurance support for debt relief, countries will still need support from climate finance in the form of grants and highly concessional loan capital to build longer-term climate resilience.

How parametric insurance can help LDCs manage debt and climate crises

Parametric insurance for sovereign debts can help LDCs better manage the twin challenges of debt and climate crisis in several ways.

Act as a safeguarding mechanism. Countries will not have to worry about bad surprises such as droughts, floods and so on that require emergency borrowing. Debt reduction through insurance will safeguard against financial-sector stress and strengthen contingency planning and crisis management capabilities. It will help in maintaining debts at levels that countries will be able to reasonably pay back. Being able to manage the unexpected and potentially large one-off costs of disasters will reduce the volatility of financial losses. This, in turn, will help governments cope more easily with the consequences of disasters.

Provide immediate liquidity. Parametric insurance can initiate debt repayment pay-out quickly as it is easier to verify if the trigger event has reached the threshold specified in the policy. These quick pay-outs can be especially beneficial to free up a country's resources that they would have otherwise used to repay debts. This would be the best way to help countries as the funds will remain in their budgets and can be invested directly and without delay to expand social protection and rescue support, among other priorities. While these funds may not be sufficient to meet all the relief and response measures needed by a country during crisis, it can save existing budgets from being diverted for debt servicing and provide immediate liquidity.

Reduce transaction costs. Parametric insurance for sovereign debt can reduce transaction costs compared to cumbersome and time-consuming sovereign debt restructuring, which often comes with several conditionalities. Debt relief through parametric insurance will also reduce the post-crisis transaction costs of humanitarian aid. Aid has high transaction costs and comes with several conditions. In contrast, debt payment relief will be like cash in hand, where the countries can exercise greater control and prioritise its use as per their needs (Aboneaaj et al., 2022).

Stabilise credit markets and attract private investments. Higher sovereign debt creates uncertainty about a government's finances and ability to deliver macroeconomic stability, which can drive away private investors. Parametric insurance will help in sustainable servicing of debts, bring stability in capital markets, improve a country's credit worthiness and credit rating, and effectively reduce borrowing costs and interest rates. It would also boost the confidence of private investors by providing a model for de-risking their investment. In the long run, this would help attract private investments in climate adaptation.

Four essential elements of parametric insurance linked to debt support

Anticipatory support

The insurance mechanisms can provide pre-agreed debt repayment relief in a timely and predictable manner. Based on reliable early warning information, the relief would kick in once a certain measure or 'trigger' is reached, regardless of actual losses. This mechanism may only work in the case of hazards where triggers can be adequately defined. These trigger events can include flood, cyclones or droughts of a certain intensity or frequency. Once the predefined trigger points are reached based on advanced warning the insurer can cover debt repayment on behalf of the country for a certain pre-agreed time frame depending on what has been agreed in the policy. The pre-agreed debt repayment period will need to be tailored and costed based on diverse contexts, including what is needed to help countries recover from a climate crisis.

Anticipatory support will enable countries to be better prepared for a climate crisis. In this way, they can use finance freed-up by debt relief for pre-emptive support under existing social protection programmes or other relief measures. Such ex ante efforts can also help ramp up support before a crisis — a more cost-effective approach than providing humanitarian assistance after disaster strikes. Ex post support can cost a lot more because the disaster has already inflicted damage. Apart from financial costs associated with displaced communities, outbreak of diseases and food insecurity, disaster brings an unmeasurable human cost. Anticipatory parametric insurance will allow countries to avert the impacts of these disasters on both people and the economy.

Risk pooling

As the intensity, scale and frequency of many disasters are increasing due to climate change, insurance premiums are getting pushed up, making it unaffordable, and many of these events are also being deemed as uninsurable. In response, several countries have established insurance risk pools. In many cases, these programmes have been established to provide affordable insurance coverage for 'uninsurable' risks through private markets. In others, they promote solidarity by establishing regional risk pools to spread out the impact of losses. The Caribbean, Pacific islands and African Union, for example, have set up the Caribbean Catastrophe Risk Insurance Facility (CCRIF SPC), the Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI) and African Risk Capacity (ARC) Insurance Programme (see Box 4). These regional pools provide significant advantages (Cebotari and Youssef, 2020). First, they provide insurance coverage at significantly lower cost than if countries had to purchase it individually. Second, they provide quick pay-outs following disasters, which help members maintain essential government functions. Third, policy holders own the facility (CCRIF, PCRAFI, ARC), which allows benefits to accrue to members either through dividend payments or lower premiums.

Parametric insurance for debt relief will need a similar risk-pooling approach to ensure that the premiums are affordable, and that the coverage and duration of debt relief meets the requirements of the countries. By offloading some portion of risk, the insurance company reduces its overall risk and can keep premium costs lower for all of its clients (Cebotari and Youssef, 2020). As risk pools grow, the cost of operation and reinsurance in global capital markets drops, which could in turn help lower premiums. Regional pools can also facilitate access of smaller countries to insurance and reinsurance markets by increasing the size of the aggregate portfolio, offering country-specific risk models and reducing administrative costs.

Optimum coverage of risks

Parametric insurance, while has advantages, will only pay after a certain level of risk is reached. This trigger might not happen for several reasons. For example, the strength of a disaster might be measured in a different location from where it occurred. As a result, it might not reach the level needed to trigger the insurance. Similarly, the risk of actual losses might also exceed modelled losses. To address these issues, parametric insurance needs better location-specific and comprehensive climate risk modelling to define triggers and thresholds for insurance pay-outs.

The distribution of future climate impacts and their associated damages, from both slow-onset and extreme weather events in climate models, are generally shown as averages. High probability events, for example, tend to appear as a huge peak on a graph. Conversely, rare events with potentially disastrous effects appear with low probability as a tail to the curve. But even with relatively low probability, the outcomes of these rare tail events can be catastrophic and cause loss and damage.

Thus, countries need insurance protection against a full range of events. To do this, insurance products need to change how they consider climate modelling outputs. Taking an average of different global climate models is common practice, but this does not always provide the true scale of impacts. Averaging all the results obscures the range of likely impacts, and the range of less likely, more catastrophic events — the very ones that usually cause greater loss and damage — tend to get neglected.

The trigger measurement and design for insurance coverage should be fit for purpose for a range of these possible extreme weather events. The probability of these major disasters is small, but the fast — and

BOX 4. RISK POOLING

Participating countries in the Caribbean, the Pacific islands and African Union have transferred their risks to three well-established regional pools that provide lower insurance premiums:

RISK-POOLING INITIATIVES	HAZARDS INSURED
CCRIF (2007)	Earthquake, tropical cyclone (hurricanes), excess rainfall, drought
PCRAFI (2013)	Tropical cyclone, earthquake/tsunami, excess rainfall
ARC (2013)	Drought, extreme weather (excess rainfall, heatwaves and tropical cyclones)

potentially large — insurance pay-outs are more valuable in mitigating their effects on possible debt default and its cascading effect on growth. Similarly, the higher frequency of smaller disasters may also require coverage to help countries rebuild because even recurring moderate events can cause significant damage. The design of the triggers will need to consider all the types of events that could have an impact on the country's fiscal performance.

Climate and other sources of finance to cover insurance cost

Under the proposed model, parametric insurance is not expected to cover the full debt. Rather, it would provide emergency liquidity to help countries recover from disasters. But this coverage might be inadequate for several reasons. First, it might only cover debt payment for a short time. Second, it may not provide enough protection to help a country recover fully from a disaster.

Insurance coverage that adequately covers these possibilities would cost more. Conversely, less coverage would cost less but also provide limited protection in terms of debt relief. This is why LDCs and SIDS would need optimal financial protection. These countries are already facing tighter borrowing constraints with higher interest rates and poor credit ratings because of their climate vulnerability. The benefits of risk transfer for debt sustainability are higher for them, but insurance costs can be prohibitive and would only add to their debt burden.

The cost of insurance premiums will therefore need to be covered through climate finance, members of the Paris Club and other sources proposed to provide debt relief to countries, such as the IMF and multilateral development banks, under the principles of climate justice and solidarity. The Global Shield initiative announced at COP 27 also opens up opportunities for piloting and scaling up parametric insurance for sovereign debt relief.

The trade-offs between fiscal costs and risk to growth, debt default and costs of debt restructuring would need to be weighed carefully. The ex post benefits of covering the insurance premium for debt relief can far exceed the investment in premiums. Direct support to LDCs for insurance costs would alleviate the financial constraints and help countries scale up financial resilience. It would also stabilise their growth, reduce poverty and allow them to invest in social protection.

BOX 5. HOW MUCH INSURING GDP LOSSES CAN COST

To estimate the average insurance premium for a risk pool, we used the data of 49 LDCs on fatalities; absolute losses (in million US$ purchasing power parity (PPP)); losses per unit GDP in percentage and Climate Risk Index (CRI); core from Global Climate Risk Index, 2021; and IMF estimate of actual GDP (in million US$) and their forecasted GDP based on PPP (in million US$) of these countries. The risk premiums were assigned by assuming probabilities for frequency of losses to GDP and hazard and vulnerability exposure based on CRI score. Based on composite function of these factors, the risk premium (for loss in GDP PPP) for 49 LDCs comes to US$135 million. Using the same approach, the risk premium for Mozambique comes to US$58.42 million (highest CRI score), if insured individually. The premium calculation has assumed factors like vulnerability to climate impacts, expected losses, expenses and profit margin of insurance company and deductibles. Although standardised rates have been assumed for calculation, the actual estimate of the probabilities of occurrence of climate events, as well as the resulting loss estimate, would require building complex and sophisticated models. These values should thus be viewed with those limitations in mind.

Delivering debt support linked to parametric insurance

A coordinated effort with support from G20 governments, other major developed countries and key institutions such as the IMF and World Bank will be needed to operationalise parametric insurance for sovereign debts. This should cover the points below.

Establish a global fund

A global fund based on contribution from G20 countries, debt relief funds of the IMF and World Bank, and climate finance pledges from developed countries will be needed to service the insurance premium for LDCs. This fund will enable risk pooling of all LDCs and SIDS and offer a more diversified portfolio to insurance companies.

The fund may need to respond to some critical questions to make such a model work at scale, particularly for LDCs and SIDS:

- What conditions would be attractive to insurers and reinsurers to keep premiums as low as possible?
- How can the risk pool work for a diversified portfolio of countries given some will be at higher risk than others and may need access to insurance support more often than others?
- What conditions would allow international climate finance to support risk-pooled debt finance at scale?

- How can non-insurability of some events be addressed? How might reinsurance or guarantee from the global fund work for high-severity events to limit the magnitude of potential losses for insurers?

In addition to covering premiums and guarantees for sovereign debts, the global fund can support longer-term adaptation and resilience building in LDCs. This would support risk reduction and therefore help reduce the magnitude of future losses and bring down the cost of premiums in the long run.

Undertake comprehensive risk modelling and data analytics

The global fund will also need to play a leading role in developing risk analytics and modelling tools. What risks should insurance cover? What is the likely frequency and size of losses that will need to be covered? This assessment will help in pricing, designing trigger thresholds and structuring the provision of adequate insurance coverage. Improved measurement will also help lower insurance costs.

Catastrophe risk modelling, developed by the insurance industry, uses data on parameters that describe the magnitude, frequency and geographic distribution of potential losses. This enables insurance companies to price and structure coverage correctly. The development, calibration and use of such models require multidisciplinary technical expertise and experience with interpretation of model output, and the input data for such models are often unavailable or incomplete (UNISDR, 2017). Incomplete knowledge of hazard events and their impact means more uncertainty for insurance pricing. To address these needs and reduce uncertainties, the global fund will need to invest in collecting and modelling hazard, exposure and vulnerability data. This would support the design of appropriate trigger mechanisms and avoid basis risks.

The data collection and models could be developed in collaboration with national meteorological and climate modelling experts. These could include academics; national meteorological, hydrological and geological services; and other government and nongovernmental agencies that collect and maintain sectoral data such as national bureaus of statistics. The process could build capacity to promote sustainable maintenance of the risk data. Further, engaging in-country stakeholders will ensure that LDC government needs and requirements are considered in design of the triggers and thresholds. Stakeholders can also ensure that development of in-country technical and operational capacities for data collection and risk analytics feeds in to design of triggers and insurance coverage. Finally, an inclusive approach will help ensure transparency on source and analysis of risk parameters.

Establish collaboration between multiple stakeholders

Collective buy-in will be crucial to make such a global fund work. Key partners, and their roles, are noted below:

(i) Participating LDC governments, and their relevant finance and environment ministries — to understand their needs and requirements for debt relief and how to structure the debt relief to support adequate time for recovery from disasters.

(ii) Major public and private sector creditors, Paris Club creditors, IMF, World Bank and other international and regional development banks — to bring them on board, seek funding support and design the structure and modality for retrofitting insurance with existing debts or imbedding it with those planned in future.

(iii) Insurance and reinsurance industry — to help co-design the insurance product and risk-pooling arrangements that provide optimum coverage of risks.

(iv) National technical agencies, data providers and the risk modelling community — to support availability of data and more accurate risk modelling.

(v) Academia, centres of excellence and nongovernmental organisations — to bring in a local/grassroots perspective to understand the needs, vulnerabilities and priorities of local communities and incorporate them in design of insurance cover.

A range of creditors must come on board. In previous eras, the multilateral and Paris Club lenders owned the LDCs' debt, but today private creditors and China own the bulk of it. The participation of private creditors will increase capital and bring down insurance costs. But more than that, it is essential for success. If some creditors do not sign on and collect their debt payment in full when other parties provide relief, it would not free up all debt. This, in turn, would prevent LDCs/SIDS from focusing their budget on relief and rehabilitation following the disasters.

4. Looking ahead

The climate crisis is pushing vulnerable LDCs into over-indebtedness, amplifying their disparity with developed countries. A deeply unequal global system makes it difficult for them to graduate out of debt and poverty. Fundamental changes are needed to re-engineer, regulate and equalise global debt and growth.

The Global Financing Pact agenda and the commitment to create a loss and damage fund under the United Nations Framework Convention on Climate Change offer an opportunity to create a global fund for supporting debt relief of LDCs and SIDS. Such a fund could better respond to the needs of communities at the frontline of the crisis. Automatic debt payments before or in the aftermath of extreme weather events would cover both public and private lenders. In addition, such a mechanism would provide adequate and appropriate grant-based climate finance to help countries develop long-term resilience. We call upon the IMF, World Bank, G20 countries and developed countries to channel the needed climate finance and technical assistance into this global fund to help LDCs and SIDS better manage the twin challenges of climate and debt risks.

Annexes

List of countries considered for the correlation/regression analysis

ANALYSIS: RELATIONSHIP BETWEEN HAZARD AND EXPOSURE INDEX AND SOVEREIGN DEFAULT TO DEBT RATIO

LDCs	Other countries	
Angola	Albania	Serbia
Benin	Argentina	Seychelles
Burkina Faso	Belarus	St Vincent and the Grenadines
Burundi	Belize	Syrian Arab Republic
Cambodia	Bolivia	Tajikistan
Congo, Rep.	Bosnia and Herzegovina	Tonga
Djibouti	Botswana	Tunisia
Equatorial Guinea	Cameroon	Ukraine
Ethiopia	Dominica	Uzbekistan
Gambia, The	Dominican Republic	Vietnam
Guinea	Ecuador	Zimbabwe
Guinea-Bissau	Fiji	
Haiti	Gabon	
Liberia	Georgia	
Madagascar	Ghana	
Malawi	Iran, Islamic Republic of	
Maldives	Iraq	
Mali	Jamaica	
Mauritania	Jordan	
Mozambique	Kazakhstan	
Myanmar	Kenya	
Niger	Korea, Republic of	
Rwanda	Kyrgyz Republic	
Senegal	Libya	
Sierra Leone	Mauritius	
Sudan	Mongolia	
Tanzania	Nicaragua	
Togo	Papua New Guinea	
Uganda	Peru	
Vanuatu	Romania	

ANALYSIS: RELATIONSHIP BETWEEN SOVEREIGN DEFAULT TO DEBT RATIO AND SOCIAL ASSISTANCE SPENDING	
LDCs	Other countries
Afghanistan	Albania
Angola	Argentina
Benin	Belarus
Burkina Faso	Bolivia
Burundi	Bosnia and Herzegovina
Cambodia	Botswana
Congo, Democratic Republic of	Brazil
Congo, Republic of	Cameroon
Djibouti	Dominica
Ethiopia	Dominican Republic
Guinea	Ecuador
Guinea-Bissau	Egypt, Arab Republic of
Maldives	Fiji
Mali	Georgia
Mauritania	Grenada
Mozambique	Iraq
Myanmar	Jamaica
Niger	Jordan
Rwanda	Kazakhstan
Senegal	Kenya
Sierra Leone	Kyrgyz Republic
Sudan	Libya
Tanzania	Mauritius
Togo	Mongolia
Uganda	Papua New Guinea
Zambia	Peru
	Romania
	Serbia
	Seychelles
	Tajikistan
	Tonga
	Tunisia
	Ukraine
	Vietnam
	Zimbabwe

ANALYSIS: RELATIONSHIP BETWEEN SOVEREIGN DEFAULT TO DEBT RATIO AND MULTIDIMENSIONAL RISK INDEX

LDCs	Other countries	
Afghanistan	Albania	Kyrgyz Republic
Angola	Argentina	Lebanon
Benin	Barbados	Libya
Burkina Faso	Belarus	Mauritius
Burundi	Belize	Mongolia
Cambodia	Bolivia	Nauru
Congo, Democratic Republic of	Bosnia and Herzegovina	Nicaragua
Djibouti	Botswana	Papua New Guinea
Equatorial Guinea	Brazil	Peru
Ethiopia	Cameroon	Romania
Gambia, The	Congo, Rep.	Serbia
Haiti	Dominica	Seychelles
Liberia	Dominican Republic	St Vincent and the Grenadines
Madagascar	Ecuador	Syrian Arab Republic
Malawi	Egypt, Arab Republic of	Tajikistan
Maldives	Fiji	Tonga
Mali	Gabon	Tunisia
Mauritania	Georgia	Ukraine
Mozambique	Ghana	Uzbekistan
Myanmar	Greece	Vietnam
Niger	Grenada	Zimbabwe
Rwanda	Guinea	Ukraine
Senegal	Guinea-Bissau	Uzbekistan
Sierra Leone	Iran, Islamic Republic of	Vietnam
Sudan	Iraq	Zimbabwe
Tanzania	Jamaica	
Togo	Jordan	
Uganda	Kazakhstan	
Vanuatu	Kenya	
Zambia	Korea, Republic of	

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The climate crisis is pushing Least Developed Countries into over-indebtedness, amplifying their disparity with developed countries. Fundamental changes are needed to re-engineer, regulate, and equalise global debt and growth. Parametric insurance for sovereign debt can be one of the sustainable options for resolving the debt crisis. Insurance could cover debt repayment on behalf of the country during the period of climate crisis, helping them to focus their budget on relief and recovery, with the provision of a global fund to cover the insurance premiums.

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International Institute for Environment and Development
Third Floor, 235 High Holborn, London WC1V 7DN, UK
Tel: +44 (0)20 3463 7399
Fax: +44 (0)20 3514 9055
www.iied.org

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"Sinking islands, rising debts: Urgent need for new financial compact for Small Island Developing States", *The International Institute for Environment and Development*, September 2023

Sinking islands, rising debts

Urgent need for new financial compact for Small Island Developing States

Ritu Bharadwaj, Tom Mitchell, N Karthikeyan and Balakrishnan Ananda Kumar

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September 2023

Climate change

Keywords:
Social protection, climate resilience, climate finance, debt management and swaps, climate change justice

About the authors

Ritu Bharadwaj is a principal researcher in the Climate Change Group of the International Institute for Environment and Development.

Dr Tom Mitchell is the executive director of the International Institute for Environment and Development.

N Karthikeyan is a development economist who focuses on climate change, natural resource management, safe drinking water, sanitation, elderly care and microfinance.

Balakrishna Ananda Kumar is a finance and development professional with 23 years of expertise in the areas of accounting, taxation and quantitative analysis.

Corresponding author: Ritu Bharadwaj (ritu.bharadwaj@iied.org)

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The Climate Change Group works with partners to help secure fair and equitable solutions to climate change by combining appropriate support for adaptation by the poor in low- and middle-income countries, with ambitious and practical mitigation targets. The work of the Climate Change Group focuses on achieving the following objectives:

- Supporting public planning processes in delivering climate-resilient development outcomes for the poorest
- Supporting climate change negotiators from poor and vulnerable countries for equitable, balanced and multilateral solutions to climate change
- Building capacity to act on the implications of changing ecology and economics for equitable and climate-resilient development in the drylands.

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International Institute for Environment and Development
Third Floor, 235 High Holborn, London WC1V 7DN, UK
Tel: +44 (0)20 3463 7399
www.iied.org

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www.facebook.com/theIIED

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Small Island Developing States (SIDS) are getting entrapped in financial quagmire due to climate impacts. This paper delves into the urgent financial plight of SIDS, examining the multifaceted challenges they face across social, environmental and economic domains. It argues for a comprehensive approach to debt relief, future protection, resilience investment and advisory support as necessary steps for the survival and sustainable development in these vulnerable regions.

Contents

Figures and tables

Acronyms

ADB	Asian Development Bank
AfDB	African Development Bank
AfDF	African Development Fund
AIMS	Atlantic, Indian Ocean, Mediterranean and South China Sea
AOSIS	Alliance of Small Island States
ARC	African Risk Capacity
BCR	Benefit–cost ratio
CARICOM	Caribbean Community
CCRIF	Caribbean Catastrophe Risk Insurance Facility
CV	Coefficient of variation
DR	Debt reprofiling
DS	Debt swap
DSA	Debt Sustainability Analysis
DSSI	Debt Service Suspension Initiative
EEZ	Exclusive Economic Zone
FDI	Foreign direct investment
GDP	Gross domestic product
GNI	Gross national income
HIPC	Heavily Indebted Poor Countries
IDA	International Development Association
IMF	International Monetary Fund
LDC	Least Developed Countries
LEP	Loss exceedance probability
MDRI	Multilateral Debt Relief Initiative
MVI	Multidimensional Vulnerability Index
NGO	Nongovernmental organisation
ODA	Official development assistance
PC	Pause clause
PCRAFI	Pacific Catastrophe Risk Assessment and Financing Initiative
PI	Parametric insurance
RB	Resilience bond
SAMOA	States Accelerated Modalities of Action
SDGs	Sustainable Development Goals
SIDS	Small Island Developing States
UN	United Nations
UNCTAD	UN Conference on Trade and Development

Summary

Small Island Developing States (SIDS) are a widely varied group of countries spread across three major geographical regions — the Caribbean; the Pacific; and the Atlantic, Indian Ocean, Mediterranean and South China Sea (AIMS). While diverse in many respects, they share a complex set of social, environmental and economic challenges.

These challenges stem from their inherent characteristics: limited populations and confined land areas, widespread geographical separation, and often significant distances from key global markets. For many SIDS, the majority of the natural resources they access come from the ocean. Their narrow resource base compels them to rely heavily on external markets for many goods. Many SIDS grapple with high import and export costs because of this, which also makes them susceptible to sudden global economic or political crisis, and climate change impacts.

Traditional income-based measurements often don't capture the multifaceted vulnerabilities faced by SIDS. Many SIDS are classified as middle- or high-income countries, resulting in ineligibility for concessional financing. Eleven SIDS are considered high income, more than half are classified as middle income, and only eight nations are Least Developed Countries (LDCs). The high- and middle-income status of many SIDS greatly obscures the level of risk and vulnerability these countries face and overlooks their structural challenges.

Vulnerability profile of SIDS: a multidimensional perspective

Recognising these limitations, we have used the Multidimensional Vulnerability Index (MVI) approach to provide a more comprehensive and nuanced understanding of SIDS' vulnerabilities. Our assessment shows a striking similarity in the MVI of SIDS at 56.64 with LDCs at 55.70. SIDS also exhibit a lack of structural resilience, with a score of 59.00 and LDCs at 58.39, showing a limited capacity to withstand shocks like natural disasters or economic downturns. The MVI also reveals that all but five SIDS are far more vulnerable than their income level would suggest, and despite the similarity in their vulnerabilities, only eight SIDS are classified as LDCs.

Vulnerability to climate impacts

Even though SIDS contribute less than 1% to global greenhouse gas emissions, they are disproportionately affected by the climate crisis. They are particularly exposed to the devastating impacts of climate change due to their unique geographical characteristics. Many SIDS are situated in areas prone to tropical cyclones, and their remote locations and small economies hinder their ability to cope with these events. The vulnerability of islands with an elevation of only five or less metres above sea level is heightened by predicted sea level rises, posing an existential threat.

Disaster impact in SIDS: The data for SIDS shows an increasing trend of disaster intensity and frequency. The number of high-intensity disasters affecting SIDS have increased in the last three decades, with a 300% increase in 2012 and a 133.33% increase in 2020. After 2010, significant increases in mean intensity were recorded, including a 321.82% increase in 2015 and a 196.50% increase in 2020.

In comparison to other countries, SIDS and LDCs faced higher disaster intensity from 2010 to 2022, experiencing more intense disasters in eight (66.67%) and seven years (58.33%) respectively, compared to decades before that. During 1990–2009, the frequency of occurrence of high disaster intensity was only 25% in SIDS and 35% in LDCs.

From 2011 to 2022, the percentage of the population affected by disasters in SIDS showed a noticeable increase, with the last decade witnessing a significant rise of around 120%. Similarly, the trends in deaths per million of population in SIDS showed a noticeable increase of approximately 60% in the last decade.

Scale of climate impact on economy: What makes SIDS particularly vulnerable is the relative impact of natural disasters on their economies. Although the absolute financial losses from disasters might seem

small compared to larger countries, the relative effects on SIDS are immense. A single disaster can be catastrophic, wiping out essential industries, impacting entire islands, or destroying vital infrastructure without readily available alternatives. Globally, SIDS comprise two-thirds of the nations that experience the highest relative annual losses from natural disasters (1–9% of their gross domestic product (GDP)). Additionally, 14 out of the 20 countries with the highest average annual disaster losses relative to their GDP are SIDS. The impact on GDP due to weather, climate and water-related events on SIDS between 1970 and 2020, was US$153 billion — a considerable figure considering the average GDP of SIDS is US$13.7 billion. Our assessment shows that the damage caused by disasters as a percentage of GDP in SIDS increased by nearly 90% from 2011 to 2022.

Climate and debt profile

The International Monetary Fund (IMF) conducts Debt Sustainability Analysis (DSA) to assess a country's ability to meet its current and future debt obligations without needing drastic measures such as debt relief or significant balance of payments adjustments. The analysis covers key indicators, such as the debt-to-GDP ratio, fiscal deficit, external debt, and tax revenue volatility. We analysed these indicators for 33 SIDS for which most recent debt data was available.

Debt to GDP ratio: Overall, more than 40% of SIDS are either highly indebted or are pushing towards debt distress, and 70% are above the sustainability threshold of 40% of GDP as debt. Six countries have a debt-to-GDP ratio exceeding 100% — Dominica, Cabo Verde, Barbados, Suriname, Maldives, and Antigua and Barbuda. These countries are heading towards debt distress. Eight countries were found to be highly indebted with a debt-to-GDP ratio greater than 80% but less than 100%, including Mauritius and Saint Lucia, both of which have a ratio exceeding 90%. Countries that have a debt-to-GDP ratio ranging from 40% to 80% were classified as moderately indebted. There are nine countries in this group. There are only ten countries with a debt-to-GDP ratio below 40%.

External debt: SIDS often rely on external borrowing to finance development and respond to shocks. From 2011 to 2019, SIDS' average external debt fluctuated between 48% and 51% of gross national income (GNI), revealing a consistent reliance on external sources of financing. The consistent proximity to the 50% threshold highlights a precarious fiscal position that can be easily tipped into distress by external shocks or changes in global economic conditions, such as climate events, commodity price fluctuations, and shifts in global trade and finance. To further understand the impact of climate disasters on the SIDS' external debt, we examined the correlation between disaster intensity and external debt levels by comparing two distinct periods: Period I (2007–2009) of minimal disaster intensity, and Period II (2020–2021) of high disaster intensity. During Period I, the mean external debt of SIDS was 45.37%. Contrastingly, Period II, saw a rise in the mean external debt to 58.50%. Analysis of the two periods unearthed several key trends and observations. Nearly 70% of the countries experienced an increase in external debt, with some witnessing remarkable surges. For example, the Bahamas saw a 720.83% increase in debt, moving from 5.74% to 47.11%. Papua New Guinea also experienced a substantial rise of 379.03%, from 14.52% to 69.57%.

Fiscal deficit: The fiscal balance of a country plays a pivotal role in determining its financial health. The fiscal balance can manifest either as a surplus, when revenue exceeds expenditure, or as a deficit, when the opposite occurs. We compared fiscal balance as a percentage of GDP in SIDS during Period I (2007–2009) of minimal disaster intensity, which showed an average fiscal deficit of –2.83%. Period II (2020– 2021), of high disaster intensity, had an average fiscal deficit of –4.53%, underscoring the trend of worsening fiscal balance during years of high disaster intensity. The countries with most significant negative changes (worsening in fiscal balance) were Suriname (decline of 12.39 percentage points), Seychelles (decline of 11.83 percentage points) and Palau (decline of 11.38 percentage points).

Coefficient of variation (CV) of fiscal balance represents standard deviation from the mean fiscal balance, expressed as a percentage. A high CV indicates potential volatility in government revenue and expenditure. Our analysis shows that the CV of fiscal deficit in SIDS is approximately 2.87 times higher than that in LDCs and approximately 1.90 times higher than that in other countries. This situation for SIDS is concerning because high levels of debt can make it difficult for a country to spend money on essential services such as healthcare, education and infrastructure.

Tax revenue volatility: Tax revenue volatility refers to fluctuations and unpredictability in the collection of taxes over time. Our analysis of its correlation with disaster intensity showed a strong positive correlation of 0.61. In comparison, LDCs showed a correlation of 0.48 and other developing and developed countries showed the weakest correlation of 0.40, highlighting that disaster intensity has a lesser impact on tax revenue volatility in most developing and developed economies.

Private debt and climate impacts

Private debt often comes at a higher interest rate. Our analysis shows that in earlier years, specifically in the 2000s, the proportion of private debt accrued by SIDS was relatively low, averaging around 6.47% of GDP. However, by the 2020s, this average rose substantially to 35.85% of GDP. Private external debt was seen to increase in the years of major disaster or in the years after that. Seychelles stands out with the highest private external debt, reaching a staggering 88.74%. Countries like Trinidad and Tobago, Papua New Guinea and the Solomon Islands have close to or more than 50% of private debt in their overall debt stock.

When examining the private external debt levels as a percentage of GDP for SIDS over two distinct high and low disaster intensity periods, a clear divergence in trends emerges. During the period of minimal disaster intensity, many SIDS displayed relatively stable or low private external debt levels. In contrast, the period marked by high disaster intensity saw a noticeable escalation in private external debt levels for several SIDS.

For the SIDS, breaking free from this vicious cycle is not just an economic imperative but a question of survival. The intertwined challenges of climate change and debt require a concerted, multifaceted response from the international community, including measures such as debt relief, concessional financing and substantial climate finance.

A way forward: building longer-term debt sustainability

Following on from our analysis of the debt trap facing SIDS, we propose measures for taking SIDS towards longer-term debt sustainability. We set out four measures and outline how each could alleviate the debt and climate risks faced by SIDS.

1. Debt alleviation

Multilayered comprehensive debt relief. When a country is hit by a climate disaster, different types of funding support are needed to help it recover from both climate and debt crises. To date, no existing debt relief measures have adequately met these needs and helped a country get its economy back on track after being hit by a disaster or series of disasters. Therefore, a layering — or combination — of debt relief options such as pause clauses, debt restructuring and reprofiling, and debt swaps would work best in restoring solvency and cover their recovery needs. To assess how layering of debt relief options might help in debt relief, we analysed two aspects: (i) impact on debt servicing and (ii) impact of reduction of total debt stock. Layering can reduce the annual debt servicing of SIDS from US$12.34 billion to US$9.49 billion. Similarly, layering can reduce the total debt stock of US$153.75 billion of SIDS (based on data of 33 SIDS) to US$81.65 billion.

Such layering can help promote sustainable recovery and promote GDP growth. Simulation of the probability of growth rate occurrence due to different debt stock reduction options shows that layering can increase the average GDP growth rate from 5.94% to 8.91%.

Complete write-off or buyout of SIDS debt stock. Recurring catastrophic climate change impacts have pushed SIDS into vicious cycles of debt; there is a need to correct historical imbalances and provide them with an opportunity to start afresh. This would require a complete write-off or buyout of all SIDS debt stocks so that they can focus on future climate resilience. It would free up resources, allowing these nations to invest in infrastructure development, longer-term climate resilience and socioeconomic betterment, ensuring their more sustainable and resilient future.

2. Future protection

The increasing frequency and intensity of climate-related events pose a continuing threat to the economies and livelihoods of SIDS. While debt relief is much needed to provide immediate fiscal breathing space after disasters, without more long-term, protective measures in place, these countries will remain precariously exposed. The ‘future protection’ concept is rooted in the idea of insulating these vulnerable nations from extreme economic fallout due to future climate impacts by limiting their economic losses through a combination of approaches. Such approaches can include insurance and other funding mechanisms that help to cover losses beyond insurable limits through a guarantee, or coverage against economic losses beyond a predetermined threshold. Our analysis shows that the cost to protect 20%, 50% and 100% loss of GDP would be US$21.34, US$53.35 and US$106.71 million, respectively. Our analysis also shows that the benefit–cost ratio (BCR) of parametric insurance to cover the losses caused by disasters at 5% Loss Exceedance Probablity (LEP) is 2.5 and 1.09 for LEP 20%.

3. Longer-term resilience investments

Resilient infrastructure, proactive adaptation through nature-based solutions and community-level resilience efforts can enable SIDS to better cope and recover form climate change. However, SIDS lack investments for these resilience measures due to the debt crisis. Raising finance though resilience bonds or green bonds with a focus on establishing robust infrastructure, such as storm-resistant housing and sea walls, or backing sustainable endeavours such as renewable energy projects, reforestation efforts or biodiversity conservation, offer transformative potential to help SIDS overcome this challenge and also build longer-term resilience. These bonds can help diversify the financing options available to SIDS, offering an alternative to traditional loans or aid and alleviating pressure on their already-strained budgets.

4. Advisor support and legal aid

Many SIDS have limited capacity for navigating the intricate process of debt restructuring, or negotiating the terms of debt or credit rating, leaving them at a disadvantage. SIDS are also increasingly engaging with private creditors who often use debt agreements which may not be immediately clear or favourable to the nations involved. Given the huge disparity in negotiating power and expertise between SIDS and large financial entities or private creditors, there is a pressing need for a dedicated facility that can guide and support SIDS. We are proposing the creation of a 'SIDS global debt and investment platform' to help SIDS deal with these challenges. The proposed platform could provide structured support to all SIDS, such as assistance on debt contract/deal management, and provide investment deal teams, supplementing local capacity and strengthening data and technical capacity and navigating political negotiations.

The increasingly frequent and severe impacts of climate change on SIDS underscore the importance of acting now to ensure long-term debt sustainability for SIDS. The four measures we outline, combined together, provide a comprehensive approach that can help SIDS respond to current and future economic and climate shocks and forge a resilient strategy for growth and security in uncertain times.

1

What are the unique development and economic challenges facing SIDS?

Small Island Developing States (SIDS) encompass a diverse segment of the global landscape. Positioned across three major geographical regions — the Caribbean; the Pacific; and the Atlantic, Indian Ocean, Mediterranean and South China Sea (AIMS) — these islands contribute a unique value and presence within the international community.

SIDS are organised within regional groups like the Caribbean Community (CARICOM), the Pacific Islands Forum and the Indian Ocean Commission, along with smaller regional organisations. Each region has unique characteristics and challenges. While their distinctiveness adds to the world's biodiversity and cultural richness, they face a shared set of complex social, environmental and economic challenges. Recognised as a special case for development at the 1992 United Nations Conference on Environment and Development in Rio de Janeiro, Brazil, SIDS gained further acknowledgement of their vulnerabilities in the outcome document of the Third International Conference on SIDS through the Small Island Developing States Accelerated Modalities of Action (SAMOA) Pathway (UN, n.d.).

The categorisation and definition of SIDS vary, with different organisations using different lists and definitions based on their focus areas (See Box 1).

Based on different categorisations used by different international organisations, SIDS comprise 20% of UN members and nearly half of the Commonwealth, and oversee 30% of the world's oceans. The 38 UN-member SIDS have a combined population of 65 million, just under 1% of the world's population. Although small in land mass, their ocean areas are vast — over 2,000 times larger than their land mass. Together, they hold 14% of the world's coastlines, and their Exclusive Economic Zone (EEZ) is 28 times larger than their land (FCDO, 2023).

1.1 SIDS are diverse

While organised into different regional groups, SIDS are incredibly diverse. They have wide-ranging differences in geography, population, economy and relationships with other nations. For instance, Pacific island states like the Solomon Islands consist of multiple islands with a small, dispersed population, and can span vast oceanic regions – more than 3.5 million kilometres in the case

BOX 1: DIFFERENT FOCUS AREAS, DEFINITIONS AND RECOGNISED LISTS OF SIDS

The United Nations Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States (UN-OHRLLS) focuses on addressing the unique challenges of these groups. They recognise 52 SIDS, including 38 UN members and focus on raising awareness, supporting international cooperation, and helping these countries gain access to necessary funding and resources for sustainable development.

The Alliance of Small Island States (AOSIS) is a coalition of small island and low-lying coastal countries that act collectively within the United Nations system to address their unique challenges. AOSIS includes 39 SIDS and focuses on climate change mitigation, adaptation and the sustainable development of these states, including the particular vulnerabilities that these countries face due to their geography.

The United Nations Conference on Trade and Development (UNCTAD) recognises 29 SIDS. Their definition of SIDS encompasses the economic vulnerabilities and trade-related needs of these states. They provide analysis and support on matters related to trade, investment, finance and technology to enable these countries to integrate into the world economy under favourable terms.

The World Bank Group defines small states as those with a population of 1.5 million or less, or members of their Small States Forum, which includes 50 states, 27 of which are SIDS. The World Bank Group's approach to SIDS involves addressing the economic and structural challenges they face. The focus is on creating resilience through development policies, supporting access to financial markets, improving infrastructure and fostering sustainable growth. The World Bank Group works with SIDS on various projects and offers financial products tailored to their unique needs and vulnerabilities.

These organisations, while sharing some common themes in their understanding of SIDS, approach them from different angles, emphasising different aspects of their challenges and vulnerabilities.

of Kiribati. In contrast, SIDS in Latin America and the Caribbean, such as Haiti, are closer to global markets and have larger, more concentrated populations. (OECD, 2018).

Economically, SIDS have a wide range of structures and income levels. Cabo Verde and Maldives lean heavily on services, whereas Papua New Guinea and Timor-Leste are resource rich. Yet, others, such as Kiribati and Tuvalu, depend predominantly on agriculture and fishing.

Despite being in the same region or income category, these islands experience distinct opportunities and challenges. In the Pacific, for example, there's a vast discrepancy in gross national income (GNI) per person, with figures ranging from US$1,830 in the Solomon Islands to US$13,330 in Nauru. Islands like Nauru, although possessing a relatively high GNI per capita, grapple with challenges like a staggering 90% unemployment rate (OECD, n.d.).

Other SIDS, such as Grenada and Jamaica, appear to have promising development trajectories due to their connections to international markets. However, their heavy reliance on major trading partners introduces a fragility to their economies, often coupled with high debt levels. Furthermore, some SIDS have established compacts with larger nations like Australia or the US, leading to a heightened dependency on these countries for various economic factors, from trade and tourism to financial assistance.

1.2 SIDS share unique vulnerabilities

Despite significant variations across SIDS, they grapple with a unique set of economic and developmental challenges that are common across all SIDS. These challenges stem from their inherent characteristics: limited populations and confined land areas, widespread geographical separation, and often significant distances from key global markets. For many SIDS, the majority of the natural resources they access come from the ocean. Their narrow resource base compels them to rely heavily on external markets for many goods. Many SIDS grapple with high import and export costs because of this, which also makes them susceptible to sudden global economic and political crises, and climate change impacts. For instance, many SIDS rely heavily on tourism, making them vulnerable to disruptions like the COVID-19 pandemic, which can have devastating impacts on their economies. Climate change, rising sea levels and extreme weather events also pose significant risks to SIDS due to their low elevation coastal zones and reliance on natural resources.

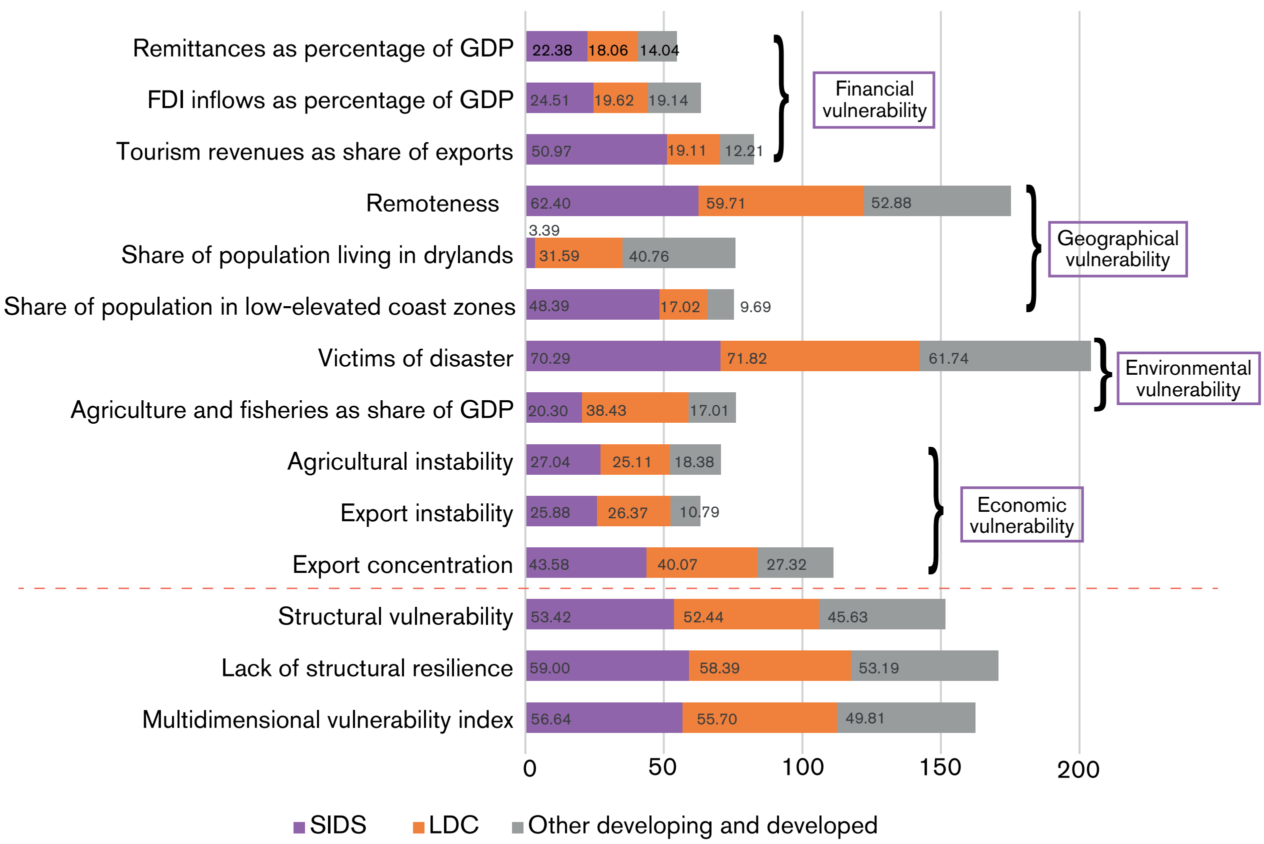
Traditional income-based measurements often don't capture these multifaceted vulnerabilities. Many SIDS are classified as middle- or high-income countries, resulting in ineligibility for concessional financing. For instance, 11 SIDS are considered high income, more than half are classified as middle income, and only eight nations are Least Developed Countries (LDCs) (Kalyan and Yihong, 2022). The high- and middle-income status of many SIDS greatly obscures the level of risk and vulnerability these countries face and overlooks their structural challenges. Conventional approaches may also fail to account for the particular geographic, environmental and economic sensitivities of SIDS, such as economic concentration, dependence on external flows, and vulnerability to disasters, resulting in generic international policies and support that may not adequately address their specific needs and challenges.

1.3 Vulnerability profile of SIDS: a multidimensional perspective

The particular vulnerabilities of SIDS necessitate a departure from traditional approaches and call for a more holistic assessment of their unique challenges. Recognising these limitations, we have used the Multidimensional Vulnerability Index (MVI) approach (Assa and Meddeb, 2021) to provide a more comprehensive and nuanced understanding of SIDS' vulnerabilities. The MVI assessment presented in Figure 1 (calculated for 126 countries, including 34 of the 38 SIDS) includes 11 indicators that go beyond income levels and encompass economic, environmental, geographical, financial and disaster-related dimensions.

The SIDS highest average MVI of 56.64 clearly demonstrates the challenges faced by SIDS. One of the defining features of SIDS is the structural challenges

Figure 1. Multidimensional vulnerability of SIDS compared to other countries



Source: Authors' calculation based on data from Assa and Meddeb (2021).

they face, such as remoteness; this is reflected in a score of 62.40, economic concentration at 43.58, and a significant dependence on external flows such as tourism revenues.

1.3.1 SIDS vulnerabilities in comparison with LDCs

A comparison with the LDCs reveals a striking similarity in their MVI, with SIDS at 56.64 and LDCs at 55.70. They also exhibit a similar lack of structural resilience, with SIDS at 59.00 and LDCs at 58.39, which shows their limited capacity to withstand shocks such as natural disasters or economic downturns. Enhancing resilience requires investments in infrastructure, social safety nets and building institutional capacity, but the lack of concessional finance due to their income categorisation limits the ability of SIDS to invest in these areas. A comparison of other aspects shows that SIDS are slightly more structurally vulnerable (53.42) than LDCs (52.44) and face export instability (25.88) similar to LDCs (26.37).

The MVI also reveals that all but five SIDS are far more vulnerable than their income level would suggest, and despite the similarity in their vulnerabilities, only eight SIDS are classified as LDCs. In Figure 2, we carried out an analysis of the relationship between gross domestic product (GDP) and MVI. This shows that even though the average per capita GDP of SIDS may be higher than LDCs, their vulnerabilities are comparable.

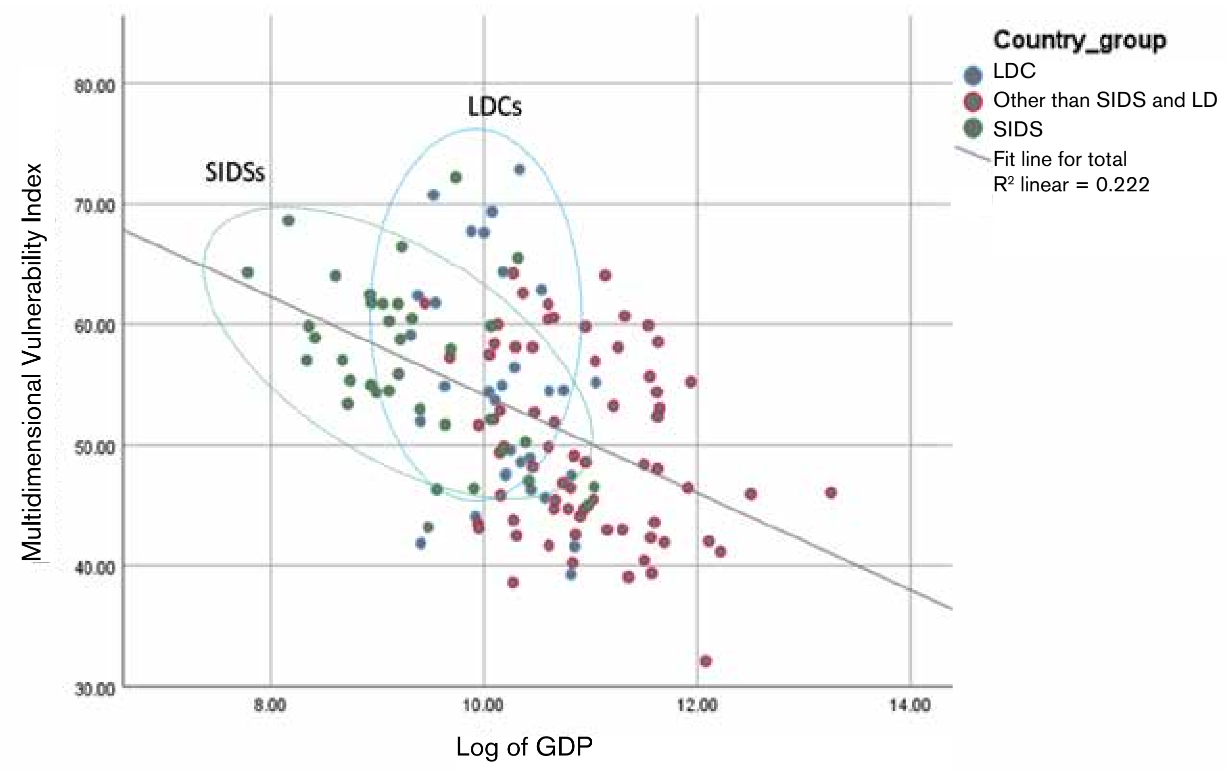
The SIDS' vulnerability profile is characterised by multiple intersecting challenges, from structural weaknesses to climate threats and economic dependencies. While sharing some similarities with LDCs, SIDS' particular geographical and economic characteristics make them even more vulnerable in specific areas highlighting the need for international support to help them build resilience.

1.3.2 Economic vulnerability

SIDS face distinct economic challenges rooted in their geographical and economic landscapes. These challenges are articulated through three core areas of vulnerability: export concentration, export instability and agricultural instability.

Export concentration. Export concentration in SIDS often manifests as an overreliance on a small number of export products, usually within sectors such as tourism, fishing or specific agricultural products. This concentrated focus can create significant vulnerability to changes in global markets, exchange rate fluctuations

Figure 2. Relationship between GDP per capita and MVI



Source: Authors' calculation based on data from database at World Bank (n.d.a) and Assa and Meddeb (2021) or disruptions in specific sectors. For example, Fiji's reliance on sugar, accounting for 20% of its total exports in 2019, exposed it to global market dynamics and potential diseases affecting the main export crop. The dependence on tourism is also a crucial aspect of export concentration in many SIDS, as seen during the COVID-19 pandemic, which led to a 45% reduction in tourist arrivals in Fiji (Fordelone, Tortora and Xia, 2022). The remote locations of SIDS further complicate this picture, leading to high transportation and import costs that affect everything from food prices in the Marshall Islands to construction costs in Cabo Verde.

Export instability. Export instability is another defining feature of the economic landscape in SIDS. Owing to their small size and heavy reliance on a few key industries, these states are particularly susceptible to export instability. The Maldives, with its high dependency on fish exports, particularly tuna, is an example of how a downturn in global demand for key products can have a significant negative impact on the entire economy. São Tomé and Príncipe's reliance on cocoa for about 80% of its export revenue further illustrates the extreme vulnerability that stems from dependency on a single export product (Chocolate Class, 2019). This susceptibility to global market fluctuations is exacerbated by the geographical challenges of SIDS, leading to increased transportation and export costs.

Agricultural instability. Agricultural instability in SIDS often stems from a dependence on a few key crops, combined with exposure to weather events like cyclones and susceptibility to diseases. It can be challenging for SIDS to diversify the agricultural sector due to limited resources. For example, in St Vincent and the Grenadines, the banana industry suffered greatly from diseases such as Black Sigatoka, causing a marked decline in banana exports (Searchlight, 2011). Exposure to environmental challenges, such as weather events, further adds to this instability.

1.3.4 Financial vulnerability

The financial vulnerability of SIDS manifests in various ways, primarily through their heavy dependence on tourism revenues, remittances and foreign direct investment (FDI). The intricate web of dependencies exposes SIDS to global economic conditions, investor sentiment and sudden disruptions, significantly impacting domestic consumption, investment and overall economic stability.

Tourism revenues as share of exports plays a vital role in the economy of many SIDS. For countries like Palau and Maldives, tourism accounts for 58–65% of GDP, making them particularly vulnerable to global disruptions. This overdependence was evidenced during the COVID-19 pandemic when the Bahamas' tourism-dependent economy contracted by 16.3% in 2020 (OECD, n.d.). Furthermore, the reliance on tourism in many SIDS, such as Seychelles and Maldives, leads to trade deficits that are two or three times higher than the median for developing countries, enhancing their vulnerability to external shocks.

Role of remittances as percentage of GDP: remittances often form a significant portion of GDP, reflecting the countries' reliance on overseas employment. Some SIDS, such as Tonga and Haiti, are highly reliant on remittances, receiving 34.1% and 30.1% of their GDP in remittances, respectively. Any fluctuations in remittances can affect the stability of the entire economy (OECD, n.d.).

FDI inflows as percentage of GDP is a crucial aspect of financial vulnerability in SIDS. FDI serves as a significant source of funding and development, but dependence on FDI also exposes countries to global financial market fluctuations. FDI inflows can vary greatly among SIDS, ranging between 1% to more than 10% of GDP (OECD, n.d.). This reliance on FDI also makes SIDS susceptible to global investor sentiment and market dynamics, potentially leading to unpredictable shifts in investment patterns and economic stability.

1.3.5 Environmental vulnerability

Environmental vulnerability in SIDS is closely linked to their socioeconomic and ecological landscapes. This vulnerability manifests itself through two primary dimensions: the significant role of agriculture and fishing in their economies and the acute risk of natural disasters.

Agriculture and fishing as share of GDP shows that SIDS derive a substantial share of their economy from these sectors. For instance, in the Solomon Islands, fishing and agriculture contribute to around 30% of GDP (UNCTAD, 2022). These sectors play a critical role in economic sustainability, which underscores the potential risks associated with climate change and overfishing. These threats have far-reaching implications for food security and livelihoods in SIDS. The challenges do not end there: rising sea levels and saltwater intrusion into freshwater reserves threaten agriculture and drinking water supplies in countries like Maldives. This highlights the interconnected environmental challenges that these states navigate. Furthermore, the integrity of coral reefs, essential to both the ecology and economy of SIDS, is under threat from rising sea temperatures and acidity. The Seychelles has already witnessed significant coral bleaching events, with repercussions for both tourism and fishing.

Disasters: these states are highly vulnerable to natural disasters such as cyclones, tsunamis and flooding. The magnitude of this vulnerability was starkly illustrated by Cyclone Pam in 2015, which led to damages estimated at a staggering 64% of Vanuatu's GDP (UNCTAD, 2022). Extreme weather events are becoming increasingly common, and their impacts can be overwhelming. In Dominica, Tropical Storm Erika caused damages equivalent to 96% of GDP in 2015. Two years later, while the country was still recovering from Erika, Hurricane Maria caused US$1.3 billion in damages. This was equivalent to 226% of its GDP (Thomas and Theokritoff, 2021). Adding to these challenges, some islands, like Tuvalu, struggle with limited landfill space and waste management, complicating the efforts to maintain environmental sustainability.

1.3.6 Geographic vulnerability

The geographic vulnerability of SIDS is manifested through three primary aspects: remoteness, the significant share of the population living in low elevated coastal zones, and the share of the population residing in dryland areas.

Remoteness is a defining feature of many SIDS, and it brings about specific challenges in terms of competitiveness, access to goods and the diversification of the economy. The Solomon Islands, for instance, consisting of some 1,000 islands with only 90 inhabited, faces logistically and financially taxing transportation and communication hurdles. This geographic isolation is not just a logistical issue, it translates into broader economic challenges. According to the UN Liner Shipping Connectivity Index, SIDS like the Solomon Islands (which ranks 122 out of 178) are less connected to global shipping networks than other developing countries (OECD, n.d.). This lack of connectivity translates into limited shipping options and high freight costs, hampering international trade. Energy challenges add another layer of complexity. Tonga's reliance on imported fossil fuels, comprising over 10% of GDP, shows the high energy costs that many SIDS face. Simultaneously, transitions to renewable energy being pursued by some SIDS are slow and costly, further highlighting the challenges stemming from geographic isolation.

Share of the population living in low elevated coast zones emerges as another facet of geographic vulnerability in SIDS. Many of these states, such as Maldives, have significant portions of their population living near the coast, making them vulnerable to climate change threats like rising sea levels. This vulnerability threatens the entire population's homes and livelihoods, a reality that has prompted nations like Kiribati to take drastic measures, such as purchasing land in Fiji for potential relocation (UNCTAD, 2022). Climate change's economic implications further extend to industries reliant on coastal ecosystems. The significant coral bleaching events seen in Seychelles due to rising sea temperatures and acidity have affected both tourism and fishing.

Share of the population living in drylands in some SIDS adds another dimension to their geographic vulnerability. In Cabo Verde, for example, parts of the population live in dryland areas prone to drought and desertification, affecting water scarcity and agriculture. These challenges are not confined to the environment alone; they reverberate through social structures. Health facilities are often limited or distant, as seen in Palau, where severe medical cases need to be flown to other countries.

Additionally, SIDS like Antigua and Barbuda face difficulty maintaining quality education due to the high costs associated with their geographic conditions, impacting human development (OECD, n.d.).

In summary, the common economic and developmental challenges faced by SIDS arise from their small populations and landmasses, spatial dispersion, remoteness from major markets and high exposure to economic shocks. These shared difficulties significantly impede their development prospects, making them more susceptible to changes in the global environment and often leaving them with limited options to surmount these challenges.

2

How is climate compounding economic, development and debt challenges of SIDS?

2.1 Lowest emissions, highest climate impacts

Even though SIDS contribute less than 1% to global greenhouse gas emissions, they are disproportionately affected by the climate crisis. They are particularly exposed to the devastating impacts of climate change, natural disasters and extreme weather events due to their unique geographical characteristics. Many SIDS are situated in areas prone to tropical cyclones, and their remote locations and small economies hinder their ability to cope with these events. The vulnerability of those islands whose elevation is only five metres or less above sea level is heightened by the predicted rise in sea levels, posing an existential threat.

Climate change is also introducing new challenges for SIDS, such as coastal erosion, coral bleaching and degradation of natural ecosystems. These environmental shifts threaten the foundations of SIDS' economies, particularly in sectors such as food production and tourism, which rely on the health and stability of local ecosystems. These vulnerabilities are further intensified by the global crises such as COVID-19 and the war in Ukraine, which has significantly affected the economies of SIDS, making them particularly sensitive to global economic disturbances.

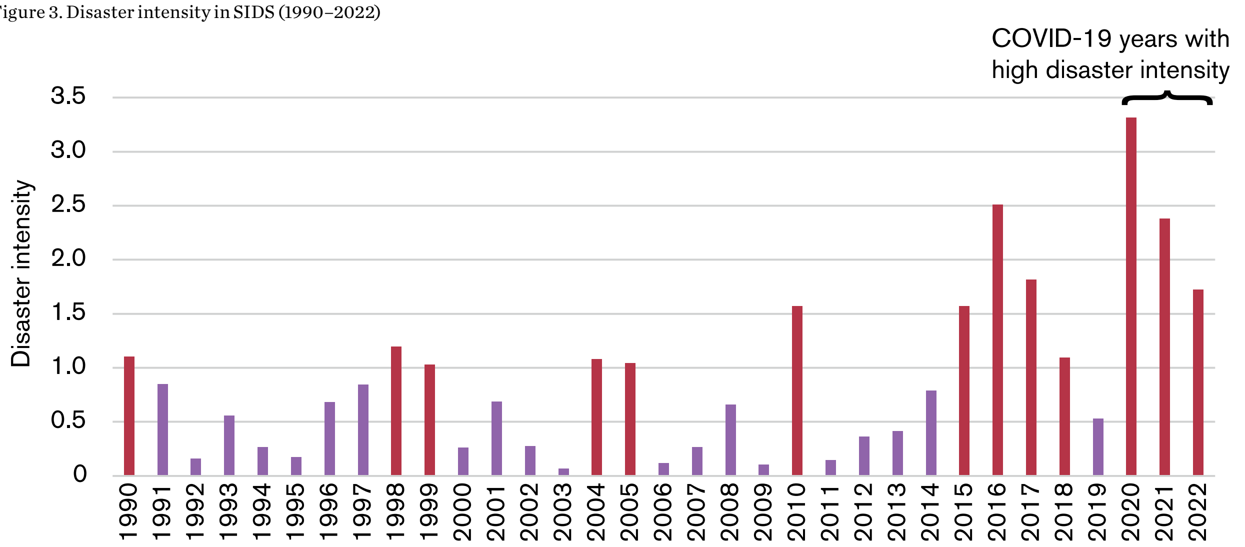
The IPCC's findings (IPCC, 2023) underscore the immediate need for climate action regarding SIDS, illustrating that these regions are not only experiencing climate change impacts but also face risks far greater than previous assessments.

2.1.1 Disaster intensity in SIDS

We carried out an analysis of change in disaster intensity and frequency in SIDS over the last three decades (see Figure 3). Our assessment shows that SIDS experienced a rising pattern of disaster intensity and frequency from 1990 to 2022.

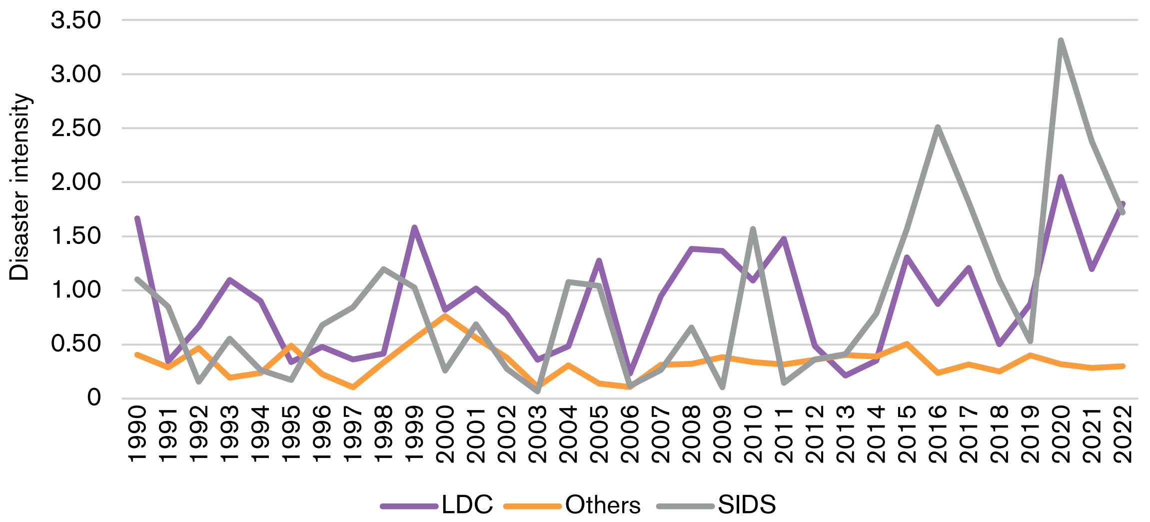
The frequency of high-intensity disasters (intensity above 1) has shown significant fluctuations, with a general upward trend observed after 2010. The number of high-intensity disasters increased from 1 in 2011 to 4 in 2012, further escalating to 11 in 2015, and settling at eight in 2022. The percentage change from year to year varied, with a 300% increase in 2012 followed by a 50% decrease in 2017 and a 133.33%

Figure 3. Disaster intensity in SIDS (1990–2022)



Note: The red bars indicate the years that experienced disaster intensity of more than one. Source: Authors' calculation based on data from EM-DAT (Centre for Research on the Epidemiology of Disasters, n.d.)

Figure 4. Disaster intensity and frequency in SIDS, LDCs and other countries (1990–2022)



Source: Authors' calculation based on EM-DAT data (Centre for Research on the Epidemiology of Disasters, n.d.)

increase in 2020. The mean disaster intensity in SIDS also exhibited variations, with notable peaks in 2015 (3.3137), 2020 (1.5689) and 2021 (2.3785). It is important to note that 2020, 2021 and 2022 were also COVID-19 years, where these high-intensity climatic disasters resulted in multi-layered crisis for many SIDS. After 2010, significant increases in mean intensity were recorded, including a 321.82% increase in 2015 and a 196.50% increase in 2020. Overall, the data for SIDS indicates a trend towards increased disaster intensity and frequency, reflecting an escalating vulnerability to high-intensity disasters.

2.1.2 Disaster intensity in SIDS compared to LDCs and other countries

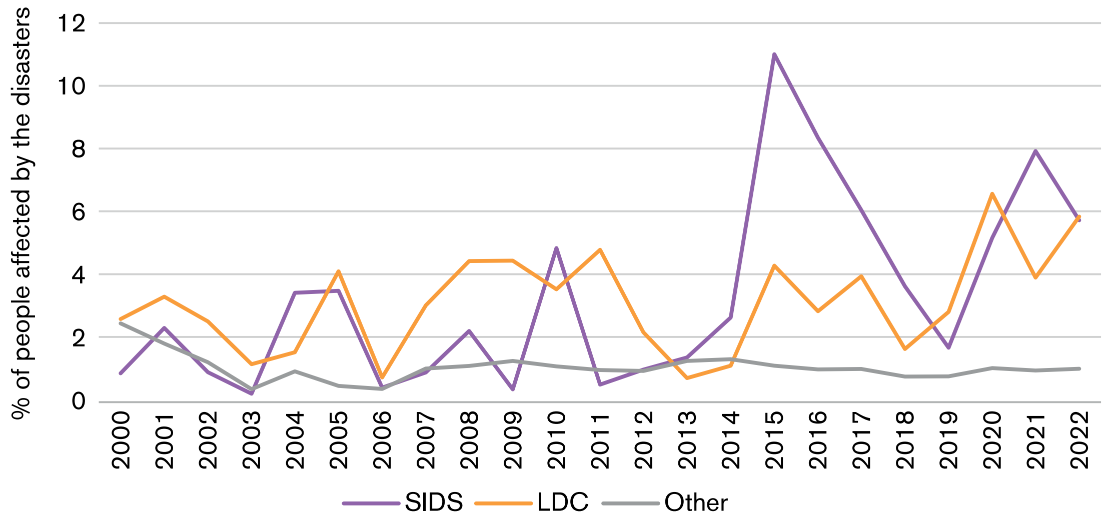
Our analysis of comparison of disaster intensity of SIDS with other countries (see Figure 4) shows that LDCs also demonstrated varying trends in disaster intensity and frequency from 1990 to 2022. The frequency of high-intensity disasters showed both significant increases and decreases, with an upward trend observed after 2010. During the last 10 years (2010–2022), SIDS experienced high disaster intensity in eight (66.67%) years and LDCs experienced it in seven (58.33%) years. During 1990–2009, the frequency of occurrence of high disaster intensity was only 25% in SIDS and 35% in LDCs. In contrast, the average disaster intensity of other developing and developed countries is less than one in the last 32 years. The data for other countries indicates a more predictable pattern compared to SIDS and LDCs, reflecting a different landscape of disaster risks and impacts.

The variations underscore the importance of tailored preparedness, response and mitigation strategies that consider the unique challenges and vulnerabilities of different country groups.

2.1.3 Percentage of population affected

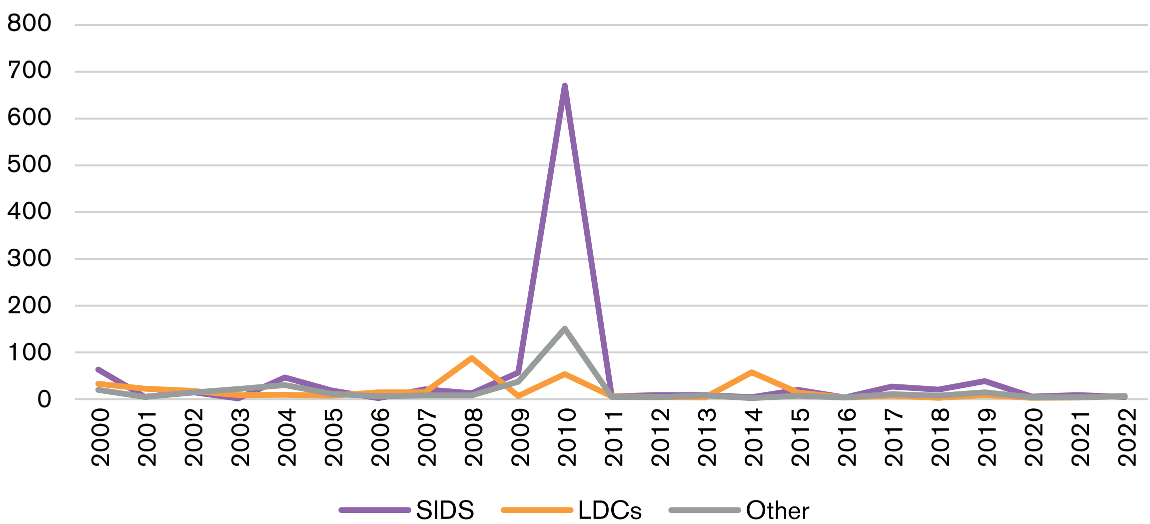
We analysed the percentage of population affected by disasters in SIDS, LDCs and other countries over the last three decades (see Figure 5). From 2011 to 2022, the percentage of the population affected by disasters in SIDS showed a noticeable increase, with the last decade witnessing a significant rise of around 120%. This rapid increase, especially pronounced in the 2020s, shows their considerable vulnerability. The years 2015 and 2016 marked significant spikes, while 2020 and 2021 demonstrated substantial increases. In contrast, LDCs saw an increase of about 40%, with occasional spikes, but without a consistent pattern, similar to SIDS.

Figure 5. Percentage of population affected by disasters in SIDS, LDCs and other countries (1990–2022)



Source: Authors' calculation based on EM-DAT data (Centre for Research on the Epidemiology of Disasters, n.d.)

Figure 6. Deaths due to disasters in SIDS, LDCs and other countries (1990–2022)



Source: Authors' calculation based on EM-DAT data (Centre for Research on the Epidemiology of Disasters, n.d.)

Other developing countries showed mixed trends, while developed countries maintained a relatively low and stable percentage of the population affected.

The deviation in these trends indicates the unique vulnerabilities faced by SIDS. The sharp increase in affected population signals immediate human costs and potential long-term challenges for these island nations.

2.1.4 Deaths per million of population

The analysis of deaths per million of population due to disasters is presented in Figure 6. The trends in deaths per million of population in SIDS fluctuated with a noticeable increase of approximately 60% in the last decade, reflecting the rising intensity of climatic events. LDCs showed a variable pattern with a general decrease, while other developing countries maintained a relatively steady trend. Developed countries observed minimal changes.

The human toll in SIDS, is evident from the increasing deaths per million of population, and its stark contrast with other regions demonstrates the critical nature of SIDS' vulnerabilities.

These patterns and implications reflect the urgency to address the increasing challenges faced by SIDS and the need to align efforts with the distinct needs of SIDS.

2.2 Scale of climate impact on economy

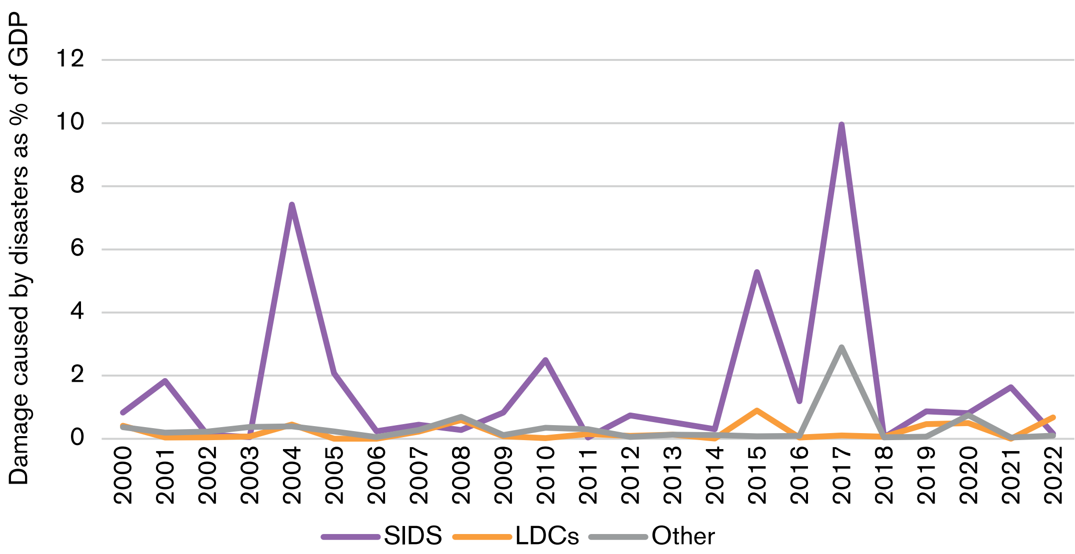
What makes SIDS particularly vulnerable is the relative impact of natural disasters on their economies. Although the absolute financial losses from disasters might seem small compared to larger countries, the relative effects on SIDS are immense. A single disaster can be catastrophic, wiping out essential industries, impacting entire islands, or destroying vital infrastructure without readily available alternatives. For example, hurricanes in 2004–2005 led to losses of 200% of GDP for Grenada. Globally, SIDS comprise two-thirds of the nations that experience the highest relative annual losses from natural disasters (1% to 9% of their GDP). Additionally, 14 out of the 20 countries with the highest average annual disaster losses relative to their GDP are SIDS.

The impact on GDP due to weather, climate and water-related events on SIDS between 1970 and 2020, was US$153 billion according to the World Meteorological Organisation — a considerable figure considering the average GDP of SIDS is US$13.7 billion (World Meteorological Organisation, 2023) .

In Figure 7, we have presented the analysis of damage caused by disasters on GDP of SIDS compared to LDCs and other developing and developed countries over the last two decades. The damage caused by disasters as a percentage of GDP in SIDS increased by nearly 90% from 2011 to 2022, with alarming levels in the 2010s. This upward trend contrasts sharply with LDCs, which experienced a modest increase of about 30%, with occasional fluctuations but without reaching the levels seen in SIDS. In other developing and developed countries, the damage as a percentage of GDP remained relatively stable or even declined.

The contrast in trends underlines the heightened financial vulnerability and unique economic risks faced by SIDS, emphasising their dependence on specific sectors like tourism and agriculture, which are susceptible to climatic changes.

Figure 7. Damage caused by disasters as % of GDP in SIDS, LDCs and other countries (1990–2022)



Source: Authors' calculation based on EM-DAT data (Centre for Research on the Epidemiology of Disasters, n.d.)

2.3 Climate and debt profile

Debt distress due to climate change introduces additional complexity to economic crisis of SIDS. Apart from suffering losses to infrastructure and GDP, after every such climatic event the costs of reconstruction and humanitarian aid are compounded in SIDS due to the need for imported materials and logistical challenges in reaching remote and widely spread populations. This exacerbates SIDS' growing debt, making them bear recurring financial burdens for post-disaster rebuilding. Moreover, adapting to climate change requires investments in protective measures, which again increases borrowings. Long-term environmental change also harms economies primarily dependent on agriculture and tourism, further increasing the debt challenges. Even global shifts tied to climate change, such as altered trade patterns or new regulations, can affect a country's ability to manage its debt.

In Figure 8 we have presented central government debt as a percentage of GDP in SIDS from 1990 to 2021, where the major disaster years are indicated as red bars.

The figure largely conforms with the trend showing that debt level increases after a major disaster, where six of the last ten years covered in the analysis have been years with major disasters. The years 2020 and 2021, apart from being high disaster years, also featured the COVID-19 pandemic, which impacted tourism-based economies of SIDS, and the Ukraine war, which has raised fuel and food grain prices, compounding the debt challenge for SIDS.

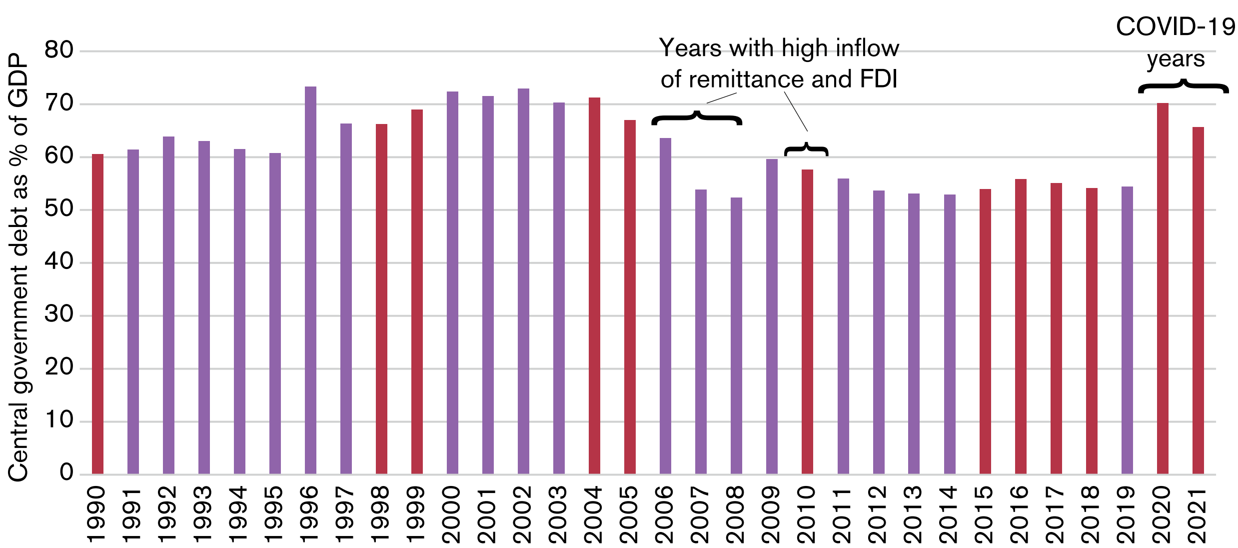
But this trend also needs to be understood from the viewpoint of the unique vulnerabilities of SIDS, particularly remittances and FDI, and how other factors impact the way debt crisis pans out in different countries.

As mentioned in Chapter 1, remittances form a significant portion of GDP in SIDS, with close to 30% of GDP being contributed by remittances in some countries. Any fluctuations in remittances can affect the stability of the entire economy. Similarly, FDI inflows as a percentage of GDP is a crucial aspect of financial vulnerability in SIDS. FDI serves as a significant source of funding and development, but dependence on FDI also exposes these countries to global financial market fluctuations.

Remittance flows to the 35 official development assistance (ODA)-eligible SIDS (OECD, 2022) have shown substantial variation over the years, with figures moving from US$10 billion in 2005 to a peak of US$27 billion in 2010, and then down to US$10 billion by 2014. Particularly notable were the fluctuations between 2007 and 2011. The increase from US$15 billion in 2006 to US$24 billion in 2007 marked a significant 60% rise, followed by a sharp decline of 33% to US$16 billion in 2008. The remittances then slightly increased to US$17 billion in 2009, representing a 6% increase, before surging by 59% to US$27 billion in 2010. A substantial drop of 41% occurred in 2011, bringing the figure down to US$16 billion.

These fluctuations in remittance flows had a profound impact on the economies of SIDS. Increased remittances likely supported improvements in foreign exchange positions, consumption and investment, reducing the need for external borrowing: we can see in Figure 8 that, despite major disasters in 2004, 2005 and 2010, debt levels did not increase in the following years. The significant influx of remittances

Figure 8. Disaster events and central government debt as % of GDP in SIDS (1990–2021)



Note: The red bars indicate the occurence of major disasters in the year. Source: Authors' calculation based on data from IMF (n.d.a) and EM-DAT (Centre for Research on the Epidemiology of Disasters, n.d.)

in 2006 and 2007 and the substantial amount in 2008 likely contributed to increased foreign exchange reserves, improved balance of payments and better macroeconomic positions. This, in turn, may have enabled governments to reduce their reliance on external borrowing, thus contributing to a reduction in debt levels during these years. However, the global financial crisis and the modest increase in remittances in 2009 might have necessitated increased borrowing to support economic stability, leading to higher debt levels that year. The substantial inflow of remittances in 2010 likely provided a strong buffer, enabling SIDS to strengthen their fiscal positions and reduce debt.

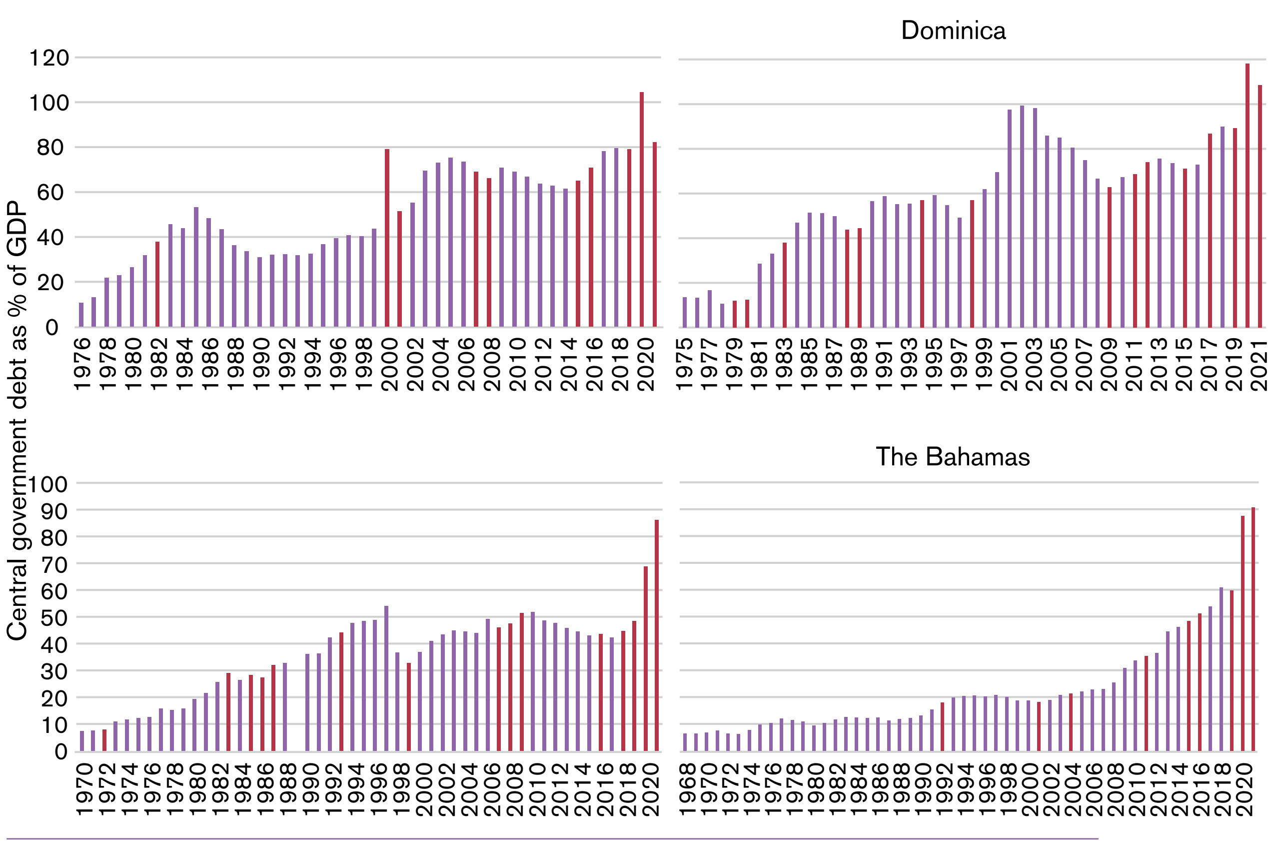
But this trend is not the same across all countries. We have presented the impact of disaster events and sovereign debts for select SIDS countries (1990–2021) in Figure 9. In the case of Dominica, we can see the impact of higher remittance flow in helping manage the debt crisis after the disaster event in 2004, however in other countries, such as the Bahamas, Fiji and Belize, increased debt levels can be seen following disaster events.

The fluctuations also illustrate the complex interdependence of various economic factors in SIDS. The relationship between remittances and debt levels underscores both the importance of remittances as a lifeline and a source of vulnerability. While addressing the debt crisis, careful consideration to this dynamic is needed to manage debt and foster sustainable economic growth, recognising the essential role that remittances play in both supporting and challenging economic stability.

2.4 Impact of climate disasters on the debt sustainability of SIDS

The International Monetary Fund (IMF) conducts debt sustainability analysis (see Box 2) as a vital framework to assess a country's ability to meet its current and future debt obligations without needing drastic measures such as debt relief or significant balance of payments adjustments. The analysis assesses key indicators, including **the debt-to-GDP ratio**, **fiscal deficit**, **external debt** and **tax revenue volatility**. The latter refers to unpredictable fluctuations in tax revenues which can impact a government's ability to plan and budget effectively and may lead to unforeseen challenges in managing debt. The IMF also focuses on future economic and fiscal scenarios, taking into account potential shocks, stress tests and the volatility of tax revenues.

Figure 9. Disaster events and sovereign debts for select SIDS countries (1990–2021)



Note: The red bars indicate the occurence of major disasters in the year. Source: Authors' calculation based on data from IMF (n.d.a) and EM- DAT (Centre for Research on the Epidemiology of Disasters, n.d.)

BOX 2. WHAT IS DEBT SUSTAINABILITY ANALYSIS?

Debt Sustainability Analysis (DSA) serves as a financial health check for a country, examining how much money a country owes and determining if it can pay back that money without falling into financial stress.

The process of DSA begins by examining the total debt, including what is owed to other countries and the applicable interest rates. It then involves predicting the country's economic growth, interest rate fluctuations, and government revenue from taxes. Stress testing or imagining potential adverse scenarios, such as sudden spikes in interest rates or drops in economic growth, helps to assess how the debt might react. Based on all this information, analysts decide if the debt levels are safe or risky. When too much debt can lead to a financial crisis, DSA can also act as a tool to provide early warnings.

By integrating economic understanding of debt with the impacts of climate change there is an opportunity to develop strategies that can help countries like SIDS in dealing with more intense and frequent disasters due to climate change and transition to a more resilient and sustainable future.

Indicators like the debt-to-GDP ratio, fiscal deficit, external debt and tax revenue volatility are thus critical indicators for understanding the complex interplay between debt sustainability and climate change in SIDS. We have analysed these indicators for 33 SIDS for which most recent debt data was available.

2.4.1 Debt-to-GDP ratio

The debt-to-GDP ratio is a key measure of a country's ability to service its debt. In SIDS, climate change can directly affect this ratio by causing damage that requires increased borrowing (raising the debt), while simultaneously impacting economic sectors like tourism or agriculture (reducing GDP). A high debt-to-GDP ratio can signal a risk of debt crisis, particularly in SIDS, where climate change effects can be sudden and severe. In Figure 10, we have presented a categorisation of SIDS based on central government debt as percentage of GDP.

As shown in Figure 10, the 60% debt-to-GDP ratio has been a commonly referenced threshold in economic analyses, including those related to debt sustainability. For advanced economies, the 60% debt-to-GDP ratio has often been used as a reference point, based on the Maastricht Treaty[1] criteria for European Union member states. While this specific threshold might not be a rigid rule for all countries, it serves as a benchmark for assessing debt sustainability. However, for SIDS, this threshold might not apply, as their specific vulnerabilities can require more tailored analysis. A lower threshold might be more appropriate for SIDS, due to their unique characteristics and increased susceptibility to shocks. IMF analyses have considered a ratio of 40% or 30% of GDP[2] as a warning sign, given these states' limited economic diversification and greater exposure to external shocks.

In our analysis, we have categorised countries (a total of 33 countries for which data was available) into four groups based on their debt levels relative to their GDP.

1. **Countries pushing towards debt distress:** Countries with a debt-to-GDP ratio exceeding 100% fall into this category. Six countries are classified here: Dominica, Cabo Verde, Barbados, Suriname, Maldives, and Antigua and Barbuda.
2. **Highly indebted:** Countries with a debt-to-GDP ratio greater than 80% but less than 100% have been classified as highly indebted. Eight countries are in this category, including Mauritius and Saint Lucia, both of which have a ratio exceeding 90%.
3. **Moderately indebted:** Countries that have a debt-to-GDP ratio ranging from 40% to 80% are classified as moderately indebted. There are nine countries in this group.
4. **Less indebted:** The final category consists of countries with a debt-to-GDP ratio below 40%. Ten countries are placed in this category.

According to our analysis, more than 40% of SIDS are either highly indebted or are pushing towards debt distress, and overall, 70% countries are above the debt sustainability threshold of 40% of GDP as debt. Even if we consider 60% debt-to-GDP ratio as the debt sustainability threshold, close to 60% of countries are above it, an alarming situation for SIDS.

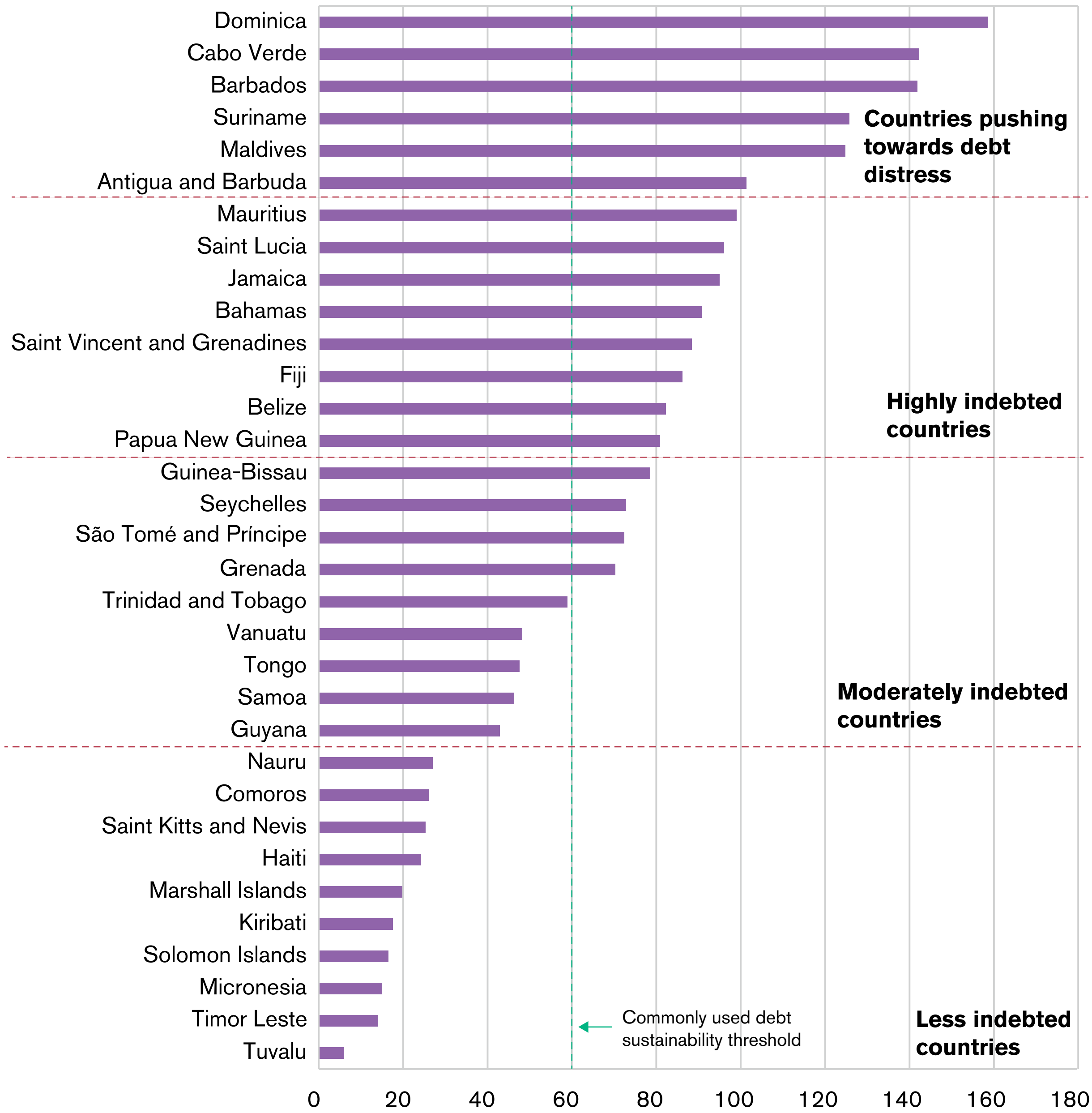
2.4.2 External debt

SIDS often rely on external borrowing to finance development and respond to shocks. Climate change increases the need for such borrowing, both for immediate recovery efforts and long-term adaptation. However, fluctuations in global economic conditions

[1] The 60% debt-to-GDP ratio threshold has its roots in the Maastricht Treaty criteria, which were established as convergence criteria for countries joining the European Monetary Union. According to the Treaty, the ratio of gross government debt to GDP must not exceed 60% at the end of the preceding fiscal year. It is important to note that while this criterion was initially applied to European countries, the 60% threshold has often been cited more broadly in economic literature and policy discussions.

[2] IMF applies different thresholds of debt sustainability. For instance, for Kiribati, the external debt burden threshold is 30%, while for Vanuatu, the external debt burden threshold is 40%.

Figure 10. Classification of SIDS based on central government debt as percentage of GDP



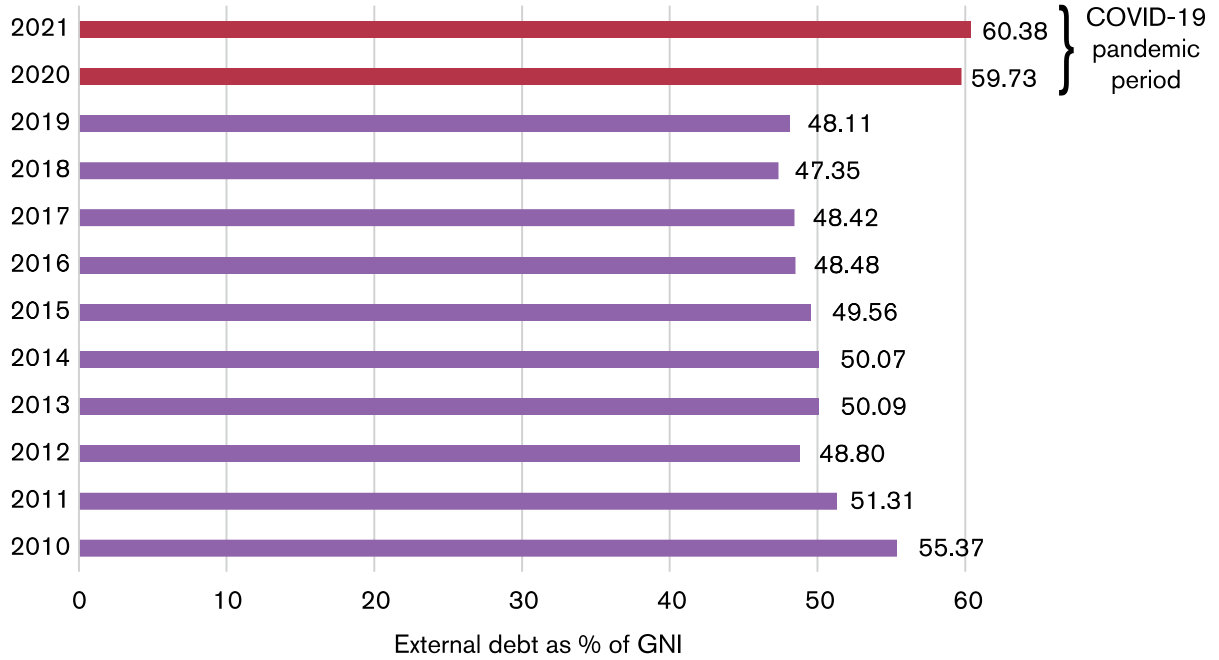
Source: Authors' calculation based on data from (World Bank, n.d.b)

influenced by climate change can affect interest rates and borrowing terms. For SIDS, where external debt may already be significant, these changes can threaten debt sustainability, necessitating careful management and negotiation of external borrowing.

In Figure 11, we have presented the analysis of external debt vulnerability in SIDS. From 2011 to 2019, SIDS' external debt fluctuated between 48% and 51% of GNI, revealing a consistent reliance on external sources of financing. The consistent proximity to the 50% threshold also highlights a precarious fiscal position that can be easily tipped into distress by external shocks or changes in global economic conditions, such as climate events, commodity price fluctuations, and shifts in global trade and finance. During such crisis, countries might have to undertake necessitated emergency spending, when they may already be facing strained economic conditions due to disruption in trade and tourism — key sectors for many SIDS. The resulting increase in borrowing from external sources may further expose these nations to the risks of debt distress and the challenges of sustainable debt management.

The years 2020 and 2021 have brought these vulnerabilities into sharp focus, with the advent of the COVID-19 pandemic exacerbating the debt crisis in SIDS. The sudden spike in external debt to 59.73% in 2020 and 60.38% in 2021 underscores the reliance on external creditors to manage the economic fluctuations wrought by the pandemic.

Figure 11. External debt of SIDS as % of GNI from 2011–2021



Source: Authors' calculation based on data from World Bank (n.d.b)

Comparing external debt as % of GDP in SIDS: period of minimal disaster intensity versus period of high disaster intensity. To further understand the impact of climate disasters on the SIDS' external debt, we examined the correlation between disaster intensity and external debt levels as a percentage of GDP in SIDS. We did this by comparing two distinct periods: Period I (2007–2009), a period of minimal disaster intensity and Period II (2020–2021), a period of high disaster intensity, including the impact of the COVID-19 pandemic — the analysis reveals a pronounced trend of increasing debt associated with greater disaster intensity (see Figure 12).

- **Period I: minimal disaster intensity (2007–2009).** During Period I, the mean external debt for SIDS stood at 45.37%, reflected varying levels of debt across these nations. This period was marked by lower intensity of disasters and relatively stable economic conditions in some countries.
- **Period II: high disaster intensity (2020–2021).** Contrastingly, Period II, which was marked by increased disaster intensity and additional pressures from the COVID-19 pandemic, saw a rise in the mean external debt to 58.50%.

The analysis between the two periods unearthed several key trends and observations. Nearly 70% of the countries experienced an increase in external debt, with some witnessing remarkable surges. For example, the Bahamas saw a 720.83% increase in debt, moving from 5.74% to 47.11%. Papua New Guinea also experienced a substantial rise of 379.03%, from 14.52% to 69.57%.

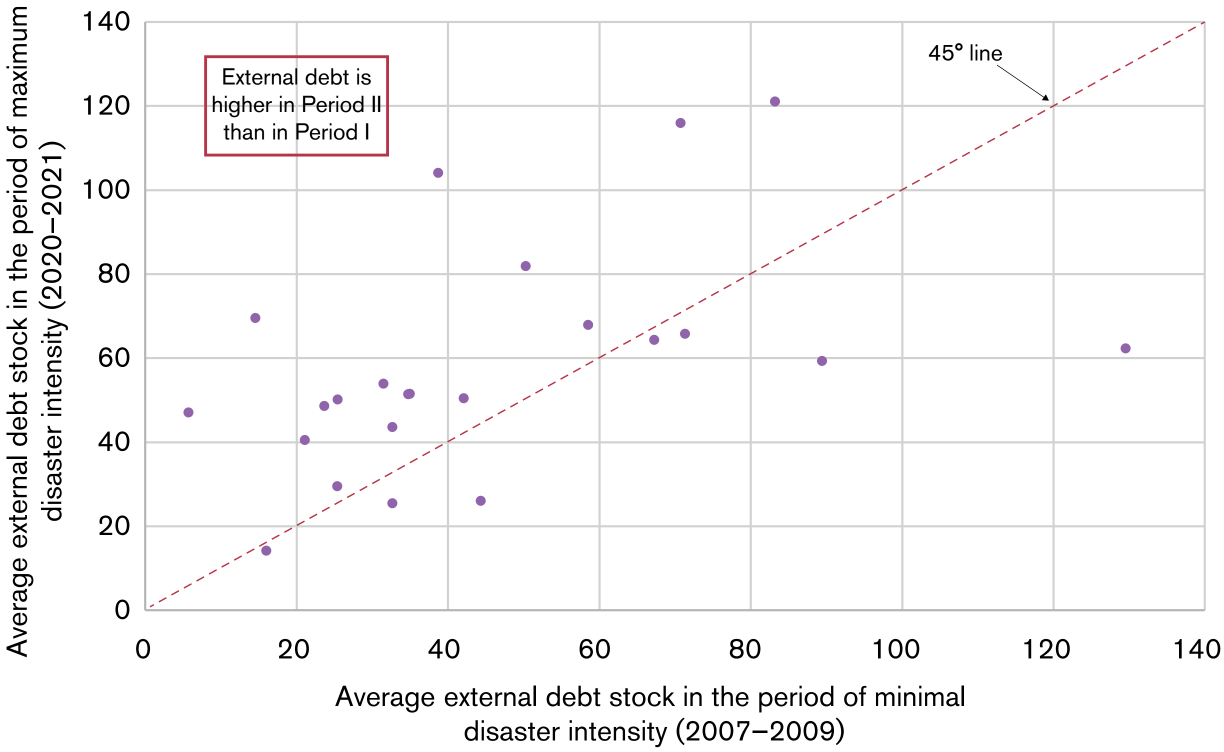
The higher overall debt in the period of high disaster intensity compared to the period of minimal disaster intensity underscores a clear relationship between climatic disasters and external debt. The mean and median values for Period II being higher than those for Period I is indicative of a general trend of increased debt associated with greater disaster intensity. The COVID-19 pandemic's dual impact on health and economic systems has further strained resources, increasing borrowing needs and compounding the debt challenges.

2.4.3 Fiscal deficit

The fiscal balance of a country plays a pivotal role in determining its financial health. The fiscal balance can manifest either as a surplus, when revenue exceeds expenditure, or as a deficit, when the opposite occurs. A fiscal deficit is akin to a situation where an individual spends more money than they earn in a given period, leading to a shortfall. When a government spends more than it receives in revenue, it faces a fiscal deficit. This deficit is often covered by borrowing money, leading to sovereign debt.

Climate change-related events like hurricanes or droughts can lead to unexpected expenditures for recovery and humanitarian assistance, widening the fiscal deficit. Simultaneously, these events may reduce tax revenues due to the loss of income in affected sectors. In SIDS, where fiscal buffers may be limited, a widening fiscal deficit can quickly lead to debt crisis.

Figure 12. Comparing external debt as % of GDP in SIDS: period of minimal disaster intensity (2007–2009) versus period of high disaster intensity (2020–2021)



Source: Authors' calculation based on data from (Kose et al., 2022) and EM-DAT data (Centre for Research on the Epidemiology of Disasters, n.d.)

Comparing fiscal balance as a percentage of GDP in SIDS: period of minimal disaster intensity versus period of high disaster intensity. We carried out the analysis of fiscal balance as a percentage of GDP in SIDS during two specific periods (see Figure 13).

The first period, from 2007 to 2009, representing years of minimal disaster intensity, had an average fiscal deficit of –2.83%. The second period, encompassing the years 2020 and 2021, representing the time of high disaster intensity, including the COVID-19 pandemic, had an average fiscal deficit of –4.53%. The increase in the fiscal deficit during the period of high disaster intensity underscores a trend of worsening fiscal balance. This trend is not uniform across all countries. The most significant negative changes (worsening in fiscal balance) were in:

1. **Suriname:** decline of 12.39 percentage points
2. **Seychelles:** decline of 11.83 percentage points
3. **Palau:** decline of 11.38 percentage points.

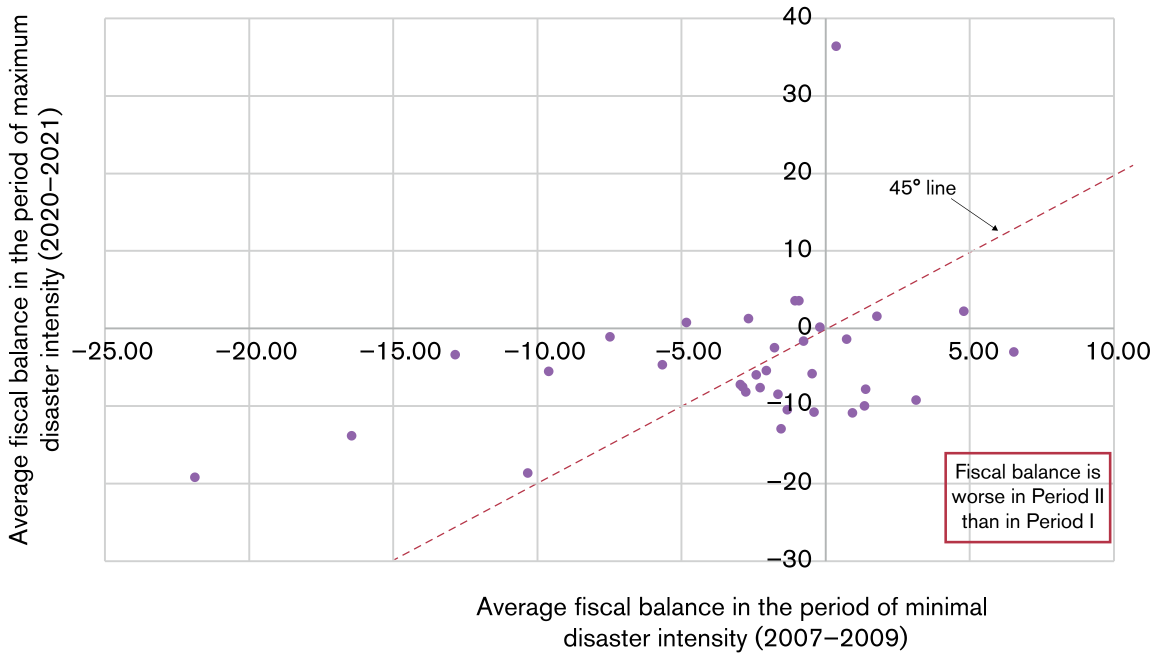
The fiscal balance, particularly the deficit, is a barometer of financial stability and an indicator of potential challenges. The analysis of fiscal balance in SIDS during periods of varying disaster intensity provides valuable insights into how crises can shape fiscal policy, drive borrowing, and influence debt dynamics.

Coefficient of variation of fiscal balance. The coefficient of variation (CV) is a statistical measure that describes the relative variability of a data set in relation to its mean. In the context of fiscal balance, the CV represents the ratio of the standard deviation to the mean fiscal balance, expressed as a percentage. The CV of fiscal balance provides insights into the stability and sustainability of a country's fiscal policy. A high CV indicates significant fluctuations in fiscal balance, reflecting potential volatility in government revenue and expenditure. This can have profound implications for economic planning, debt management and overall economic stability. We analysed the CV of fiscal balance of SIDS in comparison to LDCs and other developing and developed countries based of the data for the period 1990–2021 (see Figure 14).

Our analysis shows that the CV of fiscal deficit in SIDS is approximately 2.87 times higher than that in LDCs and approximately 1.90 times higher than that in other countries. These ratios emphasise the significantly greater variability and negative trend in fiscal balance for SIDS compared to both LDCs and other countries, highlighting the unique challenges and vulnerabilities they face.

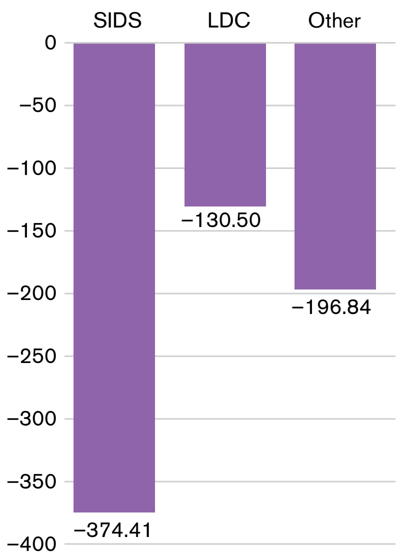
The situation for SIDS is concerning because high levels of debt can make it difficult for a country to spend money on essential services like healthcare, education and infrastructure. If too much money goes towards paying off debt, there may be less available for these crucial areas. This can slow down economic growth and make it harder for the country to develop in the long run.

Figure 13. Comparing fiscal balance as % of GDP in SIDS: period of minimal disaster intensity (2007-09) versus period of high disaster intensity (2020–2021)



Source: Authors' calculation based on from data from (Kose et al., 2022) and EM-DAT data (Centre for Research on the Epidemiology of Disasters, n.d.)

Figure 14. Coefficient of variation of fiscal balance during 1990–2021 (%)



Source: Authors' calculation based on data from (Kose et al., 2022)

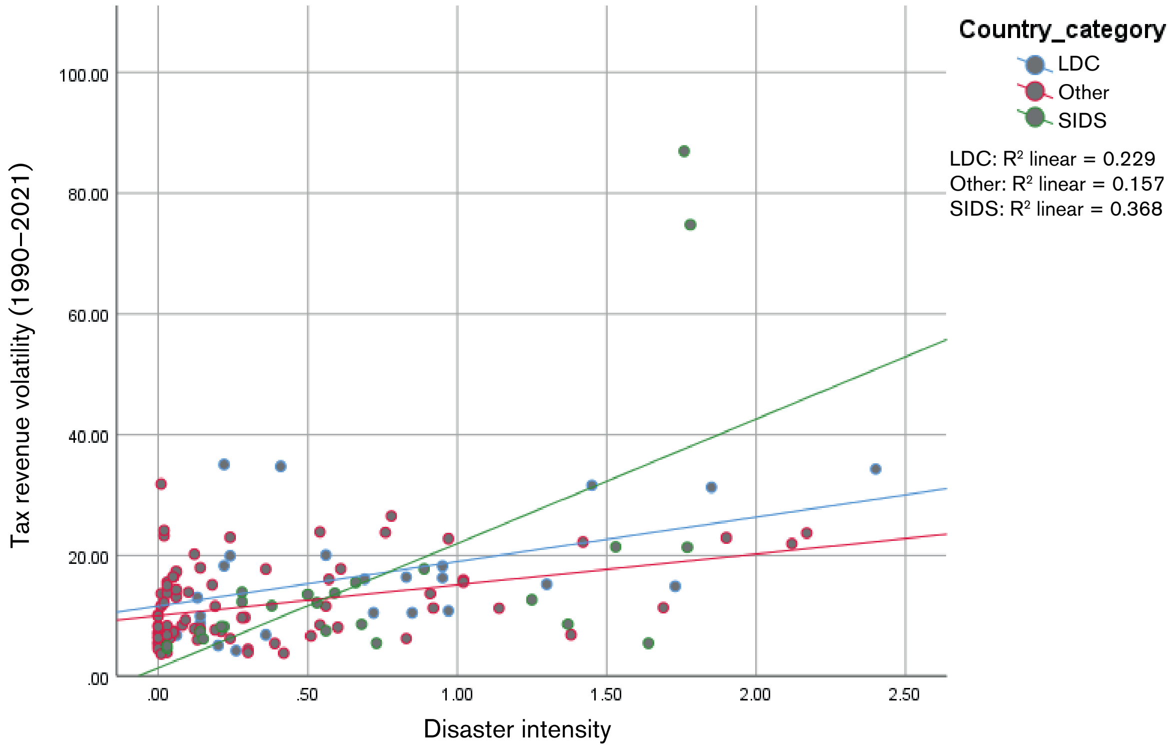
2.4.4 Tax revenue volatility

Tax revenue volatility refers to the fluctuations and unpredictability in the collection of taxes over time. It represents the degree of variability in tax revenue, which may occur due to changes in economic conditions, tax policies, natural disasters or other factors.

Many SIDS depend on specific sectors like tourism, which are highly sensitive to climate change. Extreme weather events can lead to substantial fluctuations in income from these sectors, causing tax revenue volatility. This unpredictability complicates budget planning and can exacerbate fiscal deficits, particularly in SIDS where alternative revenue sources may be limited. Volatility in tax revenue can also hinder the government's ability to commit to long-term investments in infrastructure, education, healthcare and other areas crucial for growth and development. Unstable revenue may lead to cuts in public spending or delayed projects, hindering economic progress. Understanding and managing this volatility is vital for maintaining fiscal stability and avoiding a debt crisis.

We undertook the analysis of the relationship between tax revenue volatility and disaster intensity for SIDS compared to LDCs and other developing and developed countries (see Figure 15).

Figure 15. Relationship between tax revenue volatility and disaster intensity



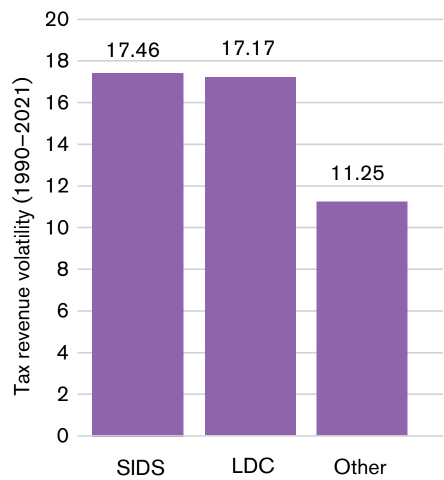
Source: Authors' calculation based on data from (Kose et al., 2022) and EM-DAT data (Centre for Research on the Epidemiology of Disasters, n.d.)

The analysis presented the following trend:

- **SIDS:** A strong positive correlation of 0.61 indicates that increased disaster intensity is associated with higher tax revenue volatility. Climate change, leading to more frequent and intense natural disasters, may be a significant driver of this volatility in SIDS.
- **LDCs:** A positive correlation of 0.48 suggests a similar but slightly weaker relationship between disaster intensity and tax revenue volatility.
- **Other developing and developed countries** show the weakest correlation of 0.40, highlighting that disaster intensity has a lesser impact on tax revenue volatility in most developing and developed economies.

Tax revenue volatility (presented in Figure 16) in SIDS compared to LDCs and other developing and developed countries shows that SIDS exhibit a higher average tax revenue volatility of 17.46 for the period 1990–2021. LDCs have a slightly lower but comparable volatility to SIDS, at 17.17. Other developing and developed countries show a significantly lower tax revenue volatility, with an average of 11.25.

Figure 16. Tax revenue volatility (1990–2021)



Note: Tax revenue volatility is represented by coefficient of variation of tax revenue of the countries for 1990–2021. Source: Authors' calculation based on data from Kose et al. (2022)

2.5 Private debt and climate impacts

Sovereign debt can be broadly categorised into two types: debt borrowed from private sector creditors (such as commercial banks, investment funds or bondholders) and debt borrowed from official or public creditors (such as other governments, international organisations or development banks). For SIDS, there can be differences in the interest rates and borrowing terms associated with these two categories of debt.

Generally, private creditors may demand higher interest rates compared to official lenders. This is because private creditors often prioritise profit and may perceive higher risks associated with lending to SIDS. Factors such as climate vulnerability, limited market access and economic vulnerabilities are perceived as potential credit risks and contribute to higher interest rates. Conversely, countries with stronger macroeconomic fundamentals and better credit rating are able to negotiate lower interest rates, even with private creditors.

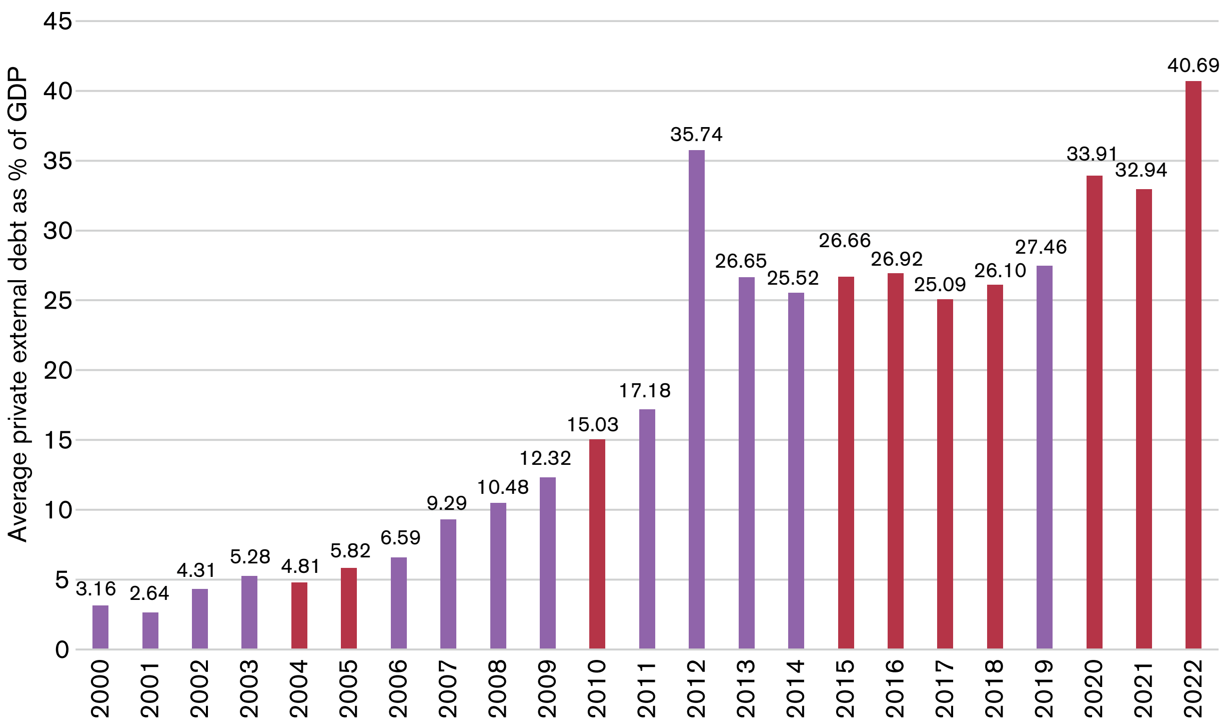
Official creditors, such as multilateral development banks or bilateral government lenders, offer more concessional terms, including lower interest rates. However, the concessional financing to SIDS remains low. Concessional flows — ODA — directed to SIDS in 2019 were US$5,742 million (UN-OHRLLS, n.d.). SIDS receive very little support as a share of total ODA (UN-OHRLLS, n.d.). Multilateral institutions like the World Bank and the Asian Development Bank (ADB) also offer concessional finance. These loans or grants come with even more favourable terms, including low or zero interest rates, extended grace periods and long repayment terms. But several SIDS who have graduated to middle-income status (determined by per capita income classifications) have lost access to concessional finance from multilateral development banks due to the eligibility requirements for access to concessional resources.

An assessment (Buhr et al., 2018) for Climate Vulnerable Forum members[3] shows that for every US$10 paid in interest by developing countries, an additional dollar will be spent due to climate vulnerability. This has also added more than US$40 billion to the debt interest paid by the 40 most vulnerable nations between 2007 and 2016. Higher interest rates based on climate vulnerability are predicted to cost the most vulnerable countries US$168 billion over the next decade. One study (Mohaddes et al., 2021) shows that 63 sovereigns may see their credit ratings downgraded by 2030 due to climate change. This could add more than US$200 billion to their annual interest payments on public debt.

In Figure 17, we have analysed the private external debt as a percentage of GDP in SIDS (n-18) for the period from 2000 to 2022, alongside high disaster years. In the earlier years, specifically in the 2000s, the debt was relatively low, averaging around 6.47% of GDP. However, by the 2020s, this average rose substantially to 35.85% of GDP. The private external debt was seen to increase in the years of major disaster or in the years after that. The upward trajectory of private sector debt as percentage of GDP indicates growing economic challenges and the implications for SIDS economies.

An increasing proportion of global South debt is owed to private creditors, and almost half of external debt and interest payments by low- and lower-middle-income countries is to private lenders (Jones, 2022). The situation

Figure 17. Private external debt as % of GDP and disaster event years



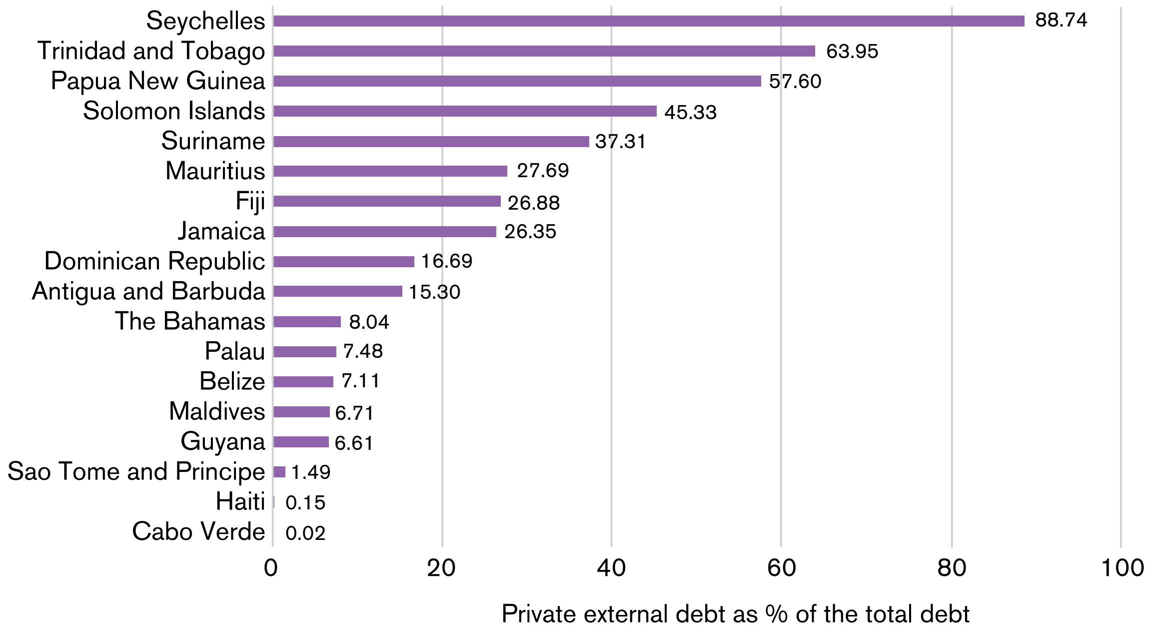
Note: The red bars indicate the years that experienced disaster intensity of more than one. Source: Authors' calculation based on data from Kose et al. (2022)

[3] The Climate Vulnerable Forum is an international partnership of countries highly vulnerable to a warming planet. The Forum serves as a South-South platform for participating governments to act together on global climate change. https://thecvf.org/

is similar in the case of many SIDS, where private sector debt forms a substantial portion of total external debt (see Figure 18). Seychelles stands out with the highest private external debt, amassing a staggering 88.74%. Countries like Trinidad and Tobago, Papua New Guinea and the Solomon Islands have close to or more than 50% share of private debt in their overall debt stock.

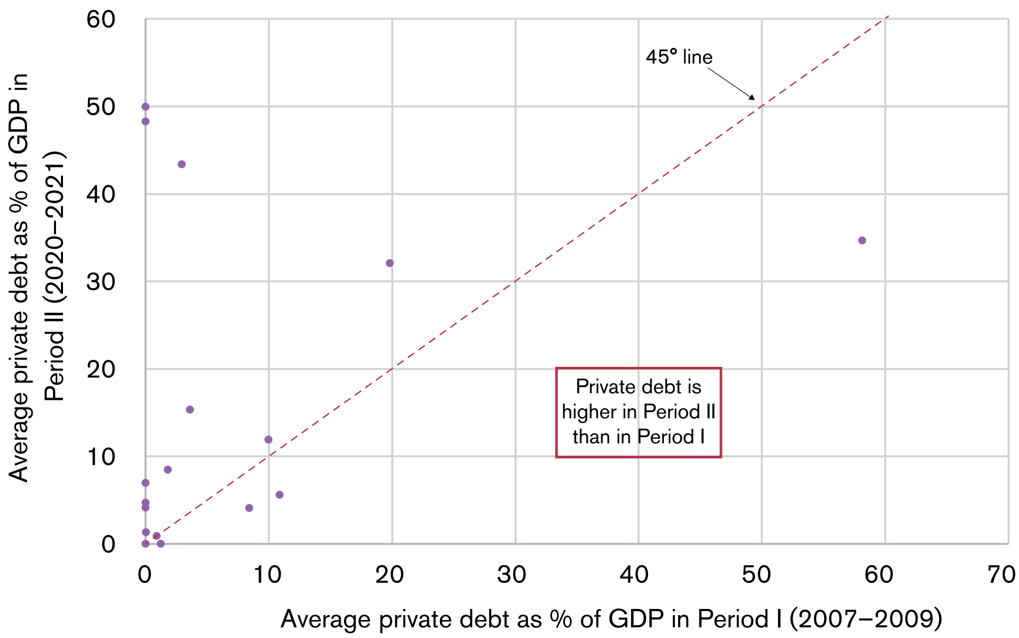
Comparing external private debt as % of GDP in SIDS: period of minimal disaster intensity (2007–2009) versus period of high disaster intensity (2020–2021). We carried out the analysis of private debt as a percentage of GDP in SIDS for two periods (see Figure 19).

Figure 18. Private external debt as % of total external debt



Source: Authors' calculation based on data from Kose et al. (2022)

Figure 19. Comparing external private debt as a percentage of GDP in SIDS: period of minimal disaster intensity (2007–2009) versus period of high disaster intensity (2020–2021)



Source: Authors' calculation based on data from Kose et al. (2022)

When examining the private external debt levels as a percentage of GDP for SIDS over these two distinct periods, a clear divergence in trends emerges, underscoring the profound economic implications of disasters.

- **Period I: stable or low debt accumulation**. During the period of minimal disaster intensity, many SIDS displayed relatively stable or low private external debt levels. The absence of significant disaster-related disruptions allowed these countries to maintain or even reduce their borrowing, as their economic activities were not severely affected. For instance, countries like St Lucia, Cabo Verde and Haiti had minimal or no private external debt growth during this period.
- **Period II: surge in debt amidst high disasters**. In contrast, the period marked by high disaster intensity saw a noticeable escalation in private external debt levels for several SIDS. With economic disruptions and often limited internal resources, many SIDS resort to external borrowing. Guyana, for example, saw its private external debt jump significantly in Period II. Similarly, the Dominican Republic and Fiji witnessed a surge in their private external debt levels. While it's evident that high disaster intensity drives up private debt levels, the magnitude of this increase also varies across countries.

The surge in private external debt for many SIDS during this period underscores the immediate and lingering economic challenges posed by significant disaster events and exacerbates the present-day economic challenges for SIDS. The magnitude of this burden is expected to increase over the next decade, as credit rating downgrades can be expected to increase the cost of public borrowing, making it more expensive to invest in recovery or build resilience for future impacts. The unique vulnerabilities and limited fiscal space in many SIDS make access to concessional financing and favourable borrowing terms from official creditors particularly important in managing debt sustainability.

2.6 Deepening debt crises have cascading impacts

Over 70% of SIDS are grappling with worrying financial indicators that signal an impending or deepening debt crisis. A significant concern is the spiralling debt-to-GDP ratio, which for many of these nations has reached alarming thresholds. When a country's debt-to-GDP ratio escalates, it indicates a growing discrepancy between its economic output and debt. For SIDS, this divergence is often exacerbated by the unforeseen costs they incur in rebuilding and rehabilitation after climate catastrophes. The financial drain doesn't stop there, and these states frequently run in to substantial fiscal deficits, due to unplanned expenditures necessitated by climatic events.

Additionally, the very structure of the debt these nations incur, as explained in the earlier sections, presents additional layers of vulnerability. A significant portion of the debt shouldered by SIDS is external, making them susceptible to the variations of global financial markets, exchange rate fluctuations and international economic downturns. This external dependence is coupled with an internal fiscal challenge: volatile tax revenue streams. Many SIDS have economies heavily skewed towards sectors like tourism, which are intrinsically vulnerable to climate events and global economic downturns. Consequently, their tax revenues are often erratic, complicating fiscal planning.

But the implications of this debt situation are not merely financial. Countries faced with debt crisis become constrained on expenditure in other crucial areas of development and resilience building. Investments in social protection schemes, which provide considerable safety nets to communities in the face of climate risks, often takes a backseat. The repercussions of this can be profound, leading to increased poverty rates, widening inequality and social unrest.

Moreover, the global community's ambitious Sustainable Development Goals (SDGs), which aim to address a range of challenges from health to education to environmental protection, can become increasingly unattainable for debt-ridden SIDS. Funds that could be channelled towards these goals are instead being diverted to service mounting debts.

Here, the role of climate finance is also under question. In 2020, out of US$68.3 billion of climate finance provided by developed countries, 71%, or US$48.6 billion, was in the form of loans (including both concessional and non-concessional) (OECD, 2022). Around half of climate finance provided to SIDS in 2017–2018 was in the form of loans, which added more debt. Furthermore, all SIDS received a combined US$1.5 billion in climate finance between 2016 and 2020. But in the same period, 22 SIDS paid more than US$26.6 billion to their external creditors — almost 18 times as much as they received in loans (Fresnillo and Crotti, 2022).

For the SIDS, breaking free from this vicious cycle is not just an economic imperative but a question of survival. The intertwined challenges of climate change and debt require a concerted, multifaceted response from the international community, including measures such as debt relief, concessional financing and substantial climate finance.

3

What debt relief mechanisms are available for SIDS?

3.1 Existing debt relief efforts are limited and not fit for purpose

Unlike individuals or companies, there is no established international insolvency mechanism for countries at the risk of default to initiate debt relief negotiations with their creditors. Instead, countries have relied on prevailing practices, contracts or patchy debt relief options emerging from international negotiations and conventions (Aboneaaj, Estes and Landers, 2022).

One of the early precedents and a success story of debt relief emerges from the United States 'Brady Plan' that was initiated for Mexico in 1989. The plan offered creditors three choices to restructure their debt: reduce the principal, reduce interest or maintain both and provide new loans. Most creditors opted for the first two options, and the reduced debt service burden on the country combined with economic reforms helped usher in a period of improved economic growth for Mexico (Aboneaaj, Estes and Landers, 2022).

In 1996, the World Bank, the IMF and other bilateral creditors, led by the United States, launched the Heavily Indebted Poor Countries Initiative (HIPC), aiming to reduce the external debt burdens of qualifying countries. Over the years, HIPC has provided debt relief packages to 37 countries, with 31 of them in Africa, resulting in approximately US$76 billion in debt-service relief (IMF, 2023). Bilateral creditors, including the United States, have played a significant role in funding debt relief under HIPC, with multilateral institutions and select private creditors also contributing. However, despite the success in reducing bilateral debt burdens, countries still faced the challenge of servicing multilateral debt. To address this, the Multilateral Debt Relief Initiative (MDRI) was established in 2005. The MDRI aimed to provide 100% debt relief for claims from the IMF, the World Bank's International Development Association (IDA), and the African Development Bank (IMF, 2019). While the MDRI achieved substantial reductions in multilateral debt, creditor countries agreed to compensate the international finance institutions for the forgone reflows associated with the relief. However these obligations and arrears have not been met by countries. For example, the United States had US$2000 million unmet MDRI commitments in 2022 that it had promised to pay to the African Development Fund (AfDF) and to the World Bank's IDA (Aboneaaj, Estes and Landers, 2022).

While HIPC, MDRI and some of the earlier debt relief measures met with some success, existing debt relief efforts are limited and not fit for purpose. In response to the COVID-19 pandemic, the IMF offered support through the Catastrophe Containment and Relief Trust, while the G20 created the Debt Service Suspension Initiative (DSSI). DSSI postponed rather than cancelled debt payments, making future recovery even more difficult for countries. In November 2020, the G20 and the Paris Club[4] set up the Common Framework

[4] The Paris Club is an informal group of creditor countries whose objective is to find sustainable solutions to sovereign debt payment difficulties. It operates according to six foundational principles: solidarity, consensus, information sharing, case-by-case, conditionality and comparability of treatment.

for Debt Treatments (Italian Ministry of Economy and Finance, n.d.). This sought to restructure sovereign debt according to traditional Paris Club terms (going beyond the postponement of debt payments under DSSI). But uptake of the Common Framework has been limited, with only three countries (Chad, Ethiopia and Zambia) seeking relief, as it lacks clear steps and timelines for bringing the creditors and parties of debt restructuring together (Aboneaaj, Estes and Landers, 2022).

The limited uptake and feasibility of recent debt relief measures are due to the changing landscape of global creditors in recent years. The effectiveness of HIPC and MDRI was based on multilateral and Paris Club lenders owning the bulk of poor countries' debt. However, in the years since, the share of HIPC debt stocks owned by private creditors such as bondholders, state-owned enterprises and non-Paris Club lenders, namely China, has grown significantly. These new actors, particularly China, are more inclined to pursue independent negotiations for debt restructuring, and do not conform to the principles of solidarity, consensus, information sharing and comparability of treatment that the Paris Club embodies. This evolving profile of creditors has posed a challenge, and existing debt relief efforts have failed to the create consensus between the main creditors.

3.2 Innovative debt relief solutions are available, but their scope is limited

Beyond some of the existing efforts of the World Bank, G20 and the IMF, some other innovative debt relief solutions are available, such as:

Pause clause, also known as a moratorium or standstill provision, is a contractual provision that allows a debtor country to temporarily suspend or delay its debt repayments to creditors during times of economic or financial crisis. The pause clause provides flexibility to debtor countries by granting them a grace period to address immediate challenges and implement necessary economic reforms without the burden of debt servicing obligations (Mustapha, Talbot and Gascoigne, 2023). This temporary relief can allow the country to redirect financial resources towards critical areas such as recovery efforts, social welfare programmes and economic stabilisation. The pause clause helps alleviate short-term financial pressures and provides breathing space for the debtor country to implement effective policies and restore economic stability before resuming debt payments. For example, in 2020, Zambia requested a suspension of debt payments under the G20's DSSI due to the economic impact of COVID-19. This allowed the country to redirect resources towards addressing the pandemic and supporting the economy.

Parametric insurance of sovereign debt involves providing parametric insurance cover for debt undertaken by a country (Bharadwaj, Mitchell and Karthikeyan, 2023). The insurance covers debt repayment on behalf of the country during a period of climate crisis, allowing the country time to recover without worrying about debt repayment during the crisis period. This goes far beyond a debt moratorium, where the debt remains and keeps getting accumulated for a later period. Here, debt repayments continue as normal through the insurance mechanism — and countries are freed from that burden during crisis, helping them to focus on relief and recovery. It can act as a safeguarding mechanism, provide immediate liquidity and reduce transaction costs compared to a sovereign debt restructuring process, which often comes with several conditionalities. It can bring stability in capital markets and help bring private creditors to the table. For example, although it was not directly parametric insurance of sovereign debt, in 2017, the Caribbean Catastrophe Risk Insurance Facility (CCRIF) paid out US$15.6 million to 13 member countries, including Antigua and Barbuda, after they were impacted by Hurricane Irma. The CCRIF's parametric insurance policies allowed for a quick payout to help with immediate relief efforts.

Debt reprofiling is a financial strategy used to modify the terms and conditions of existing debt obligations without necessarily reducing the overall amount owed. It involves extending the maturity dates, adjusting interest rates or restructuring payment schedules to provide temporary relief to debtor countries facing financial challenges. Debt reprofiling aims to improve the sustainability of debt burdens by aligning repayment obligations with a country's economic capacity, allowing for more manageable debt servicing and creating space for the implementation of long-term recovery and development plans (IMF, n.d.b). For example, in 2020, Argentina restructured US$65 billion of its sovereign debt, pushing back repayment deadlines and reducing interest rates. This was done to help the country avoid default and address its ongoing economic crisis.

Debt swaps (IIED, n.d.), also known as debt-for-nature swaps or debt-for-climate swaps, are agreements whereby a debtor country exchanges its outstanding debt with a creditor country or organisation for investments in environmental conservation, social development or other priority areas. The debtor country can use the amount of debt relieved for funding sustainable projects, such as protecting biodiversity, supporting renewable energy initiatives or improving healthcare and education. Debt swaps provide an opportunity to address both the financial obligations of the debtor country and promote sustainable development, contributing to long-term resilience and economic growth while relieving the debt burden. For example, in 2020, Seychelles announced plans to swap

US$30 million of its sovereign debt in exchange for protecting and restoring its marine ecosystems. In 2022, Belize's national debt refinancing unlocked US$180 million for ocean conservation (the Belize Barrier Reef Reserve System). This debt-for-nature swap was designed to help the country address the impacts of climate change on its economy and environment.

Resilience bonds are financial instruments designed to raise capital for projects that enhance resilience to climate change and natural disasters. These bonds are issued by governments, municipalities or organisations and are backed by the revenue generated from resilience-building projects, such as infrastructure upgrades, flood mitigation measures or renewable energy installations. Investors purchase these bonds, and the proceeds are used to fund the projects (Global Center on Adaptation, n.d.). The unique aspect of resilience bonds is that their performance and returns are linked to specific resilience metrics, such as reduced vulnerability, enhanced adaptation capacity or improved disaster response. If the resilience goals are achieved, investors receive their principal and potential returns. Resilience bonds incentivise investment in climate resilience and provide a financial mechanism to support long-term sustainability and adaptation efforts. For example, in 2019, the government of Mexico issued a US$485 million catastrophe bond to help cover losses from earthquakes and tropical cyclones. The bond was designed to provide the country with financial resources to quickly respond to disasters and support its long-term resilience efforts.

3.3 Advantages and limitations of debt relief options

We have analysed the advantages and limitations of different debt relief measures in Table 1.

While these existing innovative debt measures may offer relief to SIDS, they also have certain limitations:

- Each have different costs and deliver different levels of support during crisis
- These options can only work well in certain contexts
- Each of these debt relief options are suitable for providing support in different phases of recovery and not all.

Also, for countries with unsustainable debt, one debt relief measure cannot restore solvency unless it involves a sufficiently large share of a country's debt and substantial relief. So far, no debt relief measure has come close to achieving this.

Table 1. Advantages and limitation of some existing debt relief options

ADVANTAGES	LIMITATIONS
Immediate term	
Pause clause in sovereign debt	
▪ Provides immediate relief to countries experiencing financial difficulties due to a crisis, such as a climate disaster. ▪ Allows countries to redirect resources towards disaster response and recovery efforts instead of servicing debt payments. ▪ Can provide a breathing space for countries to stabilise their economy and implement necessary reforms.	▪ May lead to increased costs in the long run due to accumulating interest and extended repayment periods. ▪ Could impact the country's creditworthiness and access to future borrowing. ▪ Lack of universal adoption or standardised clauses may limit its availability in certain debt agreements. ▪ Can discourage investors from lending to countries with pause clauses in their debt contracts.
Parametric insurance of sovereign debt	
▪ Provides a predictable source of funding to countries in the event of a disaster, which can help to cover emergency response costs. ▪ Can help countries to access financing quickly, without needing to go through lengthy approval processes. ▪ Can provide a measure of stability and certainty to investors, which can make lending to developing countries more attractive.	▪ Premium costs can be relatively high, especially for countries with higher risks. ▪ Can be difficult to determine the appropriate level of coverage needed, which can lead to under-insurance or over-insurance. ▪ The effectiveness of parametric insurance depends on accurate and reliable data for trigger activation.

ADVANTAGES	LIMITATIONS
Short to medium term	
Debt reprofiling	
▪ Provides immediate relief by restructuring debt obligations, reducing interest rates, or extending repayment periods. ▪ Enhances fiscal sustainability and improves debt service capacity. ▪ Can help to prevent defaults, which can have negative consequences for both the country and its creditors.	▪ May lead to credit rating downgrades and increased borrowing costs. ▪ Requires cooperation and negotiations with creditors, which can be complex and time-consuming. ▪ Restructuring agreements may involve conditionality and policy reforms imposed by creditors.
Debt swaps	
▪ Can provide additional financial resources for nature conservation and climate-related projects or initiatives. ▪ Reduces debt burdens and debt service obligations. ▪ Incentivises environmental conservation and sustainable development through debt-for-nature/climate swaps.	▪ Requires cooperation from creditors and negotiations for debt restructuring. ▪ The amount of debt relief may be limited compared to the overall debt burden. ▪ Debt swaps may have specific eligibility criteria or conditions that limit their applicability.
Long term	
Resilience bonds	
▪ Can provide a way to finance climate resilience and adaptation projects in developing countries, which may not have the resources to invest in these projects on their own. ▪ Can help to attract investment from a wider range of investors, including those who are motivated by environmental and social objectives. ▪ Can provide a measure of predictability and stability to investors, which can make it easier for countries to access financing in the future.	▪ Requires a well-developed and reliable pipeline of climate resilience projects to attract investors. ▪ Structuring and issuance costs can be relatively high. ▪ Vulnerable to market conditions and investor sentiment, which may impact bond pricing and demand.

4

Beyond 'reactive fixes': Building longer term debt sustainability

The irony is bitter — as climate change intensifies and its impacts on SIDS become more severe, they will find themselves less equipped to deal with these challenges. Their ability to invest in adaptation and resilience will diminish with each dollar allocated to debt repayment. This reality presents a paradox where every new climate disaster not only brings immediate devastation but also undermines the nation's future ability to respond, pushing it further into debt.

In this document we set out four propositions for taking SIDS towards longer-term debt sustainability:

1. Debt alleviation. Debt alleviation will provide immediate fiscal relief. By reducing or clearing the outstanding liabilities, nations can breathe more easily, releasing funds previously earmarked for debt servicing. This action will not only alleviate immediate economic strain but also pave the way for infusing investments in core areas of growth and development.

2. Future protection. In the face of unpredictable climate challenges, ensuring future protection for SIDS is important so that they do not fall into the cycle of debt distress again. By instituting robust safeguards, such as insurance products that limit economic losses from climate-related disasters, countries can gain a shield against unforeseen adversities. This proactive measure can instil a degree of financial predictability and security, essential for sustained growth and stability at a time of climatic uncertainty.

3. Longer-term resilience investment. Beyond immediate interventions, the long-term prosperity of SIDS hinges on resilience building. This entails strategic investment of resources into sectors that bolster their ability to withstand and bounce back from shocks, be they climate-induced or economic. Investments in infrastructure, development and community-level resilience building efforts can fortify SIDS against future challenges, ensuring they not only survive but thrive in the face of global challenges.

4. Legal aid and advisory support. The complexities surrounding debt negotiations, international contracts and resilience-building initiatives necessitate specialised legal guidance. With legal aid and advisory support, SIDS can navigate these intricacies more effectively, ensuring their interests are protected and advanced in international fora. This assistance will empower them to make informed decisions and engage in dialogues while protecting their interests and promoting their needs and aspirations.

We have explained how each of these options might work in separate sections, but it is crucial to emphasise that to take SIDS towards a longer-term debt sustainability and secure their future through sustainable and resilient growth and development, they need to be implemented as a package.

5

Debt alleviation

We are proposing two viable solutions for the pressing debt issue: firstly, a multi-layered, comprehensive debt relief, which entails a strategic layering of various existing debt relief measures, ensuring a tailored approach that addresses the multifaceted nature of SIDS' debt. This would enable these nations to benefit from a combination of short-term relief and long-term structural adjustments, bolstering their resilience and promoting sustainable development. Secondly, considering the acute challenges faced by SIDS, a complete write-off or buyout of their debt stock offers a more radical yet immediate remedy. This would free up resources, allowing these nations to invest in infrastructure development, longer-term climate resilience and socioeconomic betterment, ensuring their more sustainable and resilient future.

5.1 Multi-layered comprehensive debt relief

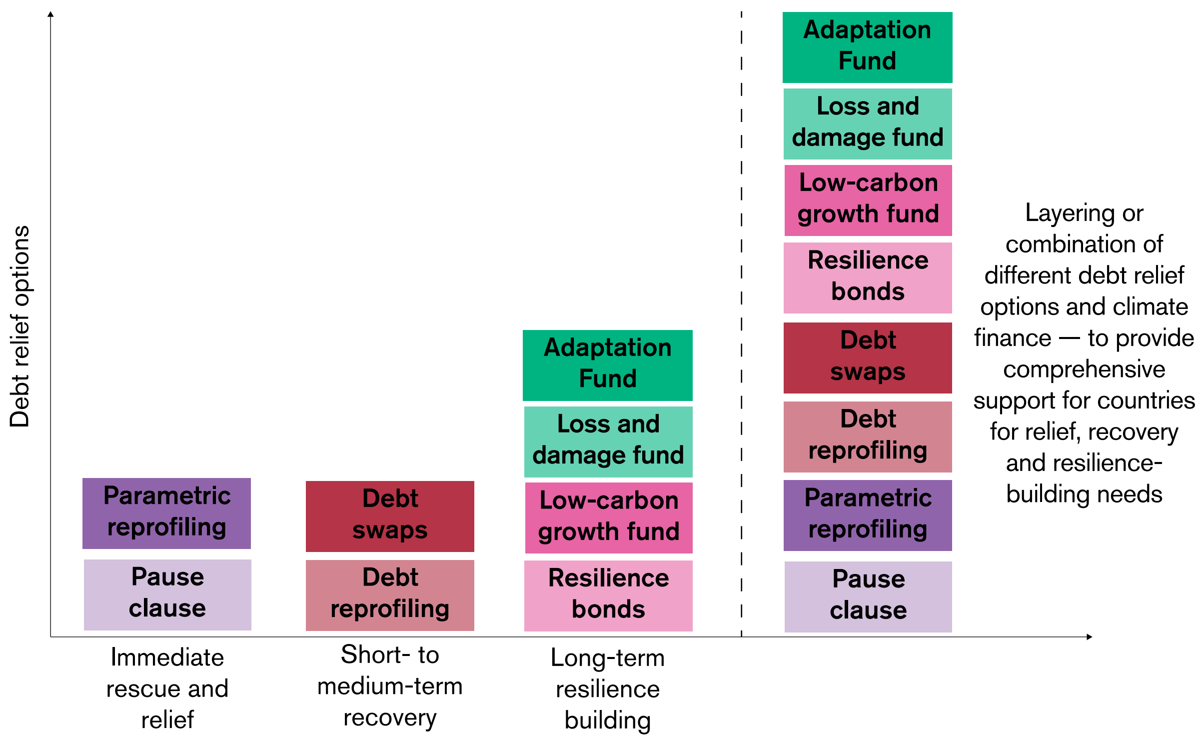
When a country is hit by a climate disaster, different types of funding support are needed to help it recover from both climate and debt crises. Funding needs can be typically divided into three phases: immediate relief and support; medium-term recovery; and longer-term resilience building. Lack of support in any of these phases can negatively impact the population and the economy, undermine their capacity for coping with such disasters in future and push countries into downward spirals of debt. SIDS need financial assistance in all three phases of post-disaster recovery to allow them to adequately prepare, cope and recover from recurring climate shocks.

To date, no existing debt relief measures have adequately met these needs, and helped a country get its economy back on track after being hit by a disaster or series of disasters. Therefore, a combination of debt relief packages would work best in restoring solvency and covering their recovery needs over the short, medium and long term. Measures to support climate investment would need to be further layered to support longer-term resilience and protection from future climate impacts.

The analysis in Table 1 shows that the effectiveness and suitability of these debt relief measures may vary depending on the specific circumstances and requirements of each country, and they may only be suitable for a particular phase of post-disaster recovery or not all. On the other hand, using a combination of debt relief options such as the pause clause in sovereign debt, parametric insurance, debt reprofiling, debt swaps and resilience bonds may provide a more comprehensive and sustainable solution (also see Figure 20):

1. **Immediate relief and recovery:** The pause clause in sovereign debt allows countries to temporarily suspend debt payments, providing immediate relief and freeing up financial resources to address the urgent needs after a climate disaster. Parametric insurance, at the same time can provide quick payouts for debt repayment based on pre-determined triggers, enabling countries to use their budgets for emergency response and recovery efforts.
2. **Debt restructuring and reprofiling:** Debt reprofiling, such as extending repayment terms or reducing interest rates, can provide medium-term relief by easing the debt burden and allowing countries to allocate resources towards recovery and resilience building. These measures can be combined with debt swaps, where a portion of the debt is exchanged for investments in climate resilience projects, providing additional funding and aligning debt restructuring with climate goals.
3. **Long-term resilience and climate financing:** Resilience bonds can be utilised to attract investment specifically for climate resilience projects and initiatives. By issuing resilience bonds, countries can secure long-term financing for resilience-building efforts, ensuring sustained support for climate adaptation, infrastructure development and disaster risk reduction measures. in addition, countries will also need access to climate finance for adaptation, addressing loss and damage and supporting low carbon growth.

Figure 20. Debt relief option in different timeframes and multi-layered approach



5.1.1 How can multi-layered debt relief work in practice?

To illustrate the need for layering debt relief options and how it might work in the context of SIDS, we analysed the sovereign debt data of SIDS countries from the IMF's global debt database (IMF, n.d.a) and the data of climate change loss and damage from figures of the Emergency Events Database (EM-DAT), based on disasters between 1990 and 2021.

We analysed the debt profile, the number and scale of disasters and their associated losses and the change in the debt profile of SIDS in the years they were impacted by disasters. To work out how debt layering might work in SIDS to protect them from debt default, we adopted the following approach:

Stochastic modelling. We used stochastic modelling based on the EM-DAT emergency events database for SIDS. Stochastic models are tools used to estimate and assess the potential losses and impacts of large-scale disasters or catastrophic events, such as hurricanes, earthquakes or floods. In simple terms, if we want to know the probability of a hurricane causing damages exceeding US$1 million to a specific area, the stochastic model uses historical data, scientific analysis and other relevant information to simulate thousands of possible scenarios and calculate the likelihood of losses exceeding US$1 million. This probability is represented as a percentage or fraction (Cebotari and Youssef, 2020).

For our analysis, we developed a stochastic model to work out the probability distribution and values of loss and damage caused by natural disasters based on the historical data. We used the frequency and volume of loss and damage caused by natural disasters to simulate and predict the potential consequences of these events, including the extent of economic losses. The model output provided insights into the potential financial impacts of catastrophic events, which helped inform how the debt relief strategies might be layered to mitigate debt default.

Estimation of loss exceedance probability. Loss exceedance probability (LEP) in stochastic models refers to the likelihood or probability of experiencing losses beyond a certain threshold or level. It helps estimate the chance of a stochastic event causing damages that exceed a specific predefined amount (Humphreys, 2022). For example, a LEP of 5% means that there is a 5% chance of experiencing losses beyond US$1 million due to a hurricane or a similar catastrophe. This information helps governments and other stakeholders assess the potential financial risks and make decisions about emergency response plans and investment in mitigation measures.

LEP is a critical component of stochastic models, as it provides insights into the potential severity and frequency of catastrophic events, aiding in risk management and decision-making processes. We worked out the LEP for SIDS by running 10,000 simulations. The loss exceedance curve based on the disaster data of all

SIDS is provided in Figure 21. At a 5% LEP, there is a possibility that the value of loss and damage may surpass US$5.11 billion and at a 50% LEP, the loss value is projected to exceed US$1.34 billion.

In the context of LEP and stochastic models, the attachment point refers to the threshold or level at which losses are considered to start accumulating or being counted. It represents the minimum loss value that needs to be exceeded for it to be included in the calculations of the LEP (Humphreys, 2022). For example, if we are analysing hurricane risks for a specific region, and we set the attachment point at US$1 million. This means that only hurricanes causing losses exceeding US$1 million will be considered in the LEP calculations. Any hurricane causing losses below this threshold will not be included.

We worked out the attachment point for SIDS to help us define the scope and severity of events that can be considered for triggering debt relief measures and focus on losses that are significant or relevant for debt relief. In Figure 22 we have presented the classification of all the disasters faced by SIDS and defined their attachment point based on severity of events. We used these attachment points to define the assumptions for debt relief measures.

Figure 21. Loss exceedance curve for SIDS

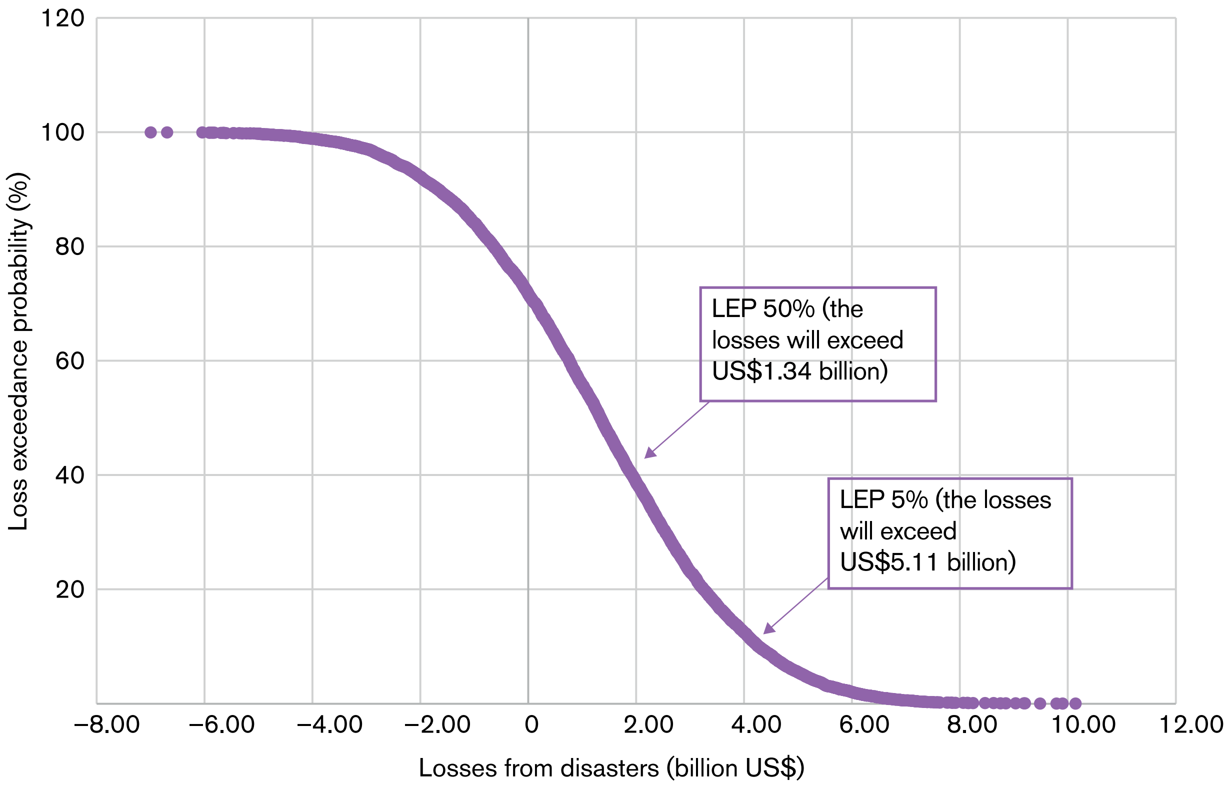
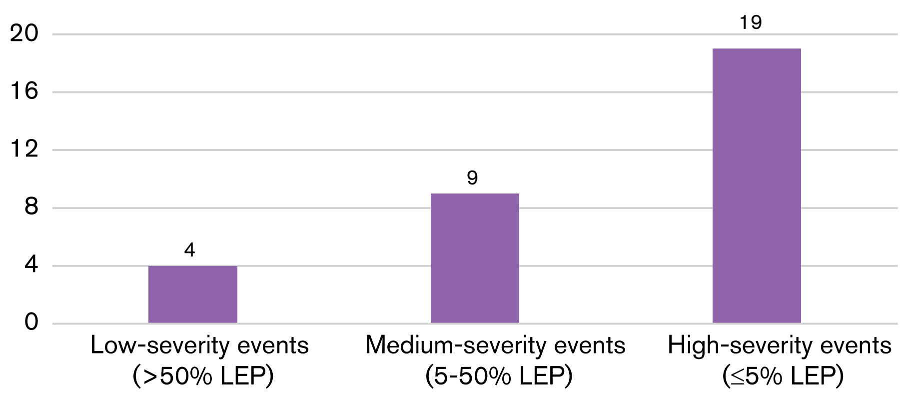


Figure 22. Classification of disasters based on severity from 1990–2021



Layering of debt measures. To work out the layering of debt relief measures, we assumed that the SIDS would experience a default in loan repayments at a LEP of 50% at which it can seeks debt relief options to mitigate the associated default risk. The attachment point for debt relief payouts would occur when the LEP reaches 5%. We have also assumed that the repayment terms for the sovereign debt was 20 years, with an interest rate of 5% with an annual repayment schedule.

To work out the layering we defined the following conditions:

- **Parametric insurance (PI):** When the LEP reaches 5%, the payout is activated, and the insurer disburses an amount equivalent to the yearly repayment installment.
- **Pause clause (PC):** For LEP greater than 5% and equal to or less than 50%, the creditor grants the debtor the option to temporarily suspend repayment for a period of six months.
- **Debt swap (DS):** The creditor country or organisation agrees to relieve 10% of debt stock for investment in climate/nature or resilience-building measures.
- **Debt reprofiling (DR):** For LEP greater than 5% and equal to or less than 50%, the creditor reduces the interest rate for the loan from 5% to 1%.
- **Resilience bond (RB):** The resilience bond helps countries raise capital for projects that enhance resilience to climate change and natural disasters, equivalent to 20% of payout.

To assess how layering might help in debt relief we have analysed two aspects: (i) impact on debt servicing and (ii) impact of reduction of total debt stock.

5.1.1.1 Impact of debt layering on debt servicing

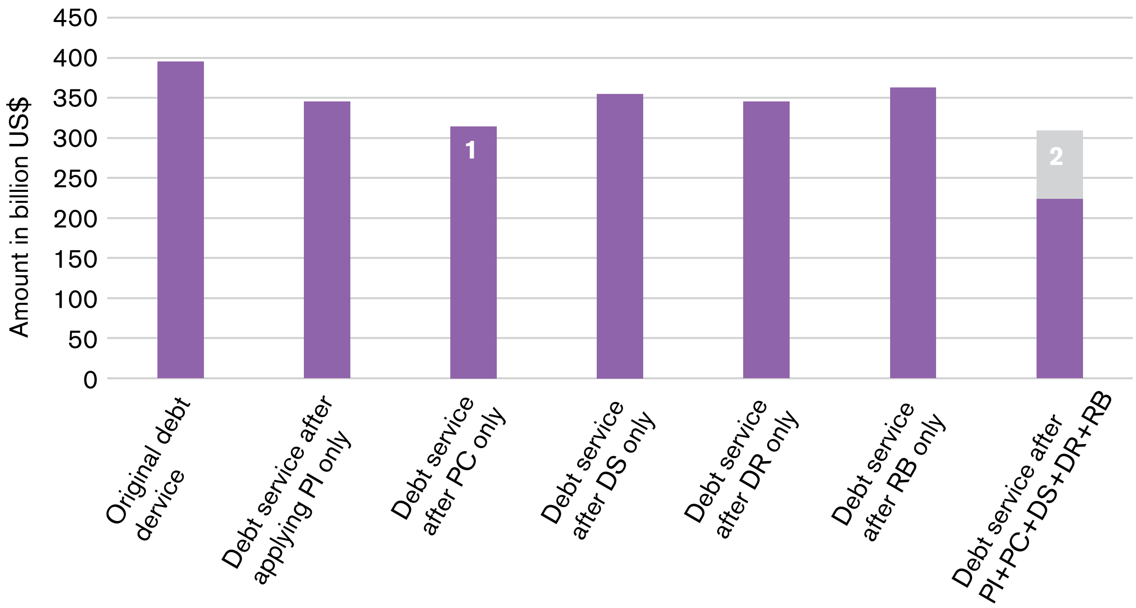
The impact of layering debt relief measures based on these conditions on debt servicing for SIDS is presented in Figure 23. The cumulative debt services done by SIDS (n-33) from 1990–2021 is US$394.78, and the figure provides analysis of how application of different debt relief measures can reduce this debt servicing.

We used the same analysis to calculate how the layering approach might reduce the current annual debt servicing of SIDS, which is presented in Table 2.

Such a layering can help SIDS alleviate the risk of debt servicing default and promote sustainable recovery as these measures would contribute to immediate relief, short- to medium-term recovery and long-term resilience building as follows:

- By having parametric insurance in place, when the LEP reaches 5%, the insurance payout will provide immediate financial relief, allowing the country to meet its debt obligations without depleting its resources or borrowing further.
- The pause clause will grant countries the option to temporarily suspend repayment for a period of six months, providing a breathing space and allowing them to redirect financial resources towards post-disaster recovery efforts.

Figure 23. Impact of layering of debt relief measures on debt servicing by SIDS



Note: 1 and 2 indicate the reduction in debt service due to pause clause. The debt servicing reduction is provided only in disaster hit years. However, there is no actual reduction in debt. The country still has to pay the debt in the subsequent years, which may lead to an increase in the overall debt due to interest paid for the repayment period.

Table 2. Reduction in annual debt servicing through layering of debt relief measures

REDUCTION IN ANNUAL DEBT SERVICE	AMOUNT IN BILLION US$
Annual debt servicing for the SIDS	12.34
Reduction if only parametric insurance (@5%LEP) is applied	10.79
Reduction if only pause clause is applied	9.83
Reduction if only debt swap is applied	11.08
Reduction if only debt restructuring is applied	10.79
Reduction if only a resilience bond is applied	11.33
Reduction after layering all measures	9.49

- Debt swaps will allow the relieved amount to be used by the debtor country to allocate resources towards measures that address the underlying causes of the debt crisis while promoting sustainability.
- Reducing the interest rate through debt reprofiling will help reduce the immediate burden on the debtor country, providing it with more time to generate revenue, rebuild its economy, and allocate resources towards recovery and resilience-building efforts.
- Finally, the resilience bond will allow countries to raise additional financing to invest in long-term resilience measures, such as infrastructure improvements, early warning systems and community preparedness, which can mitigate the impacts of future disasters and reduce the risk of future debt crises.

The analysis shows that layering of debt relief measures could serve as a catalyst for GDP growth in SIDS. The combined effect of different relief options could help SIDS achieve a more holistic and significant reduction in their debt burdens. This comprehensive alleviation could free up substantial fiscal resources, allowing these countries to redirect funds previously reserved for debt servicing into vital sectors of their economies, thus spurring economic growth. Moreover, the GDP growth trajectory would enhance investor confidence, further stimulating economic activities. From a broader perspective, the funds freed up from debt servicing could be channelled into critical development projects, advancing sectors like healthcare, education and infrastructure for climate resilience, ensuring that these countries are better equipped to face future climate challenges and safeguard their developmental gains.

Cost benefit of different debt relief options. It is also important to understand the cost implications of various debt relief options. In Figure 24, we have provided the estimated costs associated with each debt relief option for SIDS, offering an understanding of the financial outlays required for their implementation.

The debt restructuring option emerges as the most expensive, with a cost of US$49.62 billion. It is closely followed by debt swap, which has an associated cost of US$40.09 billion. The resilience bond is also a significant cost, priced at US$32.08 billion. The pause clause stands moderately in the spectrum, with a cost of US$28.65 billion. Among all the options, parametric insurance is the most affordable, with a cost of US$23.69 billion.

Figure 25 provides the estimated benefits each option can potentially yield.

In terms of benefits, parametric insurance and debt restructuring stand out, offering estimated benefits of US$49.35 billion and US$49.62 billion respectively. These two are the top options in terms of financial gains or reliefs. Debt swap follows closely, providing benefits worth US$40.09 billion, while the resilience bond offers benefits amounting to US$32.08 billion. A significant point to note is that the pause clause does not offer any real benefit as it merely involves postponement of debt payment.

To synthesise our analysis, the BCR that parametric insurance provides is 2.08, while debt swap, debt restructuring, and resilience bond options all have a BCR of 1.00. Pause clause does not offer any real benefit to the country.

5.1.1.2 Impact of layering debt relief on debt stock reduction

As of the latest available figures for 2021, US$153.75 billion is the total debt stock of SIDS (n-33). The impact of layering debt relief measures on the reduction of debt stock is presented in Figure 26.

In this analysis, we have only considered parametric insurance, debt swap and resilience bonds, as pause clause and debt reprofiling only impact debt servicing. A real reduction in overall debt stock would only be achieved by these measures.

Figure 24. Estimated cost of different debt relief solutions

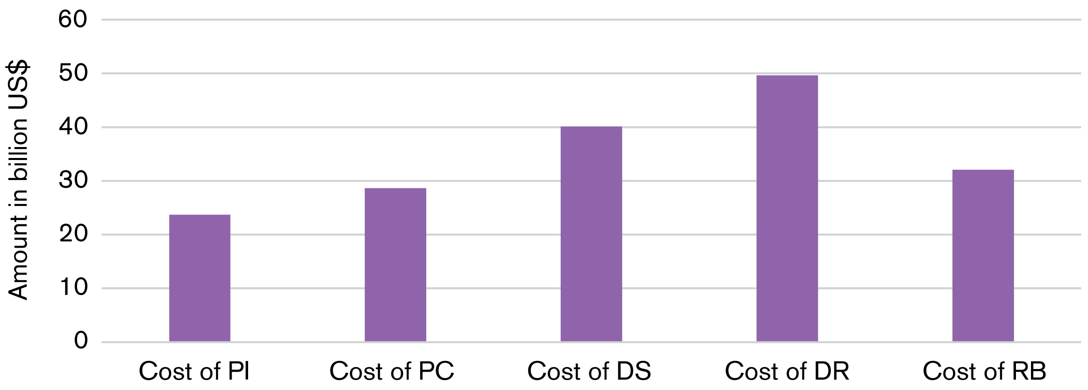


Figure 25. Estimated benefit of different debt relief solutions

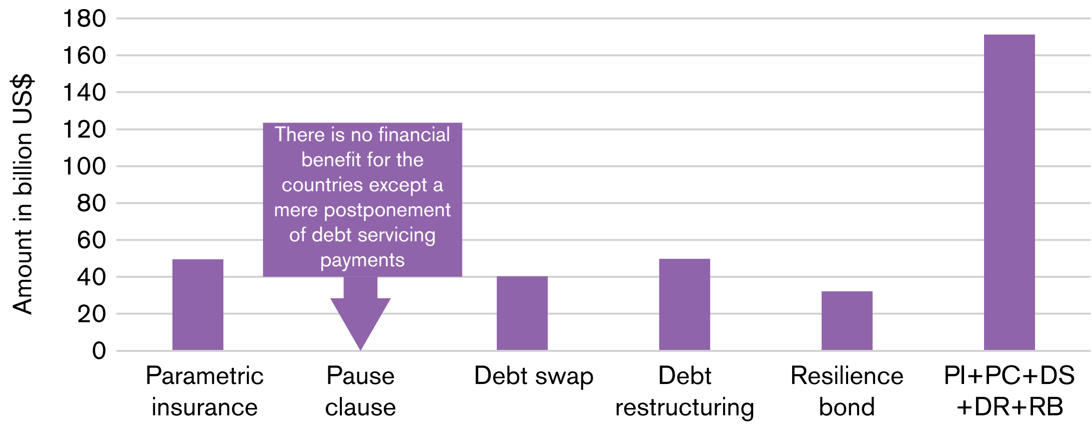
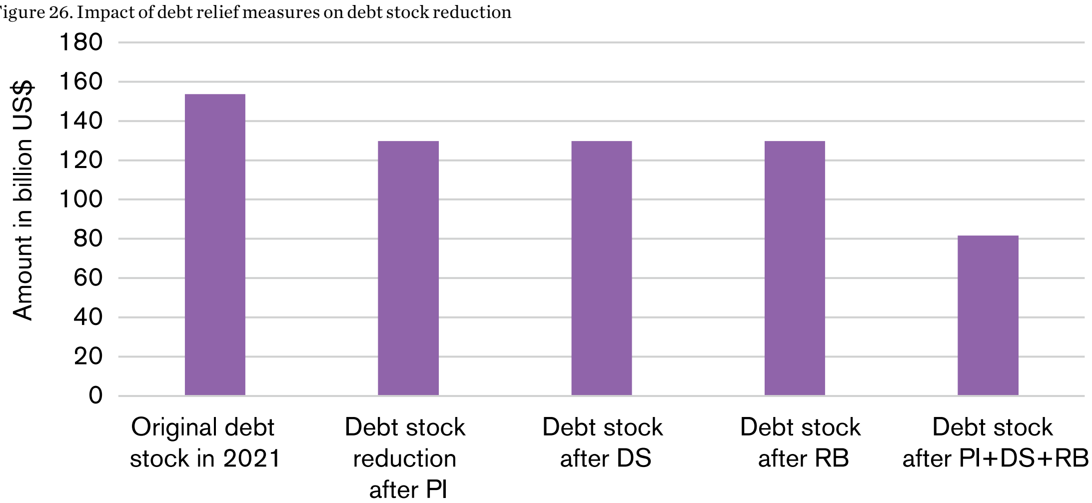


Figure 26. Impact of debt relief measures on debt stock reduction



To work out the layering, we defined the following conditions:

- **Parametric insurance:** When the LEP reaches 5%, the payout is activated, and the insurer disburses an amount equivalent to the debt stock.
- **Debt swap:** The creditor country or organisation agrees to relieve 10% of debt stock for investment in climate/nature or resilience-building measures.
- **Resilience bond:** The resilience bond helps countries raise capital for projects that enhance resilience to climate change and natural disasters, equivalent to 20% of debt stock.

Impact on GDP growth. Such a layering can help SIDS reduce debt stock, promote sustainable recovery and promote GDP growth. We simulated the change in GDP growth rate due to different debt stock reduction options, based on the assumptions used in an IMF working paper by Greenidge et al. (2012), which developed an econometric model examining the long-run relationship between public debt and economic growth among 12 SIDS. Using the assumptions used in the paper we applied the conversion factor on each debt relief option — a 1% point increase in debt-to-GDP ratio would result in a 0.082%-point decline in the growth rate, given that the debt-to-GDP ratio is above an estimated threshold of 54.7%. Therefore, to achieve a minimum 1%-point increase in the growth rate, a 12.2%-point reduction in the debt-to-GDP ratio would be required. For each debt relief option, we ran 500 simulations on their actual growth data covering the last 31-years (1990–2021), and then worked out the mean probability of growth values. Figure 27 provides the probability of growth rate occurrence with different relief options.

Based on the probability of growth rate occurrence, we worked out the average change in growth rate due to debt reduction from different relief options, which is presented in Figure 28.

The analysis presented in this section is based on certain assumptions and the actual calculations might vary, depending on actual data on interest rates, repayment terms, conditions of different creditors, and so on. Our purpose in presenting this analysis is to illustrate why one debt relief measure might only provide partial support to a country struggling with debt default and would not be sufficient to take them out of a vicious cycle of indebtedness, and why layering might be needed.

Figure 27. Probability of growth rate occurrence with different relief options

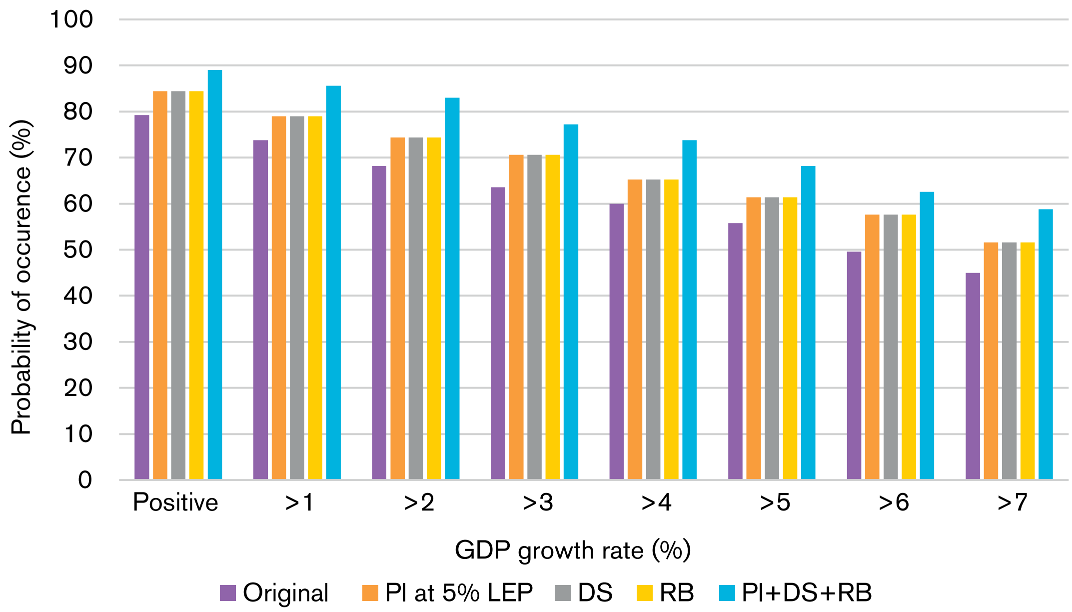
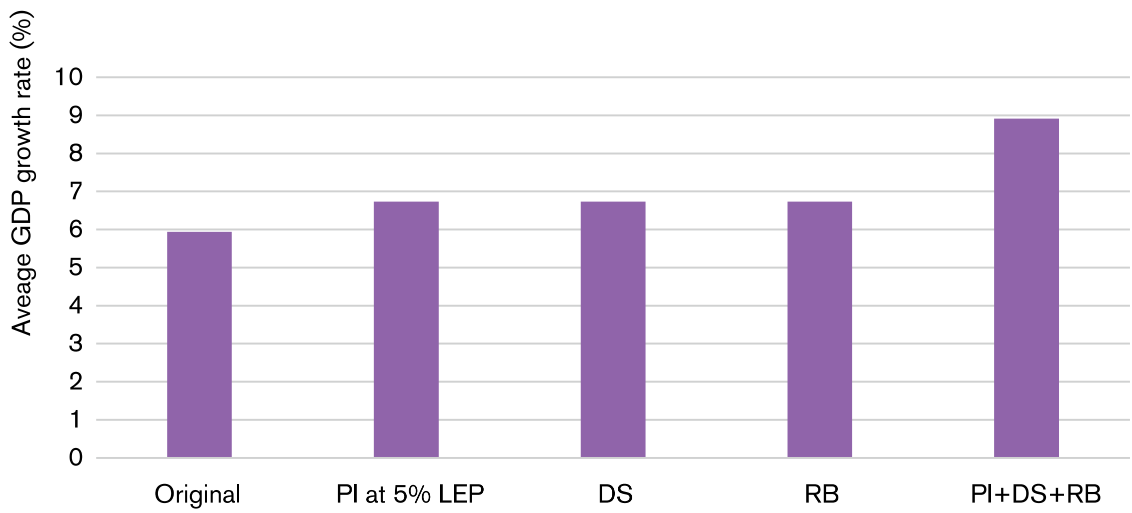


Figure 28. Probability of growth rate with different relief options



5.1.3 Advantages of layering debt relief and climate financing options

A combination of different debt relief and climate finance support can create more fiscal flexibility and less indebtedness for countries experiencing disaster cycles. Such a combination can be advocated as part of the risk layering approach alongside other risk mitigation and support mechanisms (such as humanitarian assistance or ODA). Some of the advantages offered by the layering approach are:

Comprehensive risk management. Different debt relief measures address different aspects of risk management. Parametric insurance provides coverage against specific climate-related events, such as cyclones or droughts, allowing countries to access immediate funds for response and recovery. Debt reprofiling and swaps provide opportunities to restructure debt payments and secure more favourable terms, easing the burden of repayment. Resilience bonds, on the other hand, enable countries to raise funds specifically for climate resilience projects. Layering these measures allows for a comprehensive approach to risk management, considering both immediate and long-term needs.

This layered approach will also recognise the multidimensional nature of climate impacts and the diverse financial needs that arise at different stages of recovery and resilience building. It will allow countries to access various sources of funding, align debt restructuring with climate objectives, and leverage private investment for sustainable and long-lasting solutions.

Enhanced financial flexibility. Layering multiple debt relief measures will provide SIDS with increased financial flexibility. Each measure will be able to tackle a specific aspect of debt management, allowing countries to access immediate relief, insurance coverage, restructuring options and innovative financing mechanisms. By combining these measures, countries can optimise their financial resources, manage debt obligations effectively, and allocate funds towards recovery and resilience-building initiatives. By layering different options, a country can also have a more robust financial safety net that can help them better manage future crises and minimise the negative impacts of climate change on their economy and communities.

Tailored solutions for specific needs. Each debt relief measure serves a specific purpose and can be tailored to meet the unique needs and circumstances of a given country. Layering these measures provides a more customised approach to debt management and climate resilience. For example, a country may opt for parametric insurance to cover immediate response costs, while simultaneously pursuing debt reprofiling to ease debt burdens and free up resources for longer-term recovery. Combining measures allows countries to design a comprehensive strategy that aligns with their specific requirements.

Diversification of financing sources. The combination of debt relief measures will provide SIDS with more diversified sources of finance. Parametric insurance and resilience bonds, for instance, offer alternative channels for accessing financial resources beyond traditional borrowing. Besides this, countries will also need access to humanitarian assistance, climate finance and ODA support. By diversifying their sources of funds, countries can reduce reliance on a single avenue and create a more robust and sustainable financial framework to address climate-related challenges.

5.1.4 Key considerations for layering of debt relief options

It is important to note that these advantages may vary depending on the specific context and implementation of debt relief measures. Additionally, the success of layering debt relief measures would rely on effective coordination, collaboration among stakeholders, particularly different types of creditors (including private creditors), and careful consideration of each measure's terms and conditions to ensure they complement each other and align with the country's adaptation goals and priorities. Some of the key considerations for layering of debt relief options that would be essential to designing an effective model are:

Debt sustainability assessment. The aim of combining debt relief and climate finance should be directed towards alleviating a country's debt burdens and improving their debt sustainability outlook, in other words, the country's ability to continue paying their debt, based on their growth rate, tax and revenue collection. Assessing debt sustainability typically involves analysing a country's ability to service its debt obligations without endangering its long-term fiscal health. Therefore, when designing a combination of different debt support measures, it will be important to consider factors such as debt-to-GDP ratio, debt service payments, debt maturity profiles and the country's capacity to generate enough revenue to continue paying its debt.

This assessment would also need to consider the types of climate disaster a country is exposed to, the current and likely future scale of impacts, which sectors of the economy, geographies and communities may be most impacted, what impact climate shocks might have on their GDP and tax/revenue collection, and how shocks might impact their ability to service debts. This will help in understanding the level of debt relief, period of relief and climate finance that will be needed by a country to tide it over a crisis and build long-term resilience without creating an additional debt burden. It would also help in assessing which of the debt relief options might work in different phases of disaster, individually or in combination. But before deciding the optimum mix of different layers of debt relief and climate finance packages, a comprehensive multidimensional risk assessment would also be needed to identify potential risks and challenges associated with combining different debt relief options. This would include:

(i) Evaluation of the risks related to market conditions, including potential fluctuations in interest rates or exchange rates

(ii) Assessing insurance triggers and potential limitations of parametric insurance

(iii) Identifying legal and contractual risks associated with debt reprofiling, swaps, or bond issuances.

Based on the risk assessment, the layers of different debt relief measures will need to ensure adequate mitigation strategies for potential risks, to ensure the effectiveness and sustainability of the combined relief measures.

Financial implications. The value of a combined package of debt relief would need to be assessed against the financial implications of different debt relief options. This would require assessing the costs associated with implementing each option alone and in combination — undertaking a cost–benefit analysis, including how a pooled approach to supporting debt relief might work in comparison to individual support, liquidity or potential savings it would create in debt servicing payments, and its impact on the country's fiscal space. To assess the financial cost benefit of layering debt relief measures, it will also be important to consider the creditor profile and whether the private creditors would come on board. This will define how debt relief might pan out. If private creditors don't agree the debt relief may only be partial.

Ideally, such an analysis will need to consider the existing debt profile, the scale and nature of debt taken by country after a climate crisis and how it is spent, in other words, how much of the new debt goes in to servicing existing debt, or providing immediate relief after a disaster or long-term resilience building. This should also explore whether the terms of debt for a country change after each climate crisis and whether this has a significant implication on borrowing costs and credit rating, including the type of creditors countries have access to or whether there are only a particular type of creditor available to countries as a last resort.

The financial assessment will also need to include the availability or lack of availability of additional sources of finance such as climate finance, humanitarian assistance, ODA or FDI, and the form (grant, loans or concessional loan) in which they flow into the country, and consider the feasibility of securing favourable terms, such as grants, lower interest rates or longer repayment periods in debt restructuring options.

The cost assessment would also need to carefully weigh the trade-offs between fiscal costs of implementing the debt relief options and not providing such support, in terms of impacts on SDG achievement, risks to growth, debt default and cost of debt restructuring after a country slips into economic crisis. Such an assessment will need to use the existing evidence on how much GDP of a country goes into debt servicing, compare debt and debt servicing over years with changes in budget allocation for different ministries (for example, agriculture, forestry, health, education and industry) and understand the effect of reduced budgets on jobs created in these sectors and a reduction in resilience investments. Reducing these investments makes it difficult for these countries to anticipate, respond to and recover from climate impacts, resulting in loss and damage. In these contexts, the benefits of providing this debt relief can far exceed the investment.

Policy coherence. When developing the debt relief package, it is important to ensure that the selected debt relief options align with the country's climate change adaptation and mitigation strategies and overall sustainable development objectives and contribute to the country's growth targets, national development priorities, Nationally Determined Contributions, National Adaptation Plans and Nationally Appropriate Mitigation Actions. Integration with existing policies and plans will enhance policy coherence and promote a coordinated approach to debt relief and resilience building.

Along with policy coherence, it will also be necessary to assess regulatory and legal frameworks for implementing the chosen debt relief options. It will be important to assess whether the country's legal system supports the proposed measures and whether any regulatory reforms or adjustments are needed. Addressing legal complexities and ensuring regulatory compliance will be vital for successful implementation of the combined debt relief measures.

The impact of the chosen measures will need to be assessed on:

(i) Macroeconomic stability. It will be crucial to consider the potential implications of the measures on inflation, exchange rates, fiscal sustainability and debt sustainability. The package should be designed in a way that it supports macroeconomic stability and avoids any adverse effects that could hinder long-term economic growth.

(ii) Social and environmental impacts. It is important to assess how the package of options contributes to social inclusion, poverty reduction and environmental sustainability. The measures should support equitable and sustainable development, avoiding negative consequences for vulnerable groups and ecosystems.

The debt relief measures will have to be flexible enough to accommodate evolving circumstances and changing policy and regulatory environments. The adaptability of the combined relief measures will ensure that they remain relevant and effective in supporting the country's recovery and resilience-building efforts. To ensure this, there will be a need to establish robust monitoring and evaluation mechanisms to track the progress and effectiveness of the combined debt relief measures. Regular evaluation of the effectiveness of the combined relief measures, and review and feedback mechanisms, will facilitate necessary adjustments or refinements based on results.

Stakeholder engagement and coordination. When developing a package of different debt relief and financing options, stakeholder engagement and coordination will play a crucial role in ensuring the effectiveness, transparency and legitimacy of the process — especially with those who will be affected by, or have a stake in, the debt relief and financing options. This will include government agencies, financial institutions, civil society organisations, local communities, international partners, and particularly the creditors. The debt profile of a country includes different types of creditors, who provide debt under different conditionalities. As an increasing proportion of global South debt is now owed to private creditors, and almost half of external debt and interest payments by low- and lower-middle-income countries are to private lenders (Jones, 2022), it will be important to have this group at the table. Excluding private sector creditors may lead to incomplete debt resolutions and hinder a country's ability to achieve long-term financial stability and sustainable development. It will be important to bring these creditors on board right from the early stages of designing a debt relief package and to explore which solutions might work for which type of creditor.

Ensuring the representation and participation of different types of stakeholders throughout the process will also help in getting diverse perspectives and inputs and promote open and transparent communication. This will encourage creditors to express their views, concerns and suggestions to foster an inclusive and participatory decision-making process. This will help in developing debt relief packages that are practically viable.

Along with stakeholder engagement, adequate institutional capacity and coordination mechanisms will be necessary for effective implementation and management of the combination of debt relief and financing options. This may require a comprehensive country-level diagnostic of existing institutional frameworks to identify potential gaps and areas for improvement. This may include assessing a country's technical capacity and expertise to implement and manage the chosen debt relief options, evaluating whether the necessary institutional structures, human resources and technical skills are in place, identifying any capacity gaps and developing plans for strengthening capacity, including training programmes or technical assistance, to ensure effective implementation of the combined relief measures. Strengthening coordination arrangements and institutional governance among relevant government agencies, financial institutions and international partners will be essential to ensure policy coherence, flow of funds and efficient implementation.

5.2 Complete write-off or buyout of SIDS debt stock

For many SIDS, debt poses a significant constraint that limits their ability to maintain expenditure in crucial sectors such as healthcare, education and infrastructure. But now, they must also address a more pressing concern: climate resilience. The very same funds that are currently directed towards debt servicing could be invested in projects aimed at bolstering resilience against the impacts of climate change. Whether it is investing in providing social safety nets to people exposed to climate disasters, or promoting sustainable agriculture to ensure food security in the face of unpredictable weather patterns, or creating infrastructure that can withstand intense cyclones, there's an urgent need to redirect resources to resilience building.

A radical proposal — a complete write-off or buyout of all SIDS debt stocks is needed to correct the historical imbalance, in which they face recurring catastrophic climate change impacts despite not contributing to it. It will provide them with a level playing field to focus on future climate resilience. This approach is essential when viewed through the lens of solidarity and shared future.

A complete write-off or buyout would also provide SIDS with the opportunity to invest in research, knowledge sharing, community-based projects and capacity-building initiatives that will empower them to anticipate, respond to, and recover from climate impacts.

5.2.1 What could complete debt write-off or buyout lead to?

The total debt stock of SIDS (n-33) as per the latest available figure for 2021 is US$153.75 billion. The complete write-off or buyout of debt for SIDS would be in the range of US$165–175 billion assuming growth in the debt levels and figures for 39 SIDS.

A complete write-off or buyout of SIDS debt will not only offer immediate fiscal relief but can also act as a catalyst for sustainable, inclusive growth and faster progression towards achieving the SDGs.

Impact on GDP growth. In Figure 29 we have analysed the projected effect of the write-off option on the GDP growth rate of SIDS.

The actual GDP growth rate of SIDS in 2019 was 0.53. If complete debt write-off was done for the same year the GDP growth would have been 12.73. Similarly in 2020, a COVID-19 and high disaster year, the GDP growth rate was −12.42. If debt write-off was done in that year the negative GDP growth would have been restricted to −0.22.

This is because a debt write-off would provide immediate relief and infuse liquidity into the economy, acting as an immediate financial catalyst. Historically, debt servicing has consumed substantial portions of national budgets for close to 70% of SIDS, who are forced to divert funds that could otherwise be used to support growth. With this burden alleviated, governments would be able to allocate resources, possibly adopting expansionary fiscal policies, which could catalyse job creation, stimulate infrastructure development, and spur demand, all of which collectively can have a multiplier effect on economic activity. As consumer spending and business activities escalate, it would have a positive impact on GDP. Furthermore, in the absence of overarching debt, these nations could potentially benefit from reduced borrowing costs. When lenders perceive a country as lower risk, they are more likely to offer loans at more favourable interest rates for resilience and development projects. The increased economic activity resulting from such investments could potentially augment government revenue via taxes, which, when reinvested, could sustain and potentially elevate GDP growth over extended periods.

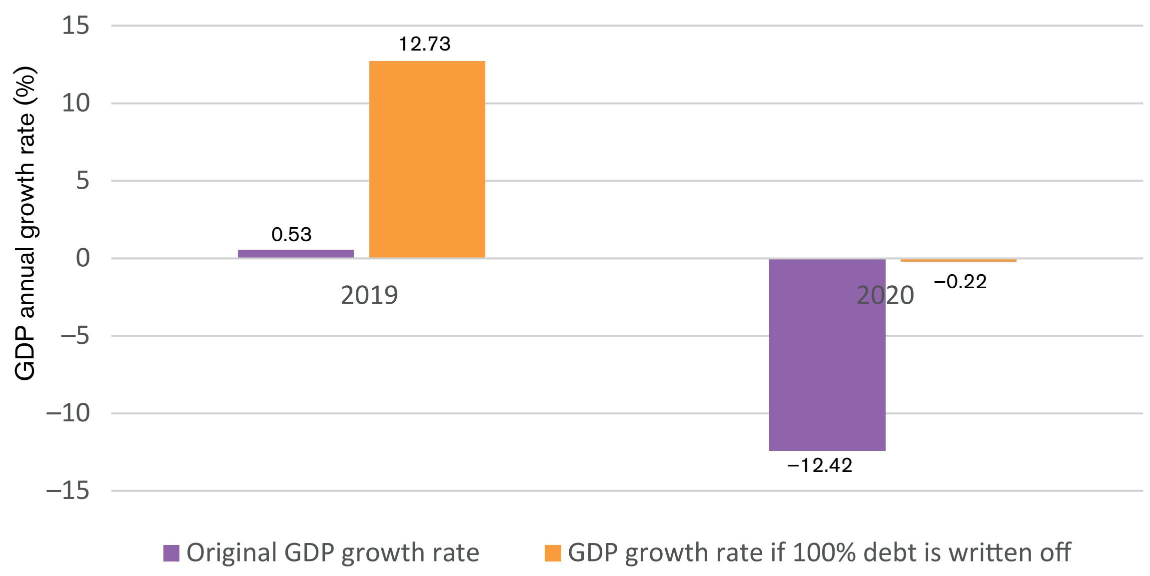
Investment in social protection, SDG and climate resilience. With the alleviation of debt, there would be an opportunity for SIDS to channel investments into building resilience against climate threats. For example, to improve infrastructure, they could embark on constructing robust seawalls or cyclone shelters to protect communities from climate impacts. Beyond physical infrastructure, they can also invest in community resilience, disaster preparedness, research in climate-resistant crops to ensure longer-term food security, conservation of marine ecosystems protecting biodiversity and bolstering fisheries, which are a significant source of livelihood for many SIDS. With more predictable fiscal space, SIDS could allocate more funds to social safety nets, such as unemployment benefits, pensions, child protection schemes and health insurance. Social protection programmes can help governments to address inequality and poverty, ensuring that vulnerable populations are taken care of, leading to a more inclusive growth and development trajectory.

5.2.2 Key considerations for debt write-off or buyout

The decision to write-off or buyout SIDS debt, while transformative, will require a multifaceted approach. Key considerations for effective debt write-off or buyout include:

Economic impact. The relief from debt write-off, while providing immediate fiscal breathing room, could also support a vision for the long-term health of the economy. This will require re-evaluation and potential reshaping of domestic fiscal and monetary policies. The funds that once went towards debt servicing can be

Figure 29. Projected effect of write-off option on GDP growth rate of SIDS



channelled to pivotal areas that address both present and future challenges. Investing in resilience building can fortify SIDS against external shocks, particularly from climate change. Prioritising low-carbon growth can help SIDS focus on sustainable growth. Simultaneously, ramping up investments in foundational sectors like infrastructure, education and healthcare will help drive community-level resilience in these sectors.

Legal and contractual implications. The SIDS' accumulated debt portfolio is governed by a series of contracts, each with its set of terms, conditions and legal provisions. Disentangling from these obligations would not only be a financial exercise but also a legal one. Contracts would require careful renegotiation to ensure they do not lead to legal disputes or financial penalties. It would be important to undertake a meticulous review of these agreements, consulting with legal experts to ensure that the debt alleviation process carefully considers and manages any potential consequences for SIDS.

Impact on international financial markets. Financial markets thrive on stability and predictability. A complete debt relief for SIDS would unsettle markets due to its unprecedented nature. Credit rating agencies might recalibrate their ratings in response, which in turn could influence the cost and availability of future borrowings for SIDS. Furthermore, the global investor community with its diverse set of actors could interpret this move in various ways. Some might see it as an indication of potential economic growth, making SIDS an attractive investment destination. Others, more cautiously, might perceive total debt relief as an indication of potential financial mismanagement, making them wary of future investments.

It would be important to manage these perceptions via outreach to different stakeholder groups. It would also be useful to bring together a range of stakeholders in this process, from the governments, civil societies and the private sector to external entities like the World Bank and the IMF, each bringing their unique perspective to the table. Ensuring their insights are integrated into the debt relief provisions would not only enrich the process but also secure wider support, lending legitimacy and credibility to such an initiative. Coordinated efforts, especially with major international bodies, would ensure a decision is not just symbolic but also beneficial in real terms to all involved.

Long-term development strategy. With the significant fiscal resources that would be freed from debt servicing, SIDS would have a unique opportunity to design their path forward. Their strategy would need to incorporate a judicious mix of immediate needs and long-term goals. Given the heightened vulnerability of SIDS to climate change, a significant investment would need to be directed towards climate resilience. From infrastructure that can withstand both slow-onset and rapid climatic events, to initiatives that conserve and rejuvenate their rich biodiversity, the SIDS would need to design resilience measures to proactively ensure a sustainable future for their communities.

6

Future protection

The increasing frequency and intensity of climate-related events pose a continuous threat to the economies and livelihoods of SIDS. SIDS have repeatedly faced devastating economic setbacks due to climate-related disasters. As noted previously, the damages inflicted by a single extreme event have in some cases surpassed the annual GDP of the affected SIDS. These shocks have not only reversed developmental gains but also strained their financial capacities, limiting their ability to rebound effectively. In Figure 30 we have provided the loss and damage caused by disasters in SIDS (1990–2021) based on the EM-DAT emergency events database for SIDS.

While debt relief is much-needed to provide immediate fiscal breathing space after such disasters there is also a need to immunise SIDS against future climate-induced financial shocks. Without a more long-term, protective measure in place, these countries will remain precariously exposed. Even after large-scale debt relief now, they could still be exposed to similar crises in future.

The 'future protection' concept is rooted in the idea of insulating these vulnerable nations from extreme economic fallout due to future climate impacts. The proposition is to limit the economic losses experienced by any individual SIDS from climate-related disasters to a level from which they can easily get their economy back on track without resorting to debt. This is planned to be achieved through an integrated approach that combines insurance with other funding mechanisms that helps cover the losses from events that are beyond insurable limit through a guarantee or coverage against economic losses beyond a predetermined threshold.

By establishing such a protective mechanism, these vulnerable nations could ensure a cap on potential economic damages, introducing a much-needed layer of financial predictability amidst the uncertainties of climate change. Beyond this immediate safeguard, the benefits of such an insurance and funding mechanism would extend to reinforcing their economic sovereignty. Post-disaster payouts through insurance and other protection mechanisms would ensure that the economic

Figure 30. Loss and damage caused by disasters in SIDS (1990–2021)

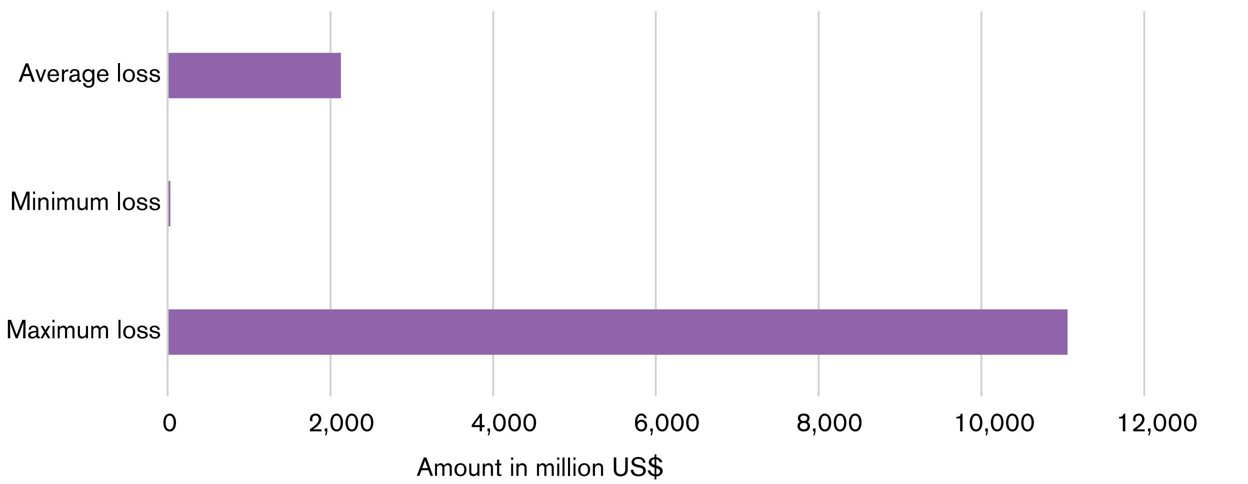
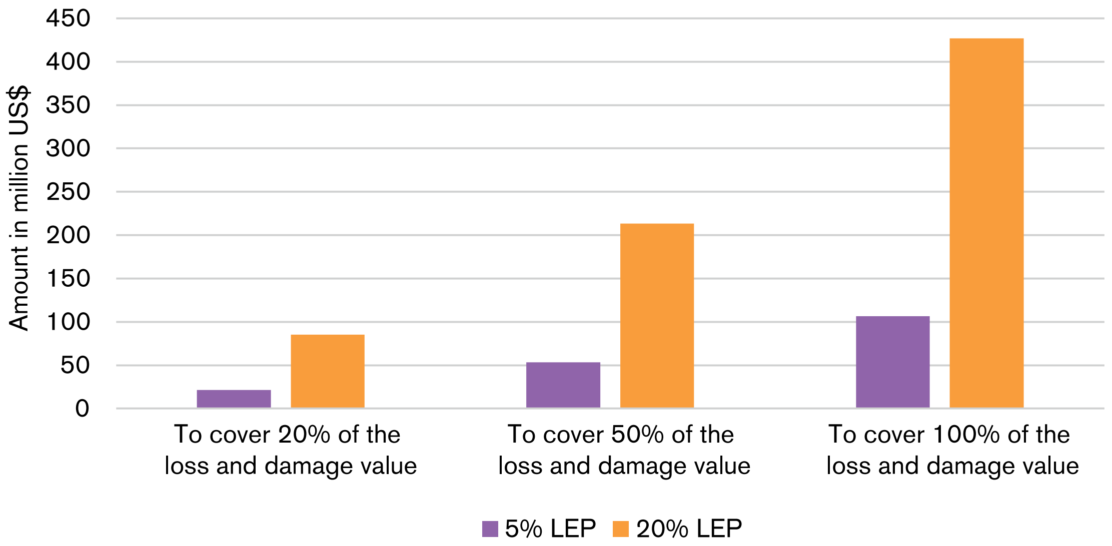


Figure 31. Cost of parametric insurance to cover the disaster losses per year in SIDS



growth of SIDS is not constrained and they are not pushed into debt to finance recovery efforts. This would not only empower them to act promptly but also diminish their reliance on external humanitarian aid or loans, minimising the risk of further indebtedness in the wake of disasters. Moreover, this protective measure would instil confidence, both for potential investors and community. It will act as a safety net to foster a sense of security and stability, crucial for future socioeconomic wellbeing of SIDS.

6.1 Mechanics of future protection

In the Figure 31 we have shown the cost of parametric insurance to cover the disaster losses per year in SIDS at 5% and 20% LEP to cover 20%, 50% and 100% of loss and damage value. This analysis is based on the loss and damage to GDP suffered by SIDS in the last 30 years.

The trade-offs between the cost of providing protection against such losses would need to be weighed carefully against the risk to growth, debt default and costs of debt restructuring that would need to be undertaken later, if such a support is not provided. Our analysis shows that the BCR of parametric insurance to cover the losses caused by disasters at 5% LEP is 2.5, and 1.09 for 20% LEP. The longer-term benefits of covering the insurance premium can far exceed the investment in premiums. Direct support to SIDS for insurance costs and other financing mechanism that covers losses beyond insurable losses can stabilise their growth, reduce poverty and allow them to invest in social protection.

6.2 Key considerations for future protection

Some of the key considerations that would be essential for ensuring effective cover for SIDS are:

Risk pooling and premium structure: By aggregating the climate-related risks of various SIDS, the initiative could distribute the potential financial burdens of climate disasters more evenly. This would mean that the occasional heavy payouts to an individual SIDS due to a catastrophic event could be balanced out by periods with minimal or no payouts. This would help make the insurance premiums affordable and cover events that are deemed as uninsurable. Over time, pooling reduces the unpredictability of insurance payouts, leading to a more sustainable and affordable system. Such a system would become crucial, especially when considering that some SIDS might experience severe impacts infrequently, but with devastating consequences when they do occur (Bharadwaj, Mitchell and Karthikeyan, 2023).

Several countries have already established insurance risk pools. In many cases, these programmes have been established to provide affordable insurance coverage for ‘uninsurable’ risks through private markets. In others, they promote solidarity by establishing regional risk pools to spread out the impact of losses. The Caribbean, Pacific islands and African Union, for example, have set up the Caribbean Catastrophe Risk Insurance Facility (CCRIF), the Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI) and the African Risk Capacity (ARC) Insurance Programme respectively (see Box 3). These regional pools provide significant advantages (Cebotari and Youssef, 2020).

BOX 3. RISK POOLING

Countries in the Caribbean, the Pacific islands and African Union have transferred their risks to three well-established regional pools that provide lower insurance premiums:

RISK-POOLING INITIATIVES	HAZARDS INSURED
CCRIF (2007)	Earthquake, tropical cyclone (hurricanes), excess rainfall, drought
PCRAFI (2013)	Tropical cyclone, earthquake/tsunami, excess rainfall
ARC (2013)	Drought, extreme weather (excess rainfall, heatwaves and tropical cyclones)

First, they provide insurance coverage at significantly lower cost than if countries had to purchase it individually. Second, they provide quick payouts following disasters, which help members maintain essential government functions. Third, the policyholders own the facility (CCRIF, PCRAFI, ARC), which allows benefits to accrue to members either through dividend payments or lower premiums.

Future protection will need a similar SIDS-wide risk-pooling approach to ensure that the premiums are affordable, and the coverage meets the requirements of the countries. By offloading some portion of risk, the insurance company will be able to reduce its overall risk and can keep premium costs lower for all of its clients (Cebotari and Youssef, 2020). As risk pools grow, the cost of operation and reinsurance in global capital markets drops, which could in turn help lower premiums. Regional pools can also facilitate access of smaller countries within SIDS to insurance and reinsurance markets by increasing the size of the aggregate portfolio, offering country-specific risk models and reducing administrative costs.

BOX 4. PARAMETRIC VERSUS TRADITIONAL INSURANCE

Parametric, or index-based, insurance, is a non-traditional insurance that provides payouts based on a trigger event. Trigger events can include environmental parameters like wind speed or rainfall measurements. Once parameters are reached, the payout is processed without the need to verify losses. In comparison, traditional indemnity insurance reimburses for the total value of the loss after an event like a flood or storm. To quantify loss, a representative from the insurance company assesses the damage.

Parametric insurance is suited to hard-to-model, low-frequency but high-intensity losses. These include catastrophic perils, weather-related risks or economic activities. They can also cover risks that lack a sufficient history of losses captured as insurance-readable data.

Payout triggers. The agility of the insurance mechanism is determined by its payout triggers. Rather than relying on post-event assessments, which can be time-consuming, indexed (see Box 4) triggers based on objective data would be more efficient to implement. For instance, if a set index like storm intensity or sea-level measurement exceeds a predetermined threshold, the payout process can be initiated automatically (Bharadwaj et al., 2023). Further nuancing the mechanism, the magnitude of the payout could vary depending on the severity of the climatic event. This will ensure that the financial support provided aligns with the scale of the disaster.

Coverage scope. Parametric insurance, while offering advantages, will only pay out after a certain level of risk is reached. This trigger might occur for several reasons. For example, the strength of a disaster might be measured in a different location from where it occurred. As a result, it might not reach the level needed to trigger the insurance. Similarly, the risk of actual losses might also exceed modelled losses. To address these issues, parametric insurance needs better location-specific and comprehensive climate risk modelling to define triggers and thresholds for insurance payouts.

The distribution of future climate impacts and their associated damages, from both slow-onset and extreme weather events in climate models, are generally shown as averages. High probability events, for example, tend to appear as a huge peak on a graph. Conversely, rare events with potentially disastrous effects appear with low probability. But even with relatively low probability, the outcomes of these rare events can be catastrophic and cause loss and damage.

Countries need insurance protection against a full range of events. To provide this, insurance products need to change how they consider climate modelling outputs.

Taking an average of different global climate models is common practice, but this produces results that may be very different from how climate impacts actually unfold. Averaging all the results obscures the range of likely impacts, and the range of less likely, more catastrophic events — the very ones that usually cause greater loss and damage — tend to get neglected.

The trigger measurement and design for insurance coverage should be fit for purpose for a range of these possible extreme weather events. The probability of these major disasters is small; but rapid — and potentially large — insurance payouts are more valuable in mitigating their effects on possible debt default and its cascading effect on growth. Similarly, the higher frequency of smaller disasters may also require coverage to help countries rebuild, because even recurring moderate events can cause significant damage. The design of the triggers will need to consider all the types of events that could have an impact on the country's fiscal performance.

Premium payment. Given the widely acknowledged fact that SIDS face a disproportionate brunt of climate change while contributing minimally to global emissions, the idea is for these premiums to be borne by international climate finance mechanisms or a dedicated global fund. Potential contributors to this fund might include established international climate funds, philanthropies or private sector entities seeking to contribute meaningfully towards global climate responsibility. The fund may need to respond to some critical questions to make such a model work at scale:

- What conditions would be attractive to insurers and reinsurers to keep premiums as low as possible?
- How can the risk pool work for a diversified portfolio of countries, given that some will be at higher risk than others and may need access to insurance support more often than others?
- What conditions would allow international climate finance to support risk-pooled debt finance at scale?
- How can the non-insurability of some events be addressed? How might reinsurance or a guarantee from the global fund work for high-severity events to limit the magnitude of potential losses for insurers?

In addition to covering premiums and guarantees for protecting the economic losses, the global fund could support longer-term adaptation and resilience building in SIDS. This would support risk reduction and thereby help reduce the magnitude of future losses and bring down the cost of premiums in the long run.

Comprehensive risk modelling and data analytics. The global fund would also need to play a leading role in developing risk analytics and modelling tools. What risks should insurance cover? What is the likely frequency and size of losses that will need to be covered? This assessment will help in pricing, the design of the trigger thresholds and structuring the provision of adequate insurance coverage. Improved measurement will also help lower insurance costs.

Catastrophe risk modelling, developed by the insurance industry, uses data on parameters that describe the magnitude, frequency and geographic distribution of potential losses. This enables insurers to price and structure coverage correctly. The development, calibration and use of such models require multidisciplinary technical expertise and experience of interpretating of model output. However, the input data for such models are often unavailable or incomplete (UNISDR, 2017). Incomplete knowledge of hazard events and their impact means more uncertainty for insurance pricing. To address these needs and reduce uncertainties, the global fund would need to invest in collecting and modelling hazard, exposure and vulnerability data. This would support the design of appropriate trigger mechanisms and avoid basis risks. In the context of insurance, basis risk occurs when there's a mismatch between the payout from an insurance product and the actual loss suffered. For example, in weather index-based insurance, a payout might be triggered when rainfall drops below a certain level in a particular region. However, if that region experiences a loss due to a localised weather event that doesn't affect the entire region, the index might not trigger a payout. Conversely, the index might trigger a payout even if the region hasn't suffered a loss. Both scenarios create basis risk. In the context of climate change and weather-related risks, basis risk can be a significant concern, especially when implementing large-scale insurance schemes that must account for highly localised and variable climate phenomena.

The data collection and models could be developed in collaboration with national meteorological and climate modelling experts. These could include academics; national meteorological, hydrological and geological services; and other government and nongovernmental agencies that collect and maintain sectoral data, such as the national bureau of statistics. The process could build capacity to promote sustainable maintenance of the risk data. Further, engaging in-country stakeholders would ensure that SIDS government needs and requirements are considered in the design of the triggers and thresholds. Stakeholders can also ensure that development of in-country technical and operational capacities for data collection and risk analytics supports the design of triggers and insurance coverage. Finally, an inclusive approach will help ensure transparency regarding the source and analysis of risk parameters.

Establish collaboration between multiple stakeholders. Collective buy-in would be crucial to make such a global fund work. Key partners, and their roles, could include:

(i) Participating SIDS governments, and their relevant finance and environment ministries, their role being to highlight their needs and requirements for debt relief and how to structure the debt relief to support adequate time for recovery from disasters

(ii) Major public and private sector creditors, Paris Club creditors, the IMF, the World Bank and other international and regional development banks, their role being to provide funding support and design the structure and modality for retrofitting insurance with existing debts or imbedding it with those planned in future

(iii) The insurance and reinsurance industries, their role being to help co-design the insurance product and risk-pooling arrangements to provide optimum coverage of risks

(iv) National technical agencies, data providers and the risk modelling community, their role being to support availability of data and more accurate risk modelling

(v) Academia, centres of excellence and nongovernmental organisations (NGOs), with a role to bring in a local/grassroots perspectives to understand the needs, vulnerabilities and priorities of local communities and incorporate them in the design of insurance cover.

By weaving together these mechanisms, the SIDS 'future protection' could emerge as not just a financial safety net but a model for solidarity and shared responsibility in the era of climate change.

7 Longer-term resilience investments

For SIDS, the challenge of climate adaptation and resilience is existential and is exacerbated by the need to manage economic and natural disaster shocks. Over 10% of the population of many SIDS will be threatened by chronic coastal flooding or permanent inundation by 2100, displacing close to 40 million people. Kiribati and Tuvalu are at risk of disappearing by the end of this century, due to rising sea levels. This is a real threat and land has been purchased on Fiji's Vanua Levu Island to accommodate future climate-induced migration from Kiribati (UNCTAD, 2022). The majority of Pacific SIDS will need to relocate some communities within the next two decades. The food security of SIDS is also under threat: for example, fish provides up to 90% of dietary protein in some Island States, but fish biomass is projected to decline by up to 25% by 2100 due to overfishing and climate change (UNCTAD, 2022).

In theory, resilient infrastructure, proactive adaptation through nature-based solutions and community-level resilience should enable SIDS to deal with some of these impacts. However, resourcing for such strategies is low due to the debt crisis, which reduces their capacity to manage immediate crises and resilience needs, let alone achieve long-term adaptation.

7.1 Why resilience bonds?

Resilience and green bonds (See Box 5) offer transformative potential to help SIDS overcome this challenge, if properly designed and executed. At their core, these bonds offer direct financing for initiatives aimed at bolstering resilience to climate-induced impacts. This ranges from funding the establishment of robust infrastructure, such as storm-resistant housing and sea walls, to backing sustainable endeavours like renewable energy projects, reforestation efforts or biodiversity conservation. These projects can help SIDS manage immediate impacts of climate change and also pave the way for sustainable economic growth.

From an investment perspective, introducing these bonds would diversify the financing toolkit available to SIDS, offering an alternative to traditional loans or aid. This can alleviate some pressure from their already-strained budgets.

7.2 Key consideration for resilience bonds

Strategic planning and project viability. Any resilience or green bond initiative for SIDS, will need a robust strategic plan anchored in clear objectives. This would involve ensuring that bond proceeds are earmarked exclusively for genuine resilience building or environmentally friendly projects. Feasibility studies might need to precede any bond issuance, providing a breakdown of project viability, associated costs, timelines and anticipated outcomes. Given the unique vulnerabilities of SIDS to climate change, a comprehensive risk assessment might be crucial. This would entail an in-depth analysis of potential hazards, vulnerabilities and impacts, offering a blueprint for structuring the bond to address the identified challenges.

Transparency, accountability and certification. Transparency and accountability are the bedrocks of any bond's success. Investors need assurance that their capital is being utilised ethically and effectively. To ensure this, mechanisms that facilitate regular reporting, third-party audits and ongoing monitoring of bond proceeds, would be required. Additionally, acquiring certifications from reputable entities can bolster investor

BOX 5. WHAT IS A RESILIENCE BOND?

A resilience bond is like a special type of loan given to a country or organisation, specifically for projects that help them better handle and recover from disasters, especially those caused by climate change. For example, to build stronger houses along the coastline that can withstand storms, or to develop farming methods that can cope with changing weather. The idea is to ensure that communities are better prepared for challenges and can bounce back more quickly after they experience them. Those who buy these bonds are essentially lending money for these projects. In return, they get their money back with some interest after a set period.

The money for the resilience bond is returned to the investors with interest through what is known as bond 'redemption'. The money to pay back the bondholders – both the principal and the interest – typically comes from:

- Revenues generated from projects: The projects or initiatives funded by the bond might generate income. For instance, if the bond funds the construction of a resilient infrastructure project like a toll bridge, the tolls collected could be a source of revenue.
- Budgetary allocations: Governments might allocate a portion of their budget for bond repayments. This would especially be the case if the bond doesn't directly fund income-generating projects.
- Refinancing: At times, the issuer might take a new loan or issue a new bond to repay an existing one. It would be like replacing an old debt with a new one, often with better terms or interest rates.
- Savings from reduced disaster impacts: Since the bond funds projects that reduce the impacts of disasters, the savings accrued (such as less money spent on disaster recovery) can also be a source for repayments.

confidence, providing a seal of approval that the bond will genuinely contribute to environmental betterment or resilience. Engaging a broad spectrum of stakeholders, from grassroots communities to international organisations, can further enrich this process. Their insights and expertise would ensure that the bond issuance and its subsequent utilisation align seamlessly with ground-level necessities. Also, engaging community in crowdsourcing data on monitoring the verification of the impacts of the project would increase accountability and reduce the cost of monitoring.

Legal and financial frameworks. Creating a conducive legal and regulatory environment will be essential. This would need to be tailored to facilitate the issuance of bonds while safeguarding SIDS' and investors' interests. Considering the intricacies of global finance, challenges tied to currency denomination and exchange rate fluctuations might also need to be addressed upfront. These issues can significantly influence the bond's appeal to both domestic and foreign investors. Furthermore, bond pricing and bond duration would need to strike a balance, making it attractive for investors and feasible for issuers in the context of investment needs.

Capacity building and market engagement. The global bond market is intricate, and for SIDS, there would be a need for a steep learning curve. Capacity-building initiatives can empower SIDS and deepen their understanding of market dynamics, financial nuances and the effective management of bond proceeds. At the same time, there would be a need for proactive market engagement. Raising awareness among potential investors about the particular challenges faced by SIDS and the multifaceted benefits of these bonds could help drive demand and foster a larger investor base.

Post-issuance management and utilisation. Issuing a bond is only half the journey: the real challenge lies in post-issuance management. Efficient utilisation of funds, channelling them into designated projects, is a task that requires proper oversight. A rigorous project management approach, complemented by regular evaluations and progress reports, could ensure that SIDS are able to report on tangible development and resilience-building outcomes.

By addressing these requirements, SIDS can harness the potential of resilience or green bonds, generating substantial funds for investment in longer-term resilience building.

8 Legal and advisor support

In the rapidly evolving global finance landscape, SIDS may find themselves at the intersection of vulnerability and opportunity. Many SIDS have limited capacity when it comes to navigating the intricate world of debt restructuring, credit agency negotiations and the broader financial ecosystem, which puts them in a disadvantageous position. The intricacies of international finance and debt negotiations, compounded by the nuanced economic and environmental challenges facing SIDS, often tilt the balance against them, resulting in less favourable terms or missed opportunities.

Increasingly, SIDS are also engaging with private creditors, who now hold a significant portion of SIDS debt. Private creditors often employ intricate loan agreements, drafted by seasoned financial experts, which may contain terms that are not immediately clear or favourable to the nations involved. For many SIDS, the fine print and long-term implications of such contracts are hard to decipher, given their limited expertise in this field.

Given the huge disparity in negotiation power and expertise between SIDS and large financial entities or private creditors, there is a pressing need for a dedicated facility. We are proposing the creation of a '**SIDS global debt and investment platform'**, to help SIDS deal with these challenges.

8.1. How can a SIDS global debt and investment platform help?

The proposed platform could provide structured support to all SIDS, providing assistance with debt contract/deal management and investment deal teams, supplementing local capacity and strengthening data, technical capacity and navigating political negotiations. The platform can provide advisory support and legal aid to negotiate the terms of future debt, restructuring of existing debt or debt alleviation efforts, negotiations on credit ratings and terms of debt, and support in designing the terms of resilience bonds and insurance products. More specifically the platform could help in:

Addressing debt and climate impact intersectionality. The vulnerability of SIDS to climate impacts may be perceived as high economic risks by creditors and they may accordingly reduce their credit scores. This can increase the cost of borrowing for SIDS. Some SIDS might have the expertise for negotiations with creditors to ensure they are not unduly penalised with poor rating due to climate risk exposure, but others may need support. This platform could offer advice, ensuring SIDS can secure favourable lending terms or debt relief agreements. It can also create a comprehensive database of all SIDS, that can support data analytics, bringing in geopolitical insights, and technical expertise to craft comprehensive strategies that resonate with the diversified challenges and the need for investment in resilience.

Examining credit rating nuances. Credit ratings dictate borrowing costs and have a huge impact on country debt challenges. The impacts of climate change and other risks on credit rating can be challenging to grasp. A dedicated advisory platform for SIDS could play a pivotal role in serving as a bridge between SIDS and credit rating agencies, ensuring that the rating methodologies holistically capture the particular challenges facing SIDS countries, instead of applying generic criteria that might overlook nuances.

Harnessing resilience bonds and insurance markets. The financing avenues of resilience bonds and insurance products, though beneficial, can be laden with complexities, such as the pricing of the products/premiums and risk assessment. The platform could provide comprehensive guidance on leveraging these financial instruments, tailored to the particular requirements of SIDS.

Capacity building. The platform can support gradual capacity building for SIDS by enabling knowledge transfer, upskilling government negotiators, local legal teams, NGOs and advocacy organisations on topics such as debt management investment negotiations, thereby fostering a self-reliant, sustainable ecosystem of expertise with in SIDS.

Leveraging collective political strength. By unifying the collective interests of all SIDS, the platform could offer a consolidated voice and strategy in international negotiations, securing terms that truly resonate with SIDS' needs and aspirations.

Such a platform would not only bridge the capacity gap but also ensure that the interests of SIDS are robustly represented, and their challenges and aspirations are effectively addressed in financial negotiations. This dedicated help could ensure they fully understand, evaluate and negotiate these agreements in a way that safeguards their interests both now and in the future.

9

The way forward

Characterised by limited resources, geographical isolation and a heightened susceptibility to climate impacts, SIDS find themselves bearing the heavy burden of climate change, despite contributing little to it. Climate impacts are pushing SIDS into vicious cycles of debt, due to repeated economic, development and infrastructure damage caused by more intense and frequent climate events.

As the effects of climate change escalate, the capacity of SIDS to counteract these impacts is diminishing proportionally with their increasing financial burdens. Each dollar channelled into debt repayment limits potential investments in climate resilience and adaptation. Consequently, every climate setback does not only signify immediate damage, it further erodes countries' future resilience capacity, deepening their financial challenges. To navigate this intricate conundrum, we have set out four strategies aimed at guiding SIDS towards sustainable debt management, an issue which needs to be addressed comprehensively.

Debt alleviation undoubtedly brings much-needed financial relief to these nations, facilitating more effective resource allocation. However, this is only one component of the solution needed to address the multi-faceted debt challenge. Addressing individual challenges can alleviate specific pressures, but a holistic, sustainable solution necessitates support across all four identified areas.

The increasing manifestations of accelerating climate change underscore the importance of establishing future protection mechanisms now. By setting such measures in place, SIDS can be better equipped to weather potential economic or environmental crises. Investments in longer-term resilience are paramount, with an emphasis on initiatives that bolster nations' inherent ability to withstand and recover from external disturbances such as climate change and economic shocks. Yet, as they navigate the complex corridors of international treaties and contracts, SIDS can benefit immensely from tailored legal aid and advisory services. Such support will ensure they are well-prepared to negotiate agreements that serve their best interests.

It is crucial to recognise that for this holistic and sustainable solution to take shape, international cooperation and commitment will be needed. Institutions such as the World Bank, the IMF and the Asian Development Bank, along with developed countries and philanthropic entities, must rally to pledge their support. This not only involves addressing the four key areas, but also includes the provision of climate finance, concessional finance and grants under the principles of climate justice and solidarity.

The challenges faced by SIDS highlight the importance of creating a united approach and shared responsibility. This should be seen as a collective endeavour to ensure that these states have the means to protect themselves from grave threats to their survival.

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Small Island Developing States (SIDS) are getting entrapped in financial quagmire due to climate impacts. This paper delves into the urgent financial plight of SIDS, examining the multifaceted challenges they face across social, environmental and economic domains. It argues for a comprehensive approach to debt relief, future protection, resilience investment and advisory support as necessary steps for the survival and sustainable development in these vulnerable regions.

International Institute for Environment and Development
Third Floor, 235 High Holborn, London WC1V 7DN, UK
Tel: +44 (0)20 3463 7399
Fax: +44 (0)20 3514 9055
www.iied.org

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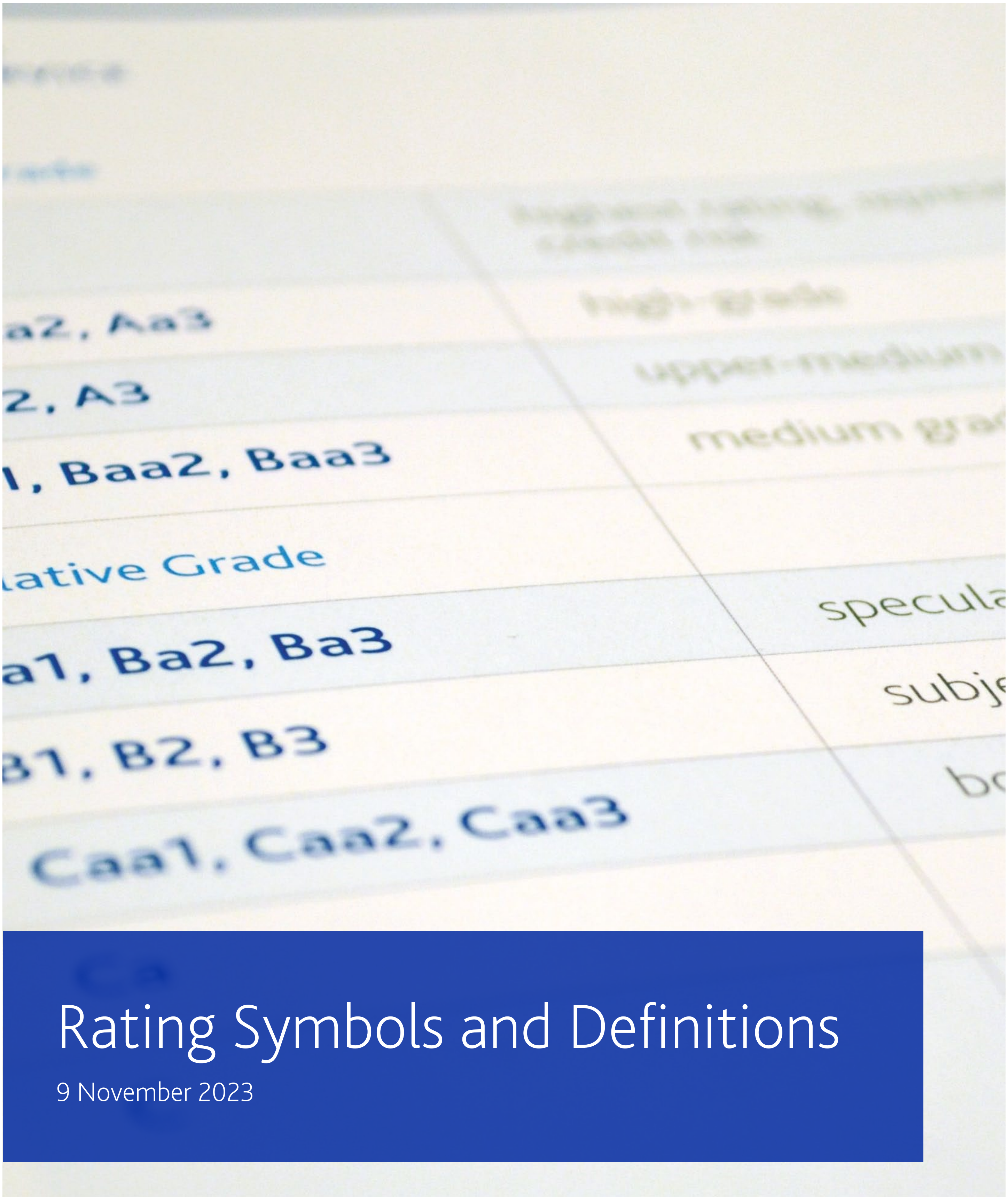

Rating Symbols and Definitions

9 November 2023

Moody's
INVESTORS SERVICE

Preface

In the spirit of promoting transparency and clarity, Moody's Standing Committee on Rating Symbols and Definitions offers this updated reference guide which defines Moody's various ratings symbols, rating scales and other ratings-related definitions. In addition to credit ratings, this document contains symbols and definitions for Other Permissible Services, Inputs to Ratings, and Research Transparency Assessments, which are symbols and scores that are not credit ratings.

Since John Moody devised the first bond ratings more than a century ago, Moody's rating systems have evolved in response to the increasing depth and breadth of the global capital markets. Much of the innovation in Moody's rating system has been in response to market needs for increased clarity around the components of credit risk or for finer distinctions in rating classifications.

I invite you to contact us with your comments.

Kenneth Emery
Chair, Standing Committee on Rating Symbols and Definitions
+1.212.553.4415
kenneth.emery@moodys.com

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Credit Rating Services

Moody's Global Rating Scales

Ratings assigned on Moody's global long-term and short-term rating scales are forward-looking opinions of the relative credit risks of financial obligations issued by non-financial corporates, financial institutions, structured finance vehicles, project finance vehicles, and public sector entities. Moody's defines credit risk as the risk that an entity may not meet its contractual financial obligations as they come due and any estimated financial loss in the event of default or impairment. The contractual financial obligations[1] addressed by Moody's ratings are those that call for, without regard to enforceability, the payment of an ascertainable amount, which may vary based upon standard sources of variation (e.g., floating interest rates), by an ascertainable date. Moody's rating addresses the issuer's ability to obtain cash sufficient to service the obligation, and its willingness to pay.[2] Moody's ratings do not address non-standard sources of variation in the amount of the principal obligation (e.g., equity indexed), absent an express statement to the contrary in a press release accompanying an initial rating.[3] Long-term ratings are assigned to issuers or obligations with an original maturity of eleven months or more and reflect both on the likelihood of a default or impairment on contractual financial obligations and the expected financial loss suffered in the event of default or impairment. Short-term ratings are assigned to obligations with an original maturity of thirteen months or less and reflect both on the likelihood of a default or impairment on contractual financial obligations and the expected financial loss suffered in the event of default or impairment.[4,5] Moody's issues ratings at the issuer level and instrument level on both the long-term scale and the short-term scale. Typically, ratings are made publicly available although private and unpublished ratings may also be assigned.[6]

Moody's differentiates structured finance ratings from fundamental ratings (i.e., ratings on nonfinancial corporate, financial institution, and public sector entities) on the global long-term scale by adding (sf) to all structured finance ratings.[7] The addition of (sf) to structured finance ratings should eliminate any presumption that such ratings and fundamental ratings at the same letter grade level will behave the same. The (sf) indicator for structured finance security ratings indicates that otherwise similarly rated structured finance and fundamental securities may have different risk characteristics. Through its current methodologies, however, Moody's aspires to achieve broad expected equivalence in structured finance and fundamental rating performance when measured over a long period of time.

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1 In the case of impairments, there can be a financial loss even when contractual obligations are met. See the definition of Impairment in this publication.

2 For issuer level ratings, see the definition of Issuer Ratings in this publication. In some cases the relevant credit risk relates to a third party, in addition to, or instead of the issuer. Examples include credit-linked notes and guaranteed obligations.

3 Because the number of possible features or structures is limited only by the creativity of issuers, Moody's cannot comprehensively catalogue all the types of non-standard variation affecting financial obligations, but examples include equity indexed principal values and cash flows, prepayment penalties, and an obligation to pay an amount that is not ascertainable at the inception of the transaction.

4 For certain preferred stock and hybrid securities in which payment default events are either not defined or do not match investors' expectations for timely payment, long-term and short-term ratings reflect the likelihood of impairment (as defined below in this publication) and financial loss in the event of impairment.

5 Debts held on the balance sheets of official sector institutions – which include supranational institutions, central banks and certain government-owned or controlled banks – may not always be treated the same as debts held by private investors and lenders. When it is known that an obligation is held by official sector institutions as well as other investors, a rating (short-term or long-term) assigned to that obligation reflects only the credit risks faced by non-official sector investors.

6 For information on how to obtain a Moody's credit rating, including private and unpublished credit ratings, please see Moody's Investors Service Products. Please note that Moody's always reserves the right to choose not to assign or maintain a credit rating for its own business reasons.

7 Like other global scale ratings, (sf) ratings reflect both the likelihood of a default and the expected loss suffered in the event of default. Ratings are assigned based on a rating committee's assessment of a security's expected loss rate (default probability multiplied by expected loss severity), and may be subject to the constraint that the final expected loss rating assigned would not be more than a certain number of notches, typically three to five notches, above the rating that would be assigned based on an assessment of default probability alone. The magnitude of this constraint may vary with the level of the rating, the seasoning of the transaction, and the uncertainty around the assessments of expected loss and probability of default.

Global Long-Term Rating Scale

Aaa	Obligations rated Aaa are judged to be of the highest quality, subject to the lowest level of credit risk.
Aa	Obligations rated Aa are judged to be of high quality and are subject to very low credit risk.
A	Obligations rated A are judged to be upper-medium grade and are subject to low credit risk.
Baa	Obligations rated Baa are judged to be medium-grade and subject to moderate credit risk and as such may possess certain speculative characteristics.
Ba	Obligations rated Ba are judged to be speculative and are subject to substantial credit risk.
B	Obligations rated B are considered speculative and are subject to high credit risk.
Caa	Obligations rated Caa are judged to be speculative of poor standing and are subject to very high credit risk.
Ca	Obligations rated Ca are highly speculative and are likely in, or very near, default, with some prospect of recovery of principal and interest.
C	Obligations rated C are the lowest rated and are typically in default, with little prospect for recovery of principal or interest.

Note: Moody's appends numerical modifiers 1, 2, and 3 to each generic rating classification from Aa through Caa. The modifier 1 indicates that the obligation ranks in the higher end of its generic rating category; the modifier 2 indicates a mid-range ranking; and the modifier 3 indicates a ranking in the lower end of that generic rating category. Additionally, a "(hyb)" indicator is appended to all ratings of hybrid securities issued by banks, insurers, finance companies, and securities firms.*

Note: For more information on long-term ratings assigned to obligations in default, please see the definition "Long-Term Credit Ratings for Defaulted or Impaired Securities" in the Other Definitions section of this publication.

** By their terms, hybrid securities allow for the omission of scheduled dividends, interest, or principal payments, which can potentially result in impairment if such an omission occurs. Hybrid securities may also be subject to contractually allowable write-downs of principal that could result in impairment. Together with the hybrid indicator, the long-term obligation rating assigned to a hybrid security is an expression of the relative credit risk associated with that security.*

Global Short-Term Rating Scale

P-1	Ratings of Prime-1 reflect a superior ability to repay short-term obligations.
P-2	Ratings of Prime-2 reflect a strong ability to repay short-term obligations.
P-3	Ratings of Prime-3 reflect an acceptable ability to repay short-term obligations.
NP	Issuers (or supporting institutions) rated Not Prime do not fall within any of the Prime rating categories.

Standard Linkage Between the Global Long-Term and Short-Term Rating Scales

The following table indicates the long-term ratings consistent with different short-term ratings when such long-term ratings exist.[8]

LONG-TERM RATING	SHORT-TERM RATING
Aaa, Aa1, Aa2, Aa3, A1, A2, A3	Prime-1
A3, Baa1, Baa2	Prime-2
Baa2, Baa3	Prime-3
Ba1, Ba2, Ba3 B1, B2, B3, Caa1, Caa2, Caa3 Ca, C	Not Prime

Obligations and Issuers Rated on the Global Long-Term and Short-Term Rating Scales

Deposit Ratings

Deposit Ratings are opinions of a deposit-taking institution's ability to repay punctually its foreign and/or domestic currency deposit obligations and also reflect the expected financial loss of the default. Deposit Ratings do not apply to deposits that are subject to a public or private insurance scheme; rather, the ratings apply to the most junior class of uninsured deposits, but they may in some cases incorporate the possibility that official support might in certain cases extend to the most junior class of uninsured as well as preferred and insured deposits. Foreign currency deposit ratings are subject to Moody's foreign currency country ceilings which may result in the assignment of a different (and typically lower) rating for the foreign currency deposits relative to the deposit-taking institution's rating for domestic currency deposits.

Clearing Counterparty Ratings

A Clearing Counterparty Rating (CCR) reflects Moody's opinion of a Central Counterparty Clearing House's (CCP) ability to meet the timely clearing and settlement of clearing obligations by the CCP as well as the expected financial loss in the event the obligation is not fulfilled. A CCR can be assigned at a CCP legal entity or clearing service level to the extent a legal entity operates multiple clearing services.

Counterparty Risk Ratings (CRR)

CRRs are opinions of the ability of entities to honor their non-debt financial liabilities, typically to unrelated counterparties (CRR liabilities), such as derivatives and sale and repurchase transactions. CRRs also reflect the expected financial losses not covered by collateral, in the event such liabilities are not honored. For clarity, CRRs are not applicable to funding commitments or other obligations associated with covered bonds, letters of credit, guarantees, servicer and trustee obligations, and other similar obligations that arise from a bank performing its essential operating functions.

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8 Structured finance short-term ratings are usually based either on the short-term rating of a support provider or on an assessment of cash flows available to retire the financial obligation.

Corporate Family Ratings

Moody's Corporate Family Ratings (CFRs) are long-term ratings that reflect the relative likelihood of a default on a corporate family's debt and debt-like obligations and the expected financial loss suffered in the event of default. A CFR is assigned to a corporate family as if it had a single class of debt and a single consolidated legal entity structure. CFRs are generally employed for speculative grade obligors. Under certain very limited circumstances, CFRs may also be assigned to investment grade obligors. The CFR normally applies to all affiliates under the management control of the entity to which it is assigned. For financial institutions or other complex entities, CFRs may also be assigned to an association or group where the group may not exercise full management control, but where strong intra-group support and cohesion among individual group members may warrant a rating for the group or association. A CFR does not reference an obligation or class of debt and thus does not reflect priority of claim.

Credit Default Swap Ratings

Credit Default Swap Ratings measure the risk associated with the obligations that a credit protection provider has with respect to credit events under the terms of the transaction. The ratings do not address potential losses resulting from an early termination of the transaction, nor any market risk associated with the transaction.

Enhanced Ratings

Enhanced Ratings only pertain to US municipal securities. Enhanced ratings are assigned to obligations that benefit from third-party credit or liquidity support, including state aid intercept programs. They primarily reflect the credit quality of the support provider, and, in some cases, also reflect the credit quality of the underlying obligation. Enhanced ratings do not incorporate support based on insurance provided by financial guarantors.

Insurance Financial Strength Ratings

Insurance Financial Strength Ratings are opinions of the ability of insurance companies to punctually pay senior policyholder claims and obligations and also reflect the expected financial loss suffered in the event of default.

Insured Ratings

An insured or wrapped rating is Moody's assessment of a particular obligation's credit quality given the credit enhancement provided by a financial guarantor. Moody's insured ratings apply a credit substitution methodology, whereby the debt rating matches the higher of (i) the guarantor's financial strength rating and (ii) any published underlying or enhanced rating on the security.

Issuer Ratings

Issuer Ratings are opinions of the ability of entities to honor senior unsecured debt and debt like obligations.[9,10] As such, Issuer Ratings incorporate any external support that is expected to apply to all current and future issuance of senior unsecured financial obligations and contracts, such as explicit support stemming from a guarantee of all senior unsecured financial obligations and contracts, and/or implicit support for issuers subject to joint default analysis (e.g. banks and government-related issuers). Issuer Ratings do not incorporate support arrangements, such as guarantees, that apply only to specific (but not to all) senior unsecured financial obligations and contracts.

While Issuer Ratings reflect the risk that debt and debt-like claims are not serviced on a timely basis, they do not reflect the risk that a contract or other non-debt obligation will be subjected to commercial disputes. Additionally, while an issuer may have senior unsecured obligations held by both supranational institutions and central banks (e.g., IMF, European Central Bank), as well as other investors, Issuer Ratings reflect only the risks faced by other investors.

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9 Issuer Ratings as applied to US local government special purpose districts typically reflect an unlimited general obligation pledge which may have security and structural features in some states that improve credit quality for general obligation bondholders but not necessarily for other counterparties holding obligations that may lack such features. An Issuer Rating as applied to a US state, territory, K-12 public school district, city or county reflects its ability to repay debt and debt-like obligations without consideration of any pledge, security or structural features.

10 These opinions exclude debt known to be held by official sector investors because in practice such debt could effectively be treated as either senior or junior to senior unsecured debt held by private sector investors.

Long-Term and Short-Term Obligation Ratings

Moody's assigns ratings to long-term and short-term financial obligations. Long-term ratings are assigned to issuers or obligations with an original maturity of eleven months or more and reflect both on the likelihood of a default or impairment on contractual financial obligations and the expected financial loss suffered in the event of default or impairment. Short-term ratings are assigned to obligations with an original maturity of thirteen months or less and reflect both on the likelihood of a default or impairment on contractual financial obligations and the expected financial loss suffered in the event of default or impairment.

Medium-Term Note Program Ratings

Moody's assigns provisional ratings to medium-term note (MTN) or similar programs and definitive ratings to the individual debt securities issued from them (referred to as drawdowns or notes).

MTN program ratings are intended to reflect the ratings likely to be assigned to drawdowns issued from the program with the specified priority of claim (e.g. senior or subordinated). To capture the contingent nature of a program rating, Moody's assigns provisional ratings to MTN programs. A provisional rating is denoted by a (P) in front of the rating and is defined elsewhere in this document.

The rating assigned to a drawdown from a rated MTN or bank/deposit note program is definitive in nature, and may differ from the program rating if the drawdown is exposed to additional credit risks besides the issuer's default, such as links to the defaults of other issuers, or has other structural features that warrant a different rating. In some circumstances, no rating may be assigned to a drawdown.

Moody's encourages market participants to contact Moody's Ratings Desks or visit moodys.com directly if they have questions regarding ratings for specific notes issued under a medium-term note program. Unrated notes issued under an MTN program may be assigned an NR (not rated) symbol.

Pledge-Specific Ratings

Pledge-specific ratings are opinions of the ability of a US state, local government, related entity, or nonprofit issuer to honor debt and debt-like obligations based upon specific security payment pledges or structural features.

Structured Finance Counterparty Instrument Ratings

Structured Finance Counterparty Instrument Ratings are assigned to a financial contract and measure the risk posed to a counterparty arising from a special purpose entity's (SPE's) default with respect to its obligations under the referenced financial contract.

Structured Finance Counterparty Ratings

Structured Finance Counterparty Ratings are assigned to structured financial operating companies and are founded upon an assessment of their ability and willingness to honor their obligations under financial contracts.

Structured Finance Interest Only Security (IO) Ratings

A structured finance IO is a stream of cash flows that is a fraction of the interest flows from one or multiple referenced securities or assets in a structured finance transaction. IO ratings address the likelihood and degree to which payments made to the IO noteholders will be impacted by credit losses to the security, securities or assets referenced by the IO. Such IO securities generally do not have a principal balance. Other non- credit risks, such as a prepayment of the referenced securities or assets, are not addressed by the rating, although they may impact payments made to the noteholders.

Underlying Ratings

An underlying rating is Moody's assessment of a particular obligation's credit quality absent any insurance or wrap from a financial guarantor or other credit enhancement.

For US municipal securities, the underlying rating will reflect the underlying issue's standalone credit quality absent any credit support provided by a state credit enhancement program.

US Municipal Short-Term Debt and Demand Obligation Ratings

We use the global short-term Prime rating scale for commercial paper issued by US municipalities and nonprofits. These commercial paper programs may be backed by external letters of credit or liquidity facilities, or by an issuer's self-liquidity.

For other short-term municipal obligations, we use one of two other short-term rating scales, the Municipal Investment Grade (MIG) and Variable Municipal Investment Grade (VMIG) scales discussed below.

MIG Ratings

We use the MIG scale for US municipal cash flow notes, bond anticipation notes and certain other short-term obligations, which typically mature in three years or less.

MIG Scale	
MIG 1	This designation denotes superior credit quality. Excellent protection is afforded by established cash flows, highly reliable liquidity support, or demonstrated broad-based access to the market for refinancing.
MIG 2	This designation denotes strong credit quality. Margins of protection are ample, although not as large as in the preceding group.
MIG 3	This designation denotes acceptable credit quality. Liquidity and cash-flow protection may be narrow, and market access for refinancing is likely to be less well-established.
SG	This designation denotes speculative-grade credit quality. Debt instruments in this category may lack sufficient margins of protection.

VMIG Ratings

For variable rate demand obligations (VRDOs), Moody's assigns both a long-term rating and a short-term payment obligation rating. The long-term rating addresses the issuer's ability to meet scheduled principal and interest payments. The short-term payment obligation rating addresses the ability of the issuer or the liquidity provider to meet any purchase price payment obligation resulting from optional tenders ("on demand") and/or mandatory tenders of the VRDO. The short-term payment obligation rating uses the VMIG scale. Transitions of VMIG ratings with conditional liquidity support differ from transitions of Prime ratings reflecting the risk that external liquidity support will terminate if the issuer's long-term rating drops below investment grade. Please see our methodology that discusses obligations with conditional liquidity support.

For VRDOs, we typically assign a VMIG rating if the frequency of the payment obligation is less than every three years. If the frequency of the payment obligation is less than three years, but the obligation is payable only with remarketing proceeds, the VMIG short-term rating is not assigned and it is denoted as "NR".

Industrial development bonds in the US where the obligor is a corporate may carry a VMIG rating that reflects Moody's view of the relative likelihood of default and loss. In these cases, liquidity assessment is based on the liquidity of the corporate obligor.

VMIG Scale	
VMIG 1	This designation denotes superior credit quality. Excellent protection is afforded by the superior short-term credit strength of the liquidity provider and structural and legal protections.
VMIG 2	This designation denotes strong credit quality. Good protection is afforded by the strong short-term credit strength of the liquidity provider and structural and legal protections.
VMIG 3	This designation denotes acceptable credit quality. Adequate protection is afforded by the satisfactory short-term credit strength of the liquidity provider and structural and legal protections.
SG	This designation denotes speculative-grade credit quality. Demand features rated in this category may be supported by a liquidity provider that does not have a sufficiently strong short-term rating or may lack the structural or legal protections.

Standard Linkages Between the Long-Term and MIG and VMIG Short-Term Rating Scales

The following table indicates the municipal long-term ratings consistent with the highest potential MIG and VMIG short-term ratings. The rating may be lower than indicated by this table when there are higher risks for investors.

LONG-TERM RATING	SHORT-TERM MIG AND VMIG RATINGS
Aaa, Aa1, Aa2, Aa3, A1, A2, A3	MIG 1 / VMIG 1
A3, Baa1, Baa2	MIG 2 / VMIG 2
Baa2, Baa3	MIG 3 / VMIG 3
Ba1, Ba2, Ba3 B1, B2, B3, Caa1, Caa2, Caa3 Ca, C	SG

National Scale Long-Term Ratings

Moody's long-term National Scale Ratings (NSRs) are opinions of the relative creditworthiness of issuers and financial obligations within a particular country. NSRs are not designed to be compared among countries; rather, they address relative credit risk within a given country. Moody's assigns national scale ratings in certain local capital markets in which investors have found the global rating scale provides inadequate differentiation among credits or is inconsistent with a rating scale already in common use in the country.

In each specific country, the last two characters of the rating indicate the country in which the issuer is located or the financial obligation was issued (e.g., Aaa.ke for Kenya).

Long-Term NSR Scale	
Aaa.n	Issuers or issues rated Aaa.n demonstrate the strongest creditworthiness relative to other domestic issuers and issuances.
Aa.n	Issuers or issues rated Aa.n demonstrate very strong creditworthiness relative to other domestic issuers and issuances.
A.n	Issuers or issues rated A.n present above-average creditworthiness relative to other domestic issuers and issuances.
Baa.n	Issuers or issues rated Baa.n represent average creditworthiness relative to other domestic issuers and issuances.
Ba.n	Issuers or issues rated Ba.n demonstrate below-average creditworthiness relative to other domestic issuers and issuances.
B.n	Issuers or issues rated B.n demonstrate weak creditworthiness relative to other domestic issuers and issuances.
Caa.n	Issuers or issues rated Caa.n demonstrate very weak creditworthiness relative to other domestic issuers and issuances.
Ca.n	Issuers or issues rated Ca.n demonstrate extremely weak creditworthiness relative to other domestic issuers and issuances.
C.n	Issuers or issues rated C.n demonstrate the weakest creditworthiness relative to other domestic issuers and issuances.

Note: Moody's appends numerical modifiers 1, 2, and 3 to each generic rating classification from Aa through Caa. The modifier 1 indicates that the obligation ranks in the higher end of its generic rating category; the modifier 2 indicates a mid-range ranking; and the modifier 3 indicates a ranking in the lower end of that generic rating category.

National Scale Short-Term Ratings

Moody's short-term NSRs are opinions of the ability of issuers or issuances in a given country, relative to other domestic issuers or issuances, to repay debt obligations that have an original maturity not exceeding thirteen months. Short-term NSRs in one country should not be compared with short-term NSRs in another country, or with Moody's global ratings.

There are four categories of short-term national scale ratings, generically denoted N-1 through N-4 as defined below.

In each specific country, the first two letters indicate the country in which the issuer is located (e.g., KE-1 through KE-4 for Kenya).

Short-Term NSR Scale	
N-1	N-1 issuers or issuances represent the strongest likelihood of repayment of short-term debt obligations relative to other domestic issuers or issuances.
N-2	N-2 issuers or issuances represent an above average likelihood of repayment of short-term debt obligations relative to other domestic issuers or issuances.
N-3	N-3 issuers or issuances represent an average likelihood of repayment of short-term debt obligations relative to other domestic issuers or issuances.
N-4	N-4 issuers or issuances represent a below average likelihood of repayment of short-term debt obligations relative to other domestic issuers or issuances.
Note: The short-term rating symbols P-1.za, P-2.za, P-3.za and NP.za are used in South Africa.	

The symbols for the long-term and short-term NSRs are:

» Czech Republic (.cz)
» Kazakhstan (.kz)
» Kenya (.ke)
» Lebanon (.lb)
» Morocco (.ma)
» Nigeria (.ng)
» Saudi Arabia (.sa)
» Slovakia (.sk)
» South Africa (.za)
» Tunisia (.tn)
» Turkiye (.tr)
» Ukraine (.ua)

Probability of Default Ratings

A probability of default rating (PDR) is a corporate family- level opinion of the relative likelihood that any entity within a corporate family will default on one or more of its long-term debt obligations. For families in default on all of their long-term debt obligations (such as might be the case in bankruptcy), a PDR of D-PD is assigned. For families in default on a limited set of their debt obligations, the PDR is appended by the indicator "/LD", for example, Caa1-PD/LD.

A D-PD probability of default rating is not assigned (or /LD indicator appended) until a failure to pay interest or principal extends beyond any grace period specified by the terms of the debt obligation.

A D-PD probability of default rating is not assigned (or /LD indicator appended) for distressed exchanges until they have been completed, as opposed to simply announced.

Adding or removing the "/LD" indicator to an existing PDR is not a credit rating action.

PDR Scale	
Aaa-PD	Corporate families rated Aaa-PD are judged to be of the highest quality, subject to the lowest level of default risk.
Aa-PD	Corporate families rated Aa-PD are judged to be of high quality and are subject to very low default risk.
A-PD	Corporate families rated A-PD are judged to be upper-medium grade and are subject to low default risk.
Baa-PD	Corporate families rated Baa-PD are judged to be medium-grade and subject to moderate default risk and as such may possess certain speculative characteristics.
Ba-PD	Corporate families rated Ba-PD are judged to be speculative and are subject to substantial default risk.
B-PD	Corporate families rated B-PD are considered speculative and are subject to high default risk.
Caa-PD	Corporate families rated Caa-PD are judged to be speculative of poor standing, subject to very high default risk, and may be in default on some but not all of their long-term debt obligations.
Ca-PD	Corporate families rated Ca-PD are highly speculative and are likely in, or very near, default on some but not all of their long-term debt obligations.
C-PD	Corporate families rated C-PD are the lowest rated and are typically in default on some but not all of their long-term debt obligations.
D-PD	Corporate families rated D are in default on all of their long-term debt obligations.

Note: Moody's appends numerical modifiers 1, 2, and 3 to each generic rating classification from Aa-PD through Caa-PD (e.g., Aa1-PD). The modifier 1 indicates that the obligation ranks in the higher end of its generic rating category; the modifier 2 indicates a mid-range ranking; and the modifier 3 indicates a ranking in the lower end of that generic rating category.

Other Permissible Services

Bond Fund Ratings

Bond Fund Ratings are opinions of the maturity-adjusted credit quality of investments within mutual funds and similar investment vehicles that principally invest in fixed income obligations. As such, these ratings primarily reflect Moody's assessment of the creditworthiness of the assets held by the fund, adjusted for maturity. Other risks, such as liquidity, operational, interest rate, currency and any other market risk, are excluded from the rating. Bond fund ratings specifically do not consider the historic, current, or prospective performance of a fund with respect to appreciation, volatility of net asset value, or yield.

Bond Fund Rating Scale	
Aaa-bf	Bond Funds rated Aaa-bf generally hold assets judged to be of the highest credit quality.
Aa-bf	Bond Funds rated Aa-bf generally hold assets judged to be of high credit quality.
A-bf	Bond Funds rated A-bf generally hold assets considered upper-medium credit quality.
Baa-bf	Bond Funds rated Baa-bf generally hold assets considered medium credit quality.
Ba-bf	Bond Funds rated Ba-bf generally hold assets judged to have speculative elements.
B-bf	Bond Funds rated B-bf generally hold assets considered to be speculative.
Caa-bf	Bond Funds rated Caa-bf generally hold assets judged to be of poor standing.
Ca-bf	Bond Funds rated Ca-bf generally hold assets that are highly speculative and that are likely in, or very near, default, with some prospect of recovery of principal and interest.
C-bf	Bond Funds rated C-bf generally hold assets that are in default, with little prospect for recovery of principal or interest.

Equity Fund Assessments

Moody's equity fund assessments are opinions of the relative investment quality of investment funds which principally invest in common stock or in a combination of common stock and fixed-income securities. Investment quality is typically judged based on the fund's historical performance relative to funds employing a similar investment strategy, as well as on the quality of the fund manager. The assessments are not opinions on prospective performance of a fund with respect to asset appreciation, volatility of net asset value or yield. They are not intended to be used to compare funds in different countries or even funds in the same country that are pursuing different investment strategies (e.g. balanced funds vs. equity funds).

Equity Fund Assessment Scale	
EF-1	Equity funds assessed at EF-1 have the highest investment quality relative to funds with a similar investment strategy.
EF-2	Equity funds assessed at EF-2 have high investment quality relative to funds with a similar investment strategy.
EF-3	Equity funds assessed at EF-3 have moderate investment quality relative to funds with a similar investment strategy.
EF-4	Equity funds assessed at EF-4 have low investment quality relative to funds with a similar investment strategy.
EF-5	Equity funds assessed at EF-5 have the lowest investment quality relative to funds with a similar investment strategy.

Indicative Ratings

An Indicative Rating is a confidential, unpublished, unmonitored, point-in-time opinion of the potential Credit Rating(s) of an issuer or a proposed debt issuance by an issuer contemplating such a debt issuance at some future date. Indicative Ratings are not equivalent to and do not represent traditional MIS Credit Ratings. However, Indicative Ratings are expressed on MIS's traditional rating scale.

Investment Manager Quality Assessments

Moody's Investment Manager Quality assessments are forward- looking opinions of the relative investment expertise and service quality of asset managers. An MQ assessment provides an additional tool for investors to aid in their investment decision- making process. Moody's MQ assessments provide general insights into the quality of an asset manager, including how it manages its investment offerings and serves its clientele.

MQ assessments do not indicate an asset manager's ability to repay a fixed financial obligation or satisfy contractual financial obligations, neither those entered by the firm nor any that may have been entered into through actively managed portfolios.

The assessments are also not intended to evaluate the performance of a portfolio, mutual fund, or other investment vehicle with respect to appreciation, volatility of net asset value, or yield. Instead, MQ assessments are opinions about the quality of an asset manager's management and client service characteristics as expressed through the symbols below.

Investment Manager Quality assessment definitions are as follows:

Manager Quality Assessment Scale	
MQ1	Investment managers assessed at MQ1 exhibit excellent management characteristics.
MQ2	Investment managers assessed at MQ2 exhibit very good management characteristics.
MQ3	Investment managers assessed at MQ3 exhibit good management characteristics.
MQ4	Investment managers assessed at MQ4 exhibit adequate management characteristics.
MQ5	Investment managers assessed at MQ5 exhibit poor management characteristics.

Money Market Fund Ratings

Moody's Money Market Fund Ratings are opinions of the investment quality of shares in mutual funds and similar investment vehicles which principally invest in short-term fixed income obligations. As such, these ratings incorporate Moody's assessment of a fund's published investment objectives and policies, the creditworthiness of the assets held by the fund, the liquidity profile of the fund's assets relative to the fund's investor base, the assets' susceptibility to market risk, as well as the management characteristics of the fund. The ratings are not intended to consider the prospective performance of a fund with respect to appreciation, volatility of net asset value, or yield.

Money Market Fund Rating Scale	
Aaa-mf	Money market funds rated Aaa-mf have very strong ability to meet the dual objectives of providing liquidity and preserving capital.
Aa-mf	Money market funds rated Aa-mf have strong ability to meet the dual objectives of providing liquidity and preserving capital.
A-mf	Money market funds rated Aa-mf have moderate ability to meet the dual objectives of providing liquidity and preserving capital.
Baa-mf	Money market funds rated Baa-mf have marginal ability to meet the dual objectives of providing liquidity and preserving capital.
B-mf	Money market funds rated B-mf are unable to meet the objective of providing liquidity and have marginal ability to meet the objective of preserving capital.
C-mf	Money market funds rated C-mf are unable to meet either objective of providing liquidity or preserving capital.

Net Zero Assessments

A Net Zero Assessment (NZA) represents our opinion of the strength of an entity's emissions reduction profile relative to a global net zero pathway consistent with the most ambitious goals of the 2015 Paris Agreement on climate change of limiting temperature increases to 1.5°C, with global net zero achieved in 2050. The assessment has three components: Ambition, Implementation, and Greenhouse Gases (GHG) Governance. Net Zero Assessments are expressed on a five-point scale that represents gradations of meaningful carbon transition profiles. Net Zero Assessments are point-in-time opinions.

Net Zero Assessment Scale

Score	Definition
NZ-1	The entity has a leading emissions reduction profile. Its emissions reduction targets are consistent with an ambition to limit temperature increases to at most 1.5 degrees Celsius. Implementation and governance oversights are supportive of reaching the ambitious targets.
NZ-2	The entity has an advanced emissions reduction profile. Its emissions reduction targets are consistent with an ambition to limit temperature increases to at most well below 2 degrees Celsius. Where targets are more ambitious, the score is constrained by implementation or governance risks.
NZ-3	The entity has a significant emissions reduction profile. Its emissions reduction targets are consistent with an ambition to limit temperature increases to at most 2 degrees Celsius. Where targets are more ambitious, the score is constrained by implementation or governance risks that are more material than for an NZ-2.
NZ-4	The entity has a constructive emissions reduction profile. Its emissions reduction targets are consistent with an ambition to limit temperature increases to at most 2.3 degrees Celsius. Where targets are more ambitious, the score is constrained by implementation or governance risks that are more material than for an NZ-3.
NZ-5[1]	The entity has a limited emissions reduction profile. Its emissions reduction targets are consistent with an ambition to limit temperature increases to at most 2.5 degrees Celsius. Some entities in this category may have more ambitious targets, but the score is constrained by implementation or governance risks that are more material than for an NZ-4.

[1] We do not provide Net Zero Assessments to entities whose carbon transition profiles do not imply a meaningful contribution towards climate goals, which we define as an implied temperature rise of 2.5 degrees Celsius or below relative to pre-industrial levels.

Source: Moody's Investors Service

Originator Assessments

Moody's Originator Assessments (OAs) provide general insights into the operational quality of originators' loan origination practices, relative to other originators of the same type of loans within a given country.

Moody's assigns originators one of the following five assessment levels: Strong, Above Average, Average, Below Average, Weak.

Rating Assessment Services

The Rating Assessment Service or RAS is a confidential, unpublished, unmonitored, point-in-time opinion relating to potential Credit Rating(s), or the potential impact on the current Credit Rating(s), given one or more hypothetical Scenario(s) (defined below) communicated to MIS in writing by a Rated Entity or other applicant. Rating Assessments are not equivalent to and do not represent traditional MIS Credit Ratings. However, Rating Assessments are expressed on or referenced to MIS's traditional rating scale.

A Scenario is (1) a proposed credit transforming transaction, project and/or debt issuance which materially alters the issuer's current state (including acquisitions, disposals, share buybacks, listings, initial public offerings and material restructurings) or (2) a proposed initial transaction, project and/or debt issuance; or materially different variation on any such transaction, project and/or debt issuance, including a material change in the overall size of the debt being contemplated.

Second Party Opinions - Sustainability Quality Scores

Moody's Second Party Opinions provide an assessment of how financial instruments or financing frameworks align to relevant sustainability principles and the extent to which they are expected to contribute to the issuer's advancement of long-term sustainable development. Moody's Second Party Opinions consider alignment with principles and contribution to sustainability. We express the overall assessment through the Sustainability Quality Score. Second Party Opinions are point-in-time opinions.

Second Party Opinion - Sustainability Quality Scores Scale	
SQS1	The financial instrument or financing framework is overall considered to be of excellent sustainability quality. Documentation and information are aligned with relevant principles and exhibit a high level of transparency and issuer accountability consistent with best practices, and the instrument or framework is expected to make a high contribution to the issuer's advancement of long-term sustainable development.
SQS2	The financial instrument or financing framework is overall considered to be of very good sustainability quality. Documentation and information are at least aligned with relevant principles and the instrument or framework is expected to make at least a significant contribution to the issuer's advancement of long-term sustainable development.
SQS3	The financial instrument or financing framework is overall considered to be of good sustainability quality. Documentation and information are typically at least aligned with relevant principles and the instrument or framework is expected to make at least a moderate contribution to the issuer's advancement of long-term sustainable development, or the documentation or information is partially aligned with relevant principles and is balanced by an expected high contribution.
SQS4	The financial instrument or financing framework is overall considered to be of intermediate sustainability quality. There are some weaknesses identified in the alignment of the documentation and information with relevant principles or in the contribution the financial instrument or financing framework is expected to make to the issuer's advancement of long-term sustainable development, with limited offsetting strengths.
SQS5	The financial instrument or financing framework is overall considered to be of weak sustainability quality. There are material weaknesses identified in the alignment of the documentation and information or in the contribution the financial instrument or financing framework is expected to make to the issuer's advancement of long-term sustainable development, with no or very limited offsetting strengths.

Servicer Quality Assessments

Moody's Servicer Quality Assessments (SQAs) provide general insights into the operational quality of servicers' loan servicing practices, relative to other servicers performing the same servicing role within a given country. SQAs are provided for servicers who act as the Primary Servicer (servicing the assets from beginning to end), Special Servicer (servicing only the more delinquent assets), or Master Servicer (overseeing the performance and reporting from underlying servicers). Each SQA is assigned for a specific servicing role by reference to the servicing activity and product type.

Servicer Quality Assessment Scale	
SQ1	Strong.
SQ2	Above average.
SQ3	Average.
SQ4	Below average.
SQ5	Weak.

Note: Where appropriate, a "+" or "-" modifier will be appended to the SQ2, SQ3, and SQ4 rating categories, a "-" modifier will be appended to the SQ1 assessment category and a "+" modifier will be appended to the SQ5 assessment category. A "+" modifier indicates the servicer ranks in the higher end of the designated assessment category. A "-" modifier indicates the servicer ranks in the lower end of the designated assessment category.

Other Rating Symbols

Provisional Ratings - (P)

Moody's will often assign a provisional rating to an issuer or an instrument when the change to a definitive rating is subject to the fulfilment of contingencies that could affect the rating. Examples of such contingencies are the finalization of transaction documents/terms where a rating is sensitive to changes at closing. When such contingencies are not present, a definitive rating may be assigned based upon documentation that is not yet in final form. Moody's will also often assign provisional ratings to program ratings, such as shelf registrations and medium term note programs. A provisional rating is denoted by placing a (P) in front of the rating. The (P) notation provides additional information about the rating, but does not indicate a different rating. For example, a provisional rating of (P)Aa1 is the same rating as Aa1.

For provisional ratings assigned to an issuer or instrument, the (P) notation is removed when the applicable contingencies have been fulfilled. A Credit Rating Action to remove the (P) notation indicates that the rating is no longer subject to contingencies, and changes the provisional rating to a definitive rating.[11] Program ratings for shelf registrations and other issuance programs remain provisional, while the subsequent ratings of issuances under these programs are assigned as definitive ratings.

Refundeds -

Issues that are secured by escrowed funds held in trust, reinvested in direct, non-callable US government obligations or non-callable obligations unconditionally guaranteed by the US Government or Resolution Funding Corporation are identified with a # (hash mark) symbol, e.g., #Aaa.

Withdrawn - WR

When Moody's no longer rates an obligation on which it previously maintained a rating, the symbol WR is employed. Please see Moody's Guidelines for the Withdrawal of Ratings, available on www.moodys.com.

Not Rated - NR

NR is assigned to an unrated issuer, obligation and/or program.

Not Available - NAV

An issue that Moody's has not yet rated is denoted by the NAV symbol.

Terminated Without Rating - TWR

The symbol TWR applies primarily to issues that mature or are redeemed without having been rated.

[11] Provisional ratings may also be assigned to unexecuted credit default swap contracts or other debt-like obligations that define specific credit risk exposures facing individual financial institutions. In such cases, the drafter of the swap or other debt-like obligation may have no intention of executing the agreement, and, therefore, the provisional notation is unlikely to ever be removed.

Research Transparency Assessments

Covenant Quality Assessments

Moody's covenant quality assessments measure the investor protections provided by key bond covenants within an indenture. The assessments are unmonitored, point-in-time scores, but may be updated as circumstances dictate. Key covenants assessed include provisions for restricted payments, change of control, limitations on debt incurrence, negative pledges, and merger restrictions, among others.

Inputs to Rating Services

Inputs to Rating Services are not Credit Ratings and they are expressed using differentiated symbols to distinguish them from Credit Ratings. Their use in helping to assign Credit Ratings is described in the respective Credit Rating Methodologies where they are used.

Baseline Credit Assessments

Baseline credit assessments (BCAs) are opinions of issuers' standalone intrinsic strength, absent any extraordinary support from an affiliate[12] or a government. BCAs are essentially an opinion on the likelihood of an issuer requiring extraordinary support to avoid a default on one or more of its debt obligations or actually defaulting on one or more of its debt obligations in the absence of such extraordinary support.

As probability measures, BCAs do not provide an opinion on the severity of a default that would occur in the absence of extraordinary support.

Contractual relationships between a government or an affiliate and a supported issuer and any expected ongoing annual subsidies from the government or an affiliate are incorporated in BCAs and, therefore, are considered intrinsic to an issuer's standalone financial strength. Extraordinary support is typically idiosyncratic in nature and is extended to prevent an issuer from becoming nonviable.

BCAs are expressed on a lower-case alpha-numeric scale that corresponds to the alpha-numeric ratings of the global long- term rating scale.

BCA Scale	
aaa	Issuers assessed aaa are judged to have the highest intrinsic, or standalone, financial strength, and thus subject to the lowest level of credit risk absent any possibility of extraordinary support from an affiliate or a government.
aa	Issuers assessed aa are judged to have high intrinsic, or standalone, financial strength, and thus subject to very low credit risk absent any possibility of extraordinary support from an affiliate or a government.
a	Issuers assessed a are judged to have upper-medium-grade intrinsic, or standalone, financial strength, and thus subject to low credit risk absent any possibility of extraordinary support from an affiliate or a government.
baa	Issuers assessed baa are judged to have medium-grade intrinsic, or standalone, financial strength, and thus subject to moderate credit risk and, as such, may possess certain speculative credit elements absent any possibility of extraordinary support from an affiliate or a government.
ba	Issuers assessed ba are judged to have speculative intrinsic, or standalone, financial strength, and are subject to substantial credit risk absent any possibility of extraordinary support from an affiliate or a government.
b	Issuers assessed b are judged to have speculative intrinsic, or standalone, financial strength, and are subject to high credit risk absent any possibility of extraordinary support from an affiliate or a government.
caa	Issuers assessed caa are judged to have speculative intrinsic, or standalone, financial strength, and are subject to very high credit risk absent any possibility of extraordinary support from an affiliate or a government.
ca	Issuers assessed ca have highly speculative intrinsic, or standalone, financial strength, and are likely to be either in, or very near, default, with some prospect for recovery of principal and interest; or, these issuers have avoided default or are expected to avoid default through the provision of extraordinary support from an affiliate or a government.
c	Issuers assessed c are typically in default, with little prospect for recovery of principal or interest; or, these issuers are benefiting from a government or affiliate support but are likely to be liquidated over time; without support there would be little prospect for recovery of principal or interest.

Note: Moody's appends numerical modifiers 1, 2, and 3 to each generic assessment classification from aa through caa. The modifier 1 indicates that the obligation ranks in the higher end of its generic assessment category; the modifier 2 indicates a mid-range ranking; and the modifier 3 indicates a ranking in the lower end of that generic assessment category.

12 Affiliate includes a parent, cooperative groups and significant investors (typically with a greater than 20 percent voting interest). Government includes local, regional and national governments.

Carbon Transition Indicators

Carbon transition indicators (CTIs) are assigned to companies in certain sectors. CTIs are scorecard-generated and use quantitative data and other indicators from issuers and third parties to provide a transparent and objective starting point for our assessment of the credit risk a company faces from carbon transition risk. CTIs inform the assignment of carbon transition issuer category scores under our Environmental Issuer Profile Scores (E-IPSs).

Carbon Transition Indicator Scale	
CT-1 Advanced	Issuers typically have a business model that benefits from the transition to a low-carbon economy.
CT-2-3 Strong	Issuers typically have a business model that is not expected to be materially affected by the carbon transition, or they have strategies and plans in place that substantially mitigate their carbon transition exposure.
CT-4-5 Moderate	Issuers typically have a business model that is subject to some exposure to carbon transition risks and their relative positioning within this category is determined by variations in the extent of their exposure to carbon risks, medium-term management actions and long-term resilience.
CT-6-7-8 Challenged	Issuers typically have a business model that is challenged, over the longer term, by the transition to a low-carbon economy.
CT-9-10 Highly Challenged	Issuers typically have a business model that is fundamentally inconsistent, over the longer term, with the transition to a low-carbon economy.

Counterparty Risk Assessments

Counterparty risk assessments (CR assessments) are opinions on the likelihood of a default by an issuer on certain senior operating obligations and other contractual commitments. CR assessments are assigned to legal entities in banking groups and, in some instances, other regulated institutions with similar bank-like senior obligations. CR assessments address the likelihood of default and do not take into consideration the expected severity of loss in the event of default.

Obligations and commitments typically covered by CR assessments include payment obligations associated with covered bonds (and certain other secured transactions), derivatives, letters of credit, third party guarantees, servicing and trustee obligations and other similar operational obligations that arise from a bank in performing its essential client-facing operating functions.

Long-term CR assessments reference obligations with an original maturity of eleven months or more. Short-term CR assessments reference obligations with an original maturity of thirteen months or less. CR assessments are expressed on alpha-numeric scales that correspond to the alpha-numeric ratings of the global long-term and short-term rating scales, with a “(cr)” modifier appended to the CR assessment symbols to differentiate them from our credit ratings.

CR Assessment Long-Term Scale	
Aaa(cr)	Issuers assessed Aaa(cr) are judged to be of the highest quality, subject to the lowest level of risk of defaulting on certain senior operating obligations and other contractual commitments.
Aa(cr)	Issuers assessed Aa(cr) are judged to be of high quality and are subject to very low risk of defaulting on certain senior operating obligations and other contractual commitments.
A(cr)	Issuers assessed A(cr) are judged to be upper-medium grade and are subject to low risk of defaulting on certain senior operating obligations and other contractual commitments.
Baa(cr)	Issuers assessed Baa(cr) are judged to be medium-grade and subject to moderate risk of defaulting on certain senior operating obligations and other contractual commitments and as such may possess certain speculative characteristics.
Ba(cr)	Issuers assessed Ba(cr) are judged to be speculative and are subject to substantial risk of defaulting on certain senior operating obligations and other contractual commitments.
B(cr)	Issuers assessed B(cr) are considered speculative and are subject to high risk of defaulting on certain senior operating obligations and other contractual commitments.
Caa(cr)	Issuers assessed Caa(cr) are judged to be speculative of poor standing and are subject to very high risk of defaulting on certain senior operating obligations and other contractual commitments.
Ca(cr)	Issuers assessed Ca(cr) are highly speculative and are likely in, or very near, default on certain senior operating obligations and other contractual commitments.
C(cr)	Issuers assessed C(cr) are the lowest rated and are typically in default on certain senior operating obligations and other contractual commitments.

Note: Moody's appends numerical modifiers 1, 2, and 3 to each generic assessment classification from Aa(cr) through Caa(cr). The modifier 1 indicates that the issuer ranks in the higher end of its generic assessment category; the modifier 2 indicates a mid-range ranking; and the modifier 3 indicates a ranking in the lower end of that generic assessment category.

CR Assessment Short-Term Scale	
P-1(cr)	Issuers assessed Prime-1(cr) have a superior ability to honor short-term operating obligations.
P-2(cr)	Issuers assessed Prime-2(cr) have a strong ability to honor short-term operating obligations.
P-3(cr)	Issuers assessed Prime-3(cr) have an acceptable ability to honor short-term operating obligations.
NP(cr)	Issuers assessed Not Prime(cr) do not fall within any of the Prime rating categories.

Country Ceilings

Moody's assigns long-term foreign and local currency ceilings to countries, expressed on the alphanumeric global long-term rating scale. Ceilings apply to the ratings of non-sovereign issuers, debt obligations, transactions and deposits in a country and facilitate the assignment of local and foreign currency ratings for bonds, other debt and debt-like obligations and deposits of locally domiciled issuers and obligors, including locally originated structured finance transactions.

Country ceilings reflect the non-diversifiable risk incurred by investors in any sovereign credit environment. For depositors, these risks affect the likelihood of being able to access deposits at any time and in their full amount. A local currency country ceiling reflects the general country-level risks that affect all local currency issues of locally domiciled obligors or structured finance transactions whose cash flows are primarily generated from domestic assets or residents. A foreign currency country ceiling builds in the transfer and convertibility risks that are incremental to the general country-level risks reflected in local currency country ceilings. Local currency country ceilings are relevant to obligations denominated in the currency of the country of domicile or origination. Foreign currency country ceilings are relevant to obligations denominated in a different currency than the currency of the country of domicile or origination.

Country ceilings indicate the highest rating level that Moody's generally assigns to the financially strongest issuers domiciled in a country, including the strongest structured finance transactions whose cash flows are generated predominantly from domestic assets or residents. In other words, ceilings generally act as a cap on ratings for locally domiciled issuers and locally originated structured finance transactions. Notwithstanding the foregoing, obligations benefiting from meaningful support mechanisms, assets or cash flows based outside the country may on occasion be rated higher than the country ceiling. Applied to deposits, local and foreign ceilings indicate the highest rating level that Moody's generally assigns to deposit obligations of domestic and foreign branches of banks headquartered in that domicile (including local subsidiaries of foreign banks), while foreign currency ceilings also apply to the branches of foreign banks operating in that domicile.

Ceilings apply to long-term and short-term obligations. The short-term ceiling equivalent can be inferred from the alphanumeric level of the country ceiling. The mapping of short-term ceiling equivalents is the same as the mapping of short-term ratings from long-term ratings.[13] While the mapping includes some overlap in the short-term equivalent that can be inferred from a given country ceiling, countries with ceilings between A3 and Baa2 typically map to a short-term equivalent of P-2.

Credit Estimates

A Credit Estimate (CE) is an unpublished point-in-time opinion of the approximate credit quality of individual securities, financial contracts, issuers, corporate families or loans. CEs are not Moody's Credit Ratings and are not assigned by rating committees. Had Moody's conducted an analysis commensurate with a full Moody's Credit Rating, the result may have been significantly different. Additionally, CEs are not monitored but are often updated from time to time.

CEs are widely used in the process of assessing elements of credit risk in transactions for which a traditional Moody's Credit Rating is to be determined. CEs are provided in the context of granular pools (where no one obligor represents an exposure of more than 3% of the total pool), chunky pools (where individual exposures represent 3% or more of the total pool) or single-name exposures.

CEs are typically assigned based on an analysis that uses public information (which at times may be limited) or information supplied by various third parties and usually does not involve any participation from the underlying obligor.

CEs are not expressed through the use of Moody's traditional 21-point, Aaa-C alphanumeric long-term rating scale; rather, they are expressed on a simple numerical 1-21 scale. They are calibrated, however, to be broadly comparable to Moody's alphanumeric rating scale and Moody's Rating Factors, which are used in CDO analysis.

[13] Please see the table showing standard linkage between the global long-term and short-term rating scales in this document.

ESG Issuer Profile Scores

Environmental (E), Social (S) and Governance (G) Issuer Profile Scores (E, S and G IPS) are opinions of an issuer or transaction's exposure to E, S and G considerations. The IPS incorporate meaningful mitigating or strengthening actions related to those specific exposures.

E, S and G Issuer Profile Scoring Scale	
E-1 S-1 G-1	Issuers or transactions with an issuer profile score of 1 typically have exposures to E or S issues that carry material credit benefits. For G, issuers or transactions typically have exposure to G considerations that, in the context of their sector, positions them strongly, with material credit benefits.
E-2 S-2 G-2	Issuers or transactions with an issuer profile score of 2 typically have exposures to E or S issues that are not material in differentiating credit quality. In other words, they could be overall slightly credit-positive, credit neutral, or slightly credit-negative. An issuer or transaction may have a IPS score of 2 because the exposure is not material or because there are mitigants specifically related to any E or S risks that are sufficient to offset those risks. Issuers or transactions with an issuer profile score of 2 typically have exposure to G considerations that, in the context of their sector, positions them as average, and the exposure is overall neither credit-positive nor negative.
E-3 S-3 G-3	Issuers or transactions with an issuer profile score of 3 typically have moderate credit exposures to E or S risks. These issuers may demonstrate some mitigants specifically related to the identified E or S risks, but they are not sufficiently material to fully offset the risks. Issuers or transactions with an issuer profile score of 3 typically have moderate credit exposure to G risks that, in the context of the sector, positions them below average.
E-4 S-4 G-4	Issuers or transactions with an issuer profile score of 4 typically have high credit exposures to E or S risks. These issuers may demonstrate some mitigants specifically tied to the E or S risks identified, but they generally have limited effect on the risks. Issuers or transactions with an issuer profile score of 4 typically have high credit exposure to G risks that, in the context of their sector, positions them more weakly than issuers with an issuer profile score of 3.
E-5 S-5 G-5	Issuers or transactions with an issuer profile score of 5 typically have very high credit exposures to E or S risks. While these issuers or transactions may demonstrate some mitigants specifically related to the identified E or S risks, they are not meaningful relative to the magnitude of the risks. Issuers or transactions with an issuer profile score of 5 typically have very high credit exposure to G risks that in the context of their sector, positions them more weakly than issuers with an issuer profile score of 4.

Loss Given Default Assessments

Moody's Loss Given Default (LGD) assessments are point-in-time opinions about expected loss given default expressed as a percent of principal and accrued interest at the resolution of the default.[14] LGD assessments are assigned to individual loan, bond, and preferred stock issues. The firm-wide or enterprise expected LGD rate generally approximates a weighted average of the expected LGD rates on the firm's liabilities (excluding preferred stock), where the weights equal each obligation's expected share of the total liabilities at default. LGD assessments are typically updated when there are material changes to a company's capital structure or at the time of a Credit Rating Action.

LGD Assessment Scale

Assessments	Loss range
LGD1	≥ 0% and < 10%
LGD2	≥ 10% and < 30%
LGD3	≥ 30% and < 50%
LGD4	≥ 50% and < 70%
LGD5	≥ 70% and < 90%
LGD6	≥ 90% and ≤ 100%

Q-scores

Q-scores are assessments that are scorecard generated, unpublished, point-in-time estimates of the approximate credit quality of sub-sovereign entities globally (such as states, regions, provinces, territories, counties, cities and closely related entities). Depending on circumstances, these can be for an individual sub-sovereign entity or sector-wide assessments. Q-scores assist in the analysis of mean portfolio credit risk and represent the distribution of credit risk from the underlying exposures in a large pool.[15] Q-scores are not equivalent to and do not represent traditional Moody's Credit Ratings and are not assigned by a rating committee. Q-scores are not expressed through the use of Moody's traditional 21-point, Aaa-C alphanumeric long-term rating scale; rather, they are expressed on a numerical 1.q-21.q scale.

14 The expected LGD rate is 100% minus the expected value that will be received at default resolution, discounted by the coupon rate back to the date the last debt service payment was made, and divided by the principal outstanding at the date of the last debt service payment.

15 There may be instances in which the pool is not large but the Q-score represents a small portion of the transaction.

Speculative Grade Liquidity Ratings

Moody's Speculative Grade Liquidity Ratings are opinions of an issuer's relative ability to generate cash from internal resources and the availability of external sources of committed financing, in relation to its cash obligations over the coming 12 months. Speculative Grade Liquidity Ratings will consider the likelihood that committed sources of financing will remain available. Other forms of liquidity support will be evaluated and consideration will be given to the likelihood that these sources will be available during the coming 12 months. Speculative Grade Liquidity Ratings are assigned to speculative grade issuers that are by definition Not Prime issuers.

SGL Rating Scale	
SGL-1	Issuers rated SGL-1 possess very good liquidity. They are most likely to have the capacity to meet their obligations over the coming 12 months through internal resources without relying on external sources of committed financing.
SGL-2	Issuers rated SGL-2 possess good liquidity. They are likely to meet their obligations over the coming 12 months through internal resources but may rely on external sources of committed financing. The issuer's ability to access committed sources of financing is highly likely based on Moody's evaluation of near-term covenant compliance.
SGL-3	Issuers rated SGL-3 possess adequate liquidity. They are expected to rely on external sources of committed financing. Based on its evaluation of near-term covenant compliance, Moody's believes there is only a modest cushion, and the issuer may require covenant relief in order to maintain orderly access to funding lines.
SGL-4	Issuers rated SGL-4 possess weak liquidity. They rely on external sources of financing and the availability of that financing is, in Moody's opinion, highly uncertain.

Structured Credit Assessments (SCAs)

Structured Credit Assessments (SCAs) are opinions of the relative credit quality of financial obligations that are collateral assets within securitizations. SCAs incorporate the credit implications of structural features of the securitization that are not intrinsic to the obligation, such as servicing, liquidity arrangements and tail periods.[16] In contrast, credit ratings on these same instruments do not reflect these structural features, as they would not be available to investors that invest in these assets directly outside of the securitization's structure.

Structured Credit Assessments are opinions of the expected loss associated with the financial obligation in the context of the corresponding securitization transaction and are expressed, with the sca indicator, on a lower-case alpha-numeric scale that corresponds to the alpha-numeric ratings of the global long- term rating scale.

SCA Scale	
aaa (sca)	Financial obligations assessed aaa (sca) are judged to have the highest credit quality and thus subject to the lowest credit risk, when used as inputs in determining a structured finance transaction's rating.
aa (sca)	Financial obligations assessed aa (sca) are judged to have high credit quality and thus subject to very low credit risk, when used as inputs in determining a structured finance transaction's rating.
a (sca)	Financial obligations assessed a (sca) are judged to have upper-medium credit quality and thus subject to low credit risk, when used as inputs in determining a structured finance transaction's rating.
baa (sca)	Financial obligations assessed baa (sca) are judged to have medium-grade credit quality and thus subject to moderate credit risk, and as such, may possess certain speculative credit elements, when used as inputs in determining a structured finance transaction's rating.
ba (sca)	Financial obligations assessed ba (sca) are judged to have speculative credit quality and subject to substantial credit risk, when used as inputs in determining a structured finance transaction's rating.
b (sca)	Financial obligations assessed b (sca) are judged to have speculative credit quality and subject to high credit risk, when used as inputs in determining a structured finance transaction's rating.
caa (sca)	Financial obligations assessed caa (sca) are judged to have speculative credit quality and subject to very high credit risk, when used as inputs in determining a structured finance transaction's rating.
ca (sca)	Financial obligations assessed ca (sca) are judged to be highly speculative and are likely to be either in, or very near, default, with some prospect for recovery of principal or interest, when used as inputs in determining a structured finance transaction's rating.
c (sca)	Financial obligations assessed c (sca) are typically in default with little prospect for recovery of principal or interest, when used as inputs in determining a structured finance transaction's rating.

Notes:

1. Moody's appends numerical modifiers 1, 2, and 3 to each generic assessment classification from aa (sca) through caa (sca). The modifier 1 indicates that the obligation ranks in the higher end of its generic assessment category; the modifier 2 indicates a mid-range ranking; and the modifier 3 indicates a ranking in the lower end of that generic assessment category.
2. The modifier pd indicates a probability of default structured credit assessment (for example aaa (sca.pd)). A probability of default structured credit assessment is an opinion of the relative likelihood that the financial instrument will default.

[16] Structural features of securitisations often include: servicing of the loans by third party experts, liquidity arrangements to mitigate specific risks or the risk of short term cash flow interruptions, and tail periods between the loan maturity date and the loss calculation date to allow for an orderly sale of the assets upon default.

Timely Payment Indicator (TPI)

A Timely Payment Indicator is an assessment of the likelihood of timely payment of interest and principal to covered bondholders following a covered bond anchor event. TPIs are assessed as Very High, High, Probable-High, Probable, Improbable or Very Improbable.

Other Definitions

ESG Credit Impact Scores

ESG credit impact scores (CISs) communicate the impact of ESG considerations on the rating of an issuer or transaction. The CIS is based on Moody's qualitative assessment of the impact of ESG considerations in the context of the issuer's or transaction's other credit drivers that are material to a given rating.

ESG Credit Impact Score Scale	
CIS-1	ESG considerations have a positive impact on the current rating which is higher than it would have been in the absence of ESG considerations.
CIS-2	ESG considerations do not have a material impact on the current rating.
CIS-3	ESG considerations have a limited impact on the current rating, with potential for greater negative impact over time.
CIS-4	ESG considerations have a discernible impact on the current rating, which is lower than it would have been if ESG risks did not exist. The negative impact of ESG considerations on the rating is higher than for an issuer scored CIS-3.
CIS-5	ESG considerations have a pronounced impact on the current rating, which is lower than it would have been if ESG risks did not exist. The negative impact of ESG considerations on the rating is higher than for an issuer scored CIS-4.

Rating Outlooks

A Moody's rating outlook is an opinion regarding the likely rating direction over the medium term. Rating outlooks fall into four categories: Positive (POS), Negative (NEG), Stable (STA), and Developing (DEV). Outlooks may be assigned at the issuer level or at the rating level. Where there is an outlook at the issuer level and the issuer has multiple ratings with differing outlooks, an "(m)" modifier to indicate multiple will be displayed and Moody's press releases will describe and provide the rationale for these differences. A designation of RUR (Rating(s) Under Review) is typically used when an issuer has one or more ratings under review, which overrides the outlook designation. A designation of RWR (Rating(s) Withdrawn) indicates that an issuer has no active ratings to which an outlook is applicable. Rating outlooks are not assigned to all rated entities. In some cases, this will be indicated by the display NOO (No Outlook).

A stable outlook indicates a low likelihood of a rating change over the medium term. A negative, positive or developing outlook indicates a higher likelihood of a rating change over the medium term. A rating committee that assigns an outlook of stable, negative, positive, or developing to an issuer's rating is also indicating its belief that the issuer's credit profile is consistent with the relevant rating level at that point in time.

The time between the assignment of a new rating outlook and a subsequent rating action has historically varied widely, depending upon the pace of new credit developments which materially affect the issuer's credit profile. On average, after the initial assignment of a positive or negative rating outlook, the next rating action – either a change in outlook, a rating review, or a change in rating – has followed within about a year, but outlooks have also remained in place for much shorter and much longer periods of time. Historically, approximately one-third of issuers have been downgraded (upgraded) within 18 months of the assignment of a negative (positive) rating outlook. After the initial assignment of a stable outlook, about 90% of ratings experience no change in rating during the following year.

Rating Reviews

A review indicates that a rating is under consideration for a change in the near term.[17] A rating can be placed on review for upgrade (UPG), downgrade (DNG), or more rarely with direction uncertain (UNC). A review may end with a rating being upgraded, downgraded, or confirmed without a change to the rating. Ratings on review are said to be on Moody's "Watchlist" or "On Watch". Ratings are placed on review when a rating action may be warranted in the near term but further information or analysis is needed to reach a decision on the need for a rating change or the magnitude of the potential change.

The time between the origination of a rating review and its conclusion varies widely depending on the reason for the review and the amount of time needed to obtain and analyze the information relevant to make a rating determination. In some cases, the ability to conclude a review is dependent on whether a specific event occurs, such as the completion of a corporate merger or the execution of an amendment to a structured finance security. In these event-dependent cases and other unique situations, reviews can sometimes last 90 to 180 days or even longer. For the majority of reviews, however, where the conclusion of the review is not dependent on an event whose timing Moody's cannot control, reviews are typically concluded within 30 to 90 days.

Ratings on review for possible downgrade (upgrade) have historically concluded with a downgrade (upgrade) over half of the time.

Confirmation of a Rating

A Confirmation is a public statement that a previously announced review of a rating has been completed without a change to the rating.

Affirmation of a Rating

An Affirmation is a public statement that the current Credit Rating assigned to an issuer or debt obligation, which is not currently under review, continues to be appropriately positioned. An Affirmation is generally issued to communicate Moody's opinion that a publicly visible credit development does not have a direct impact on an outstanding rating.

Anticipated Ratings Process

The process by which a provisional notation may be removed from a Credit Rating assigned to an instrument or issuer, when the applicable contingencies which were the basis for affixing the (P) notation are deemed to have been fulfilled. For example, when a rating of (P)Baa1 is assigned to a debt instrument, it is anticipated that the (P) notation will be removed from the Baa1 rating when it is determined that the contingencies indicated by the (P) notation have been fulfilled.

Subsequent Ratings Process

The process of assigning Credit Ratings (together with the associated outlook or review status, if applicable) that are derived exclusively by reference to an existing Credit Rating of a program, series, category/class of debt or primary Rated Entity. This includes:

- » Assignment of a Credit Rating to issuance of debt within or under an existing rated program where the transaction structure and terms have not changed in a manner that would affect the Credit Rating indicated by the program rating (examples include covered bond programs, shelf registrations, and medium term note programs);
- » Credit Ratings assigned based on the pass-through of a primary Rated Entity's Credit Rating, including monoline or guarantee linked ratings;

[17] Baseline Credit Assessments and Counterparty Risk Assessments may also be placed on review.

» Assignment of Credit Ratings to debt instruments of the same seniority as previously rated debt when such issuance of debt is contemplated in the existing Credit Ratings. Examples include ratings on debt issued by frequent corporate and government issuers. This also includes Credit Ratings assigned to new debts, new programs, or amended and extended credit facilities by reference to an existing rating of the same debt class, at the same rating level, whether or not the new debts or programs replace similarly structured debts, programs or credit facilities.

Rating Agency Conditions (RACs)

Parties to a transaction sometimes choose to include clauses in the transaction documents that require a party thereto to obtain an opinion from a rating agency that certain specified actions, events, changes to the structure of, or amendments to the documentation of, the transaction will not result in a reduction or withdrawal of the current rating maintained by that rating agency. Such an opinion is referred to by Moody's as a "RAC" and consists of a letter or other written communication, such as a press release, from Moody's issued after consideration of a request that Moody's provide a RAC. The decision to issue a RAC remains entirely within Moody's discretion, and Moody's may choose not to provide a RAC even if the transaction documents require it. When Moody's chooses to issue a RAC, the RAC reflects Moody's opinion solely that the specified action, event, change in structure or amendment, in and of itself and as of that point in time, will not result in a reduction, placement on review for possible downgrade or withdrawal of Moody's current rating on the debt. A RAC is not a "confirmation" or "affirmation" of the rating, as those terms are defined elsewhere in this Rating Symbols and Definitions publication, nor should it be interpreted as Moody's "approval of" or "consent to" the RAC subject matter.

Definition of Default

Moody's definition of default is applicable only to debt or debt- like obligations (e.g., swap agreements). Four events constitute a debt default under Moody's definition:

a. a missed or delayed disbursement of a contractually-obligated interest or principal payment (excluding missed payments cured within a contractually allowed grace period[18]), as defined in credit agreements and indentures;
b. a bankruptcy filing or legal receivership by the debt issuer or obligor that will likely cause a miss or delay in future contractually-obligated debt service payments;
c. a distressed exchange whereby 1) an issuer offers creditors a new or restructured debt, or a new package of securities, cash or assets, that amount to a diminished value relative to the debt obligation's original promise and 2) the exchange has the effect of allowing the issuer to avoid a likely eventual default;
d. a change in the payment terms of a credit agreement or indenture imposed by the sovereign that results in a diminished financial obligation, such as a forced currency re-denomination (imposed by the debtor, or the debtor's sovereign) or a forced change in some other aspect of the original promise, such as indexation or maturity.[19]

We include distressed exchanges in our definition of default in order to capture credit events whereby issuers effectively fail to meet their debt service obligations but do not actually file for bankruptcy or miss an interest or principal payment. Moody's employs fundamental analysis in assessing the likelihood of future default and considers various indicators in assessing loss relative to the original promise, which may include the yield to maturity of the debt being exchanged.

Moody's definition of default does not include so-called "technical defaults," such as maximum leverage or minimum debt coverage violations, unless the obligor fails to cure the violation and fails to honor the resulting debt acceleration which may be required. For structured finance securities, technical defaults (such as breach of an overcollateralization test or certain other events of default as per the legal documentation of the issuer), or a temporary (i.e., less than twelve months) missed interest payment on a security

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18 Among some structured finance asset classes, missed scheduled payments impose meaningful investor losses even though such payments are not contractually obligated. Therefore, for structured finance securities, Moody's practice is to recognize that a default has occurred if a material interest payment has been missed (this excludes allowable deferrals not driven by credit stress) for 12 months or longer or if there has been a material principal loss (or writedown) to the security. If such an interest or principal shortfall is subsequently reduced below the materiality threshold of 50 basis points of the original balance of the security, then the default is cured. Note that when a structured finance default is completely cured, we consider retrospectively that no default has taken place for the purposes of our studies on ratings performance.

19 Moreover, unlike a general tax on financial wealth, the imposition of a tax by a sovereign on the coupon or principal payment on a specific class of government debt instruments (even if retroactive) would represent a default. Targeted taxation on government securities would represent a default even if the government's action were motivated by fairness or other considerations, rather than inability or unwillingness to pay.

whose terms allow for the deferral of such payments together with corresponding interest (such as PIKable securities) prior to its legal final maturity date do not constitute defaults.

Also excluded are payments owed on long-term debt obligations which are missed due to purely technical or administrative reasons which are 1) not related to the ability or willingness to make the payments and 2) are cured in very short order (typically, 1-2 business days after the technical/administrative issue is recognized).[20] Finally, in select instances based on the facts and circumstances, missed payments on financial contracts or claims may be excluded if they are the result of legal disputes regarding the validity of those claims.

Definition of Impairment

A security is impaired when investors receive — or expect to receive with near certainty — less value than would be expected if the obligor were not experiencing financial distress or otherwise prevented from making payments by a third party, even if the indenture or contractual agreement does not provide the investor with a natural remedy for such events, such as the right to press for bankruptcy.

Moody's definition of impairment is applicable to debt or debt-like obligations (e.g., swap agreements), as well as preferred stock and other hybrid securities. A security is deemed to be impaired upon the occurrence of:

a. any event that meets the definition of default (above);
b. contractually-allowable payment omissions of scheduled dividends, interest or principal payments on preferred stock or other hybrid instruments;[21]
c. write-downs or "impairment distressed exchanges"[22] of preferred stock or other hybrid instruments due to financial distress whereby (1) the principal promise to an investor is reduced according to the terms of the indenture or other governing agreement,[23] or (2) an obligor offers investors a new or restructured security, or a new package of securities, cash or assets and the exchange has the effect of allowing the obligor to avoid a contractually-allowable payment omission as described in b) above; or[24]
d. rating actions leading to an assignment of a rating of Ca or C, signaling the near certain expectation of a significant level of future losses.

The impairment status of a security may change over time as it migrates from impaired to cured (e.g., if initially deferred cumulative preferred dividends are ultimately paid in full) and possibly back again to impaired. If a security is upgraded above a Ca rating then the impairment based on clause d above will be cured. Also, if a security having a Ca or C rating has its rating withdrawn and the security has been paid in full without a loss, its impairment is cured. Note that when a structured finance impairment is completely cured, we consider retrospectively that no impairment has taken place for the purposes of our studies on ratings performance.

Definition of Loss-Given-Default

The loss-given-default rate for a security is 100% minus the value that is received at default resolution (which may occur at a single point in time or accrue over an interval of time), discounted by the coupon rate back to the date the last debt service payment was made, divided by the principal outstanding at the date of the last debt service payment.

20 See "Assessing the Rating Impact of Debt Payments That Are Missed for Operational or Technical Reasons", Moody's Special Comment, April 2013. For the avoidance of doubt, payments missed due to reasons that are not purely technical or administrative, such as payments missed due to potential failures of distributed ledger technology or as the result of sovereign political sanctions, for example, do constitute defaults.

21 In this context, the exercise of a payment-in-kind option embedded in a fundamental debt security is an impairment event. Similar to default events, excluded from impairment events are 1) missed payments due to purely technical or administrative reasons which are not related to the ability or willingness to make the payments and 2) are remedied in very short order (typically, 1-2 business days after the technical/administrative issue is recognized).

22 Impairment distressed exchanges are similar to default distressed exchanges except that they have the effect of avoiding an impairment event, rather than a default event.

23 Once written down, complete cures, in which securities are written back up to their original balances are extraordinarily rare; moreover, in most cases, a write-down of principal leads to an immediate and permanent loss of interest for investors, since the balance against which interest is calculated has been reduced.

24 Examples of such impairments include mandatory conversions of contingent capital securities to common equity and mandatory write-downs of other hybrid securities that are the direct result of obligor distress.

In the special case of a distressed exchange default, when an investor is given new or modified securities in exchange, the LGD rate is 100% minus the trading value of the new securities received in exchange at the exchange date divided by the par value plus accrued interest of the original securities as of the exchange date.

Long-Term Credit Ratings for Defaulted or Impaired Securities

When a debt instrument becomes impaired or defaults or is very likely to become impaired or to default, Moody's rating on that instrument will reflect our expectations for recovery of principal and interest, as well as the uncertainty around that expectation, as summarized in the table below.[25] Given the usual high level of uncertainty around recovery rate expectations, the table uses approximate expected recovery rates and is intended to present rough guidance rather than a rigid mapping.

Approximate Expected Recoveries Associated with Ratings for Defaulted or Impaired Securities

Expected Recovery Rate	Fundamental	Structured Finance
99 to 100%*	B1*	B1 (sf)*
97 to 99%*	B2*	B2 (sf)*
95 to 97%*	B3*	B3 (sf)*
90 to 95%	Caa1	Caa1 (sf)
80 to 90%	Caa2	Caa2 (sf)
65 to 80%	Caa3	Caa3 (sf)
35 to 65%	Ca	Ca (sf)
Less than 35%	C	C (sf)

* For instruments rated B1, B2, or B3, the uncertainty around expected recovery rates should also be low. For example, if a defaulted security has a higher than a 10% chance of recovering less than 90%, it would generally be rated lower than B3.

Additionally, the table may not apply directly in a variety of unusual circumstances. For example, a security in default where the default is likely to be fully cured over the short-term but remain very risky over a longer horizon might be rated much lower than suggested by this table. At the other end of the rating scale, very strong credits that experience temporary default events that have no impact on expected credit losses might be rated much higher than B1 but no higher than Baa1. Under very rare circumstances a structured finance debt security may incur a one-time principal write-down that is very small (considerably less than 1% of par) and is not expected to recur.[26] In such cases, Moody's will add this small loss amount to its calculations of the expected loss associated with the security and may rate it higher than B1.

Securities in default where recovery rates are expected to be greater than 95% can be rated in the B category as outlined in the table above. In order to be assigned a rating in the B category, the confidence level regarding the expected recovery rates should also be high. Or in other words, uncertainty should be low. As stated in the footnote to the table, if a security has a higher than a 10% chance of recovering less than 90%, then it would generally be rated lower than B3.

[25] The approach to impairment is consistent with the approach to default. When an instrument is impaired or very likely to become impaired, the rating will reflect the expected loss relative to the value that was originally expected absent financial distress.

[26] For example, some master servicers of US RMBS implemented a new loan modification program and divided the cost of its administration across all their transactions, resulting in a loss of a few hundred dollars per security. In other examples some rated synthetic transactions have seen a very small loss attributable to the non payment of a very small CDS premium.

Credit Rating Methodologies

Our credit rating methodologies describe the analytical framework rating committees use to assign ratings. As set forth in the methodologies, they are not intended to present an exhaustive treatment of all factors reflected in our ratings. Rather, they describe the key qualitative and quantitative considerations that are usually most important for assessing credit risk in a given sector. Each rating committee applies its own judgment in determining how to emphasize rating factors.

Most of our credit rating methodologies focus on a particular industry sector or class of issuer or transaction. These primary methodologies may incorporate similar industries, sectors or classes that are not specifically cited. Primary methodologies have sufficient analytical flexibility that collectively provide an analytical framework that can be used to assign ratings to almost any debt instrument or debt issuer. Other methodologies describe our approach to analytical considerations that aren't specific to any single sector or class of issuer. These methodologies are referred to as cross-sector methodologies, and they cover general credit-related topics and are typically used in conjunction with primary methodologies to assign credit ratings.

Methodologies governing fundamental credits (e.g., non- financial corporates, financial institutions and governments) generally (though not always) incorporate a scorecard. A scorecard is a reference tool explaining the factors that are generally most important in assigning ratings. It is a summary, and does not contain every rating consideration. The weights shown for each factor and sub-factor in the scorecard represent an approximation of their typical importance for rating decisions, but the actual importance of each factor may vary significantly depending on the circumstances of the issuer and the environment in which it is operating. In addition, quantitative factor and sub-factor variables generally use historical data, but our rating analyses are based on forward- looking expectations. Each rating committee will apply its own judgment in determining whether and how to emphasize rating factors which it considers to be of particular significance given, for example, the prevailing operating environment. As a consequence, assigned ratings may fall outside the range or level indicated by the scorecard.

Methodologies governing structured finance credits often mention one or more rating models. A structured finance ratings model is a reference tool that explains how certain rating factors are considered in estimating a loss distribution for the collateral assets, or how the interplay between collateral cash flows, capital structure and credit enhancement jointly influence the credit risk of different tranches of securities. While methodologies may contain fixed values for key model parameters to be applied to transactions across an entire sector, individual rating committees are expected to employ judgment in determining model inputs, and rating committee deliberations may fall outside model-indicated outputs.

While most methodologies relate to a particular industry, sector or class of issuers or transactions, a small number — cross-sector methodologies, many originally issued as 'Rating Implementation Guidance' — have implications for a number of (and in some cases all) sectors. Examples include the methodologies which govern:

- » the assignment of short-term ratings across the Fundamental Group;
- » the use of credit estimates in the analysis of structured finance transactions;
- » the linkage between sovereign ratings and related ratings in other Fundamental Groups;
- » the 'notching' guidelines used to assign ratings to different classes of corporate debt;
- » and the determination of country ceilings.

Typically, these are broad commentaries, the output of which may be general guidance to committees on ranges or caps on ratings rather than a specific rating assignment and which, to a greater extent than sector-specific methodologies, set out broad principles and relationships rather than detailed risk factors which can be summarized in a scorecard. However, in other respects cross-sector methodologies are no different from any sector-specific methodology, in providing an analytical framework to promote consistency rather than a set of rules which must be applied rigidly in all circumstances.

Key Rating Assumptions

Methodologies may (but need not) contain separately identifiable key rating assumptions ("KRAs"). KRAs are the fixed inputs (sometimes expressed as a possible range of values) described in Credit Rating Methodologies such as mathematical or correlation assumptions which are common to broad classes of ratings, may be common to multiple Credit Rating Methodologies, and which inform rating committee judgments in assigning ratings across each class. KRAs are considered methodological and are subject to the same governance process as the methodology to which they relate, including the need for any changes to be approved by the relevant Policy Committee within MIS.

KRAs are, by their nature, relatively stable inputs to the analytical process, and because they seek to bring a degree of stability, consistency and transparency to something that may in practice be uncertain, they are intended to be reasonably resilient to change. They may change over time in response to long-term structural changes or as more is learned about long- run relationships between risk factors, but they would be very unlikely to change as a result of a short-run change in economic or financial market conditions.

By contrast, credit judgments reached in rating committees regarding the impact of prevailing credit conditions on ratings within a particular sector, country or region are not KRAs, even where those judgments affect a large number of Credit Ratings (for example because they alter a country ceiling, systemic support indicator or a Timely Payment Indicator). Moreover, rating committees will, from time to time, reach credit judgments in relation to the application of KRAs in the assignment of credit ratings for a particular deal or set of deals which are the subject of that rating committee, to reflect prevailing credit conditions in the relevant region or sub-sector (for example to apply higher or lower correlation assumptions while a given set of credit conditions persist). Such judgments would not be deemed to have amended a KRA, since they were not intended to be applied consistently and systematically across most if not all debt instruments covered by the relevant methodology, and in a manner which was largely insensitive to further changes in credit conditions. Macro-economic or financial market projections which are by definition specific to a particular point in time are not KRAs.

For Structured Finance Credit Rating Methodologies, KRAs are generally assumptions that underlie the overall methodological construct — values assigned to parameters which influence the analysis of a prototypical transaction broadly across the relevant sector. Examples would include:

- sector correlation assumptions;
- loss severity assumptions for particular sectors;
- and idealized default rates when used as a proxy for collateral performance.

Inputs to the rating of structured finance transactions that result from credit judgments reached by rating committees or which reflect analytic deliberations and that are not KRAs include, for example:

- the credit risk considerations (as reflected in credit ratings or other credit assessments) introduced by third parties, such as guarantors and other support providers, servicers, trust banks, swap providers, etc.;
- the credit risk introduced by the issuer's operating environment, as reflected, for example, by country ceilings;
- changes in collateral asset risk expectations brought on by changes in the economic environment; and
- the maximum extent to which a bank's legal and operating environment would enable overcollateralization to provide lift for a covered bond's rating over the bank's own rating, as expressed in the Timely Payment Indicator.

For Fundamental Credit Rating Methodologies, KRAs are intrinsically less common (in part reflecting the less quantitative nature of Fundamental credit analysis), and where they do exist they may be embedded within the underlying Credit Rating Methodology. Generally, they are so deeply embedded in the overlying analytical structure that it would be meaningless and misleading to identify them as distinct from the Credit Rating Methodology itself: a KRA change would almost inevitably involve a corresponding change to the Credit Rating Methodology itself. Examples of deeply embedded KRAs in Fundamental that cannot be viewed distinctly from a Credit Rating Methodology include:

- the assumption that leverage and access to liquidity are strong drivers of credit risk and appropriate factors to include in Credit Rating Methodologies;
- the assumptions that there is very strong interdependence between bank and sovereign credit strength (from which MIS concludes that a lower-rated sovereign cannot generally provide ratings lift through support to a higher rated bank);

» the assumption that legal priority of claim affects average recovery on different classes of debt sufficiently to warrant higher or lower ratings for different classes of debt;
» and the assumption that sovereign credit risk is strongly correlated with that of other domestic issuers.

Examples of assumptions in Fundamental Credit Rating Methodologies that would be considered KRAs distinct from (though perhaps stated in) the Credit Rating Methodology to which each relates would include:
» loss severity assumptions for different sectors;
» and idealized loss rates when used as a proxy for the ability of a sovereign to support its banking system;

Inputs to the fundamental ratings process that result from credit judgments reached by rating committees or which reflect analytic deliberations which are not KRAs include:
» the credit risk considerations (as reflected in credit ratings or other credit assessments) introduced by third parties, such as guarantors and other support providers or affiliates;
» the credit risk introduced by the issuer's operating environment, as reflected, for example, by country ceilings; and
» the ability a sovereign to provide support to, for example, banks, as expressed in a systemic support indicator.
» Such inputs may incorporate underlying assumptions which may be KRAs.

Benchmark Parameters Used in Rating Models

As indicated in our rating definitions, Moody's credit ratings are opinions of ordinal, horizon-free credit risk and, as such, do not target specific default rates or expected loss rates. Moody's believes the needs of market participants are best served by ratings that are assessments of relative credit risk rather than cardinal risk measures. If ratings targeted specific default and loss rates, this would likely require frequent wide-spread rating actions in anticipation of economic and market changes that might broadly push default and loss rates sharply higher or lower for a brief period of time. Due to the inherent volatility of general credit and market conditions, most such rating changes would likely soon need to be reversed. Therefore, the use of cardinal targets would result in much higher rating volatility and disruption for investors without meaningfully improving the cardinal predictive power of ratings over medium and long-term horizons.

To rate some obligations in some asset classes, however, Moody's uses models and tools that require ratings to be associated with cardinal default rates, expected loss rates, and internal rates of return in order for those models and tools to generate outputs that can be considered in the rating process. For these purposes, Moody's has established a fixed common set of default rates, expected loss rates, and internal rates of return that vary by rating category and/or investment horizon (Moody's Idealized Default and Expected Loss Rates;[27] hereafter called "Moody's Idealized Rates"). By using a common fixed set of benchmark parameters, rating models are more likely to provide consistency with respect to the estimation of relative risk across rating levels and investment horizons and can be more easily compared to one another. Moody's Idealized Rates are used with other tools and assumptions that have a combined effect on model outcomes. While cardinal measures are used as inputs to models, the performance of ratings is benchmarked against other metrics.[28] Although Moody's Idealized Rates bore some degree of relationship to corporate default and loss experience at the time they were created, that relationship has varied over time, and Moody's continuing use of the Idealized Rates for modeling purposes does not depend on the strength of that relationship over any particular time horizon. When we perceive changes in risk that necessitate changes in our credit analysis, we make revisions to key assumptions and other aspects of models and tools rather than changing this fixed common set of benchmark parameters. This approach enables us to make adjustments that only affect the particular sectors and asset classes we expect will experience significant changes in risk at a given time.

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27 These tables are highly stylized and are not intended to match historical or future ratings performance. The tables were constructed in 1989 with reference to corporate default and loss experience over four historical data points. In particular, the 10-year idealized default rates for A2, Baa2, Ba2, and B2 were set equal to the 10-year historical default rates for corporate issuers with single A, Baa, Ba, and single B ratings, as observed between 1970 and 1989. In contrast, the 10-year idealized default rates for Aaa and Aa2 were set lower than their historical default rates. All the other idealized default rates – for different alphanumeric ratings and at different rating horizons – were derived through interpolation rather than being matched to historical data. The idealized expected loss table was then derived by multiplying each element of the idealized default table by an average loss severity assumption, set equal to the approximate historical recovery rate of senior unsecured debt observed between 1970 and 1989. Moody's has not published a revised version of these tables since the 1989 version, and has no plans to revise them at the time of this writing.

28 Moody's approach to measuring ratings performance is discussed in "Measuring The Performance Of Credit Ratings" (Moody's Special Comment, November 2011).

Idealized Probabilities of Default and Expected Losses

For some obligations and asset classes we may use benchmark default probabilities and expected loss rates in our rating models and tools. These rates are shown in the Idealized Cumulative Expected Default Rates table and the Idealized Cumulative Expected Loss Rates table, which can be found here: Moody's Idealized Default and Loss Rates.

The tables can be used into two ways: (1) to suggest benchmark expected default and loss rates for modelling the credit risk of a securitization's collateral assets or the risk that a rated- counterparty will fail to perform a role, and (2) to associate different modelled expected loss rates with different benchmark ratings. Please consult Moody's published credit rating methodologies for details.

Internal Rate of Return (IRR) Reduction

For some obligations and asset classes we may use benchmark reductions of the internal rate of return (IRR) to associate different modelled internal rates of return reductions with different benchmark ratings. Please consult Moody's published credit rating methodologies for details.

The table of these benchmarks can be found here: Moody's IRR Reduction Rates. This table was derived from Moody's Idealized Rates, which can be found here: Moody's Idealized Cumulative Expected Default and Loss Rates.

For further information contact us at a location below:

Americas	EMEA	Asia-Pacific	Japan
+1.212.553.1653	+44.20.7772.5454	+852.3551.3077	+81.3.5408.4100
clientservices@moodys.com	clientservices@moodys.com	clientservices@moodys.com	clientservices@moodys.com

BX1857 / 79004

Annex 599

“Quantifying the financial costs of climate change physical risks for companies”, *S & P Global*, 20 November 2023

Quantifying the financial costs of climate change physical risks for companies

Published: November 20, 2023

HIGHLIGHTS

Companies already exposed to extreme weather events and the physical impacts of climate change will likely see increasingly significant financial costs over the coming decades.

Without adaptation measures, by the 2050s these costs will equal an average of 3.3% — and up to 28% — per annum of the value of real assets held by companies in the S&P Global 1200, according to the S&P Global Sustainable1 Physical Risk Exposure Scores and Financial Impact dataset.

These costs are annual and cumulative over time, representing a material financial risk for many companies, absent adaptation and resilience measures.

Different physical hazards are poised to create substantial financial costs in some sectors but not others. In the communications sector of the S&P Global 1200, most of the assets facing high financial impact are datacenters due to their sensitivity to extreme heat.

Author
Jennifer Laidlaw | S&P Global Sustainable1, Thought Leadership Senior Writer
Rick Lord | S&P Global Sustainable1, Head of Innovation Methodology
Matthew MacFarland | S&P Global Sustainable1, Thought Leadership Editor
Kuntal Singh | S&P Global Sustainable1, ESG Innovation and Analytics Manager

Extreme weather events have defined 2023, from Cyclone Freddy sweeping across several African countries, to wildfires in Canada that blanketed eastern North America in smoke, to extreme heat around the world that made July the hottest month on record by a wide margin.

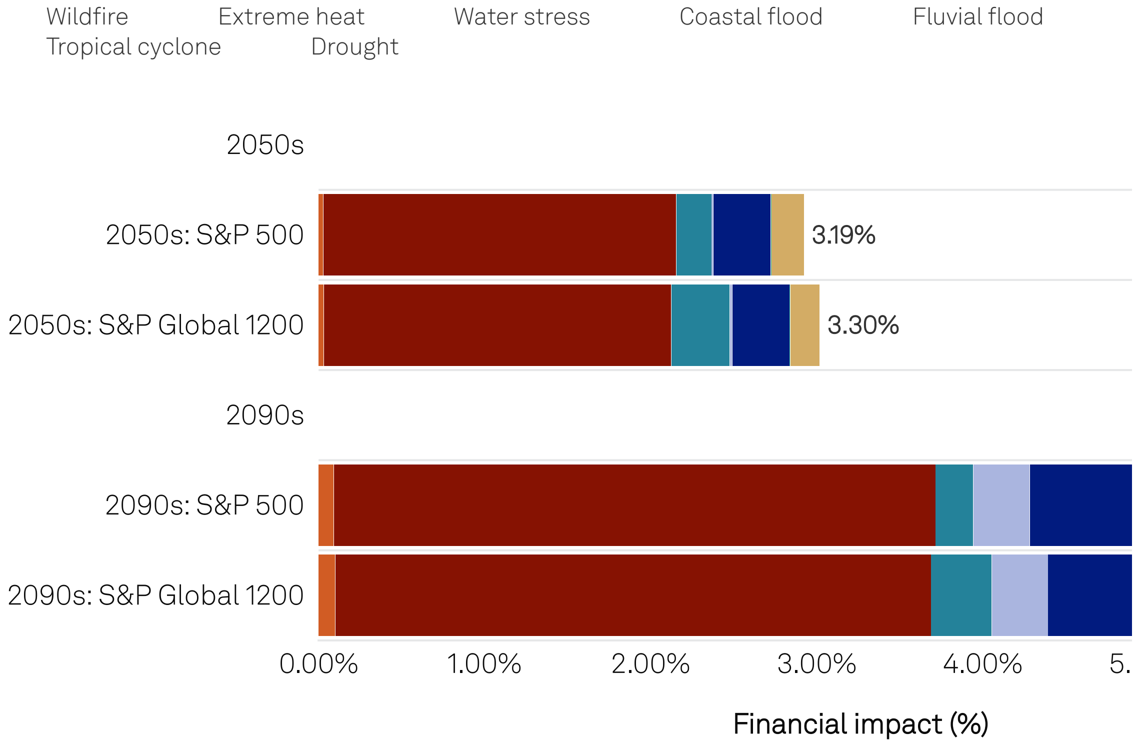
Scientists are **increasingly** making the **connection** between extreme weather events and climate change. As the damage from extreme weather events becomes more apparent, we seek in this research to measure the financial costs of climate hazards on corporate assets in different sectors and geographies.

Applying the S&P Global Sustainable1 Physical Risk Exposure Scores and Financial Impact dataset to companies in the S&P Global 1200, we find that by the 2050s the costs of the physical hazards of climate change will equal an average of 3.3% per annum — and up to 28% per annum — of the value of real assets held by companies in the index, absent adaptation. That average per-annum figure rises to 6.0% by the 2090s. These costs are annual and cumulative over time, representing a material financial risk for many companies.

The relative size of the financial impact in the 2050s and 2090s under this scenario is similar for the S&P 500.

Financial impact on major companies will nearly double from 2050s to 2090s

Weighted average financial impact on assets owned by constituents of the S&P 500 and S&P Global 1200 in the 2050s and 2090s



Data as of February 2023.
Financial impact is first calculated at the asset level and represents the sum of financial costs arising from exposure to climate hazards for an asset, expressed as a percentage of the typical replacement value for a given asset type. Financial impact at the company level is then calculated as the weighted average of the asset-level financial impact for all known assets owned by a company and its subsidiaries. Financial impact at the index level is calculated as the market capitalization-weighted average of financial impact of all companies in the index.
The climate change scenario used in this analysis, known as SSP3-7.0, is characterized by limited mitigation where total greenhouse gas emissions double by 2100 and global average temperatures rise by 2.8 degrees C to 4.6 degrees C by 2100.
Source: S&P Global Sustainable1.

The S&P Global Sustainable1 Physical Risk Exposure Scores and Financial Impact dataset defines for each company the financial impact due to changing hazard exposure, absent any adaptation and resilience measures. Financial impact at the company level reflects the weighted average financial impact for all assets linked to the company, weighted by the estimated value of the assets.

To assess the financial impact at the asset level, we use S&P Global Sustainable1 climate physical risk data, which assigns an exposure score for physical climate hazards to each of the more than 2 million corporate assets in the dataset. We assess seven physical climate hazards: extreme heat, water stress, coastal flood, fluvial flood, tropical cyclone, drought and wildfire. The hazard exposure score for an asset is combined with the asset type-specific sensitivity profile to quantify the future financial costs associated with each hazard. These costs can include a range of costs stemming from increased operational expenses to lost revenues due to business interruption through to physical damage and costs to repair assets. These costs are expressed as a percentage of the value of each asset type as an indicator of the financial impact at the asset level.

The assets considered are real assets or physical assets. The asset values are constant and indicate the relative value of different asset types, such as an office compared with an electric power plant. The costs associated with the hazards can, but do not always, reduce the value of a real asset.

These projections are based on the climate scenario known as SSP3-7.0, which is characterized by limited mitigation where total greenhouse gas emissions double by 2100 and global average temperatures rise by 2.8 degrees C to 4.6 degrees C by 2100. The S&P Global 1200 is an index that covers the largest companies across North America, Europe, Asia, Australia and Latin America, capturing approximately 70% of global market capitalization.

S&P Global Sustainable1 does not currently have complete data on all asset holdings of all companies in the S&P Global 1200, and these results could change as asset data coverage expands over time.

Some climate hazards will generate more significant financial costs for S&P Global 1200 assets than others, according to our data. Extreme heat is projected to generate the highest cost for companies in the 2050s, in part because nearly all assets will face at least some exposure to extreme heat, whereas exposure to other hazards is more variable. Water stress and fluvial flooding are the second- and third-most significant sources of financial impact for the S&P Global 1200. Water stress refers to the combination of reduced freshwater availability from sources such as rainfall and increased water demand from the general population, industrial use and agriculture.

For example, extreme heat could affect businesses across sectors through lower labor productivity: If it is too hot, employee health and safety and company operations can suffer. Energy grids can come under pressure as the general population cranks up air conditioning use. Transportation links can be damaged, leading to delays in supply chains.

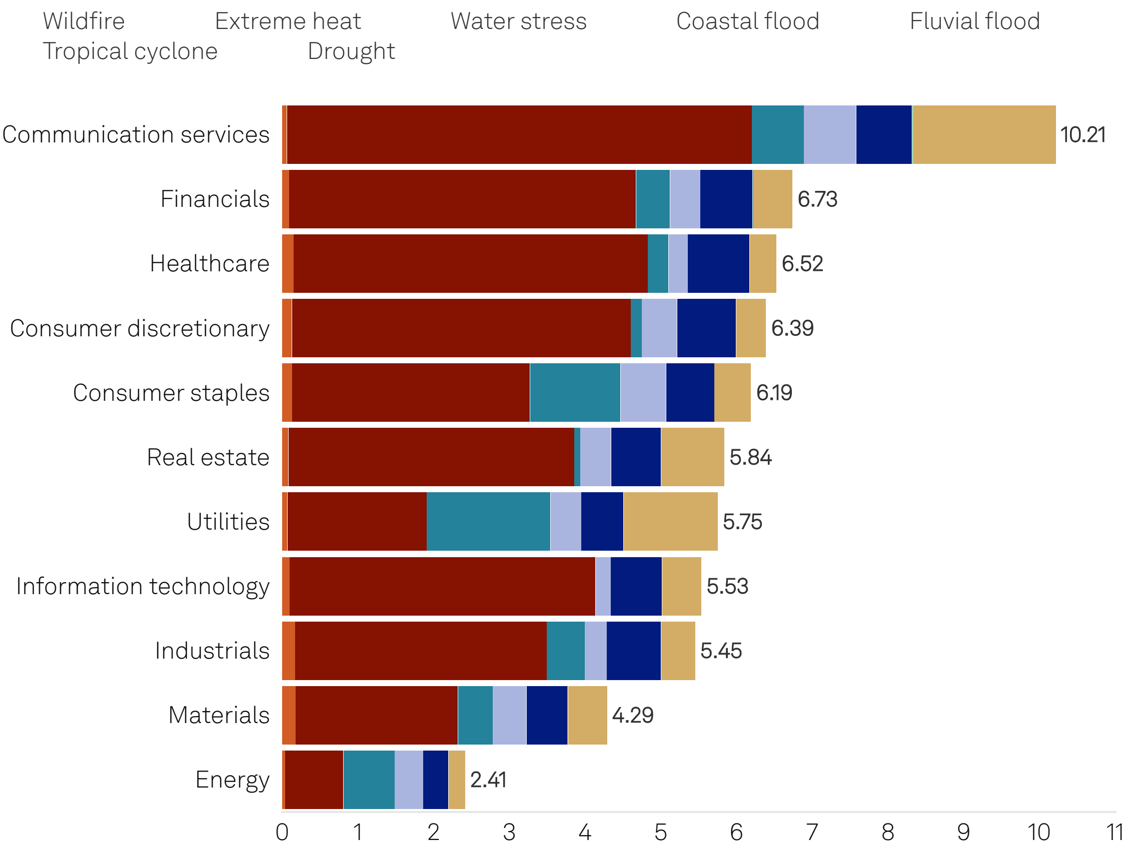
If we look further ahead to the 2090s, the financial impact of extreme heat intensifies, and hazards that are less severe in the 2050s become more significant without efforts to adapt.

How climate affects sectors differently

The potential financial impact of climate hazards could influence where a company decides to develop its operations or where investors put their money. A **severe drought** may decimate a vineyard while the productivity of a nearby office building might not be affected much at all. Such shifts, in turn, would change the risk profile of businesses and have a knock-on effect on banks, insurers and investors.

Some sectors face higher financial impact to their assets from climate hazards

2090s: Weighted average financial impact on assets owned by companies in the S&P Global 1200 by sector (%)



Data as of February 2023.
Financial impact is first calculated at the asset level and represents the sum of financial costs arising from exposure to climate hazards for an asset, expressed as a percentage of the typical replacement value for a given asset type. Financial impact at the company level is then calculated as the weighted average of the asset-level financial impact for all known assets owned by a company and its subsidiaries. Financial impact at the sector level is calculated as the market capitalization-weighted average of financial impact of all companies in the sector.
The climate change scenario used in this analysis, known as SSP3-7.0, is characterized by limited mitigation where total greenhouse gas emissions double by 2100 and global average temperatures rise by 2.8 degrees C to 4.6 degrees C by 2100.
Source: S&P Global Sustainable1.

Our analysis shows that some sectors are more sensitive than others in terms of the potential financial impact of climate hazards. The location of an asset also influences how high the financial impact could be.

For example, the communication services sector in the S&P Global 1200 would face significant financial impact: 5.4% per annum of real asset values by the 2050s. This sector includes telecommunications firms, data providers and media companies. Extreme heat would generate the largest impact absent adaptation, followed by water stress, drought and fluvial flooding. In communication services, 97% of real assets with financial impact of 10% or more by the 2050s are datacenters, and datacenter assets have the highest average financial impact for this sector at 8.3%. Datacenters are sensitive to extreme temperatures and restricted access to water due to their dependency on heating, ventilating and air conditioning (HVAC) and cooling.

Extreme heat represents the largest share of financial impact for most sectors in the 2050s. While that holds true further out toward the 2090s, other hazards become much more significant. The financial impacts from coastal flooding and drought become more severe across many sectors.

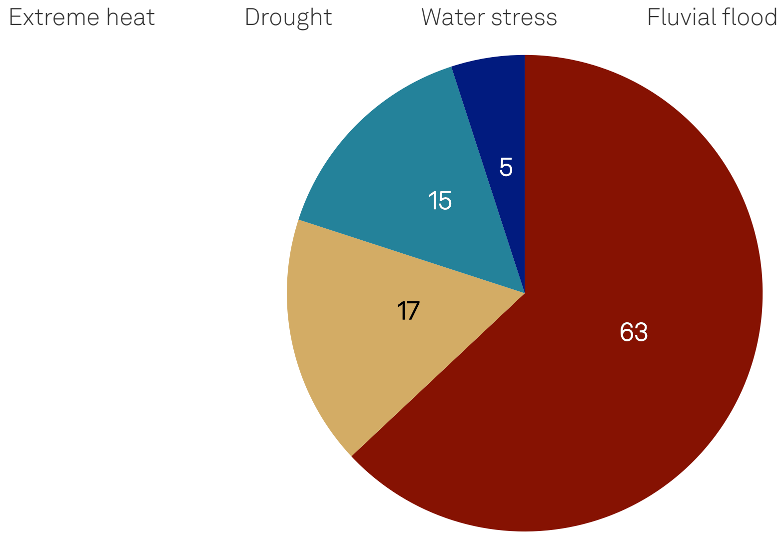
Datacenters

Zooming in on one type of corporate asset — datacenters — provides insight into how different climate hazards contribute to financial impact absent adaptation and resilience measures. Datacenters are also worth examining because they are fundamental infrastructure to the digital economy, and they are likely to become more important as technology evolves throughout the rest of the century.

The Physical Risk Exposure Scores and Financial Impact dataset covers more than 2,000 datacenters owned by S&P Global 1200 companies. These assets are particularly sensitive to extreme heat, which will have the highest financial impact by the 2050s, followed by drought and water stress.

Extreme heat, drought and water stress will cause the largest financial impacts to datacenters

Average share of financial impact by physical hazard on datacenters owned by S&P Global 1200 companies in the 2050s (%)



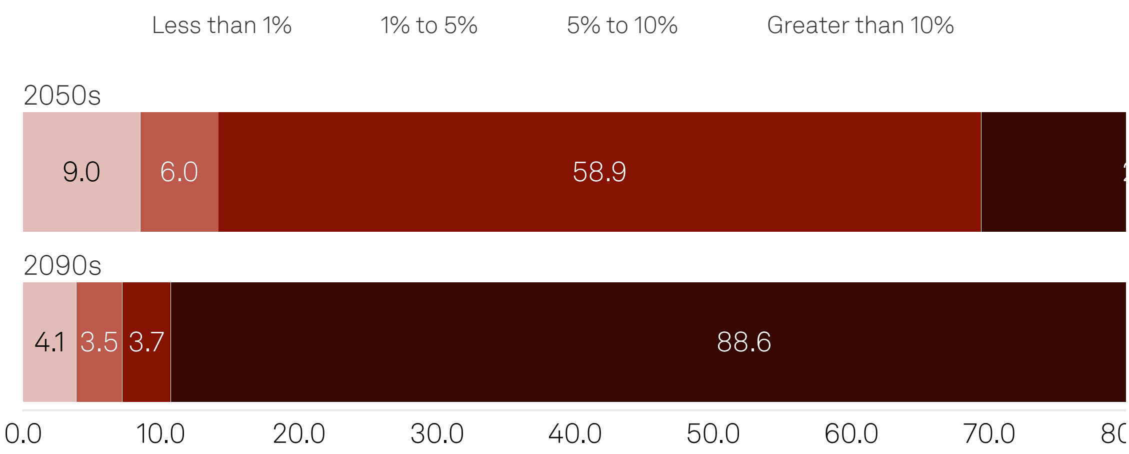
Data as of February 2023.
Not shown are tropical cyclone, wildfire and coastal flood, which each accounted for less than 1%.
Financial impact is first calculated at the asset level and represents the sum of financial costs arising from exposure to climate hazards for an asset, expressed as a percentage of the typical replacement value for a given asset type. Financial impact at the company level is then calculated as the weighted average of the asset-level financial impact for all known assets owned by a company and its subsidiaries. Financial impact at the sector level is calculated as the market capitalization-weighted average of financial impact of all companies in the sector.
The climate change scenario used in this analysis, known as SSP3-7.0, is characterized by limited mitigation where total greenhouse gas emissions double by 2100 and global average temperatures rise by 2.8 degrees C to 4.6 degrees C by 2100.
Source: S&P Global Sustainable1.

Extreme heat can lead to accelerated degradation of HVAC systems and thus increase capital expenditure. For example, take two hypothetical datacenters located on the same block in a city that is exposed to extreme heat. One of them is a small site operated by a local internet service provider while the other is a state-of-the-art facility operated by a multinational social network company. Periods of extreme heat would increase cooling costs and speed up the deterioration of HVAC systems for both datacenters. These costs can be expressed in relative terms for both assets (i.e., the percentage of typical asset value), but the absolute cost would be much higher for a state-of-the-art facility. The value of each facility is not known, which is why this analysis focuses on the relative impact.

While the absolute costs are likely to vary by location or the size of the asset, the vast majority of datacenters owned by S&P Global 1200 companies will face at least some financial impact by the 2050s. In that decade, about one-quarter of these datacenters could face financial impact equal to 10% or more of the asset's value. That share skyrockets to nearly 89% of datacenters by the 2090s.

Nearly all S&P Global 1200 datacenter assets face financial impact of 10% or more by the 2090s

Percentage of datacenter assets in the S&P Global 1200 facing financial impact from climate hazards in the 2050s and 2090s



Data as of February 2023.
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The climate change scenario used in this analysis, known as SSP3-7.0, is characterized by limited mitigation where total greenhouse gas emissions double by 2100 and global average temperatures rise by 2.8 degrees C to 4.6 degrees C by 2100.
Source: S&P Global Sustainable1.

The regional differences of climate hazards

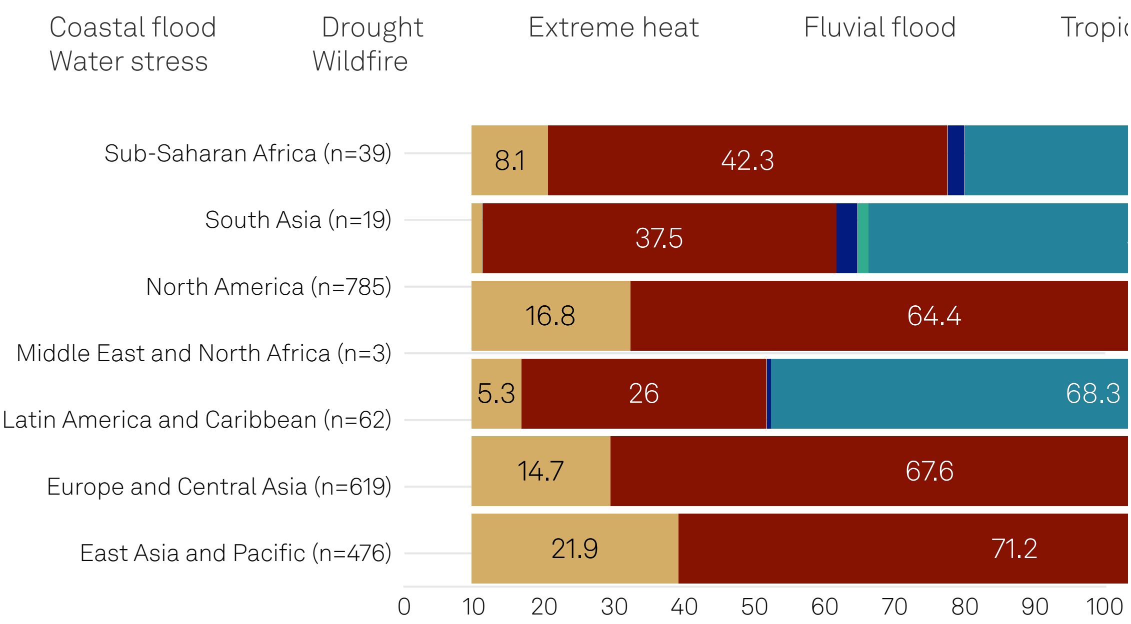
Location will also drive companies' exposure to physical risk hazards and what financial impact their assets may face. Extreme heat is the greatest source of financial impact for datacenters owned by S&P Global 1200 companies in Europe and Central Asia, North America, and Latin America and the Caribbean by the 2050s. However, in sub-Saharan Africa, South Asia, and the Middle East and North Africa, water stress will have the greatest financial impact.

These two hazards can also reinforce one another, worsening the outcome in areas dealing with both. In sub-Saharan Africa, 80% of countries **are likely** to have more than 45 days of heat waves per year by 2050, compared with less than 15% currently, according to a report on potential economic losses from physical climate risks by S&P Global Ratings.

1 of 2

Financial impact on datacenters due to drought and coastal floodi from the 2050s to the 2090s

2050s: Average share of financial impact by physical hazard for S&P Global 1200 datacent



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The slow pace of adaptation

A growing number of large corporates around the world **have pledged** to cut their greenhouse gas emissions as close to zero as possible and offset the remainder, usually by the distant deadline of 2050. But they remain the exception rather than the rule. Meanwhile, corporate action to adapt to the physical risks of climate change **has been slow**. An analysis of S&P Global ESG Raw Data, which is built on the S&P Global Corporate Sustainability Assessment, shows that just one in five companies across sectors has a plan to adapt to the physical impacts of climate change. Just over 46% of assessed companies globally conduct physical risk assessments, which could indicate how climate-related risks are embedded throughout a company. A certain amount of change is locked in due to the lag in the climate system owing to historic GHG emissions — many of the impacts of climate change will therefore materialize irrespective of the policy choices made today and absent adaptation.

In the run-up to COP28, there is urgent need for action on climate and the creation of solutions to address worsening physical risks. **Adaptation** and resilience will be key to preventing the worst damage from physical climate risks over the coming years. Understanding these hazards, weighing the severity of climate events in a geographical area, and then assessing the potential financial impact on assets could help companies make more effective decisions on adapting their operations to climate change.

Methodology of the Physical Risk Exposure Scores and Financial Impact dataset

Our data projects future financial costs of climate change on more than 20,000 companies and more than 2 million individual assets. The data includes the projected impacts of extreme heat, wildfire, water stress, drought, coastal flood, fluvial flood and tropical cyclone. The data is based on four climate scenarios, which consider future GHG emissions and to what extent governments have enacted policies to curb the effects of climate change. The dataset measures a physical asset's exposure to climate hazards through exposure scores. It also projects the future financial costs of evolving climate hazards and expresses these costs as a percentage of typical asset value to reflect the potential financial impact of those hazards absent adaptation and resilience measures. These costs can include a range of costs stemming from increased operational expenses, to lost revenues due to business interruption, through to physical damage and costs to repair assets.

Shared Socioeconomic Pathways Defined

The IPCC established the Shared Socioeconomic Pathways (SSPs) as a set of scenarios for projected greenhouse gas emissions and temperature changes. The SSPs incorporate broad changes in socioeconomic systems, including global population growth, economic growth, resource availability and technological developments:

- **SSP1-2.6** is a low-emissions scenario in which the world shifts gradually, but consistently, toward a more sustainable path. This SSP aligns with the Paris Agreement on climate change's target to limit the average increase in global temperature to well below 2 degrees Celsius by the end of the century. The global temperature is projected to increase by 1.7 degrees (a likely range of 1.3-2.2 degrees) by 2050 or by 1.8 degrees (1.3-2.4 degrees) by the end of the century.
- **SSP2-4.5** is a moderate-emissions scenario, consistent with a future with relatively ambitious emissions reductions but where social, economic and technological trends do not deviate significantly from historical patterns. This scenario falls short of the Paris Agreement on climate change's aim of limiting the global temperature rise to well below 2 degrees, with a projected increase of 2.0 degrees (1.6-2.5 degrees) by 2050 or 2.7 degrees (2.1-3.5 degrees) by the end of the century.
- **SSP3-7.0** is a moderate- to high-emissions scenario, in which countries increasingly focus on domestic or regional issues, with slower economic development and lower population growth. A low international priority for addressing environmental concerns leads to rapid environmental degradation in some regions. This SSP projects a global temperature increase of 2.1 degrees (1.7-2.6 degrees) by 2050 or 3.6 degrees (2.8-4.6 degrees) by the end of the century.
- **SSP5-8.5** is a high-emissions scenario, in which the world places increasing faith in competitive markets, innovation and participatory societies to produce rapid technological progress and development of human capital as a path to sustainable development. This SSP projects the global temperature increase at 2.4 degrees (1.9-3.0 degrees) by 2050 or 4.4 degrees (3.3-5.7 degrees) by the end of the century.

Many companies do not disclose the value of their corporate assets. To help address such data gaps, S&P Global Sustainable1 has calculated typical asset replacement values for more than 250 unique asset types and ownership structures. These typical asset values can be used to produce a relative measure of financial impact — expressing the costs of climate physical hazard exposure as a percentage of the typical asset value and providing an indicator of the financial impact of those costs to an asset, or in aggregate for a company owning many assets.

The exposure scores and financial impact metrics are measured by looking at a specific hazard. For flooding, for example, we calculate the annual frequency of exceeding a historical 100-year flood level relative to a baseline period between 1950 and 1999 for four scenarios and all decades between the 2020s and 2090s. We then look at the business interruption, cleanup and repair and calculate the projected cost to an asset. The exposure scores demonstrate the presence of climate hazards at asset locations or in aggregate for a company, while the financial impact metrics quantify the financial costs of that exposure as a percentage of the future value of a specific asset type or group of assets, enabling users to focus on those hazards that will potentially have the greatest financial impact absent adaptation and resilience measures.

This research was prepared by and reflects the views of S&P Global Sustainable1, which is separate and independent from other businesses/divisions of S&P Global, including S&P Global Ratings.

Annex 600

“A climate finance framework: decisive action to deliver on the Paris Agreement”, *Second report of the Independent High-Level Expert Group on Climate Finance*, November 2023

A climate finance framework:

decisive action to deliver on the Paris Agreement

SUMMARY

Second report of the Independent High-Level Expert Group on Climate Finance

November 2023

Preface and acknowledgements

The COP26 and COP27 Presidencies, together with the UN Climate Change High-Level Champions, extended the mandate of the Independent High-Level Expert Group on Climate Finance (IHLEG) in July 2022, to prepare a second report for COP28. The IHLEG is co-chaired by Vera Songwe and Nicholas Stern, and Amar Bhattacharya is the Executive Secretary of the group. The members of the group are indicated on the following page. Eléonore Soubeyran served as the Secretariat of the group. This independent group was tasked to help develop and put forward policy options and recommendations to encourage and enable the public and private investment and finance necessary for delivery of the commitments, ambition, initiatives and targets of the UNFCCC Paris Agreement, reinforced by the Glasgow Climate Pact, and the Sharm el-Sheikh agenda.

This report has benefited enormously from the active and high-quality participation, guidance and input of the group's members, and from feedback from a wide range of stakeholders. The views expressed are the responsibility of Vera Songwe, Nicholas Stern, Amar Bhattacharya and Eléonore Soubeyran and are not necessarily those of individual members, nor does the report claim to represent the views of either the COP27 or COP28 Presidencies or the Climate Champions.

The writing team was led by Amar Bhattacharya with Eléonore Soubeyran, under the guidance of Vera Songwe and Nicholas Stern. The following people led on different sections: Amar Bhattacharya (investment, climate finance framework, multilateral development banks) Eléonore Soubeyran (investment, climate landscape, climate finance framework), Homi Kharas and Charlotte Rivard (debt), Julia Turner, Mattia Romani, Katherine Stodulka, and Federico Apestegui Guardia (private finance), Rob Macquarie (climate finance alignment and carbon markets), Avinash Persaud (loss and damage) and Marilou Uy (domestic resource mobilisation and concessional climate finance). The authors are also grateful to Hans Peter Lankes and Josue Tanaka for their input and feedback on the role of multilateral development banks. The authors would like to thank Georgina Kyriacou for editing and production.

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Members of the Independent High-Level Expert Group on Climate Finance

Co-chairs


Dr Vera Songwe


Professor Lord Nicholas Stern

Executive Secretary


Mr Amar Bhattacharya

Secretariat


Ms Eléonore Soubeyran

Members


Mr Jean-Paul Adam


Mr Monktek Singh Ahluwahlia


Ms Sara Jane Ahmed


Dr Amal-Lee Amin


Mr Christoph Bals


Dr Muhamad Chatib Basri


Dr Barbara Buchner


Professor Richard Calland


Mr Alain Ebobissé


Dr Omar El-Arini


Dr Mohamed Farid Saleh


Professor Naoko Ishii


Dr Ma Jun


Mr Homi Kharas


Ms Rachel Kyte


Dr Frannie Léautier


Mr Joaquim Levy


Mr Hamza Ali Malik


Dr Hanan Morsy


Professor Avinash Persaud


Dr Mattia Romani


Mr Frédéric Samama


Mr Todd Stern


Dr Josué Tanaka


Dr Izabella Teixeira


Mr Daniel Titelman


Ms Laurence Tubiana


Ms Marilou Uy

Key messages

1. Finance with a purpose

- The Independent High-Level Expert Group on Climate Finance was tasked to assess how the climate finance system must change if it is to support the investment and actions necessary to deliver the goals of the Paris Agreement, within the broader goals of sustainable development. This is finance with a *clear purpose*.
- Our first report, published for COP27, focused on the *amount* of investment needed and *how* to deliver that finance. We concluded that around US$2.4 trillion of investment a year would be necessary by 2030 (in emerging markets and developing countries – EMDCs – outside China) across the priorities of a *just energy transition, adaptation and resilience, loss and damage,* and the *conservation and restoration of nature*. This is a four-fold increase from current levels devoted to these areas. The world is badly offtrack on the Paris goals, as the first Global Stocktake shows, the primary reason for which is insufficient investment in key areas, particularly in EMDCs.
- Despite the clear opportunity that this scale of investment would create *for better and more sustainable growth*, actual investment performance on key climate priorities in EMDCs has stalled. The focus of this report is therefore on *acceleration and implementation*.

2. The challenge of investment: acceleration and implementation

- We now need a much more *purposeful approach with strong and committed engagement of all key stakeholders* – countries, the private sector, the multilateral development banks (MDBs), donors and private philanthropy. Country leadership will be crucial and *country platforms* provide a promising way to bring together the main stakeholders.
- The first task is to act to *unlock investment at scale* through tackling impediments and buttressing institutional structures that can create *investable pipelines* of projects, anchored in a strategy of transformational change. This requires a shift from a do-it-alone approach to *co-creation* of investment opportunities and tackling obstacles with the combined involvement of countries, the private sector and development finance institutions.
- We must also tackle the immediate *debt constraints and lack of fiscal space* that are impeding the ability of many countries to invest, especially poor and vulnerable countries.

3. An integrated climate finance framework to deliver on the Paris Agreement

- Mobilising the scale and quality of finance to meet the large anticipated requirements will require an *integrated approach that boosts all sources of finance* – public and private, domestic and international – and uses their complementary strengths.
- *Domestic resource mobilisation* will be central, given its dominant role and importance in anchoring the macroeconomic sustainability of all finance. There is potential to boost tax revenues, including by harnessing new digital possibilities. Elimination of harmful subsidies and carbon taxation can generate much needed revenues to finance the transition.
- The role of the *private sector* in both investment and finance will be crucial and both domestic and international private finance must be boosted. *International*

private finance to EMDCs for climate action will need to be increased by more than *15 times* on current levels to deliver on climate mitigation goals.

- *MDBs are key* to both unlocking *investment opportunities* and *mobilising finance*, through own lending and catalysing private finance. They need to play a much stronger role in reducing, managing and sharing risk and in reducing the cost of capital. To deliver on the Paris targets, their role will need to change fundamentally and the scale of their support to *triple by 2030*. MDBs need to implement fully the recommendations of the G20 Expert Group on Capital Adequacy Framework to maximise capital efficiency, tap new sources of capital and guarantees to boost their immediate firepower, and secure strong shareholder support for regular capital increases to enable a sustained expansion of lending.
- *Concessional finance* is the scarcest and most vital source of finance for meeting urgent and high priority needs. A *fivefold increase* in concessional finance is needed by 2030. Developed countries must lead by *tripling the amount of bilateral concessional finance by 2030*, but concessionary finance cannot be provided at the right scale with bilateral official development assistance (ODA) alone. We must therefore pursue all options, including carbon markets (compliance and voluntary), expanded rechannelling of special drawing rights, international taxation and a bigger role for philanthropy, including from the corporate sector.
- These *four sources* of finance – from domestic public resources, the private sector, MDBs, and concessional – are *mutually supportive* and different combinations will be necessary for different investments and activities. The method of combination will be critical, as well as the overall total.

4. Seizing the opportunity – and the consequences of success or failure

- Momentum has been building over the past year to refine the elements of a more effective framework for climate finance. It is crucial to seize the opportunity at COP28 to secure a breakthrough and to put in place an action plan to deliver on this framework.
- Failure to generate investment and finance of the scale and nature required is to fail on Paris. The consequences would be devastating, particularly for the poorest people. Seizing the opportunity would unlock the growth story of the 21st century. This is truly *finance with a purpose*.

Context (Chapter 1)

The Independent High-Level Expert Group (IHLEG) on Climate Finance delivered its initial report at COP27, setting out the scale of investment that is necessary in emerging markets and developing countries (EMDCs – other than China) for climate and development, along with implications for different pools of finance. One year on, the pressing need for decisive action to tackle climate change and achieve development goals has become even more evident – yet EMDCs are falling behind. More ambitious and targeted strategies are needed to prevent these nations from being further disadvantaged in the global climate and development agenda. This new report from the IHLEG on Climate Finance, mandated by the COP27 and COP28 Presidencies, focuses on the actions required to deliver a reformed holistic framework for climate finance that can impart the necessary strong impetus to the acceleration and implementation of climate action in EMDCs.

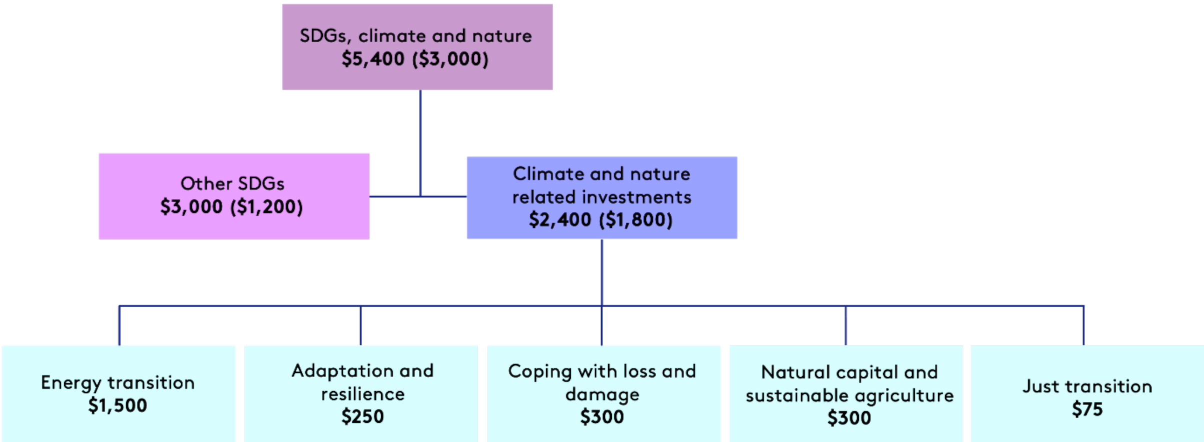
Urgency and scale of action

The urgency and opportunity for tackling climate change is becoming ever clearer. Climate change is occurring at a faster pace and with ever more severe impacts than previously anticipated and the window for remedial action is narrowing rapidly. At the same time, acting on climate change offers immense opportunities to unlock new and better forms and drivers of economic development. EMDCs can leapfrog the dirty and destructive phase of fossil fuel-based growth of developed countries and build cleaner, safer, more energy-secure, more resilient, more biodiverse and more inclusive ways of living and working – to unlock the growth story of the 21st century.

The first IHLEG report set out that to meet the Paris Agreement and related development goals, US$2.4 trillion is needed in EMDCs (other than China) by 2030 for climate-related investments, a four-fold increase from current levels.

The main investment and spending priorities fall into five categories (Figure 1). Not all of this investment will be additional to the amount EMDCs would need to invest in the expansion of energy systems and infrastructure, and there would be growing savings from the replacement of fossil fuel use.

Figure 1. Investment/spending requirements for climate and sustainable development ($ billion per year by 2030)



Note: Incremental investment from current levels is indicated in parentheses. $ = US$ throughout.

EMDCs are falling behind in the low-carbon transition

We are far behind on climate action globally, as evident from the first Global Stocktake. This is because the world is not investing sufficiently and too much of the investment is still misdirected. Investment in fossil fuel production and power generation still continues to outstrip what is being invested in renewable power generation.

While global efforts to tackle climate change are increasing, albeit more slowly than necessary, EMDCs are facing setbacks and obstacles in every critical aspect of the low-carbon transition. This includes the shift to clean energy in both its supply and use, enhancing adaptation and resilience, addressing loss and damage, the protection and restoration of nature, and ensuring a just transition.

EMDCs (other than China) are being left behind on clean energy. Global clean energy investments hit an all-time peak in 2023, driven largely by growth in solar PV and electric vehicles (EVs), but more than 90% of the increase in such investment since 2021 has taken place in developed economies and China. Low- and lower-middle income countries accounted for only 7% of clean energy spending in 2022. Challenges include higher interest rates, unclear policy frameworks and market design, financially-strained utilities and a high cost of capital. A massive increase in renewable energy is the cornerstone of an energy transition strategy for EMDCs that delivers on both Paris and development goals.

The adaptation finance gap is growing. Adaptation costs/needs are now estimated at around 10–18 times as much as current flows of international public adaptation finance. International public finance commitments for adaptation in EMDCs fell by 15% in 2021. Only 66% of the total bilateral adaptation finance committed to EMDCs for the period 2017–21 was disbursed, compared with 98% for all bilateral development finance.

Overall funding pledged for loss and damage is well below even the lowest estimates of financing needs in EMDCs, despite a clear shift in attitude towards loss and damage finance in 2022. Many uncertainties remain regarding the financial need to address loss and damage, but innovative funding sources and governance structures must be found to reach the necessary scale.

Investments in nature are skewed towards high-income countries. EMDCs (other than China) account for an estimated 90% of the investment opportunity in protecting and restoring nature from 2020–30. However, the majority of financing, at 80%, remains in developed economies. Explicit and implicit subsidies for fossil fuels, agriculture and fisheries, which have extremely detrimental impacts on nature, are at least $8 trillion, more than 56 times the actual investments in nature and biodiversity.

A just transition is needed, with investment in people and places, to manage the transition's impacts and ensure everyone can benefit, particularly vulnerable communities and workers. This includes investment in basic infrastructure, in education and lifelong learning, in training and skills, and in social protection measures for the most vulnerable.

Where are we on climate finance?

The amount of global climate finance committed has more than tripled over the last decade, reaching $1.27 trillion in 2021/22, approximately 1% of global GDP. Despite a clear increase, global climate finance flows are still too low compared with the levels needed to achieve the low-carbon transition and build resilience to climate change.

There are important shortcomings from the perspective of EMDCs: climate finance is concentrated in developed economies and China, and in mitigation rather than adaptation. Private finance is insufficient. Climate finance is primarily delivered in the form of debt. And most financing remains in its country of origin.

There are also long-standing criticisms on the lack of transparency around how climate finance is measured and delivered. There has been legitimate concern that climate finance and especially climate finance from some bilateral providers may be overstated and there is lack of accountability for what is actually delivered.

Restoring trust and delivering on immediate priorities (Chapter 2)

The commitment by developed countries to provide $100 billion per year by 2020 was not met as of 2021, eroding trust. Negotiated by Ethiopian Prime Minister Meles Zenawi in 2009, this promise was key to the breakthrough that ultimately led to the Paris Agreement. Developed countries must live up to past commitments and deliver on immediate priorities to restore trust.

According to the Organisation for Economic Co-operation and Development (OECD), preliminary and as yet unverified data indicate that the $100 billion goal is likely to have been met as of 2022, largely driven by an increase in financing from the multilateral development banks (MDBs). Informal consultations with bilateral contributors and multilateral providers suggest that this upward trend has been sustained in 2023.

Priorities for action:

- **Deliver on the $100 billion** per year commitment by developed countries for climate action in developing countries as a basis for much more ambitious climate finance goals.
- **Secure contributions from countries that have not yet contributed to the ongoing Green Climate Fund (GCF) replenishment and broaden the contributor base** to ensure that the current replenishment is 50% higher than the first replenishment.
- **Expand the pool of special drawing rights (SDRs) available for recycling beyond the initial $100 billion target and deploy these rapidly,** using the IMF's Poverty Reduction and Growth Trust (PRGT) and Resilience and Sustainability Trust (RST) and through the MDBs.
- **Deliver funding of the International Development Association (IDA) crisis facility** and embark on an ambitious IDA21 (i.e. the 21st replenishment process). Together with the recycling of SDRs, this can bolster urgently needed finance for the poor and vulnerable.
- **Ensure the operationalisation of a sizeable Loss and Damage Fund and secure credible commitments on its capitalisation.**

A framework for a climate finance system that is fit for purpose (Chapter 3)

A framework for a climate finance system that supports climate and development must:

- **Embody justice and inclusion:** ensuring an equitable distribution of resources, recognising the differential impacts of climate change on countries and communities, and addressing historical responsibilities.
- **Scale up all sources of finance and utilise them more effectively:** climate finance for EMDCs will need to quadruple between now and 2030.

A more holistic, comprehensive strategy is needed to deliver bigger, better and faster climate finance. An overall financing strategy must utilise the complementary strengths of different pools of finance to ensure the right scale and kind of finance and to reduce the cost of capital rather than simply focusing on an aggregate number. It must also align all finance with climate goals and the Kunming-Montreal Global Biodiversity Framework (where applicable), and create the necessary partnerships to deliver concrete results.

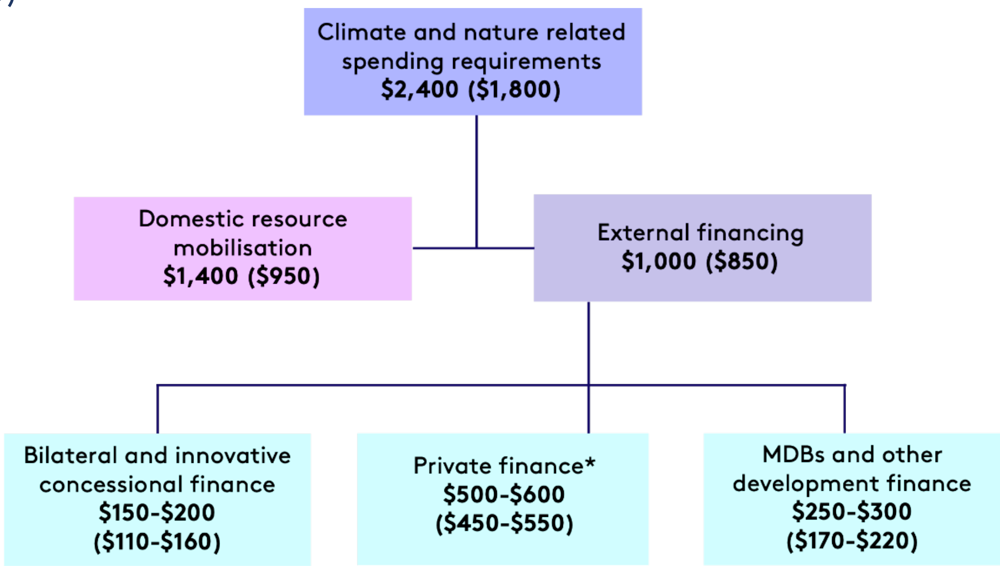
Acting on climate and nature will be mutually reinforcing: without climate action, it will not be possible to protect nature; and investing in nature and sustainable food and land use will make an important contribution to tackling climate change.

A mix of financing is needed to fit the varying attributes of investment requirements, including across differing country and market contexts. The initial report of the IHLEG on Climate Finance outlined the mix of financing for the $2.4 trillion spending required for climate and nature (see Figure 2 below).

Beyond scaling up, there is also a pressing need to tackle the shortfalls in the quality of finance provided, which will require:

- **Improved access to climate finance**, especially for poor and vulnerable countries.
- **Assurance of predictable support** to EMDCs.
- **Affordable climate finance.**
- **Improved focus on adaptation and on poor and vulnerable countries.**
- **More transparency and accountability for the delivery of climate finance.**

Figure 2. Mobilising the necessary financing for the green transition ($ billion per year by 2030)



Notes: Incremental investment from current levels is indicated in parentheses. *More than half of this private finance would be directly and indirectly catalysed by MDBs, other development finance institutions, and bilateral finance.

Aligning all finance with sustainability, including climate goals

Article 2.1(c) of the Paris Agreement states a goal to make "finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development". This is backed by the Sharm-El Sheikh Implementation Plan. The goal has proven difficult to implement, in part because of political challenges and differences in perceived interests. EMDC governments have concerns over the perceived and real risks that activities undertaken by public and private actors in pursuit of the goal will in fact lead to a decrease in financial flows to lower-income countries. Additionally, technical barriers to implementing the goal persist. Emphasising the development imperative of Paris alignment reinforces the importance of ensuring that a new climate finance framework is inclusive of lower-income countries, communities and marginalised groups.

Priorities for action:

- **All providers of finance, public and private, need to follow through to ensure that their finance is aligned with the Paris Agreement,** by boosting finance for low-carbon investments in EMDCs, incentivising transition, and curbing finance to activities that are inconsistent with the Paris Agreement.
- **Match net zero targets and commitments with plans, methods and indicators** to show how they will be implemented, to be robust and credible.
- **Central banks and financial supervisors need to continue their work to better understand risks but also lead on actions to reduce risks and benefit from transition,** even with imperfect information, to ensure that the reallocation of capital occurs at scale and on a timeline for an orderly transition.
- **Create an explicit goal on mobilising private finance for climate action in EMDCs.** This mobilisation should happen through removing barriers and taking positive action to facilitate the flow of international private finance.

Tackling debt and fostering investment (Chapter 4)

Tackling debt and fiscal constraints

Fiscal deficits that resulted from the response to COVID-19 and the current food and energy crises have left many EMDCs with a legacy of high public debt. All EMDCs feel this tension in how to manage their fiscal space. The immediate issue is to manage the bulge in debt service obligations falling due in 2024 and 2025.

Most EMDCs are facing commercial interest rates for external borrowing of well over 10 percentage points. Countries with severe solvency crises cannot expect to receive significant private capital inflows. They will need to agree on programmes with creditors for debt haircuts, and, for official creditors, on the provision of fresh money to permit investments in climate action. Vulnerable countries deserve special attention. Large, recurring natural disasters can create a vicious cycle of destruction and debt accumulation. Disaster relief as well as debt restructuring to restore solvency is needed in these cases.

Priorities for action:

- **Provide fiscal space for investment in climate action through:**
  - Strengthening international liquidity.
  - State contingent debt clauses, such as pandemic and natural disaster clauses, to offer fast, automatic, rules-based liquidity during a crisis.
  - Multi-year or multi-phase commitments from loans and guarantees from MDBs in support of public and private investment.
  - Pre-emptive, five-year, debt service cash flow relief from all bilateral creditors that do not make fresh money commitments.
  - Continued enhanced support from the IDA, accelerated disbursement of PRGT and RST funds, and an increase in ODA flows targeted to high priority investments.
- **Address situations of debt insolvency and acute debt distress, through:**
  - Purchasing private debt at a discount, with savings maximised by official guarantees and directed towards nature/conservation trusts.
  - Encouraging official bilateral debt holders to accept debt service in local currency and on-grant the proceeds to a conservation trust.

    - Streamlining the Common Framework for Debt Treatments and middle-income country debt restructuring processes to make it easier and faster to implement.
    - Expeditious and pre-emptive International Monetary Fund (IMF) agreements to forestall imminent defaults.
    - Protecting pro-growth infrastructure investments from austerity measures in IMF-supported programmes.
- Break the vicious cycle between debt and climate vulnerability through:
    - Including disaster- and pandemic-related clauses in debt contracts to provide immediate short-term liquidity that can help minimise damages (but these do not compensate for losses suffered).
    - An adequate architecture of concessional international assistance, with the highest priority for investments to improve resilience: climate-conditional debt relief to enhance adaptation and resilience spending would benefit all creditors; concessional assistance to compensate climate-vulnerable countries through a Loss and Damage Fund is morally appropriate.
- Adapt fiscal rules, with countries considering options that preserve fiscal sustainability while creating room for sound investments, through:
    - Establishing politically-independent Fiscal Councils to inform the public and guide Finance Ministers on appropriate medium-term budget frameworks.
    - Carving out selected high-priority, high-return investments for climate-related spending into a separate category, exempt from fiscal rules.
    - Creating a special purpose vehicle for public sustainable infrastructure, with an asset/liability approach and accounting practices to ensure creditworthiness.
    - Strengthening debt management offices to provide guidance on long-term fiscal sustainability.
    - Undertaking long-term (10 to 30 years) solvency risk strategies with alternative scenarios for climate-related fiscal spending.
    - Establishing debt transparency standards, including contingent liabilities and the disclosure of public debt contracts.
    - Evolving institutional norms, especially at the IMF, to favour sustainable growth strategies, even at the expense of higher rollover risk. Put in place stronger global safety nets.

Fostering investment and country platforms

Scaling up climate finance cannot happen without ramping up investment programmes and projects, but there are currently impediments to doing so. Many EMDCs lack well-articulated strategies and transition plans to provide clear direction, including in the private sector. There are often weaknesses in the investment climate and obstacles to attracting private investment, especially for the energy transition. Policy and institutional reforms, and institutional structures, are both needed to scale up project preparation and connect projects to investors. Creating country platforms with a focus on system transformation in key sectors is a promising way to bring stakeholders together behind purposeful change.

To tackle these impediments, action is needed in the five following areas.

Long-term climate and development strategies

Effective climate action begins with countries setting ambitious yet achievable long-term goals that are aligned with the temperature targets of the Paris Agreement. Articulating strategies in robust long-term strategies (LTS), nationally determined contributions

(NDCs), national adaptation plans (NAPs) and national biodiversity strategies and action plans (NBSAPs) is an important starting point, but these will need to be accompanied by clear implementation plans.

Priorities for action:

- **Ensure there are well formulated, credible pathways to meeting climate and development goals that incorporate milestones for shorter-term plans,** expressed in robust LTS, NDCs, NAPs and NBSAPs.
- **Define realistic investment and financing scenarios** that identify how much can be accommodated within state budgets and the extent of reliance on external sources.
- **Increase financial and technical support from the MDBs and bilateral agencies** for the development of clear strategies, particularly in small island developing states (SIDS) and the least developed countries (LDCs).
- **Take a comprehensive approach that considers the links between climate and development and addresses a range of factors,** including societal impacts, stakeholder engagement, governance and sector-specific strategies.
- **Set out clear implementation strategies, and create monitoring plans and revision processes** to assess their implementation and effectiveness.
- **Deepen understanding of a just transition through national dialogues, and develop country-specific just transition roadmaps,** integrated into national strategies.

Translating strategies into tangible investment programmes and project pipelines

To move from theoretical ambition to tangible climate action, countries need to build institutional capacity and address coordination failures to develop and implement investment programmes and project pipelines.

Priorities for action:

- **EMDC governments should lead on co-creating investment programmes** with the private sector and development finance institutions (DFIs) to strengthen project pipelines.
- **Increase capacity-building and technical assistance in areas where there are knowledge/skills gaps,** especially in early-stage project feasibility and preparation.
- **Provide matchmaking 'one-stop-shop' facilities with financial providers,** including for risk mitigation instruments and project preparation finance options.
- **Scale up existing project preparation facilities significantly, starting with the Global Infrastructure Facility**.
- **Provide support for corporates,** including through MDBs helping corporates access facilities when entering new locations, especially when they lack presence or previous experience there.
- **Scale up initiatives to connect prepared projects with investors,** such as the Regional Platforms for Climate Projects (RPCPs).

Implementing strong and sustained policy and institutional reforms

Creating a favourable investment climate will require a mix of policies that incentivise investment in the low-carbon economy and tackle the many market and government failures that still impede these investments. Raising and expanding the scope of carbon pricing will be crucial. Given that the path to net zero is riddled with barriers, it is insufficient to rely solely on pricing incentives: as such, effective climate policy packages will need to blend various strategies, appropriate to each country context.

Priorities for action:

- **Tackle barriers to investment in low-carbon and transition technologies.**
- **Use a mix of various policies that are designed to initiate transitions in critical systems such as energy and food**, including carbon pricing, labelling, regulations, subsidies, and direct investments (such as complementary investments in public sector infrastructure to support markets for private investment).
- **Employ technology support and demand support measures** to ensure the availability and affordability of needed technologies and infrastructure.
- **Implement policies aimed at greening existing flows in the financial system**, including requiring climate-risk tests, implementing regulatory reforms to help integrate climate risks into risk management, increasing governance and disclosure practices, and developing a green taxonomy.
- **Streamline planning and permitting**, while maintaining strong environmental, biodiversity and social safeguards.

Country/sector platforms led by countries

To get investment to the scale and quality required, key stakeholders need to come together around strategy, policy and finance in a coherent way: country/sector platforms are a promising option. These platforms, which are being pioneered in countries including Egypt, Indonesia, Vietnam and South Africa, can bring together national efforts and international support to accelerate progress through strategic collaboration. Country platforms should serve as a tool for allocating investment opportunities efficiently among the public and private sectors, using public finance to address non-commercially-viable priorities and catalyse private finance where possible.

Priorities for action:

- **Build on the ongoing country partnership efforts and the prior experience of the MDBs** to co-create country platforms that can quickly translate into investable projects, and create joint accountability with the private sector for delivery.
- **Convene all relevant stakeholders** to define priority areas to create a conducive local investment environment.
- **Develop country-level investment plans together with all players**, particularly the private sector.
- **Ensure that finance packages include sufficient concessional funding to tackle critical bottlenecks and address the human capital part of the transition**, especially for worker reskilling and community rehabilitation.

Promoting international cooperation on policy

Developed economies have rediscovered a more active role for the state, implementing industrial policies to promote domestic investment and jobs while transitioning to a green economy. Yet green policies can significantly erode the competitiveness of EMDC producers by favouring domestic suppliers either directly – through subsidies, near-shoring and local content requirements – or indirectly, as EMDCs struggle to meet the standards required and to qualify with the restrictive measures that regulate climate finance flows to emerging markets. The Carbon Club initiative launched by the G7 could provide a forum for discussion and agreement on a cooperative approach.

Priorities for action:

- **Design trade and industrial policies for cooperation, not competition,** and other fora for an inclusive approach.

- **Policymakers in developed economies should carefully assess the impact of green policies on EMDCs and ensure there are mechanisms** to create the conditions for increased investment and private finance across all countries.

Key pillars of the climate finance system (Chapter 5)

Domestic resource mobilisation (DRM)

Sixty per cent of the estimated investment financing required (and 55% of the incremental need) is expected to come from domestic resource mobilisation. EMDCs will need to mobilise domestic resources by an additional 2.7 percentage points of GDP to meet the spending gap by 2030, which is broadly achievable given potential tax capacity and scope for domestic private mobilisation. Fiscal policy will play a critical role.

Countries will need to implement a mix of policies to raise domestic revenues and improve spending efficiency. There is significant scope to increase tax revenues in many EMDCs. International tax cooperation needs to play an important supportive role.

Carbon pricing can also be significant in raising public revenues and providing incentives to decarbonise, but its implementation is politically challenging. Countries are likely to use a combination of pricing and non-pricing interventions to accelerate the net zero transition.

Harmful subsidies globally remain large and continue to expand. They weigh on government resources and cause environmental damage. Explicit and implicit fossil fuel subsidies amounted to 7% of global GDP in 2022.

Measures to improve the efficiency of public spending provide opportunities to enhance fiscal space. Evidence shows that countries waste on average about one-third of their infrastructure spending due to inefficiencies.

The role of Finance Ministers will be crucial in all of these areas and more broadly on the policy and institutional framework to drive the transition to a low-carbon, climate-resilient economy. The guide prepared by the Coalition of Finance Ministers for Climate Action with support from the Grantham Research Institute on strengthening the role of Finance Ministers in driving climate action provides a compelling case of that role, and of the policy and institutional agenda that they must grapple with.

Priorities for action:

- **Intensify efforts to raise fiscal revenues in EMDCs, through:**
  - Broadening the taxable base of consumption taxes, without necessarily raising tax rates.
  - More progressive taxation of income and wealth.
  - Implementing a minimum corporate tax rate and rationalising investment incentives.
  - Improving institutional capacity and increasing digitalisation in revenue administration.
  - Building institutional capacity on tax administration and public expenditure management, with support from the IMF, World Bank , OECD and UN.
- **Adopt carbon pricing much more widely in EMDCs and steadily increase the level of carbon taxation.**
- **Pursue phase-out of harmful subsidies, with due regard to political economy:** this will improve incentives to reduce emissions and environmental damage and release significant resources to redirect to climate-related investments.

- **Enhance the efficiency of public spending** in EMDCs through policies and capacity-building to improve the quality of public expenditure and procurement, and increase the speed of project implementation.
- **Strengthen international taxation arrangements to support EMDCs to tackle the erosion of their tax bases and profit shifting.** More work is needed to:
    - Tailor measures to administrative capacities of EMDCs, addressing challenges to participating in the Common Reporting Standards and other measures to contain profit shifting and base erosion.
    - Improve the fairness and progressivity of international taxation, such as through simpler and fairer rules to apportion profits of multinationals across jurisdictions.
    - Increase the global minimum tax rate and close loopholes to raise effective corporate tax rates relative to current levels.

Creating a new highway for private finance

At least $1 trillion a year of private capital will be needed in EMDCs excluding China by 2030 from different parts of the financial system, domestic and international, to meet climate and development goals. This is entirely feasible, given the viable business case. In addition to tackling policy and institutional gaps, action is needed in seven critical areas. The mobilisation of private finance will need to increase for all priority needs and for all markets, but will be greater for climate mitigation in middle-income countries than for low-income countries, where public or concessional finance will more likely be required.

Scale up tailored and efficient de-risking instruments

The current use of de-risking instruments to mobilise private investment is insufficient. MDBs and DFIs, donor agencies, export credit agencies, impact investors and philanthropy should explore how to increase the use of catalytic mechanisms to mobilise private capital and make it more affordable. There is a need to develop instruments and partnerships that can be taken to scale, to tackle risks and bring down the cost of capital, including foreign exchange risk, early stage and policy risks, and a need for aggregation and credit enhancement.

Priorities for action:

- **Deploy tailored, fit-for-purpose de-risking instruments in much more targeted ways** across the project lifecycle.
- **Deploy instruments to de-risk at an aggregated (portfolio) level,** where this can help reduce transaction costs and achieve greater leverage.
- **Streamline access to de-risking instruments for the private sector** by developing comprehensible and easily deployable risk mitigation instruments and guarantees.
- **Increase access to dedicated concessional funding for de-risking.**

Define parameters for transition finance

Countries, sectors, companies and financial institutions working towards net zero need clear, credible and actionable transition pathways, targets, standards and regulatory frameworks. Regulatory uncertainty and definitional ambiguities must be removed and parameters need to be more flexible to cater to different countries and sectors.

Priorities for action:

- **Align around categories of transition finance** that can together facilitate the necessary transition to a low-carbon economy.
- **Make transition frameworks fit for investors in EMDCs,** recognising differences in capabilities and technologies across regions and sectors.

- **Develop company transition plans in line with national transition plans or NDCs,** building on common global approaches, like the GFANZ transition plan framework.
- **Establish communities of practice** to identify issues and gaps, align on priorities, standards and frameworks, and share best practice.

Address bias in developed economy regulatory frameworks

Developed economy prudential regulatory frameworks can add to disadvantages faced by EMDCs by requiring higher levels of capital for banks and insurers for credit exposure and exposure to infrastructure project finance.

Priorities for action:

- **The G20 should set up an Independent Expert Group with good representation from EMDCs** to conduct analysis on historical risk and performance of infrastructure projects in EMDCs and assess implications for prudential rules across the full spectrum of financial regulation.
- **Assess the extent to which sovereign ceilings on ratings within countries unfairly punish creditworthy corporates.**
- **Address liquidity concerns and other design considerations** relating to capital treatment of guarantees and/or adjust credit risk mitigation guidelines to account for the risk-mitigating effects of guarantees.

Improve data quality and availability

Availability of comprehensive, credible, accessible data is crucial to catalysing the mobilisation of private finance towards sustainable projects and to accelerate transition.

Priorities for action:

- **Standardise data, based on robust standards and data collection methodologies,** to establish new asset classes and improve risk perception among investors.
- **Develop a broader set of metrics to measure progress in transition finance,** given existing metrics may disincentivise investment in high-emitting sectors.
- **Share data transparently to minimise the cost of accessing information.**
- **Improve data quality and verification to solidify investor confidence, mainstreaming its use in investment decisions.**
- **Build data architecture and infrastructure to develop and disseminate climate transition-related data.** The Net-Zero Data Public Utility could be a powerful platform to close this gap, with the involvement of relevant public and private partners.

Leverage domestic markets to unlock private capital

There is approximately $17 trillion of domestic financial capital in EMDCs, made up of household savings, pension capital, corporate and local bank finance. Deploying this capital will be critical to investing in low-carbon infrastructure, climate-positive technologies and transitioning companies. Developing bigger and deeper domestic financial markets should be an additional priority.

Priorities for action:

- **Increase the use of green finance products like green bonds and sustainability-linked loans,** which are underused in EMDCs compared with developed economies.
- **Mobilise domestic pension capital for infrastructure and alternative asset classes for climate action.**
- **Leverage the deep expertise within national and regional financial institutions** to build out the pipeline needed to attract private capital for climate action.

- **Expand technical assistance and capacity-building** to deepen expertise in climate and transition.
- **Develop local currency de-risking products** to mobilise domestic investors.
- **Ensure domestic fiscal rules enable investment in low-carbon solutions.**

Augment the role of corporates in EMDCs and strengthen financing channels

Corporates are key drivers of climate action. Their financial strength, innovative technologies and operational efficiency enable them to effectively marshal resources, conceive projects, and launch scalable low-carbon solutions. Global corporations are particularly crucial as they must accelerate efforts to decarbonise their value chains and can share contacts, skills and experience. In addition, investors targeting green investments in EMDCs can both identify and support investable opportunities and augment the supply of institutional capital.

Priorities for action:

- **Facilitate access to debt finance for corporate transition plans** in EMDCs, to enable companies to make investments in decarbonisation by creating green and transition bond frameworks that can be leveraged through credit enhancing mechanisms.
- **Incentivise scaling up of equity capital to support corporates in EMDCs** through public-private platforms that can provide early stage and growth capital.
- **Private financial actors should shift** towards actively developing low-carbon, resilient projects in EMDCs and channel finance towards these, to marshal larger volumes of corporate and emerging market finance.
- **Asset managers with strong experience in emerging markets can pave the way to help develop and finance green investments and provide transition finance,** and enhanced partnership between them and other providers of capital can bolster the supply of finance for EMDCs.

Promote private investment in adaptation and nature

Investments in adaptation and resilience are paramount to mitigating the escalating impacts of climate change, but current levels of investment are severely insufficient. There is a need to address climate risk in a systematic way to unlock private investment and finance in adaptation. There are several categories of resilience investment. Some generate revenue, some savings, some both or neither. Some generated savings are shared, some are internalised. Some revenue-generating investments provide clear business opportunities. Each category has different implications for where and how the private sector can engage; thus, tailored innovative financial mechanisms are required to address barriers to private investment in different situations.

There is also scope for innovative mechanisms for nature and biodiversity financing, including high-integrity biodiversity markets, blended finance vehicles, guarantees and insurance specific to nature. Key instruments include insurance, debt and blended finance models.

Priorities for action:

- **Develop country-specific, comprehensive resilience and adaptation plans**.
- **Consider insurance options that are well-suited to investments that generate savings but not revenue.**
- **Use debt instruments that can provide incentives and capabilities** to invest in resilience-building solutions.

- **Develop blended finance models for investments that are not revenue-generating in the short term**.
- **Enhance risk assessments to evaluate the financial benefits from adaptation and the costs of inaction**, clarifying the case for adaptation and resilience investments.

An MDB system that works for climate action

The critical role of the MDBs in the revamping of climate finance has been highlighted in all the deliberations and proposals on the reform of the climate finance architecture over the past year, from the Bridgetown Initiative to the Paris New Global Financing Pact to the G20. (Our first report of November 2022 has been a key foundation for this work.) The MDBs are central to a big push on investment because of their ability to help countries scale up their investment programmes and their unique capacity to mobilise low-cost financing and to catalyse much higher volumes of private finance.

The G20-mandated Independent Expert Group (IEG) on MDB Reform calls for a tripling in sustainable annual lending levels to $390 billion by 2030. The IEG's vision and agenda is based on: (i) converting operating models to support transformational investments; (ii) bringing engagement with the private sector to the centre; and (iii) significantly scaling up financing at an affordable cost. Heads of the MDBs have welcomed the recommendations and committed to a series of responses to scale up and make their role more effective. Four key areas where further agreement and follow-up are needed are described below.

A new country engagement model to ramp up transformative investments

Collectively and individually, the MDBs need to become much more proactive in scaling up transformative investments in energy transition, adaptation and resilience, and natural capital. The stalled progress on all three fronts in EMDCs should be a wake-up call for the MDBs. MDBs need to move from a project- and institution-led approach to working collectively to ramp up support. A starting point is good diagnosis of the system transformations that are necessary, as has been initiated through the World Bank's Climate Change Development Reports (CCDRs). Diagnoses now need to be quickly translated into programmes of action and support. The best way to do this is through country platforms with a clear objective, strategy and commitment from all key stakeholders under the leadership of the country.

Priorities for action:

- **Set collective MDB targets and joint scorecards for scaling up investments in the key sectors and geographies by 2030** and agree on strategies on how to meet them.
- **Work collectively and proactively on a country platform approach and set an implementation plan among MDBs**, including engaging with specific countries interested in this approach to achieve priority mitigation, adaptation and nature objectives.
- **Radically speed up project and programme approvals among MDBs,** simplify rules and procedures and improve support for policy and institutional reform with focus on these key areas.

A new partnership with the private sector

Private investment and private finance in EMDCs is dismally low and the MDBs are not playing their part. MDBs mobilised only $17 billion in private finance compared with $80.6 billion in their own lending for climate action in EMDCs in 2022. MDBs have so far lacked an effective strategy for boosting private investment and finance based on sector and country opportunities and challenges. There is insufficient cooperation with the private sector on identifying key opportunities and tackling barriers to private investment and finance. They have often competed for easy projects with the private sector and even among themselves. They have lacked the approach, incentives and instruments necessary to better manage and share risk with the private sector and bring down the cost of capital. MDBs need to establish a new partnership with the private sector, taking advantage of the sector's proactive engagement, including in the Glasgow Financial Alliance for Net Zero (GFANZ).

Priorities for action:

- **Adopt a whole-of-MDB approach to co-create investment opportunities with the private sector,** develop pipelines and provide de-risking and credit-enhancement tools to scale up private investment and finance, ideally through a country platform approach.
- **Tackle misaligned incentives and internal barriers for MDBs** to place catalysation of private investment and finance at the centre of MDB strategy, operations and scorecards.
- **Review and reform instruments for catalysing private finance,** including the role of guarantees and credit enhancement over the project cycle and at a portfolio level, drawing on lessons from the World Bank's Private Sector Investment Lab. MDBs should work to develop a market of tradable instruments of emerging market securities to mobilise institutional capital at scale.
- **Revamp the role of the Multilateral Investment Guarantee Agency (MIGA) in the provision of guarantees,** in partnership with the whole MDB system.

Boosting the firepower of the MDB system

As our first report and the IEG Report have underscored, MDBs will need to triple their lending to $390 billion by 2030 ($300 billion non-concessional, $90 billion concessional), with much of the incremental lending focused on climate in order to meet the Paris Agreement targets and related development goals. This new lending capacity can come from three sources that are complementary and mutually reinforcing: more efficient utilisation of existing capital; augmenting capital through voluntary contributions from shareholders and other contributors, through lending and portfolio guarantees and hybrid capital; and regular capital increases that can provide the basis for the sustained expansion of lending that will be needed.

Shareholder support will be critical, to enable MDBs to stretch capital while retaining their high credit ratings and to boost their capital in lock-step with increased efficiency. Funding climate finance through MDBs generates high leverage and yields a higher public return and impact than virtually any other means. All development partners, public and private, should therefore consider channelling resources through the MDBs to scale up finance for urgent climate action in EMDCs.

Measures already being implemented or under consideration by the MDBs could yield $300–400 billion of additional lending capacity over the next decade: a 40% increase in annual lending capacity. Further actions are now needed to both boost immediate lending firepower and achieve the goal of tripling lending by 2030.

Priorities for action:

- **Assess the scope for further efficiency measures based on a common approach, analytical underpinnings and benchmarks** among the MDBs, especially for callable capital; agree on this approach with credit rating agencies. Each MDB should then implement this approach expeditiously in consultation with its shareholders.

- **Expand innovative options for augmenting capital and lending by MDBs** by tapping willing shareholders and new contributors, to boost MDBs' immediate firepower.
- **Launch a systematic campaign by MDBs to mobilise such funding** from willing shareholders and other contributors, starting at COP28.
- **Major shareholders should commit to a regular system of capital increases** to provide the basis of sustained lending and support the governance and legitimacy of the institutions. Without such commitment it will be difficult for MDBs to ramp up in the short run as they might have to scale back strongly if capital constraints start to bite.

Tracking collective effectiveness of the MDB system

A robust system of reporting and accountability needs to be put in place to assess collective and individual progress made by the MDBs on these fronts. Several initiatives are collecting information and tracking progress against the agenda that has been set. The MDBs, too, are improving the quality and timeliness of their own reporting. The IEG could also play a valuable role in independently assessing progress.

Priorities for action:

- **Increase transparency in MDBs' climate finance reporting** and publish more detailed data, such as that on finance to the LDCs.
- **Launch a cooperative effort on independent monitoring of progress against agreed benchmarks,** based on the initiatives already underway.
- **Ask the IEG to take stock of and report on progress on MDB reform** in 2024, at the Spring and Annual Meetings of the World Bank and IMF and COP29, and at COP30 in 2025.

Delivering and expanding options for concessional climate finance

An inclusive architecture for climate finance will require access to concessional and debt-free financing for investments to address priority needs in EMDCs – from adaptation and resilience-building, to addressing loss and damage, restoring nature and supporting a just transition. Many of these investments do not yield the revenue streams necessary to attract private financing and, in some instances, can only be supported by highly concessional finance. Concessional financing of $150–200 billion annually will be needed by 2030 – more than four times the existing level. This can only be delivered by tapping all available pools of concessional finance, including new and innovative options. Developed countries need to lead on the expansion of concessional finance; the overall scale of needs can be met only through international taxation that can generate more predictable financing and by tapping the potential of voluntary contributions from the corporate sector and philanthropy.

Towards more ambitious concessional finance

Financing from bilateral donors is a core part of the $100 billion of annual climate financing that developed countries committed to deliver this year. The fact this target was missed reflects the slow pace of the increase in bilateral climate finance. The shortfall has been most evident in financing for adaptation. At the same time, there is a need to improve access to bilateral finance, the predictability of disbursements, and to better align with country-led processes to improve trust in the climate financing architecture.

Deliberations in technical discussions on the New Collective Quantifiable Goal (NCQG) reflect divergent views on the size of the quantitative target in relation to priority needs. We have learnt from the process around the $100 billion commitment that transparency through determining the layers and components of the overall financing goal will build trust, and this should inform the NCQG process.

The main vehicles for official multilateral assistance are the concessional windows in MDBs, of which the International Development Association is the largest, complemented by specialised multilateral funds. More than 40% of the IDA's annual lending now supports climate action.

Financing through multilateral climate funds has been increasing and they now provide $3.9 billion of annual concessional financing, mostly in grant terms, to EMDCs. The four largest climate financial intermediary funds – the Global Climate Fund (GCF), Global Environment Facility (GEF), Climate Investment Fund (CIF) and the Adaptation Fund (AF) – have cumulative commitments of more than $30 billion. The complex multilateral financing architecture has led to concerns regarding the coherence and effectiveness of these funds' different roles, as well as the adequacy and predictability of their financing.

Priorities for action:

- **Double bilateral climate finance from donors** from the 2020 level to $60 billion by 2025 and triple it to $90 billion by 2030.
- **Immediately double adaptation finance from donors** from the 2020 level and set targets commensurate with anticipated needs by 2030.
- **Provide developed country leadership and financial commitment for the operationalisation and funding of the Loss and Damage Fund.**
- **Enhance donor support of multilateral official financing by:**
  - Urgently replenishing the IDA's crisis window to bolster the IDA's capacity to respond to climate and other crises.
  - Increasing donor contributions to IDA21 and beyond with a view to tripling the IDA's annual lending by 2030.
  - Reforming the architecture and funding of the multilateral concessional climate-related funds to enhance their combined effectiveness and ensure adequate and predicable financing. The proposed review by the G20 offers a timely opportunity for assessing and improving the roles of these funds.
- **Define the scope of climate financing and the criteria for allocating concessional financing to low- and middle-income countries,** with efforts from donors and other climate finance providers:
  - The Paris Global Summit launched a process to agree on a common definition of the 'multidimensional effects of vulnerability' and their potential impact on determining eligibility to concessional resources.
  - Give consideration also to establishing a global window for concessional financing to address global public goods, as recommended by the G20's Triple Agenda Report.
- **Take steps among donors and climate finance providers to enhance the effectiveness of official concessional finance**:
  - Align support to country-led priorities and programmes.
  - Tackle bottlenecks to provide efficient access to, and predictability of, financing based on the recommendations of the Task Force on Access to Climate Finance, working with pilot countries and the Climate Finance Network.
  - Improve monitoring, tracking and accountability of the provision of climate finance.

Enhancing the use of Special Drawing Rights (SDRs)

The IMF and its members should take steps to improve the effectiveness of SDR rechannelling and tap the enormous potential of SDRs to boost liquidity and enhance development and climate finance.

Priorities for action:

- **Identify and tackle impediments to expanding lending through the RST and PRGT.**
- **Use SDRs to expand lending by MDBs that are prescribed SDR holders,** starting with implementing proposals from the African Development Bank and Inter-American Development Bank.
- **Modernise the framework for use of SDRs to make it less rigid and costly,** led by the IMF, working with central banks.
- **Initiate discussions under leadership of the IMF and G20 on the next cycle of SDR issuance** as part of a regular system of issuance to boost liquidity and further augment the pool of concessional finance for climate action.

Tapping carbon markets

Carbon markets, one way to put a price on carbon, have an important role in an overall financial strategy for transformation. Compliance markets, through which governments require firms to pay for their ongoing emissions, remain central to the policy toolbox in many countries and are an important source of government revenue. The growth of carbon credit markets – which trade verified emission reductions or removals (rather than permits) – is also an additional potential source of climate and development finance.

The voluntary carbon market (VCM) could provide up to $50 billion in the medium term but it has experienced setbacks and negative market sentiment, exacerbated by an uncertain regulatory and policy landscape, including questions over the precise relationship with the mechanisms created by Article 6 of the Paris Agreement. To counter these issues, robust and dynamic market design, greater transparency and oversight, and leveraging overlaps with policy frameworks, will be key. There should be convergence between the rules governing voluntary and compliance markets as an enabler of high-integrity finance to EMDCs.

EMDCs require strategies to access carbon credit markets. They must develop pipelines of projects or programmes that can generate high-quality credits and ensure that such issuance is compatible with their wider climate commitments and development plans. Support is required from international organisations, including bilaterally and through regional groups such as the Africa Carbon Markets Initiative (ACMI).

To scale up financial flows in the VCM, a complete, clear and credible governance framework and market architecture are needed, with end-to-end transparency accompanied by strong incentives to make investments. The many different initiatives and market players need to be joined up to deliver robust oversight.

Priorities for action:

- **All governments: continue to extend compliance markets**, ensuring sufficiently high carbon prices by design and, where possible, using the revenues for no-regrets investments in sustainable development.
- **EMDC governments: continue to prepare to receive carbon finance from high integrity activity,** including building project pipelines, linking these to climate and development strategies and NDCs, and developing institutions and capacity.
- **Advanced economy governments: develop regulations and carbon pricing instruments** that support demand for high-quality carbon credits and high integrity in companies' use of credits in their decarbonisation strategies.
- **Donors: assist EMDC governments to invest in their capability to attract high integrity carbon finance** and help to ensure that benefits are shared fairly, including by supporting Indigenous Peoples and local communities.

- **VCM integrity initiatives: deepen joint work,** inviting collaboration with market players and civil society stakeholders, urgently accelerate alignment of definitions and standards across demand and supply, and prioritise missing pieces from current frameworks in work plans for 2024.

International taxation measures to increase climate finance

Introducing international taxation on high-emitting sectors such as maritime transport and international aviation has enormous potential to close the climate financing gap and should be actively pursued. There is growing momentum behind the necessity and opportunities for such taxation, including through the Bridgetown Initiative, Paris Global Financing Pact and Africa Climate Summit. The Paris Global Summit drew attention to mandatory mechanisms, which incentivise decarbonisation, remove implicit fossil fuel subsidies, level the corporate tax playing field, embody the spirit of the polluter-pays principle, and can mobilise significant financing for a just transition.

Priorities for action:

- **Establish a Taskforce on Global Taxation,** as proposed by leading countries supporting the Paris Global Financing Pact, to consider the full range of options and build consensus on an integrated set of proposals.
- **Continue active discussions on the promising avenues of maritime and aviation levies** in parallel to setting up the taskforce, to secure agreement on options that can attract political support and take into account any potential adverse effects on EMDCs.

Leveraging private philanthropy

Climate financing accounts for only 2% of overall philanthropic giving, suggesting significant scope for philanthropy to play a bigger role in boosting climate finance, including for EMDCs. In 2022, $435 million, or about 20% of philanthropic giving by foundations, went to EMDCs (other than China). There is also significant scope to expand the pool of philanthropic contributions, including by tapping the corporate sector and rich individuals.

Priorities for action:

- **Philanthropy should assess its potential role in bridging climate financing gaps,** based on its particular strengths. This should happen in relation to country programmes such as the Just Energy Transitions Partnership (JETP) model and to priorities for which concessional financing is urgently needed, such as loss and damage, adaptation and resilience, investing in nature and biodiversity, and accelerating the energy transition in low-income countries.
- **Consider ways for philanthropy to provide flexible financing to develop new ideas that can catalyse transformative change** and advance opportunities for people.
- **Create partnerships between philanthropy and the MDBs to scale up support for climate action** through innovative structures and the provision of hybrid capital.
- **Explore the potential to tap corporate responsibility** to increase financing to achieve the Sustainable Development Goals (SDGs) and address climate change and other public goods, including by identifying areas and financial mechanisms that deliver effectively on corporate responsibility to unleash significant sources of voluntary contributions.

Annex 601

"Climate and Sovereign Debt Vulnerabilities: Some Practical Solutions", *Lazard*, February 2024

POLICY BRIEF

Climate and Sovereign Debt Vulnerabilities: Some Practical Solutions

February 2024

Executive Summary

***Key messages** based on Lazard's experience in advising governments dealing with debt problems:*

- *The concomitance of elevated public debt levels and a far-reaching climate challenge is making the solution to both problems more difficult.*
- *This is especially true when countries face financial distress, as is generally the case for developing countries rated low single B and below. These are the focus of this Policy Brief.*
- *Yet, there is some whiff of hope that the wide mobilisation behind climate may make this complication less intractable than thought, and that one could at the same time address debt and climate unsustainability.*
- *Could climate change bring a good surprise to overly indebted countries? We do not think so. But that does not mean that well thought out financial solutions cannot help, in some cases meaningfully.*
- *High public debt levels make the financing of climate adaptation and mitigation by debt generally unadvisable: compounding a climate crisis with a financial crisis is not a solution. Happily, there are other alternatives, beyond indispensable and massive transfers from rich to poor countries in the form of grants:*

    1. *Climate shock absorbing features in debt instruments.*
    2. *Non-recourse financing solutions.*
    3. *Natural asset monetisation which may alleviate the tension between climate challenges and debt overhang.*

- *When public debt is unbearable, debt reduction is needed. Adding a climate element to the solution is tempting but likely to make already protracted negotiations intractable. Liability management operations, such as debt for nature swaps, which help progress the two objectives of climate and debt sustainability at once, can be usefully considered outside debt renegotiation processes. But barring an unlikely tax or regulation response in advanced economies, the mobilisation behind climate will not solve low-income countries' over-indebtedness.*

Introduction

All countries must take costly measures to mitigate and adapt to climate change. For countries facing financial distress (which is generally the case for developing countries rated low single B and below) the confluence of excessive public debt and the need to finance climate adaptation and mitigation is making the solution to both problems more difficult.

The IMF estimates that the necessary climate mitigation investment by developing and emerging market economies to reach net-zero by 2050 may amount to USD 2 trillion per year by 2030. To dimension the issue, speculative grade countries' debt stock is USD 5.5 Trillion, of which USD 2.8 Trillion for single B and below rated countries. The ability of low-income countries to stretch their balance sheet in the face of massive investment needs is highly doubtful.

Yet, there is some whiff of hope that the mobilisation behind climate and the seniority which the cause could (should) get amongst competing objectives may make this complication less intractable than thought, and that one could at the same time address debt and climate unsustainability.

There are two key issues:

i. Whether climate change adaptation and mitigation has necessarily to result in higher debt levels.
ii. Whether climate-related financial solutions can decisively help address problems of debt unsustainability.

Based on our experience, we believe that:

i. Climate change is a net negative for financially vulnerable countries, and financing adaptation and mitigation through debt is not advisable. That said, well structured financing instruments and carbon credits monetisation can to some extent alleviate the financial pressure.
ii. The mobilisation behind climate objectives is unlikely to solve acute over-indebtedness problems, and adding climate considerations to already complex and protracted debt restructurings is bound to disappoint. That said, (improbable) changes in tax and regulatory policies in advanced countries may make a difference if they tilt the balance between fiduciary and social responsibility.

This note, based on Lazard's experience in financing and debt restructuring, offers some practical solutions to one of the key financial challenges of our time – how countries in or at high risk of distress can finance the urgently needed investments to adapt to and mitigate climate change, without exacerbating their debt problems.

1. Climate shock absorptive instruments – debt with equity-like features

One of the most promising ways to reduce the risk of concomitant debt and climate crises is to make debt repayments more sensitive to climate shocks. Thus, several countries, though principally small island states, have issued so-called **“climate resilient bonds” that allow the country to suspend debt service payments in the event of a loss due to a natural disaster such as a hurricane or flooding.**

The issuance of climate resilient bonds raises at least two issues: if the risk of debt service suspension reduces the value of the related bonds, the cost of debt at origin will be higher; and if only a small portion of a country’s debt includes climate resilient clauses, their inclusion will do little to protect the country against the financial burden of dealing with natural catastrophes.

Several Multilateral Development Banks have announced the introduction of climate resilient debt clauses into some of their development loans. But this only applies to a very limited subset of the portfolio – essentially new loans.

The Caribbean Development Bank (CDB), advised by Lazard, is working on an innovative solution: *all of the loans* it has extended to member countries exposed to the risk of periodic hurricanes would include a climate resilient debt suspension clause based on insurance models; the bank would cover its risk by issuing hybrid debt with parallel triggering conditions with the overall objective of protecting its credit rating.

Ultimately, the CDB is looking to offer a form of collective insurance to its member countries with the support of outside investors. The advantage that the CDB has in doing so is that, like all other Multilateral Development Banks (MDBs), it does not have to provide its shareholders with a return on equity.

Of course, if the CDB is the only MDB to offer this benefit to its clients, the impact will be limited. Although it intends to include this feature in all its existing and new loans, the fact is that most of its members borrow from several other sources as well. So, the real benefit from this project will only be achieved once the other MDBs offer similar protection to their borrowers, that is covering the stock (the outstanding loan) and not only the flow (the new loan).

It may then reach another level of materiality if low-income countries’ governments were assisted in the issuance of bonds (or other forms of debt) with similar clauses. Obviously, the cost may be prohibitive, at least at the beginning: bondholders will have difficulties pricing it and will be conservative; and some fixed income funds will simply balk at investing in instruments with deferral options outside their control. Still, with some well-structured guarantees from AAA countries, this type of debt may get traction over time if the attraction for bespoke clauses is resisted.

2. Non-recourse financing

Non-recourse financing, where the lender looks only to a dedicated payment stream for payment and has no claim (recourse) against the borrower itself, is an exception to the caution against borrowing by over-indebted countries. It is also a form or monetisation of assets, in this case a financial asset. As such, it is discussed in the following Section.

3. Monetisation of natural assets

Asset sales are a source of funds for both public and private sector actors, but it would be a mistake to believe that they are inherently a better choice for a heavily indebted country. To the extent that the asset sold is a right to receive future payments (which is typical of non-recourse financing), the sale effectively accelerates the receipt of those payments in the form of the purchase price of the asset sold. But the sale also eliminates the right to receive future payments that could otherwise have been used to service debt. So, although debt does not increase, the *capacity to service debt* decreases.

The analysis is different in the case of an asset that does not generate a future payment stream (new or existing) and, in particular, in the case of an asset the acquisition or creation of which directly contributes to climate change mitigation.

As it happens, a significant number of distressed countries are fortunate to have a large – and in some case massive – store of onshore and offshore assets (natural carbon sinks and renewable energy sources, for example) the protection or development of which can make a significant contribution to efforts to combat climate change and can readily be monetised in the process. Here, **as the assets generally do not generate a future payment stream, monetisation does not impair the capacity to service debt and, if well done, can in fact facilitate the reduction of debt.**

Several developing countries have abundant assets in the form of natural resources whose value in the hands of advanced economies lies not in their potential exploitation but in their preservation. Thus, the value of carbon sinks (or offsets) can be embodied in carbon credits, which are a prototypical example of such an asset. Although most of these countries lack the technical capacity to create and market credible carbon credits, there are a number of private firms that are offering their services to do so to these developing countries, although at a hefty price.

The big problem today is that there is at best only a nascent market, with trading done on a bespoke basis, and it is difficult to find buyers willing to offer a "fair" price, assuming one can figure out what that is. Absolute GHG sequestration – the main benefit of a carbon sink – is also not adequately valued under current carbon credit standards which rather tend to reward GHG reduction outcomes compared to a do-nothing baseline.

One solution would be for **MDBs to offer technical assistance in the form of assisting countries in the production of carbon credits** and supervising, or indeed providing, the certification as to their validity needed to make these credits marketable. The World Bank has started to go in that direction, at least partly.

Ideally, these MDBs would take one step further and agree to accept carbon credits in repayment of their loans to borrowing countries. Thus, for example, if the African Development Bank assisted one of its borrowers in the creation of carbon credits, it would accept these credits as currency to repay loans made by it to that country. In doing so, it would stand behind the validity of the credit and rely on its institutional and market expertise to monetise it.

Although not itself a game changer, this could be an important expansion of the role of MDBs and a step the right direction of increasing their relevance in today's complex environment, without expanding their balance sheet.

4. Addressing debt distress and climate needs at the same time

As noted above, the confluence of debt distress and the urgent need to invest in adaptation to and mitigation of climate change has spurred proposals to kill two birds with one stone: use the occasion of a needed restructuring of public debt to design the new debt that will be issued in such a way as to give the issuer incentives to pursue measures to address climate change.

For example, issue the new debt in the form of sustainability linked bonds (SLBs), where the issuer's debt servicing costs are reduced if it meets certain defined climate-related objectives.

Our experience as advisors to the governments of nearly all countries that have had to restructure their public debt over the last years suggests that adding climate-related objectives to an already complicated negotiation risks prolonging the successful conclusion of the restructuring, at significant cost to both the debtor and its creditors.

In a restructuring two issues are paramount: the level of debt relief (or from the creditors' perspective the level of impairment of their claims) and comparability of treatment of different creditor classes. The first is <u>the</u> issue on which the parties are focused. They, and particularly the creditors with fiduciary duties to those whose money they manage, are not interested in balancing the objectives of minimizing losses and proactively addressing climate change. And if comparability of treatment means that all creditor groups, official and commercial, bondholders and other private creditors must in some measure contribute to a climate agenda (not as farfetched as it may seem), the added complexity will be unwelcome to all, to put it mildly.

That said, there is a class of investors, not necessarily those whose debt is being restructured, that are natural investors in SLBs and other bonds designed to promote climate-related objectives. Accordingly, including in the new debt to be issued in a restructuring, one or more tranches of SLBs or other climate-related debt available to those creditors who wish to acquire it could at the margin facilitate a restructuring, but we should not anticipate the effect on climate issues to be large.

In summary, the possibilities of achieving synergies that will further important goals to achieve both debt sustainability and climate-related objectives are, as a general rule, limited.

There are, however, two cases – one available today outside the context of a debt restructuring and a second embedded in a restructuring, but dependent on government or regulatory action – in which debt reduction and action to address adaptation to climate change can be achieved in a single transaction.

The first case is a class of transactions familiarly known as **debt for nature swaps**.

In these transactions, expensive debt, typically trading at a substantial discount, is exchanged for debt with external credit support and a substantially lower interest rate (and typically lower aggregate principal amount) than the debt surrendered in exchange. The debtor country in turn agrees to invest the savings in debt service cost to further climate objectives.

A recent example is the debt swap carried out by Ecuador with the advice of Lazard, where the savings were dedicated to the protection of the Galapagos Islands. This transaction was carried out after a debt restructuring, but other debt for nature swaps have been done before a debt restructuring, in which case the amount of debt to be restructured will have been reduced by the amount of debt previously exchanged in the swap. Debt for nature swaps involve multiple parties, are complex and take considerable time from start to finish.

It is not clear to what extent these transactions can be scaled up. The Ecuadorean swap involved the exchange of $1.6 billion face amount of bonds that were trading at approximately 40 cents and resulted in a savings of $1.1 billion in debt service costs over 17 years. The discount on the bond was exceptionally high. If one took all the bonds from frontier economies that today trade with a significant discount (higher than 30%), we come to less than 5% of the total debt stock[1].

The second case would require prior action by governments regulating or taxing bondholders.

[1] Outstanding of relevant discounted bonded debt divided by total debt for countries rated B1 or below by Moody's.

The question is the extent to which advanced economies' governments can help facilitate sovereign debt restructuring negotiations through some sort of 'green' nudging of the international creditors. Fund managers – the creditors – are mostly based in advanced economies and thus responsive to regulatory or tax policies.

There is precedent in the United States and elsewhere for governments to provide favourable tax or regulatory treatment to debt that is deemed to promote policies favoured by the government. Thus, interest on bonds issued by municipalities in the United States as well as on so-called Industrial Revenue Bonds is exempt from Federal income tax, and several other countries have provided favourable regulatory treatment to certain categories of debt from time to time. In the same vein, but working in the other direction, the European Union is introducing a Carbon Border Adjustment Mechanism (CEBAM), which is a tax targeting 'carbon leakage' in the context of the import of carbon intensive goods. The whole point is that tax and regulation have a role to play in shaping incentives as part of the climate agenda.

The underlying issue is that fund managers will inevitably give priority to their fiduciary responsibility over social/climate responsibility. Therefore, tax or policy incentives may change the balance.

Considering the support, including subsidies, that advanced countries currently give to climate-related measures, one possibility to expand that support would be to grant for instance favourable tax (or regulatory) treatment to interest received on bonds issued, in the context of a debt restructuring, to promote or fund climate-related goals.

This would be a way for advanced economies to help unlock some debt restructuring negotiations, especially when there is a gridlock: the debtor country would for instance offer to exchange its defaulted bonds against climate-linked bonds with a lower value; but such bonds would benefit from tax or regulatory benefits in advanced economies, helping find a compromise where debt is reduced to ensure sustainability for the debtor but the effort made by the lenders is reduced by the tax benefits enjoyed by the new climate-related bonds.

Conclusion

Climate adaptation and mitigation is a net cost for all countries, and primarily for those whose finances are already stretched. The first solution is a large transfer from rich to low-income countries. It may not be realistic as the pledges so far have generally not been followed by action.

Funding the climate response by conventional debt is a recipe for more problems. Climate shock absorptive debt instruments are much more promising, to the extent they can reach sufficient scale.

Helping financially poor but natural resources rich (in terms of biodiversity) countries repay their debt with carbon assets is a solution that in our view deserves to be explored more thoroughly.

Last, while adding green features to debt restructuring negotiations is tempting, it should be kept in mind that the primary objective of these negotiations is to provide timely and sufficient debt relief to countries facing financial distress. Our experience shows that adding additional constraints or variables to the negotiation is likely to prolong the process further. That said, significant changes in tax or regulation in advanced economies in favour of climate-related assets may change the equation and facilitate debt restructurings as the value of such bonds, in the eyes of investors, would be partly disconnected from the cost, for the debtor, of carrying them.

Contact Information

Lazard's Sovereign Advisory Group is committed to serving its clients: governments and public institutions looking for solutions to their complex financial problems.

The sheer scope and importance of these matters also compels us to share our decades of experience for the broad public interest.

Contact persons:

- Pierre Cailleteau – pierre.cailleteau@lazard.fr
- Thomas Lambert – thomas.lambert@lazard.fr
- Mark Walker – mark.walker@lazard.com
- Jérôme Alexis – jerome.alexis@lazard.com
- Thomas Moatti – thomas.moatti@lazard.com
- Leonardo Pupetto – leonardo.puppetto@lazard.com
- Raphaël Hecht – raphael.hecht@lazard.fr

Annex 602

“Cost of Capital and Capital Allocation – Investment in the Era of ‘Easy Money’”, *Morgan Stanley*, 28 February 2024

Morgan Stanley

INVESTMENT MANAGEMENT

Counterpoint Global Insights

Cost of Capital and Capital Allocation

Investment in the Era of "Easy Money"

CONSILIENT OBSERVER | February 28, 2024

AUTHORS

Michael J. Mauboussin
michael.mauboussin@morganstanley.com

Dan Callahan, CFA
dan.callahan1@morganstanley.com

Introduction

There is an old saying that "in theory there is no difference between theory and practice, while in practice there is."[1] One area where this appears to be true is the actions of public companies in the U.S. during the recent period of "easy money," when financial capital was cheap and abundant.

We define that time from 2009, when the Federal Reserve and other central banks around the world reduced policy rates to essentially zero, to the end of 2021. During this period the Fed also initiated multiple rounds of asset purchases in the open market to lower interest rates and increase the supply of money. The Federal Reserve reversed course in early 2022 and started aggressively raising interest rates to more than five percent by the end of 2023.[2]

This era began as an attempt to heal the wounds from the Global Financial Crisis of 2007 to 2008, and was punctuated by additional easing in 2020 to mitigate the negative economic shock that the COVID-19 pandemic caused. It ended in an attempt to tame the inflation that rose sharply in 2021 and persisted through 2022.

For this analysis, we examine two periods of equal duration: the phase of easy money (2009-2021) and the thirteen years preceding it (1996-2008). The label of easy money suggests some distinctions between the periods. We expect to see lower short- and long-term interest rates in the easy money period than in the one before it. That is the case. The average yield on the 10-year U.S. Treasury note, calculated monthly, was 2.3 percent from 2009-2021 versus 5.0 percent from 1996-2008.

All things being equal, declining interest rates are good for asset prices because future cash flows are worth more when they are discounted at a lower rate. Here again, the point is borne out. The compound annual growth rate (CAGR) for the S&P 500, an index of the largest public companies in the U.S., was 16.0 percent when there was easy money and 4.8 percent in the equivalent time before.

Earnings growth was higher in the easy money phase than in the prior one in part because it started as the result of poor economic conditions and depressed earnings in 2008. But the returns also benefited from an expansion in the price-earnings (P/E) multiple, a natural outcome of lower rates. The CAGR for the S&P 500 was 9.6 percent from 1928 to 2023, so the returns during the easy money era were exceptional.[3]

Easy money periods have a long history of spurring financial shenanigans, and the recent episode was no exception.[4] For example, investors took on greater risk in search of returns (see appendix). This contributed to the financing of highly speculative companies, money flowing into nefarious schemes in the cryptocurrency sector, and an increase in the number of "zombie firms," companies unable to service their debt with present profits but able to access cheap financing.[5]

There was also a flurry of interest in meme stocks, which traded based more on social media hype than on fundamentals, and a surge in the number of special purpose acquisition companies (SPACs) seeking to do deals. These booms were followed by a bust after the end of easy money.[6]

Our focus is on how U.S. public companies acted in the regime of easy money. In theory, lower interest rates and ready access to capital would suggest that public companies invest more, use more debt, and hold less cash. More abundant investment opportunities would also imply restraint from returning cash to shareholders. But that is not what public companies did.

We place particular emphasis on the observation that companies often use hurdle rates that are substantially higher than their cost of capital based on market indicators, and that share buybacks will contribute less to earnings per share growth now than they did in the period of easy money given today's valuation multiples and interest rates.

Discount Rates, Cost of Capital, and Return on Invested Capital

This first example of a gap between theory and practice is how public companies reacted to lower interest rates. We estimate that the weighted average cost of capital (WACC) for companies in the Russell 3000 dropped to 6.9 percent in the time of easy money from 7.5 percent in the prior period, based on annual averages. The Russell 3000 Index includes the largest 3,000 U.S. companies and represents nearly all of the investable equity market in the U.S.

Standard corporate finance dictates that companies fund projects that have a positive net present value (NPV), defined as when the present value of the future cash flows from an investment exceeds the initial outlay. For example, if the investment to acquire a customer is $1,000 and the present value of the cash flows that customer is expected to generate is $1,500, the NPV is $500. The company ought to acquire that customer because the investment passes the NPV test ($500 = $1,500 – $1,000).

Companies should ideally rank their investment opportunities and pursue those that pass the NPV test. A lower cost of capital boosts the future cash flows and therefore allows more investments to clear the hurdle. A logical consequence is an increase in investment opportunity.

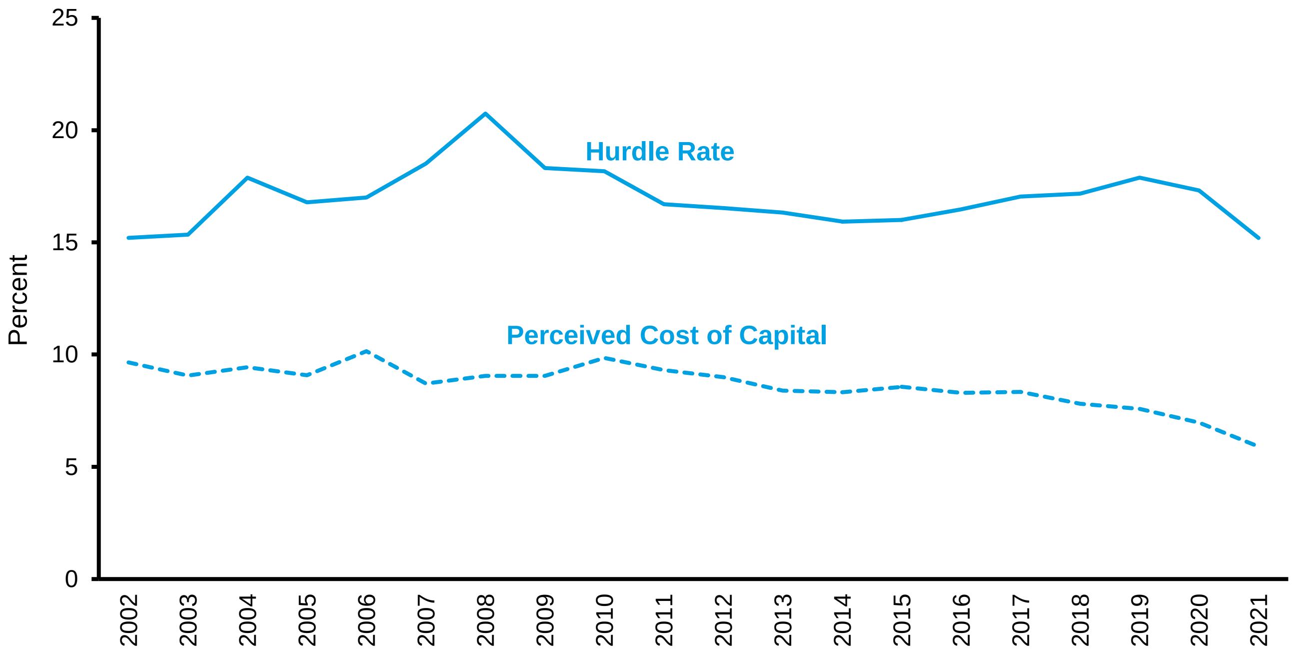
Surveys of executives over decades reveal that changes in the cost of capital have a muted effect on their decisions. Most firms do have an internal estimate of the cost of capital, which researchers determined through the analysis of more than 100,000 paragraphs in the transcripts of quarterly conference calls from 2002 to 2022.[7]

Consistent with our estimates, the average cost of capital perceived by companies did in fact drift lower through the period of easy money.

But that did not make much of a dent in corporate decisions because the cost of capital is not what most companies use to discount cash flows. Rather, about 80 percent of companies adopt a hurdle rate that is substantially higher than the cost of capital (see exhibit 1). In the period of easy money, for instance, the researchers estimate that the average hurdle rate was 16.8 percent, more than double the average perceived cost of capital of 8.3 percent.[8]

Companies around the globe also have a gap between the hurdle rate and cost of capital, albeit the disparity is the largest in the U.S.[9] This observation runs counter to the idea that companies have to increase their discount rates to reflect the end of easy money.[10]

Exhibit 1: Hurdle Rates and Perceived Cost of Capital for U.S. Companies, 2002-2021



Source: costofcapital.org and Counterpoint Global.

This is relevant because, in theory, the present value of one dollar of earnings in perpetuity is twice as high if you discount it by the perceived cost of capital ($12.05 = $1 ÷ 0.083) than by the hurdle rate ($5.95 = $1 ÷ 0.168).

John Graham, a professor of finance, has been surveying financial executives for decades.[11] He makes three observations about how executives actually make decisions. First, they are very conservative, which helps explain the policy of using a hurdle rate much higher than the perceived cost of capital. The gap between the hurdle rate and cost of capital can offset the effect of cash flow forecasts that are too optimistic.

The idea is that in practice two wrongs, overestimating cash flows and applying a hurdle rate that is too high, make a right. Take the example of capitalizing earnings. If the plan is to earn $2 from a project and the company discounts it at the hurdle rate, it is worth $11.90 ($11.90 = $2 ÷ 0.168). But in reality the company actually earns $1, worth $12.05 when discounted by the cost of capital. The value of the overstated cash flow and discount rate yield a value similar to the proper cash flow and discount rate ($11.90 versus $12.05).

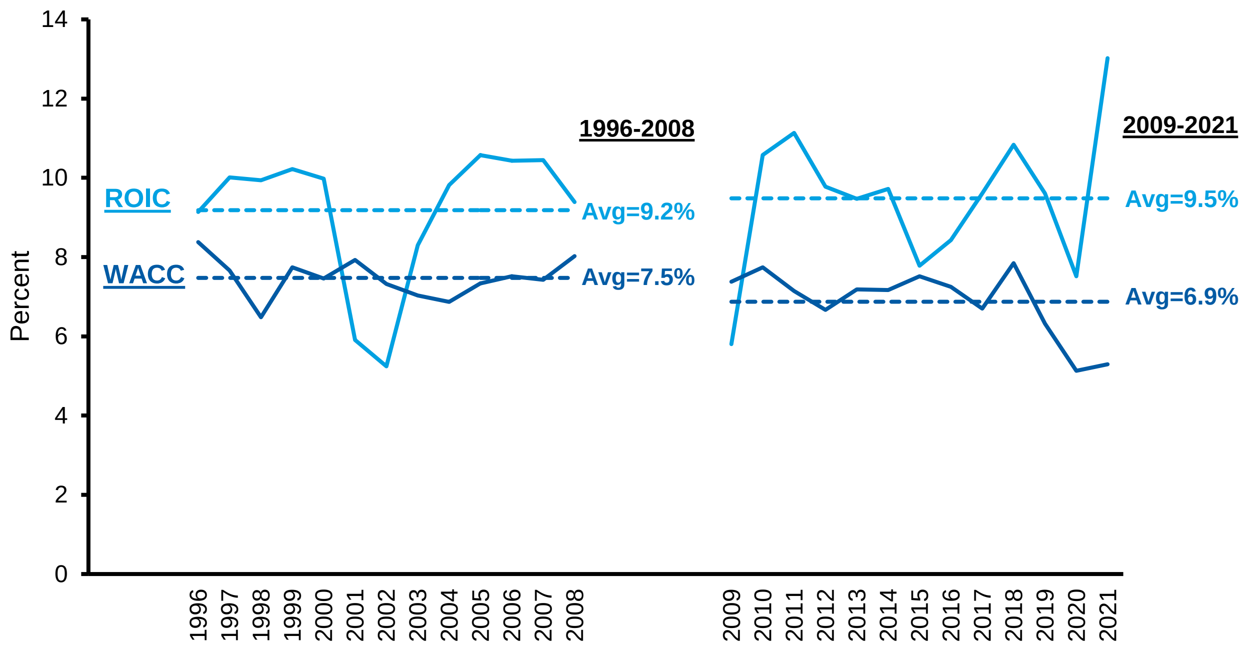
Second, the process they use to make decisions is sticky. As a result, they do not move their hurdle rates frequently. Overall hurdle rates in recent decades have come down much less than what market rates would suggest. In addition, companies tend to allocate capital internally the same way from year to year even when a more dynamic process would generate higher returns.[12]

Finally, executives suffer from a form of overconfidence called "overprecision," defined as excessive certainty in the accuracy of one's judgment."[13] And they commonly forecast ranges of outcomes that are too optimistic. This is the main reason financial executives use a hurdle rate that is higher than the cost of capital: it helps cushion the blow of rosy forecasts. Financial executives are fine with using a hurdle rate well above the cost of capital because they are aware that the projected returns are generally too high on the investments they approve.

Exhibit 2 shows that the aggregate return on invested capital (ROIC), defined as net operating profit after taxes divided by invested capital, averaged 9.5 percent in the easy money period and 9.2 percent in the preceding time. Companies earn an ROIC in the aggregate that is roughly 50-60 percent of the hurdle rate they use. That means a lot of investments fail to earn the hurdle rate.

But, on average, companies in the U.S. do earn an ROIC in excess of the actual cost of capital.[14] The average spread between the ROIC and WACC was 2.6 percentage points in the easy money era and 1.7 percentage points in the prior period.

Exhibit 2: ROIC and Weighted Average Cost of Capital for Russell 3000, 1996-2021



Source: FactSet and Counterpoint Global.

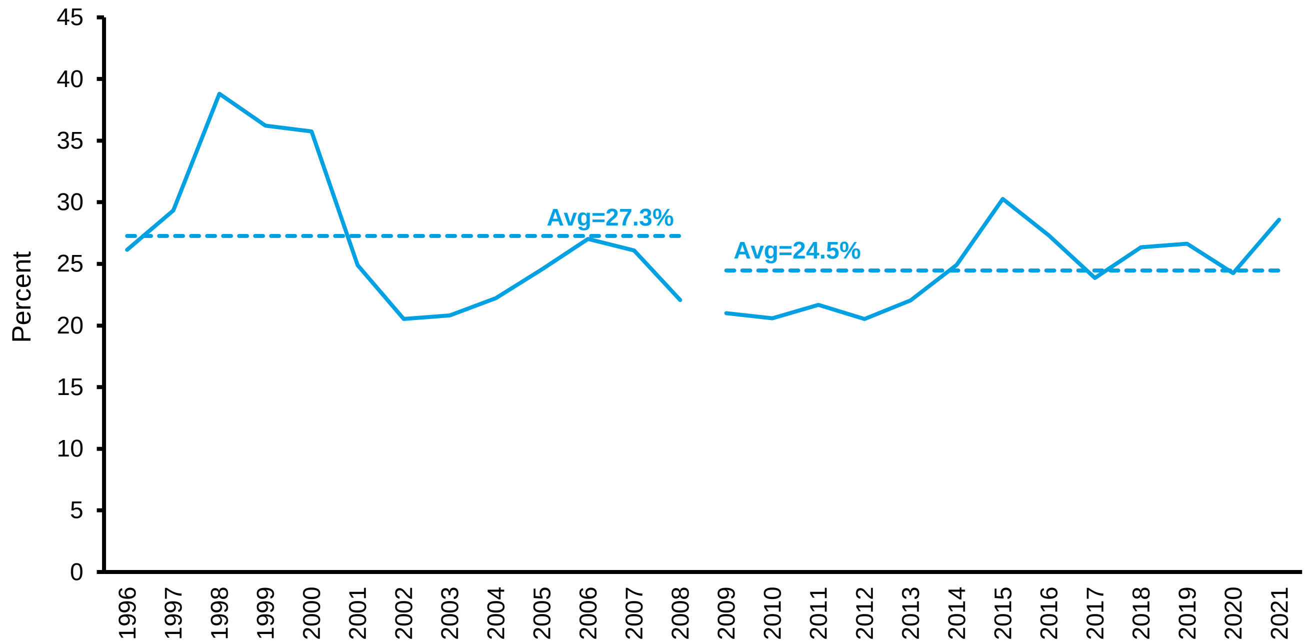
Economic profit is defined as the spread between the ROIC and WACC multiplied by invested capital. The point is you need to know how much a company will earn relative to the cost of capital as well as how much it will invest at that spread. We now look at the rate of investment, which determines invested capital, in these two periods.

Lower Interest Rates and Investments

A successful investment is a cash outlay today that generates cash flows in the future in excess of the amount spent. Companies largely rely on the cash their businesses generate to fund their investments. Investments can be internal, such as capital expenditures, working capital, research and development (R&D), and intangible investments within selling, general, and administrative (SG&A) expense excluding R&D. Investments can also be external, including mergers and acquisitions (M&A).

Exhibit 3 shows investments, including capital expenditures, M&A, R&D, and non-R&D SG&A, as a percentage of sales in the period of easy money versus the prior one.[15] Counter to the assumption that lower interest rates lead to higher investment activity, investments were 24.5 percent of sales from 2009-2021 versus 27.3 percent from 1996-2008. Only intangible investments were higher.

Exhibit 3: Investment as Percent of Sales for Companies in the Russell 3000, 1996-2021



Source: FactSet and Counterpoint Global
Note: Capital expenditures and M&A reflect all sectors; R&D and non-R&D SG&A exclude financial and real estate sectors.

The easy money era launched following the Global Financial Crisis, which may have made companies skittish to invest. But the preceding period included the dot-com bust and a three-year bear market in stocks, which also deterred investment.

These sums reflect total spending on these investments. It is common to break down spending into components of growth and maintenance. Proxies for maintenance spending include depreciation for tangible assets and amortization for intangible assets. The decline in growth investments, to 9.5 percent of sales from 12.7 percent, was similar to the overall pattern.

Despite lower capital costs, companies invested at a slower rate and the spread between ROIC and the cost of capital widened. Aggregate invested capital grew at a 2.6 percent CAGR in the easy money era and 4.9 percent in the previous period. Both figures are adjusted for inflation.

M&A is consistently one of the largest forms of investment.[16] Deals create value in the aggregate because there are commonly synergies, which are cost or revenue benefits of putting the businesses together. Researchers measure overall value as the increase in the combined market capitalizations of the buyer and seller from before to after the deal.

But wealth transfers also happen frequently. A buyer generally has to offer a premium to the seller's stock price to assume control. If the premium exceeds the value of the synergy, there is a wealth transfer from the shareholders of the buyer to the shareholders of the seller. The market signals this transfer when the buyer's stock price goes down beyond what would be expected based on changes in the overall stock market.

Historically, a majority of deals failed to create value for the buyer based on this measure.[17] However, there was a marked change following the Global Financial Crisis, and the success rate of buyers improved substantially.

While the dates do not align exactly with our designation, one study found that buyers had an average abnormal return of positive 1.05 percent from 2010 to 2015 versus negative 1.08 percent from 1990 to 2009. Further, the research concluded that 54 percent of deals added value for the buyer, up from 42 percent in the earlier time.[18] Another study, using somewhat different data, also found that success rates improved markedly after 2009.[19]

There does not appear to be a simple explanation for this result. Candidates include the phase within the M&A cycle, investor demand for growth, and the benefit of lower interest rates.[20] In any case, the benefit faded after COVID-19 took grip of the world economy in 2020.[21]

Companies did not spend more on investments in the easy money era despite a lower cost of capital than in the prior time. There are multiple potential explanations for this lack of investment, including decreased competition and heightened governance.[22] Indeed, the aggregate ROIC for public companies in the U.S. rose to a level above the long-term average.

As John Graham says, "sticky hurdle rates make a lower cost of capital less relevant, and thus, imply that monetary policy (i.e., reducing interest rates) may not be able to spur corporate investment."[23] Companies are aware that the cost of capital is lower but do not change their investment patterns as a result. Over the long haul, investment growth shows little link to short- or long-term interest rates.[24]

All things being equal, lower interest rates allow companies to take on more debt while maintaining similar ratios of operating profit to interest expense. Lower rates also make holding excess cash less desirable as it earns modest returns. In theory we would expect companies to increase leverage and decrease cash holdings. That is not what they did.

Lower Interest Rates and Financial Leverage

Franco Modigliani and Merton Miller, economists who would each go on to win the Nobel Memorial Prize in Economic Sciences, published a famous paper showing that a company's capital structure does not affect its value under a strict set of conditions.[25] The beauty of the approach is that we can see why the capital structure does matter by relaxing the conditions to better fit reality. The big condition is the assumption of no taxes.

A company has to deal with numerous stakeholders, including employees, customers, suppliers, shareholders, and the government. The ability to tax a company's profit is the government's main claim on the firm.

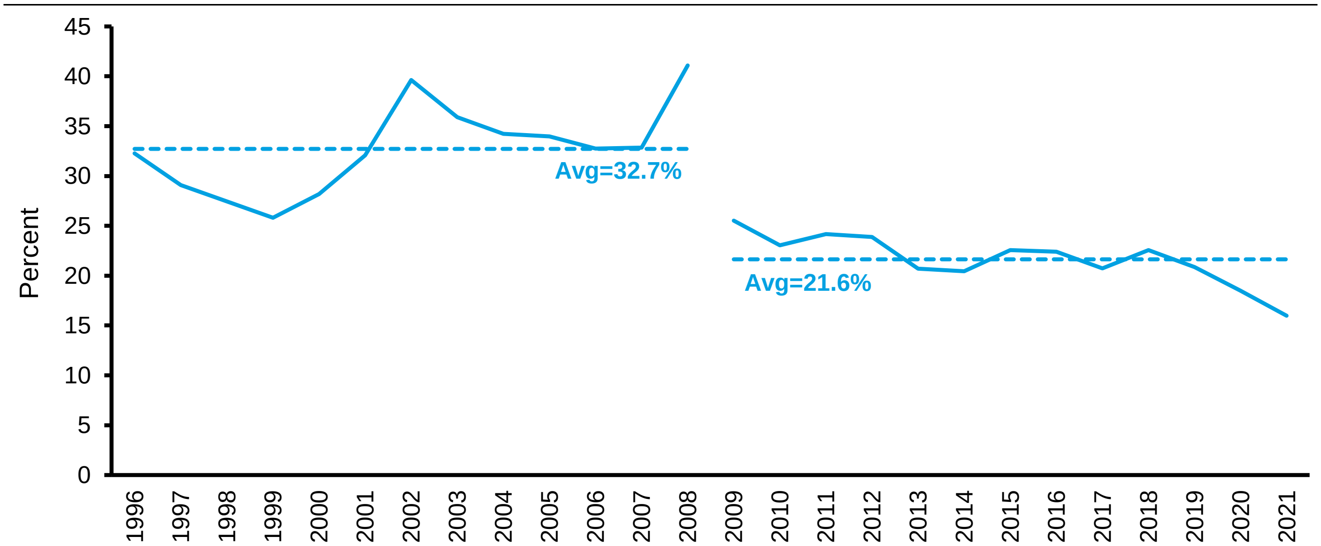
For many countries, interest expense is considered a cost of doing business and hence lessens taxable income.[26] This reduces the value of the government's claim and increases the value to other stakeholders. The right amount of debt creates a valuable tax shield while maintaining sufficient financial flexibility in case the company experiences adverse business results.

Corporate practice differs from theory. Companies tend to settle on a capital structure with less debt than what is ideal because they are conservative and prize resilience. The tax deductibility of interest expense, considered important by 60 percent of chief financial officers (CFOs) in a survey done in 2001, was deemed important by less than 25 percent of CFOs in a survey completed two decades later.

This likely reflects lower tax rates. Taxes were 19.4 percent of operating income in the easy money era for U.S. public companies, excluding financial companies, versus 25.6 percent in the prior period.

Exhibit 4 shows the debt to total capital ratio for the Russell 3000, excluding financials and real estate, in aggregate from 1996 to 2021. Total capital is defined as the book value of debt plus the market value of equity. The average ratio was 21.6 percent in the era of easy money, down from 32.7 percent in the previous period. The change in the aggregate was much more than in the median, suggesting that most of the deleveraging happened among the larger companies. Further, the interest coverage ratio, operating income divided by interest expense, was 7.9 times, up from 5.5 times preceding the time of easy money.[27]

Exhibit 4: Debt to Total Capital Ratio for the Russell 3000, 1996-2021



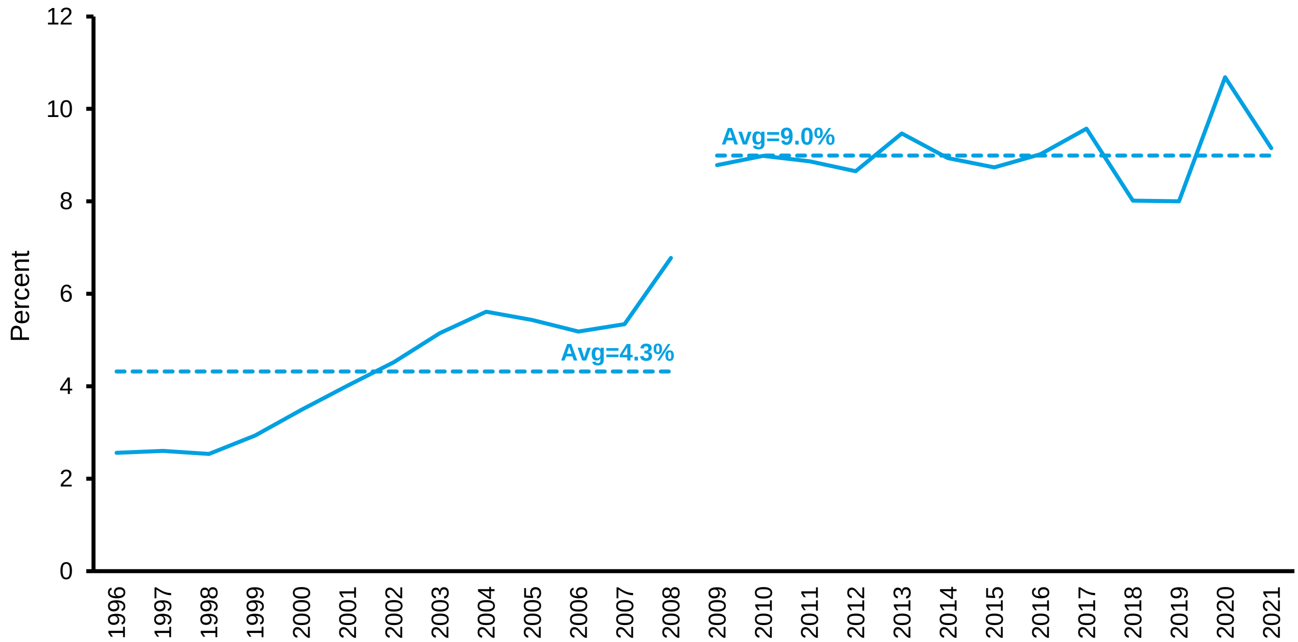
Source: FactSet and Counterpoint Global.
Note: Russell 3000 excluding financial and real estate sectors.

Part of the explanation for this decline in the debt to total capital ratio is that a number of companies had to raise equity capital to improve their financial footing following the Global Financial Crisis. But the ratio drifted lower throughout the 13-year period, suggesting that companies did not have the appetite to increase leverage.

Lower interest rates mean cheaper borrowing costs. But they also imply less interest income from the excess cash and marketable securities that companies hold. In theory, companies would not want to hold substantial amounts of cash earning next to nothing.

Exhibit 5 shows excess cash and marketable securities as a percent of assets in the two regimes. We define excess as any amount above two percent of sales. That ratio doubled, to 9.0 from 4.3 percent, in the period of easy money. Here again, companies exhibited substantial conservatism.

Exhibit 5: Excess Cash and Marketable Securities as a Share of Assets, Russell 3000, 1996-2021



Source: FactSet and Counterpoint Global.
Note: Russell 3000 excluding financial and real estate sectors.

While balances of excess cash and marketable securities swelled to almost $2.3 trillion in 2021, most of that money was concentrated in the hands of a small percentage of large firms. Specifically, 10 companies held one-quarter of the cash, 25 firms one-third, and 80 firms one-half.

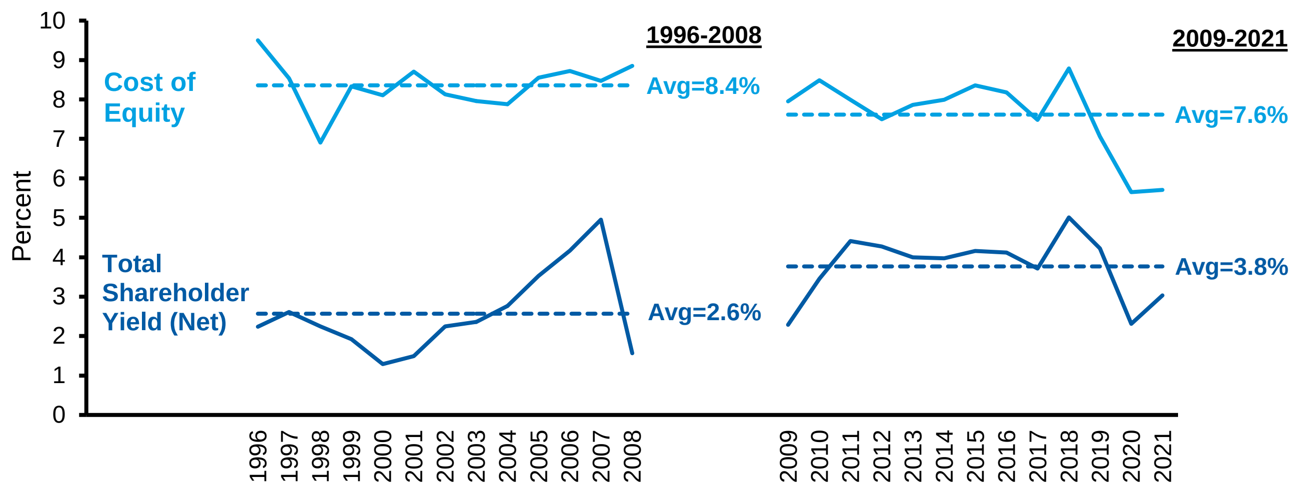
Companies place much higher emphasis on financial flexibility than on interest rates when deciding on their capital structure.[28] The data are shaped a great deal by large companies that are unusually conservative both in capital structure and in holding excess cash. Some companies certainly did indulge in debt, but the overall picture suggests that prevailing interest rates were not central to the decisions many executives made.

Lower Interest Rates and Share Buybacks

The era of easy money may not have compelled companies to change their hurdle rates much, invest more, or take on more debt. But companies did bump up the rate at which they returned capital to shareholders. And easy money may provide an explanation for one of the motivations to do so.

Exhibit 6 shows that the total shareholder yield, dividends plus buybacks (net of equity issuance) divided by market capitalization, rose to 3.8 percent in the period of easy money, up from 2.6 percent in the equivalent preceding period. The exhibit also shows that the total shareholder yield was one-half of the cost of equity, on average, in the easy money period versus less than one-third from 1996-2008.

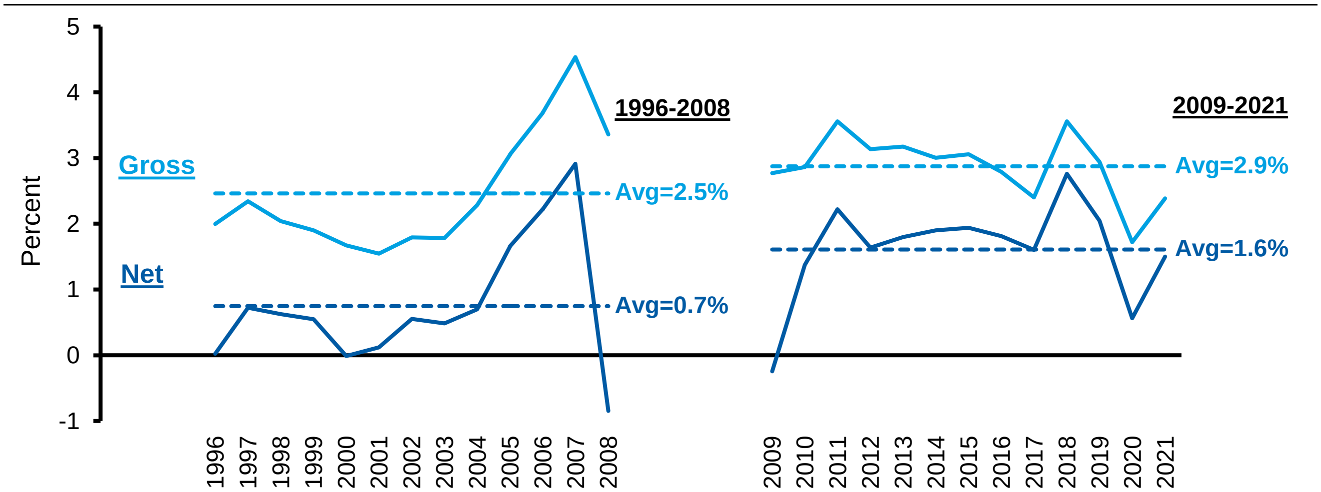
Exhibit 6: Total Shareholder Yield and Cost of Equity for the Russell 3000, 1996-2021



Source: FactSet and Counterpoint Global.

Exhibit 7 shows gross and net buybacks as a percent of market capitalization for both periods, and it reveals buybacks were higher in the era of easy money. Buybacks as a percentage of the total payout increased only a modest amount. The combination of curtailed buybacks and equity issuance during the financial crisis in 2008 and 2009 affected the sums in each period.

Exhibit 7: Share Buybacks as a Percent of Market Capitalization for the Russell 3000, 1996-2021



Source: FactSet and Counterpoint Global.

Kenneth French, a professor of finance, quipped, “Buybacks are divisive, they divide people who do understand finance from people who don’t.”[29] Sometimes it is hard to know where financial executives fall on this divide.

Companies that buy back shares below intrinsic value trigger a wealth transfer from selling shareholders to ongoing shareholders. This is because the selling shareholders get less than what the stock is worth and the intrinsic value per share rises for the ongoing shareholders. Buying back undervalued stock is an excellent way to build long-term value per share for ongoing shareholders, which should be the goal of management.

But executives are not always discerning. For example, most believe that the stock of their company is undervalued. A survey of CFOs in 2020 found that 83 percent of them held this view, and a majority of them said the same going back to 1996.[30] Further, the most popular method to value the stock, revealed in a survey completed in 2022, was “current price relative to historic highs and lows.” By contrast, “internal valuation performed by company” was the fourth most popular.[31]

Research also shows that executives make financial decisions that stray from the ideal of creating long-term value for continuing shareholders and instead focus on maximizing earnings per share (EPS).[32] The era of easy money made buybacks particularly effective at boosting EPS.

CFOs, when asked, indicate that they are very aware of the link between buybacks and EPS. In one survey, 76 percent of CFOs said that increasing EPS was an important, or very important, factor in the decision to buy back stock, and 68 percent indicated that offsetting EPS dilution from stock-based compensation (SBC) was important or very important.[33] More than one-third of buybacks by big companies in recent years have been to counter the dilutive effect of SBC.[34]

Financial executives hold these views despite a lack of evidence that using buybacks to increase EPS creates shareholder value.[35] However, EPS are relevant for executive compensation in many companies, providing management teams with sufficient incentive to use buybacks as a means to lift earnings.

It is worth examining why buybacks are so effective at boosting EPS when interest rates are low. To start, buybacks do not always increase EPS despite lowering the number of shares outstanding. The reason is that the company must pay for a buyback using either excess cash or the proceeds from borrowing. Because excess cash earns interest income and debt incurs interest expense, net income is lower following a buyback than it would have been without the buyback.[36]

We can calculate the impact of buybacks on EPS by comparing the after-tax interest rate (either on interest income from cash or interest expense from debt) to the earnings yield, defined as earnings divided by price (the reciprocal of the P/E multiple). Buybacks add to EPS when the earnings yield is higher than the after-tax interest rate. The size of the buyback also contributes to the impact on EPS if the earnings yield and interest rate are different.

Exhibit 8 presents a simple example with three companies that have the same earnings but trade at different P/E multiples. We assume they all have operating income of $95, $5 of interest income on $100 of excess cash, pay taxes at a 20 percent rate, and have 80 shares outstanding. Each have earnings of $80 and EPS of $1.00, and the after-tax interest rate is 4.0 percent ($0.04 = 0.05 \times (1 - .20)$).

Exhibit 8: Company Comparison Before Buyback

	Company A	Company B	Company C
Operating income	$95	$95	$95
Interest income ($100 at 5%)	$5	$5	$5
Pretax income	$100	$100	$100
Taxes (at 20%)	$20	$20	$20
Net income	$80	$80	$80
Shares outstanding	80	80	80
Earnings per share	**$1.00**	**$1.00**	**$1.00**
Stock price	$10.00	$25.00	$50.00
P/E	10.0	25.0	50.0
E/P	10.0%	4.0%	2.0%
After-tax interest rate	4.0%	4.0%	4.0%

Source: Michael J. Mauboussin and Alfred Rappaport, Expectations Investing: Reading Stock Prices for Better Returns—Revised and Updated *(New York: Columbia Business School Publishing, 2021), 202.*

Company A trades at a P/E multiple of 10, or an earnings yield of 10 percent (0.10 = $1 ÷ $10). Company B has a P/E of 25 and an earnings yield of 4 percent. And Company C has a P/E of 50 and an earnings yield of 2 percent.

We now assume that each company uses $100 to buy back stock.[37] They all realize a drop in net income, but the action makes the EPS rise from $1.00 to $1.09 for Company A, has no effect on EPS for Company B, and causes a decline from $1.00 to $0.97 for Company C.

Exhibit 9: Company Comparison After Buyback

	Company A	Company B	Company C
Operating income	$95	$95	$95
Interest income	$0	$0	$0
Pretax income	$95	$95	$95
Taxes (at 20%)	$19	$19	$19
Net income	$76	$76	$76
Shares outstanding	70	76	78
Earnings per share	**$1.09**	**$1.00**	**$0.97**

Source: Michael J. Mauboussin and Alfred Rappaport, Expectations Investing: Reading Stock Prices for Better Returns—Revised and Updated *(New York: Columbia Business School Publishing, 2021), 203.*

Whether buybacks increase or decrease EPS is a function of interest rates and multiples. The era of easy money provided low interest rates and multiples that were, for the most part, within historical norms. As a result, buybacks were strongly additive for many companies.

To give some sense how this driver of EPS can change, consider that the yield on BBB-rated bonds, calculated as the 10-year U.S. Treasury note plus the option-adjusted spread, was 2.23 percent at the end of 2020.

Assuming a 20 percent tax rate, the after-tax interest rate was 1.78 percent. The S&P 500 Index traded at 22.4 times the estimate of earnings at the time for 2021, or an earnings yield of 4.46 percent. A buyback for a company with a profile consistent with the S&P 500 would get a boost in EPS. The magnitude of the increase is related to the size of the buyback program.

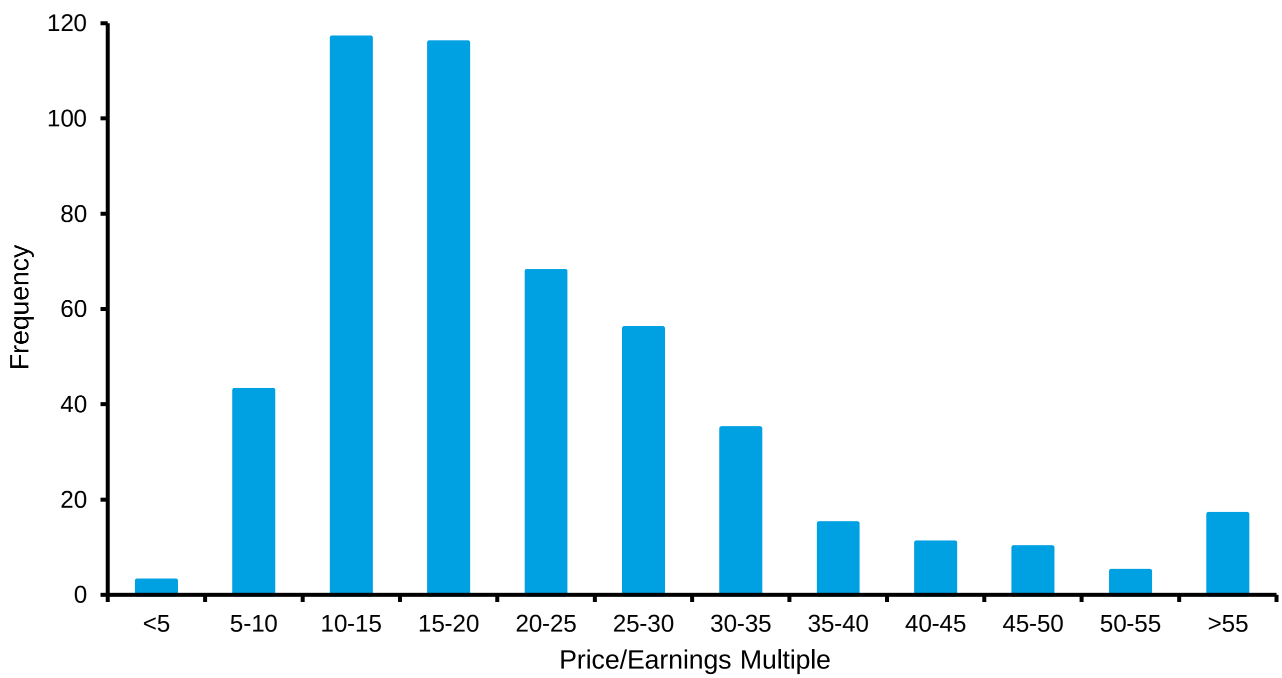
At the beginning of 2024, the pre-tax yield on BBB bonds was 5.17 percent and the after-tax yield was 4.14 percent. The S&P 500 was at 19.5 times the estimate of earnings for 2024, a 5.13 percent earnings yield. A repurchase program for a company with those figures would realize a slight lift to EPS but the effect would be close to neutral.

Some of the companies with the largest buyback programs today trade at P/E multiples that make buybacks neutral or even slightly dilutive to EPS given current interest rates.

Exhibit 10 shows the distribution of P/E multiples, based on earnings estimates for the next four quarters, for companies in the S&P 500 at the end of January 2024. The after-tax interest rate is a little higher than year-end 2023, which means that the breakeven P/E multiple is 22.9. The median multiple is well below that but about one-third of companies in the index have a multiple that is above that level.

Buybacks provided a lift to EPS and EPS growth because of the relationship between interest rates and P/E multiples. Executives and investors need to measure the impact that buybacks have on EPS for each individual company. However, it is clear that the relationship today is less beneficial to EPS than it was during the easy money era.

Exhibit 10: Distribution of Forward Price-Earnings Ratios, S&P 500



Source: FactSet and Counterpoint Global.
Note: Based on FactSet consensus estimates of EPS for the next four quarters as of 1/31/24.

Conclusion

Central banks around the world lowered interest rates significantly in reaction to the Global Financial Crisis, making financial capital relatively inexpensive and accessible. In theory, companies would increase their rate of investment and add financial leverage to take advantage of the lower rates. Higher investment is justified by a reduced cost of capital because more projects clear the hurdle to create value. More debt makes sense because companies can keep their ratios of profit to interest expense while reducing the government's claim on cash flows.

In an ideal world, corporate executives would make decisions to maximize long-term value per share. But there's a lot of evidence that they fall short of this objective for reasons that are mostly understandable.[38] Executives are cautious, slow to change policies, and poorly calibrated. They commonly use hurdle rates that are nearly double their perceived cost of capital, maintain capital structures that are conservative, and place emphasis on EPS and EPS growth ahead of creating value for shareholders. Executive pay is commonly tied to earnings.

We separated 1996 to 2021 into two periods of equal length. We consider the latter one to be a period of easy money, as indicated by below-average interest rates. While these low rates encouraged plenty of undisciplined behavior among investors and companies, the large U.S. public companies behaved in ways that were not consistent with what theory would suggest (see exhibit 11).

We place special emphasis on share buybacks. The relationship between interest rates and market valuation that prevailed during most of the era of easy money made buybacks especially useful for boosting EPS. That all changed as interest rates rose in 2022 and the S&P 500 had a total shareholder return of 26 percent in 2023, lifting the market's P/E ratio.

Exhibit 11: Metrics Before (1996-2008) and During (2009-2021) Easy Money

	Average	
	Before 1996-2008	**Easy Money 2009-2021**
Risk and Return		
Yield on 10-year U.S. Treasury note (monthly)	5.0%	2.3%
Cost of capital	7.5%	6.9%
Total shareholder return CAGR (S&P 500)	4.8%	16.0%
Investment		
Investment SG&A as a percent of sales	9.2%	10.3%
M&A as a percent of sales	12.0%	9.3%
Capital expenditures as a percent of sales	7.0%	6.2%
Leverage		
Debt to total capital	32.7%	21.6%
Excess cash as a percent of assets	4.3%	9.0%
Return of Capital		
Total shareholder yield	2.6%	3.8%
Share buybacks (net of issuance)	0.7%	1.6%

Source: Counterpoint Global.
Note: Unless otherwise stated, annual averages based on Russell 3000; intangible investments, debt, and excess cash exclude financial and real estate sectors; CAGR=compound annual growth rate.

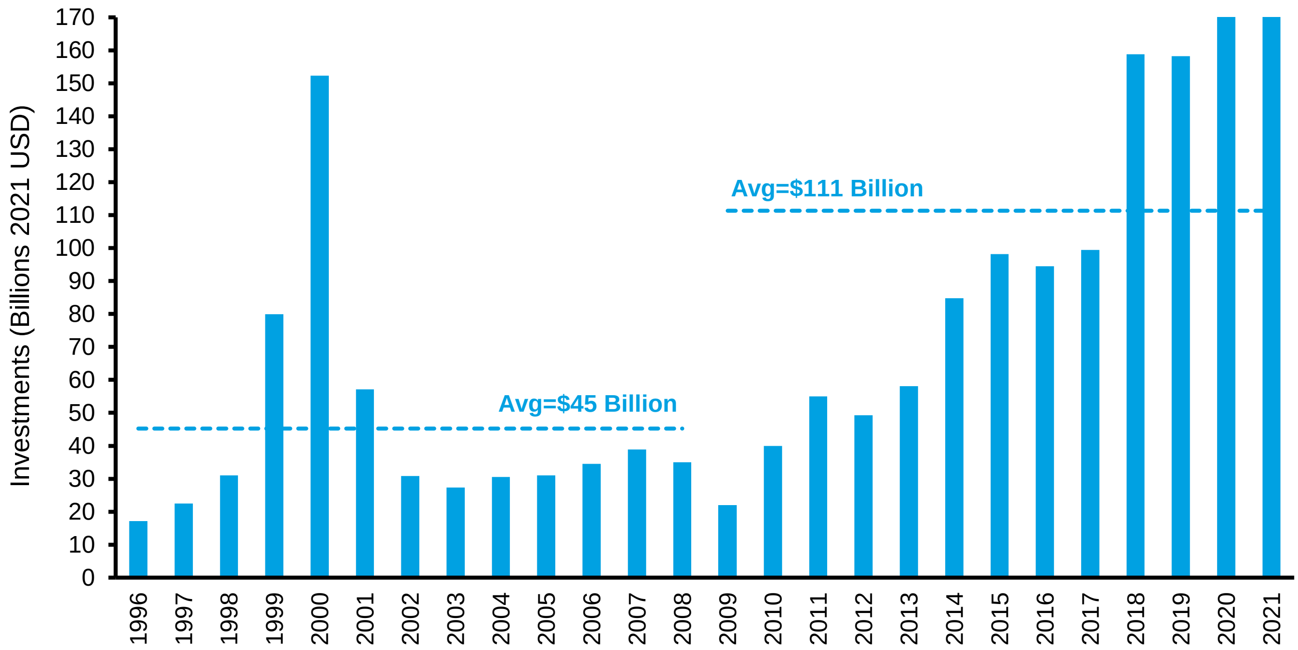
Please see Important Disclosures on pages 19-21

Appendix: Easy Money and Venture Capital

This report focused on the behavior of public companies in the U.S. during a period of easy money. But low interest rates, which imply low expected returns, encouraged institutional investors to take on more risk in the pursuit of higher returns. The venture capital industry benefitted from this shift in asset allocation. Investor commitments to U.S. venture capital were more than 20 percent higher in the easy money era than in the one that preceded it.

In turn, venture capital firms accelerated their investments. Exhibit 12 shows the average annual investment was $111 billion in the period of easy money, up from $45 billion in the prior period. Venture capital firms invested 2.5 times more money, adjusted for inflation, from 2009 to 2021 versus 1996 to 2008. The annual investment in 2000, at the apex of the dot-com boom, was not exceeded until 2018.

Exhibit 12: U.S. Venture Capital Annual Investment, 1996-2021



Source: National Venture Capital Association and Counterpoint Global.

The capacity to make productive venture capital investments is limited, especially for young companies. The flow of venture capital encouraged companies to pursue growth. But growth is good only when the business model leads to value creation.

In some cases, companies subsidized their customers to buy their good or service to become the dominant network. Examples include industries that have two-sided networks such as ridesharing and food delivery. The idea is that a company can curtail subsidies once it reaches the tipping point and therefore becomes the network of choice for consumers. Companies such as Uber Technologies and DoorDash illustrate businesses that lost money as they sought to establish their businesses but are now profitable.

In other cases, companies pursued growth that exceeded organizational capacity or where the basic unit of analysis, which captures how the company makes money, was flawed. Those were poor investments. WeWork is an example of a company that grew faster than its organization could support.

Endnotes

[1] No, Yogi Berra does not get credit for this. The first acknowledged use of the phrase is by Benjamin Brewster, a student at Yale University, in “The Yale Literary Magazine” dated February 1882. See https://quoteinvestigator.com/2018/04/14/theory/.
[2] Howard Marks, “Easy Money,” *Memo to Oaktree Clients*, January 9, 2024. The federal funds rate is “the interest rate at which depository institutions trade federal funds with each other overnight.” Federal funds are the balances these institutions hold at Federal Reserve Banks.
[3] The S&P 500 as we know it today was launched in 1957. For prior periods, we use an equivalent measure.
[4] Edward Chancellor, *The Price of Time: The Real Story of Interest* (New York: Atlantic Monthly Press, 2022).
[5] Ryan Banerjee and Boris Hofmann, “The Rise of Zombie Firms: Causes and Consequences,” *BIS Quarterly Review*, September 2018, 67-78.
[6] Arash Aloosh, Hyung-Eun Choi, and Samuel Ouzan, “The Tail Wagging the Dog: How Do Meme Stocks Affect Market Efficiency?” *International Review of Economics and Finance*, Vol. 87, September 2023, 68-78 and www.spacinsider.com/data/stats.
[7] Niels Joachim Gormsen and Kilian Huber, “Firms’ Perceived Cost of Capital,” *Working Paper*, November 2023.
[8] Gormsen and Huber, “Firms’ Perceived Cost of Capital,” and Niels Joachim Gormsen and Kilian Huber, “Corporate Discount Rates,” *Working Paper*, September 2023.
[9] See https://costofcapital.org/; John R. Graham, “Presidential Address: Corporate Finance and Reality,” *Journal of Finance*, Vol. 77, No. 4, August 2022, 1975-2049; and Philip Bromiley, *Corporate Capital Investment: A Behavioral Approach* (Cambridge, UK: Cambridge University Press, 1986).
[10] For example, in a recent podcast the interviewer, Patrick O’Shaughnessy, asked Aswath Damodaran, a professor, “What are the biggest market and business implications of that new normal or status quo?” Damodaran replied, “I think for those companies that got used to using 6% or 7% cost of capital, it’s time to let go. I know there are companies that still hang on to those hurdle rates they set in the last decade saying, you know what, rates are low, therefore, those costs of capital are not coming back. So the way we assess projects at your companies has to change…” See Aswath Damodaran, “Making Sense of the Market—Part 2,” *Invest Like the Best Podcast*, October 24. 2023 at www.joincolossus.com/episodes/72302556/damodaran-making-sense-of-the-market-pt2?tab=transcript.
[11] Graham, “Presidential Address.”
[12] Dan Lovallo, Alexander L. Brown, David J. Teece, and David Bardolet, “Resource Re-Allocation Capabilities in Internal Capital Markets: The Value of Overcoming Inertia,” *Strategic Management Journal*, Vol. 41, No. 8, August 2020, 1365-1380.
[13] Don A. Moore, *Perfectly Confident: How to Calibrate Your Decisions Wisely* (New York: Harper Business, 2020), 8.
[14] This is consistent with prior research. For example, see Eugene F. Fama and Kenneth R. French, “The Corporate Cost of Capital and the Return on Corporate Investment,” *Journal of Finance*, Vol. 54, No. 6, December 1999, 1939-1967.
[15] Capital expenditures and M&A reflect the entire Russell 3000 and intangible investments reflect the Russell 3000 universe excluding companies in the financial and real estate sectors. All investments are scaled by the sales for the entire Russell 3000 universe.
[16] Michael J. Mauboussin and Dan Callahan, “Capital Allocation: Results, Analysis, and Assessment,” *Consilient Observer: Counterpoint Global Insights*, December 15, 2022.
[17] Mark L. Sirower, *The Synergy Trap: How Companies Lose the Acquisition Game* (New York: Free Press, 1997).
[18] G. Alexandridis, N. Antypas, and N. Travlos, “Value Creation from M&As: New Evidence,” *Journal of Corporate Finance*, Vol. 45, August 2017, 632-650.
[19] Mark Sirower and Jeff Weirens, *The Synergy Solution: How Companies Win the Mergers and Acquisitions Game* (Boston, MA: Harvard Business Review Press, 2022).
[20] See Samer Adra, Leonidas G. Barbopoulos, and Anthony Saunders, “The Impact of Monetary Policy on M&A Outcomes,” *Journal of Corporate Finance*, Vol. 62, June 2020, 101529 and Alice Bonaimé, Huseyin Gulen, and

Mihai Ion, "Does Policy Uncertainty Affect Mergers and Acquisitions?" *Journal of Financial Economics*, Vol. 129, No. 3, September 2018, 531-558.
[21] Barbara Sveva Magnanelli, Luigi Nasta, and Emanuele Ramazio, "Bid Premiums and Cumulative Abnormal Returns: An Empirical Investigation of the Consequences of the Covid-19 Pandemic," *Finance Research Letters*, Vol. 49, October 2022, 103093.
[22] Germán Gutiérrez and Thomas Philippon, "Investment-Less Growth: An Empirical Investigation," *NBER Working Paper 22897*, December 2016.
[23] Graham, "Presidential Address," 1991.
[24] S.P. Kothari, Jonathan Lewellen, and Jerold B. Warner, "The Behavior of Aggregate Corporate Investment," *Working Paper*, September 2016.
[25] Franco Modigliani and Merton H. Miller, "The Cost of Capital, Corporation Finance and the Theory of Investment," *American Economic Review*, Vol. 48, No. 3, June 1958, 261-297.
[26] Not all companies in the U.S. are allowed to take all of their interest expense as a deduction from taxes. The Tax Cuts and Jobs Act of 2017 set a limit on the tax deductibility of interest at 30 percent of earnings before interest and taxes (EBIT) for U.S. companies with sales of $25 million or more. This went into effect in 2022. We estimate this affects about one-quarter of the profitable companies in the Russell 3000.
[27] Michael Smolyansky, "End of an Era: The Coming Long-Run Slowdown in Corporate Profit Growth and Stock Returns," *Board of Governors of the Federal Reserve System Finance and Economics Discussion Series 2023-041*, June 2023.
[28] Graham, "Presidential Address," 2016.
[29] "Ken French: Expected the Unexpected," *Rational Reminder Podcast*, May 28, 2020.
[30] Graham, "Presidential Address," 2021.
[31] Ibid., 2022.
[32] Itzhak Ben-David and Alexander M. Chinco, "Modeling Managers as EPS Maximizers," *NBER Working Paper 31125*, June 2023.
[33] Alon Brav, John R. Graham, Campbell R. Harvey, and Roni Michaely, "Payout Policy in the 21st Century," *Journal of Financial Economics*, Vol. 77, No. 3, September 2005, 483-527.
[34] Bruce Dravis, "Dilution, Disclosure, Equity Compensation, and Buybacks," *Business Lawyer*, Vol. 74, No. 3, Summer 2019, 631-658.
[35] Jacob Oded and Allen Michel, "Stock Repurchases and the EPS Enhancement Fallacy," *Financial Analysts Journal*, Vol. 64, No. 4, July-August 2008, 62-75.
[36] This is true for a dividend as well.
[37] This analysis holds if the company instead issues debt at a 5 percent interest rate.
[38] Ben-David and Chinco, "Modeling Managers as EPS Maximizers."
[39] Kevin Roose, "Farewell, Millennial Lifestyle Subsidy," *New York Times*, June 8, 2021.

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Annex 603

"Public Hearing of the Advisory Opinion on Climate Emergency and Human Rights Day 1 Morning Session", *Cave Hill School of Business & Management, The UWI*, 23 April 2024

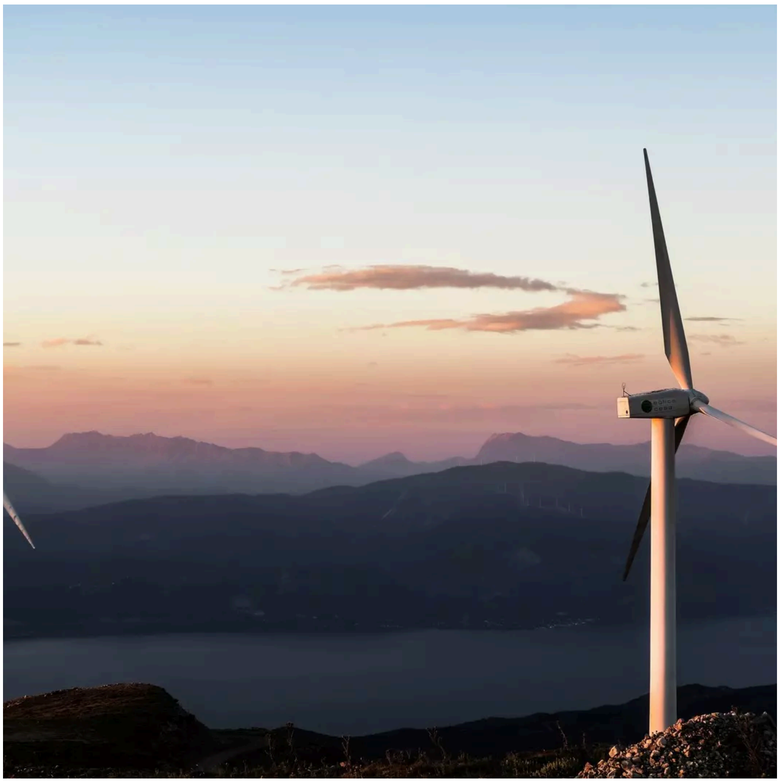
Annex 604

“Climate finance: What are debt-for-nature swaps and how can they help countries?”, *World Economic Forum*, 26 April 2024

FORUM INSTITUTIONAL

Climate finance: What are debt-for-nature swaps and how can they help countries?

Apr 26, 2024



Climate finance: “Debt-for-nature swaps or debt-for-energy-transition swaps is where the world needs to push further,” says Rania Al-Mashat, Minister of International Cooperation, Ministry of International Cooperation of Egypt.
Image: Unsplash/Jason Blackeye

Kate Whiting
Senior Writer, Forum Agenda

This article is part of:
The Growth Summit: Jobs and Opportunity for All

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This article has been updated, it was first published on 12 May 2023.

- Debt-for-nature swaps could provide $100 billion to restore nature and help countries adapt to climate change, according to a report.
- What exactly are debt-for-nature and debt-for-climate swaps, and do they go far enough to help countries reduce their debt and take climate action?
- The World Economic Forum's Centre for Nature and Climate takes a holistic approach to addressing the climate emergency, focusing on industry decarbonization, nature-positive systems and resource stewardship.

Debt-for-nature swaps are increasingly hitting headlines as a form of climate finance that reduces countries' debts in return for environmental commitments.

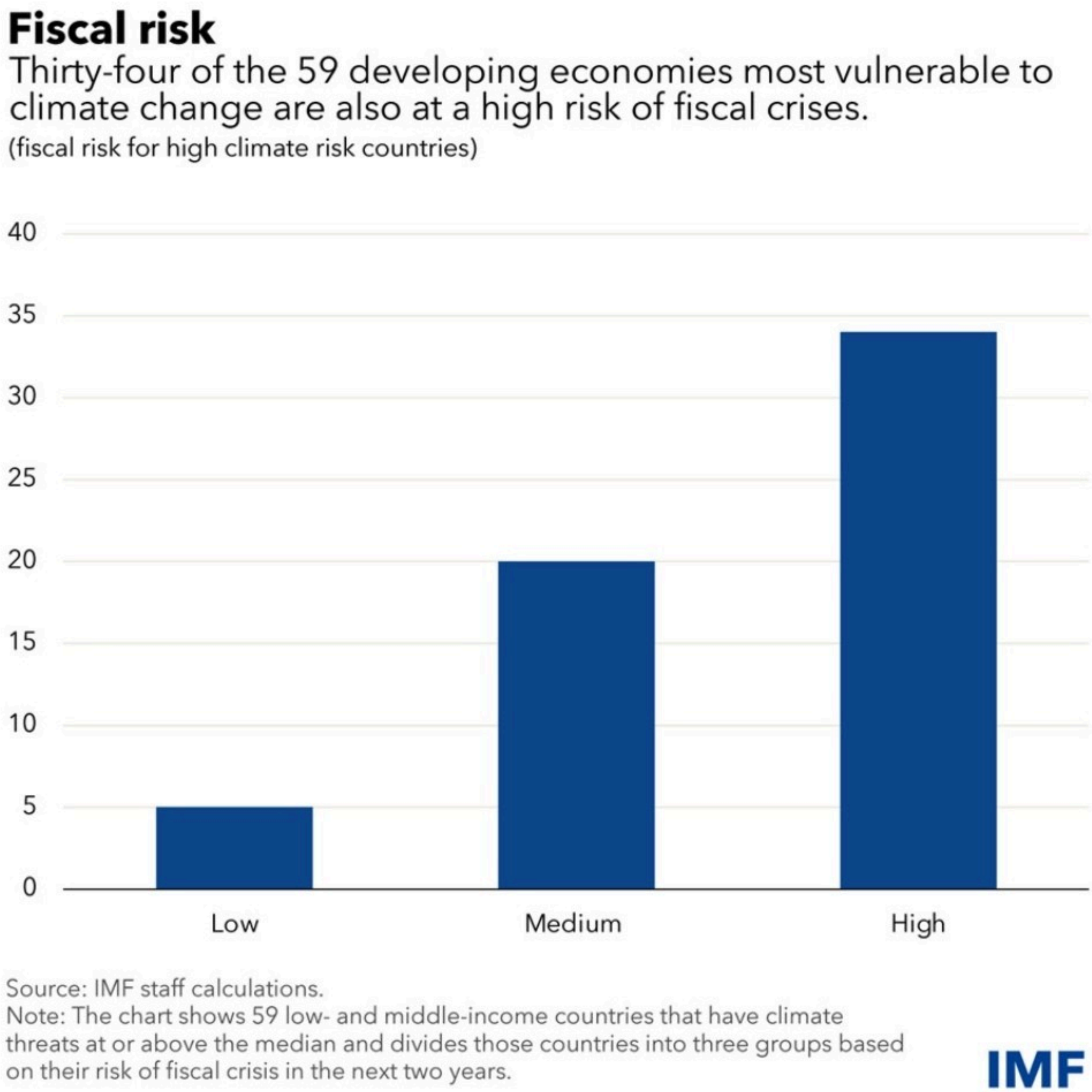
In May 2023, Ecuador sealed a landmark deal that will help protect the endangered ecosystem of the Galapagos Islands through the sale of a blue bond that will mature in 2041.

It's now scoping out new debt-for-nature swaps to protect the Amazon rainforest and a Marine Protected Area along the Pacific coast, according to a Reuters report in April 2024.

It comes as analysis finds debt-for-nature swaps could free up as much as $100 billion to restore nature and help climate change adaptation.

The estimate made by the International Institute for Environment and Development focused on the possibility of debt swaps in the 49 countries most at risk of defaulting on their external debts for which data could be found.

By 2050, it will cost between $3-6 trillion a year globally to mitigate climate change, according to the International Monetary Fund (IMF). But while developed economies are more able to afford the transition and invest in mitigation efforts, there are big funding gaps for emerging economies.



The connection between climate vulnerability and fiscal risk. Image: IMF

Funding the green transition

Emerging markets require $95 trillion to transition, according to a 2022 report from Standard Chartered Bank. They're the countries most vulnerable to climate change and with the most debt, meaning they're at risk of fiscal crisis, says the IMF.

This is where innovative financing models like debt-for-nature or debt-for-climate swaps can help, as participants at the World Economic Forum's Growth Summit

2023 agreed during a panel session on Squaring the Circle: Delivering on Growth, Jobs and Climate.

Rania Al-Mashat, Minister of International Cooperation of Egypt, which hosted the COP27 climate conference, said: “Debt-for-nature swaps or debt-for-energy-transition swaps is where the world needs to push further.”

Protecting natural resources in a time of polycrisis – climate, biodiversity, debt – was high on the agenda in June 2023 at the Summit for a New Global Financing Pact, in Paris. Initiated by French President Emmanuel Macron, the event brought over 300 global decision-makers together to find innovative ways forward in international financing.

DISCOVER

What’s the World Economic Forum doing about climate change?

Show more

What are debt-for-nature swaps?

Debt-for-nature swaps have been around for decades – as this 1990 paper from the World Bank shows. They were first envisioned by the WWF’s Thomas Lovejoy in a *New York Times* article back in 1982 that advocated conservation groups use debt-equity swaps to raise money locally.

In essence, they are a financial instrument that allows countries to free up fiscal resources to build resilience against the climate crisis, and take action to protect nature while still being able to focus on other development priorities without triggering a fiscal crisis.

As the IMF’s Managing Director, Kristalina Georgieva says: “Creditors provide debt relief in return for a government commitment to, say, decarbonize the economy, invest in climate-resilient infrastructure, or protect biodiverse forests or reefs."

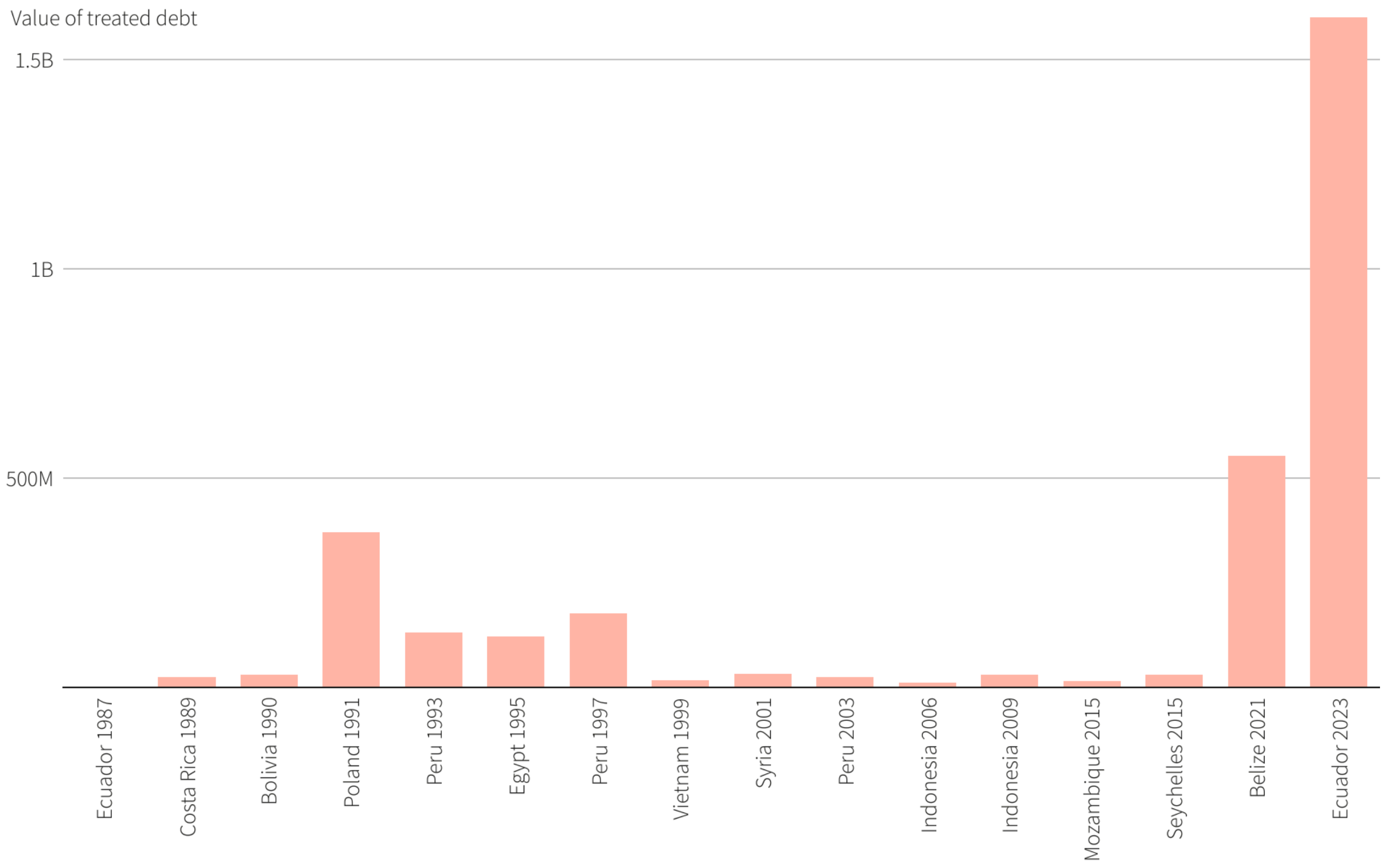
Debt-for-nature swaps are viewed by many as a win-win where the country reduces its external debt while benefiting nature and environmental groups

Which countries have debt-for-nature swaps?

The first debt-for-nature agreement was signed between US-based environmental non-profit Conservation International and Bolivia in 1987. Since then, Costa Rica, the Philippines, Belize, Barbados and Seychelles, among others, have all entered into similar agreements – with around 140 swaps in total.

Debt-for-nature swaps

Debt-for-nature swaps first started in late 1980's and are starting to balloon in size



REUTERS | Marc Jones @marcjonesrtrs
Source: African Development Bank Note: Around 140 swaps have been done in total, Seychelles' 2015 deal launched world's first "blue bond"

Debt-for-nature swaps began in the 1980s and are growing in size. Image: Reuters

The European Investment Bank, the lending arm of the European Union, and the Inter-American Development Bank (IDB) provided a $300 million guarantee in November 2023 for Barbados to execute a debt-for-climate swap to upgrade water infrastructure.

In the case of Ecuador, the world's biggest debt-for-nature swap saw Credit Suisse help the government buy back around $1.6 billion of debt for $644 million, saving the country around a billion dollars in repayments over 17 years, Reuters reports.

In return, the government has committed to spending $18 million annually for 20 years on conservation in the Galapagos, including protecting a marine reserve set up last year, which is used as a migratory corridor by sharks, whales, sea turtles and manta rays.

The old debt will be replaced with a cheaper-to-service $656 million "Galapagos Bond" maturing in 2041 and insured by the US International Development Finance Corporation.

Ecuador's Foreign Minister Gustavo Manrique Miranda said biodiversity was now a valuable "currency".

Have you read?

- **We can tackle sovereign debt and climate finance - here's how**
- **4 ways a greener economy can help debt-ridden countries**
- **Growth Summit 23: How we can bring everyone along on the green energy transition**

Do debt swaps go far enough?

Al-Mashat told the Forum's Growth Summit panel that the current global economic climate, with increased risk perception, has made concessional finance mechanisms more needed than ever. But debt swaps at their current size aren't enough to ensure a just transition.

"Debt-for-climate swaps are seen as a way to create more space for the transition in countries, but they are also done in very small amounts, not in amounts that are going to help," she said.

Egypt has a debt swap with Germany under its NWFE platform, which funds renewable energy projects, but in terms of the total amount of investment needed for the transition, Al-Mashat said the swap was "symbolic".

For swaps to really have an impact, "the number and size of transactions must be scaled up significantly", the IMF's Georgieva said.

"This means addressing barriers to scale and improving the financial terms under which swaps are conducted," she added.

While they can take a long time to negotiate and come with their own risks, the recent Ecuador example shows such swaps are growing in size and could become increasingly beneficial to more countries in the future.

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Annex 605

"Global Small Island Developing States (SIDS) Debt Sustainability Support Service: a new financial compact for resilient prosperity", *The International Institute for Environment and Development*, May 2024

Republic of
Maldives

Government
of Antigua and Barbuda

Global Small Island Developing States (SIDS) Debt Sustainability Support Service:

a new financial compact for resilient prosperity

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About the author

Ritu Bharadwaj is a team leader and principal researcher in IIED's Climate Change Group; ritu.bharadwaj@iied.org

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Foreword by His Excellency President Dr Mohamed Muizzu of the Republic of Maldives

Co-chair of the Strategic Advisory Group

Small Island Developing States (SIDS) are facing treacherous conditions every day as we try to thrive in a world where we are among the worst affected by external shocks, including climate change and conflicts — despite contributing the least to them. We are a special case for development, with unique geographical and economic circumstances. We are faced with a lack of access to adequate and concessional finance.

The Fourth International Conference on Small Island Developing States (SIDS4) represents a pivotal moment in our collective journey towards a more resilient and sustainable future for SIDS. It is a moment for us to come together and reflect on what we are trying to achieve and what the international community can do for SIDS. We firmly believe that the overall goal of the Conference and its outcome must be to make SIDS more resilient and instil confidence that they can navigate the perils of development.

The Antigua and Barbuda Agenda for SIDS (ABAS) calls for sustainable debt management by "considering the establishment of a dedicated SIDS Debt Sustainability Support Service to enable sound debt management and devise effective solutions for SIDS in relation to debt vulnerability in the immediate term and debt sustainability in the long term, building on and avoiding duplication with relevant dedicated initiatives". I acknowledge the assessment and the report by the International Institute for Environment and Development, which was compiled after deliberations by the Strategic Advisory Group. This could be a potential modality which we could capitalise on.

As we embark on such a process, we must commit to upholding the principles of collaboration, transparency, inclusivity and innovation. For the SIDS Debt Sustainability Support Service to be truly successful, a consensus of all SIDS is needed. SIDS may not be the masters of their fate. But our small size and geography will not dictate our destiny. The Service must be SIDS-led and SIDS-owned. It must serve as a symbol of hope for sustainable development and economic growth. We must build on this foundation and ensure we harness the power of our collective resolve to chart a path towards resilient prosperity.

His Excellency President Dr Mohamed Muizzu
of the Republic of Maldives

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

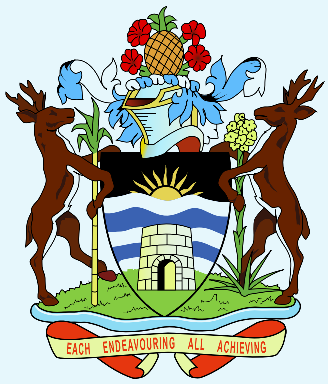
Co-chair of the Strategic Advisory Group

As nations on the frontline of climate change, Small Island Developing States (SIDS) have long faced the monumental task of overcoming vulnerabilities that disproportionately affect our environmental, social and economic stability. The Global SIDS Debt Sustainability Support Service was conceived during COP28 and subsequently endorsed by the United Nations General Assembly through the Antigua and Barbuda Agenda for SIDS. The Global SIDS Debt Sustainability Support Service stands as a crucial initiative in our ongoing struggle to build resilience against these relentless challenges. This Service is a clarion call to action, uniting SIDS around a common strategy for prosperity and resilience in the face of adversity.

As co-chair of the Strategic Advisory Group, I have witnessed first-hand the commitment and collaborative spirit that have characterised the design of the Global SIDS Debt Sustainability Support Service. Our deliberations have been rich with diversity and ambition, driven by the shared experiences of SIDS across the globe. As we launch the Global SIDS Debt Sustainability Support Service at the SIDS4 Conference in Antigua and Barbuda, it is essential to acknowledge this support service as a transformative platform designed to catalyse change and empower our nations. The Global SIDS Debt Sustainability Support Service is not merely a response to our current fiscal and environmental crises — it is a proactive strategy aimed at ensuring the long-term sustainability and self-sufficiency of SIDS. This support service integrates crucial aspects of debt management, economic protection, investment in resilience and strategic advisory support into a cohesive framework. By addressing these elements collectively, the Global SIDS Debt Sustainability Support Service enables us to move beyond survival towards thriving in an increasingly complex global landscape.

The journey to this point has been one of intense effort and purposeful dialogue involving stakeholders from various sectors and regions. Our goal has been clear — to create a mechanism that is not only responsive but also reflective of the real needs and aspirations of each Small Island Developing State. As we look forward to the operational phase, our focus must remain on the principles of equity, engagement and effectiveness that have guided our discussions. Let us embrace the Global SIDS Debt Sustainability Support Service with the resolve to enhance our collective resilience and drive our nations towards a future where sustainability and prosperity are within reach for all. Together, we are forging a new path forward, one marked by cooperation and fortified by the shared resolve to secure the wellbeing of our people and our planet.

His Excellency Prime Minister Gaston Browne of Antigua and Barbuda



Summary

Small Island Developing States (SIDS) are a widely varied group of countries spread across three major geographical regions — the Caribbean, the Pacific, and the Atlantic, Indian Ocean and South China Sea (AIS). While diverse in many respects, they share a complex set of social, environmental and economic challenges. These include their small sizes, widely dispersed populations, limited resource bases, remoteness and poor infrastructure.

In addition, SIDS are profoundly affected by climate change — despite contributing the least to global greenhouse gas emissions. Their geography makes them especially vulnerable to climate disasters and slow-onset climate impacts.

Increasingly frequent climate-related disasters are having devastating economic consequences for SIDS. SIDS constitute two-thirds of countries experiencing the highest relative annual losses from such events, with disaster-related damage as a percentage of gross domestic product (GDP) surging by nearly 90%.

The financial stability of SIDS is further compromised by escalating debt. More than 40% of SIDS are nearing or already in debt distress, and an alarming 70% surpass the debt-to-GDP sustainability threshold of 40%.

This debt crisis limits investment in social services, social protection and resilience building by diverting funds to debt servicing.

For the SIDS, breaking free from this vicious cycle is a question of survival.

The 4th UN International Conference on SIDS (SIDS4) in Antigua and Barbuda in May 2024 will see SIDS adopt the Antigua and Barbuda Accord for SIDS (ABAS), a ten-year plan for delivering a resilient future for SIDS. A central component of the Accord is creating a Global SIDS Debt Sustainability Support Service.

A Strategic Advisory Group (SAG) under the co-chairmanship of H.E. Prime Minister Gaston Browne of Antigua and Barbuda and H.E. President Dr Mohamed Muizzu of the Maldives, has worked with a wide range of stakeholders to develop this design document for the Support Service.

The Global Debt Sustainability Support Service will have four interconnected elements

(i) A layered approach to debt sustainability: this will involve designing multi-layered debt sustainability strategies

The Service design proposes a multi-layered, comprehensive approach to tackling existing debt to create the much-needed fiscal space for investment in resilience building. This approach involves a strategic layering of various existing debt relief measures, enabling SIDS to benefit from a combination of short-term relief and long-term structural adjustments to debt. This design would free up resources, allowing SIDS to invest in infrastructure development, longer-term climate resilience and socio-economic betterment, ensuring a more sustainable and resilient future.

(ii) Future protection measures

SIDS have repeatedly faced devastating economic setbacks due to climate-related disasters. The damages inflicted by some events have surpassed the affected nation's annual GDP. These shocks have strained states' financial capacities, limiting their ability to respond and rebound. The Support Service will work towards protecting SIDS against future climate-induced financial shocks via insurance and other protective measures. An integrated approach will combine insurance with other funding mechanisms that can help cover the losses from events, including those beyond insurable limits, through a guarantee or coverage against economic losses beyond a predetermined threshold.

(iii) Resilience investment

Investments in infrastructure, development and community-level resilience building efforts can protect SIDS for the future. This component of the Support Service will examine opportunities for issuing resilience bonds, blue or green bonds aimed at funding climate resilience initiatives, while also exploring new solidarity-based resilience finance mechanisms.

From an investment perspective, introducing these bonds would diversify the financing toolkit available to SIDS, offering an alternative to traditional loans or aid. The Support Service will combine introducing resilience bonds with existing measures to support access to climate finance.

(iv) Advisory and legal support

Many SIDS have limited capacity when it comes to navigating the complex mechanisms of debt restructuring, credit agency negotiations and the broader financial ecosystem. The Support Service's fourth element will offer SIDS specialised legal and commercial negotiation support. It will also focus on building long-term legal and commercial capabilities within SIDS and regional hubs, equipping them with the skills and knowledge they need to navigate intricate legal and commercial issues.

The principle of SIDS leadership will be central to the governance model of the Support Service. Ensuring equitable access for all SIDS with transparency and accountability will be vital to its success. The proposed governance structure features regional Centres of Excellence in the Caribbean, the Pacific and AIS regions, coordinated through a central Secretariat and working under the supervision of a Strategic and Operational Oversight Board.

The SIDS Debt Sustainability Support Service will be officially launched at the SIDS4 conference, together with a call for international institutions, partners and stakeholders to commit to supporting the initiative. The SAG plans to create an implementation group following SIDS4 to help operationalise the Support Service.

Looking forward, the Global SIDS Debt Sustainability Support Service will help the SIDS achieve a resilient, prosperous future.

Storm weather, Maldives. Credit: Ibrahim Rifath via Unsplash

1. Small Island Developing States face unique challenges

SIDS across the Caribbean, the Pacific, and the Atlantic, Indian Ocean and South China Sea (AIS) regions face a unique set of challenges that are not fully captured by traditional income-based measurements. These countries, many of which are classified as middle- or high-income, grapple with significant vulnerabilities due to their small size, geographic isolation, large distance from international markets and lack of structural resilience that exposes them to environmental and economic shocks. For example, despite their economic status, a Multidimensional Vulnerability Index (MVI) assessment reveals that SIDS have a similar vulnerability level to Least Developed Countries (LDCs), with scores around 56.64 for SIDS and 55.70 for LDCs, illustrating their susceptibility to shocks compared to other developing and developed countries.[1]

Despite contributing less than 1% to global greenhouse gas emissions, SIDS are disproportionately affected by climate change. Their geographical characteristics make them especially susceptible to disasters, the frequency and impact of which have escalated dramatically. IIED's most recent research, 'Sinking islands, rising debts (2023),[1] shows that from 2011 to 2022, the population affected by disasters in SIDS increased by around 120% and deaths per million rose by about 60%. These climate disasters have devastating economic consequences. SIDS constitute two-thirds of countries experiencing the highest relative annual losses from such events, with disaster-related damage as a percentage of GDP surging by nearly 90% from 2011 to 2022. IIED analysis shows that the financial stability of SIDS is further compromised by escalating debt levels due to climate impacts. More than 40% are nearing or already in debt distress, and an alarming 70% surpass the debt-to-GDP sustainability threshold of 40%.

This debt crisis impacts more than just finances. It limits investment in social services, social protection and resilience building, exacerbating poverty and inequality. Furthermore, it hampers progress towards the Sustainable Development Goals (SDGs) by diverting funds to debt servicing. The role of climate finance is also in question, as much of the support to SIDS comes in the form of loans, adding to the debt burden.

Aerial view over the Caribbean.
Credit: Makenzie Cooper via Unsplash

1 Bharadwaj, R, Mitchell, T, Karthikeyan, N and Kumar, B (2023) Sinking islands, rising debts: urgent need for new financial compact for Small Island Developing States. IIED, London. www.iied.org/21606iied

2. A way forward: building fiscal resilience in the face of the climate crisis

For the SIDS, breaking free from this vicious cycle is not just an economic imperative but a question of survival. The interconnected challenges of climate change and debt require a concerted, multifaceted response. The United Nations General Assembly, through a new 10-year programme of action for SIDS entitled the Antigua and Barbuda Agenda for SIDS, endorsed the creation of a Global SIDS Debt Sustainability Support Service with the goal of supporting SIDS in executing a new financial compact for resilient prosperity.[2] The Debt Sustainability Support Service will have four interconnected elements (see Figure 1):

(i) A layered approach to debt sustainability. This will involve designing multi-layered debt sustainability strategies that combine contingent clauses, parametric insurance, debt restructuring and debt swaps. The approach will be tested through simulation models to assess its impact on debt servicing and overall debt stock with the view to creating fiscal space for resilience investment. It can build on existing efforts to improve debt management and data availability in SIDS, as well as efforts to change the way debt sustainability analysis is structured and applied.

(ii) Future protection measures. Ensuring future protection for SIDS is important so that they do not fall into the cycle of debt distress again. By instituting robust safeguards, such as insurance products that limit economic losses from climate-related disasters, countries can gain a shield against climate uncertainty. These safeguards would include designing insurance products and alternative funding mechanisms that offer fiscal breathing space and guard against future crises or shocks, including those from climate-related events that cause economic losses.

(iii) Resilience investment. Investments in infrastructure, development and community-level resilience building efforts can fortify SIDS against future challenges, ensuring they not only survive but thrive in the face of global challenges. These would involve identifying opportunities for issuing resilience, sustainable and thematic bonds including blue or green bonds aimed at funding climate resilience initiatives while also exploring new solidarity-based resilience finance mechanisms. This can also be combined with existing measures to support SIDS' access to climate finance and build on the impact of the MVI in offering SIDS improved terms.

(iv) Advisory and legal support. This component will aim to offer specialised legal and commercial negotiation support to SIDS. Designing resilience investment bonds/deals requires specialised legal guidance to attract private sector investment and support debt management. This assistance will empower SIDS to make informed decisions and engage in dialogues while protecting their interests and promoting their aspirations. It will also focus on building long-term legal and commercial capabilities within SIDS and regional hubs, equipping them with the skills and knowledge needed to navigate legal and commercial issues.

Figure 1 Four interconnected components of the Global SIDS Debt Sustainability Support Service

2 United Nations (n.d.) Fourth International Conference on Small Island Developing States. The Antigua and Barbuda Agenda for SIDS (ABAS) – a Renewed Declaration for Resilient Prosperity. https://sdgs.un.org/sites/default/files/2024-04/SIDS4%20-%20Co-Chairs%20FINAL%20%281%29.pdf

This Service will directly respond to the needs expressed by SIDS at the Cabo Verde Interregional Preparatory Meeting for the 4th SIDS Conference[3] (30 August–1 September 2023) and the Alliance of Small Island States (AOSIS) Leaders' Declaration[4] (22 September 2023), which calls for the establishment of a dedicated debt treatment mechanism and ex-ante financing for systemic resilience building.

Box 1. The design process

The design process of the SIDS Debt Sustainability Support Service was launched in December 2023 at COP28. To steer and guide the design process, a Strategic Advisory Group (SAG) under the co-chairmanship of H.E. Prime Minister Gaston Browne of Antigua and Barbuda and H.E. President Dr Mohamed Muizzu of the Maldives was established with the aim of launching the Support Service at the SIDS4 Conference in May 2024, and integrating it with the agreement and implementation of the Antigua and Barbuda Accord for SIDS (2024–2034).[5] Details of the SAG are provided in Annex 1.

Working under the guidance of SAG members, three deliberative dialogue sessions were held in April 2024. The first session focused on getting input for the design of services for supporting debt sustainability, future protection and resilience investment. The second session focused on designing the advisory and legal support services for SIDS, and the third session focused on the governance mechanism and operational structure. The inputs from these dialogue sessions informed the design of the Support Service.

The SIDS Debt Sustainability Support Service will be officially launched at the SIDS4 conference. An implementation group will be created under the guidance of the SAG after the SIDS4 conference to help operationalise the Support Service.

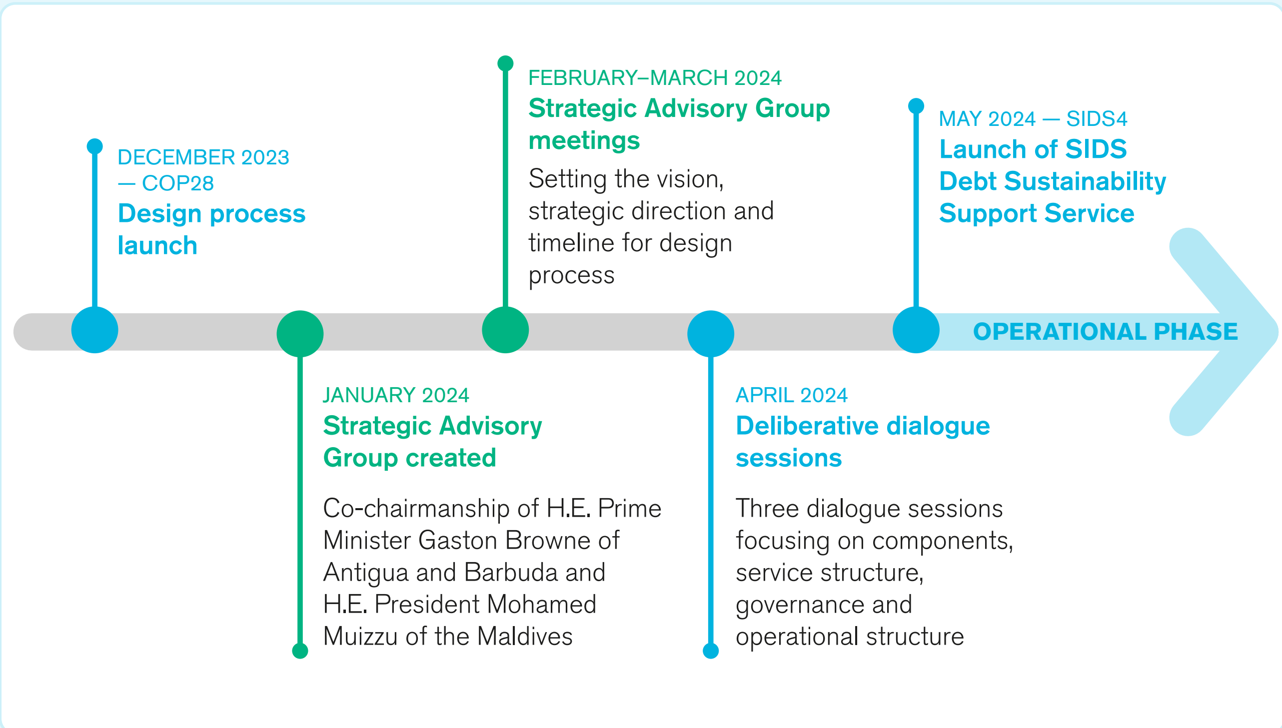


Figure 2 Proposed timeline for design and operationalisation of the SIDS Debt Sustainability Support Service

3 United Nations (n.d.) Interregional Preparatory Meeting for all Small Island Developing States. United Nations Department of Economic and Social Affairs. https://sdgs.un.org/smallislands/interregional-preparatory-meeting-all-sids

4 Alliance of Small Island States (September 22, 2023) 2023 AOSIS Leaders Declaration. www.aosis.org/2023-aosis-leaders-declaration-2

5 The fourth International Conference of Small Island Developing States (SIDS4) will be held from 27 to 30 May 2024 in St John's, Antigua and Barbuda, under the overarching theme of 'Charting the course toward resilient prosperity'. The Antigua and Barbuda Accord (2024–2034) will be announced at the SIDS4 conference. The Accord is expected to be a vital 10-year roadmap that will replace the SAMOA Pathway (the previous 10-year agenda) and guide global efforts to enhance the resilience and prosperity of SIDS.

3. Support service under each component

The rationale for a multifaceted and comprehensive service like the SIDS Debt Sustainability Support Service lies in its ability to offer cohesive support that addresses the complex, interwoven challenges confronting SIDS in the face of climate change and other economic crises caused by external factors.

By providing a holistic support framework, this initiative aims to empower SIDS to navigate their unique challenges, enhancing their capacity to adapt, thrive, and contribute to the global effort towards sustainable development and climate resilience.

Box 2. The rationale for a layered approach to debt sustainability

When a country is hit by a climate disaster, different types of funding support are needed to help it recover from both climate and debt crises. Funding needs can typically be divided into three phases: immediate relief and support, medium-term recovery and longer-term resilience building. Lack of support in any of these phases can negatively impact the population and the economy, undermine their capacity for coping with such disasters in future and push countries into downward spirals of debt. SIDS need financial assistance in all three phases of post-disaster recovery to allow them to adequately prepare for, cope with and recover from recurring climate shocks.

To date, no existing debt relief measures have adequately met these needs and helped countries get their economies back on track after being hit by a disaster or series of disasters. Therefore, a combination of debt relief packages would work best in restoring solvency and covering their recovery needs over the short, medium and long term. The impact of such a layering approach of debt relief measures on the debt servicing for SIDS is presented in Figure 3 below.

Layering could reduce the cumulative debt servicing of US$394.78 billion for SIDS (based on data of 33 SIDS) from 1990–2021 to US$223.64 billion. This could translate into a reduction of annual debt servicing of SIDS from US$12.34 billion to US$9.49 billion.[6] Simulation of the probability of growth rate occurrence due to different debt stock reduction options shows that layering can increase the average GDP growth rate of SIDS from 5.94% to 8.91%. Moreover, the GDP growth trajectory would enhance investor confidence, further stimulating resilience investment.[6]

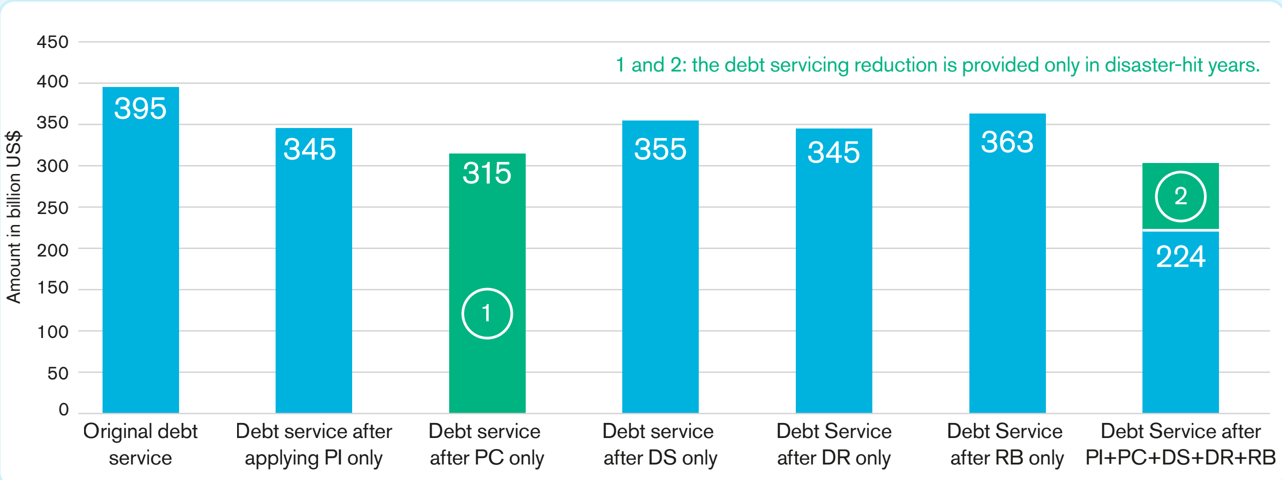


Figure 3 Layering of debt relief measures on debt servicing undertaken by SIDS

PI: parametric insurance of sovereign debt
PC: pause clause
DS: debt swap
DR: debt restructuring
RB: resilience bond

6 Bharadwaj, R, Mitchell, T, Karthikeyan, N and Kumar, B (2023) Sinking islands, rising debts: urgent need for new financial compact for Small Island Developing States. IIED, London. www.iied.org/21606iied

Accordingly, the SIDS Debt Sustainability Support Service aims to provide the following support:

3.1 Creating fiscal space through a layered approach to debt sustainability

The Service design proposes a multi-layered, comprehensive approach to tackling existing debt in order to create the much needed fiscal space for investment in resilience building. This involves a strategic layering of various existing debt relief measures, which would enable SIDS to benefit from a combination of short-term relief and long-term structural adjustments to debt.

This would free up resources, allowing SIDS to invest in infrastructure development, longer-term climate resilience and socio-economic betterment, ensuring a more sustainable and resilient future.

The proposed services (see Figure 4) delivered as part of this component will aim to enhance debt sustainability and fiscal resilience, as follows:

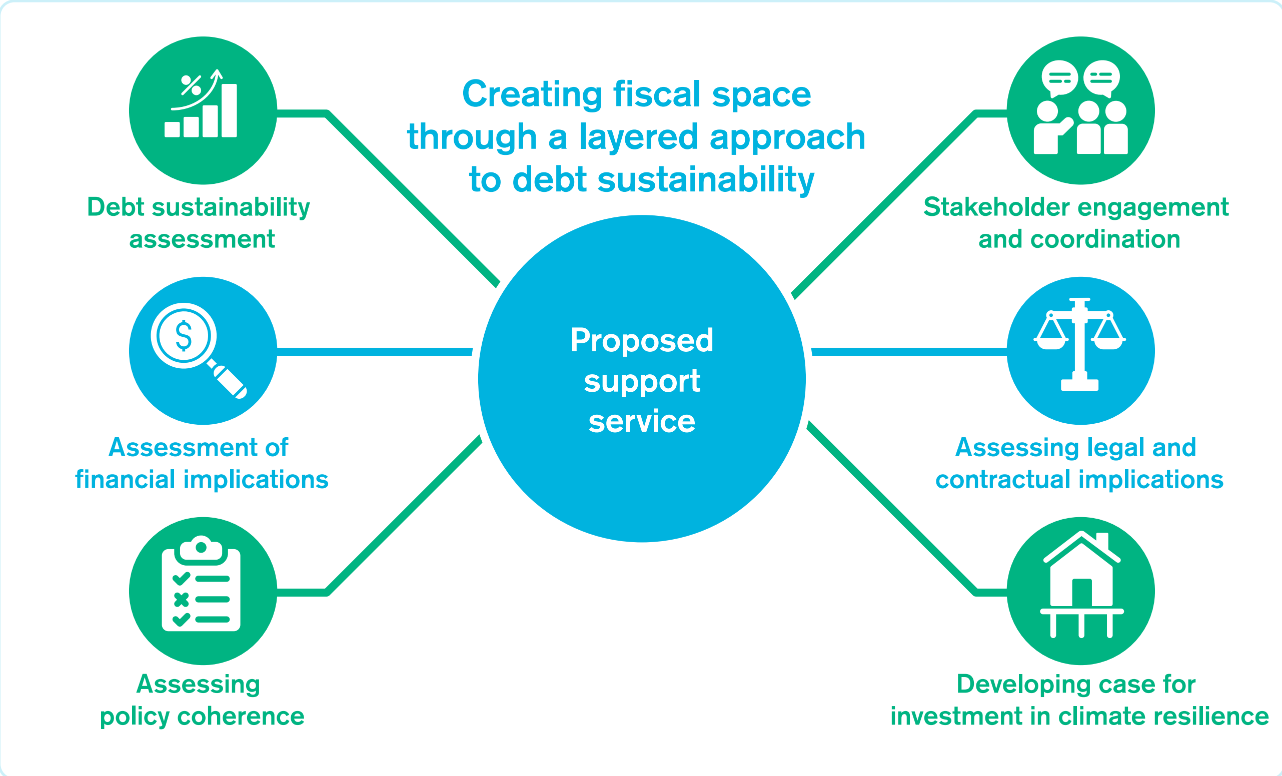


Figure 4 Proposed support service for creating fiscal space

1. Debt sustainability assessment and credit enhancement

The Support Service will assess the debt situation, evaluating the ability of SIDS to manage debt obligations while maintaining fiscal health. This will include examining factors like debt-to-GDP ratios, payment schedules and revenue-generating capacity. The Service will also assess the impact of climate disasters on economic stability and debt servicing, tailoring debt relief and innovative financing measures to suit each country's unique circumstances.

The support service would also explore credit enhancement options that could enable SIDS to have access to climate finance and reduce the cost of borrowing, which will contribute towards debt sustainability.

2. Assessment of financial implications

The Support Service will analyse the financial implications of various debt relief strategies, and explore the costs and benefits of different relief options, both individually and in combination, to identify the most efficient paths to creating fiscal space. The analysis will include assessments of potential savings, the impact on fiscal space and the viability of securing favourable borrowing terms in the future. The analysis will also consider additional financial supports, such as climate finance and humanitarian aid, to ensure a comprehensive financial strategy.

3. Assessing policy coherence

The Support Service will focus on aligning debt relief efforts with national climate adaptation and mitigation strategies, as well as broader sustainable development goals. This will entail integrating debt relief measures with existing policies, assessing regulatory and legal frameworks to support implementation, and evaluating the socio-economic and environmental impacts of these measures to ensure they contribute positively to the country's developmental and climate goals.

4. Stakeholder engagement and coordination

The Support Service is designed to focus on facilitating stakeholder engagement and coordination to ensure the effectiveness, transparency and legitimacy of the debt relief process. This will involve working closely with government agencies, financial institutions, civil society and other relevant parties to gather diverse perspectives and foster a collaborative approach to developing viable debt relief and financing solutions. The Support Service is also intended to include assessing and building institutional capacities to ensure efficient implementation and management of debt relief measures.

5. Assessment of legal and contractual implications

The SIDS' accumulated debt portfolio is governed by a series of contracts, each with a set of terms, conditions and legal provisions. Navigating through these obligations would not only be a financial exercise but also a legal one. Contracts would require careful re-negotiation to ensure they do not lead to legal disputes or financial penalties. The Support Service is designed to undertake a review of these agreements, consulting with legal experts to ensure that the debt alleviation process carefully considers and manages any potential consequences for SIDS.

6. Developing the case for investment in social protection, the SDGs and climate resilience

With the alleviation of debt, there would be an opportunity for SIDS to channel investments into building resilience against climate threats. The Support Service will provide strategic guidance and advice on these investments, for example, investing in community resilience, disaster preparedness or promoting climate-resistant crops to ensure longer-term food security.

Part of the Tuvalu Coastal Adaptation Project to manage the risks of coastal hazards. Credit: TCAP/UNDP via Flickr (CC BY-NC 2.0 DEED)

Box 3. The rationale for the future protection measures

By establishing such a protective mechanism, SIDS could ensure a cap on potential economic damages, introducing a layer of financial predictability amidst the uncertainties of climate change. Beyond this immediate safeguard, the benefits of such an insurance and funding mechanism would extend to reinforcing their economic self-reliance. Post-disaster payouts through insurance and other protection mechanisms would ensure that the economic growth of SIDS is not constrained and they are not pushed into debt due to financial recovery efforts. Moreover, this protective measure would instil confidence, both for potential investors and the community. It will act as a safety net to foster a sense of security and stability, crucial for the future socio-economic wellbeing of SIDS.

Figure 5 shows the cost of parametric insurance to cover SIDS' annual disaster losses at 5% and 20% Loss Exceedance Probability (LEP) to cover 20%, 50% and 100% of the loss and damage value. This analysis is based on the loss and damage to GDP suffered by SIDS in the last 30 years.[7]

The benefit of covering the cost of providing protection against such losses would far outweigh the debt default and the costs of debt restructuring that would need to be undertaken later if such support is not provided. IIED analysis shows that the benefit-cost ratio of parametric insurance to cover the losses caused by disasters at 5% LEP is 2.5, and 1.09 for 20% LEP.

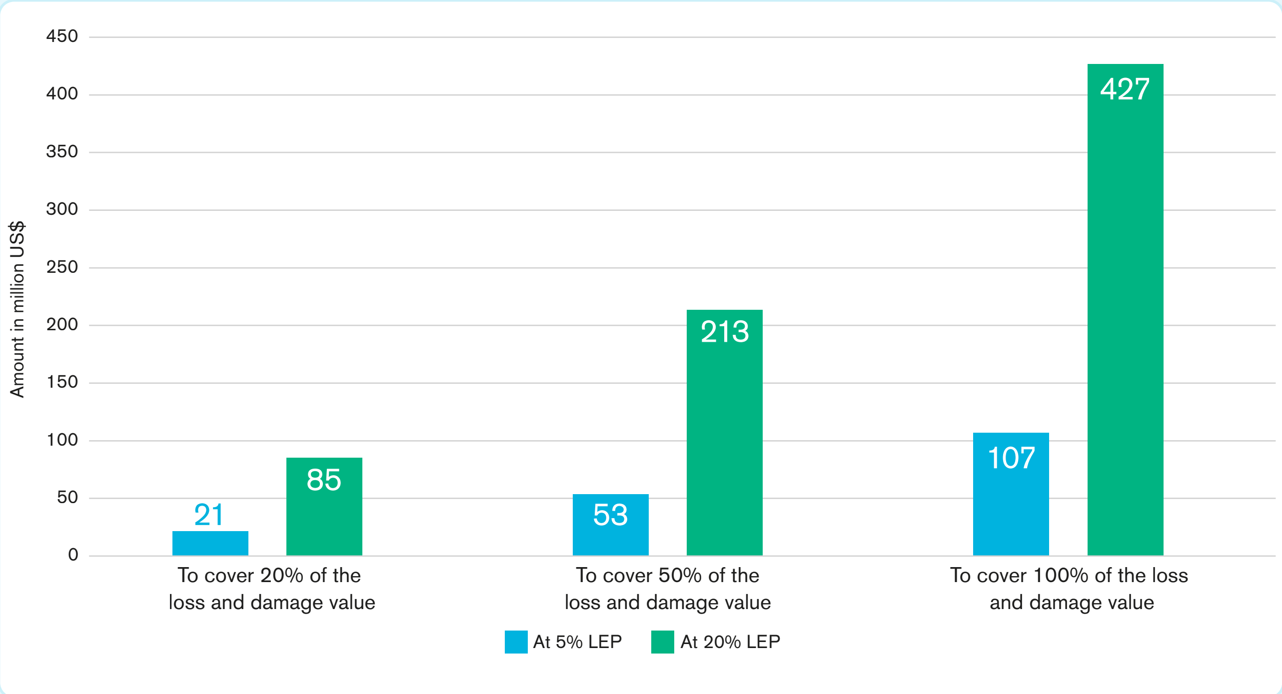


Figure 5 Cost of parametric insurance to cover SIDS' annual disaster losses

7 Bharadwaj, R, Mitchell, T, Karthikeyan, N and Kumar, B (2023) Sinking islands, rising debts: urgent need for new financial compact for Small Island Developing States. IIED, London. www.iied.org/21606iied

3.2 Future protection measures

The increasing frequency and intensity of climate-related events pose a continuous threat to the economies and livelihoods of SIDS. SIDS have repeatedly faced devastating economic setbacks due to climate-related disasters. The damages inflicted by a single extreme event have, in some cases, surpassed the affected nation's annual GDP. These shocks have not only reversed developmental gains but also strained their financial capacities, limiting their ability to rebound effectively. Without a more long-term protective measure in place, SIDS will remain precariously exposed.

So, along with support for creating fiscal breathing space after such disasters through debt relief, the Support Service will work towards immunising SIDS against future climate-induced financial shocks through insurance and other protective measures. This is designed to be achieved through an integrated approach that combines insurance with other funding mechanisms that help cover the losses from events, including those that are beyond insurable limits, through a guarantee or coverage against economic losses beyond a predetermined threshold.

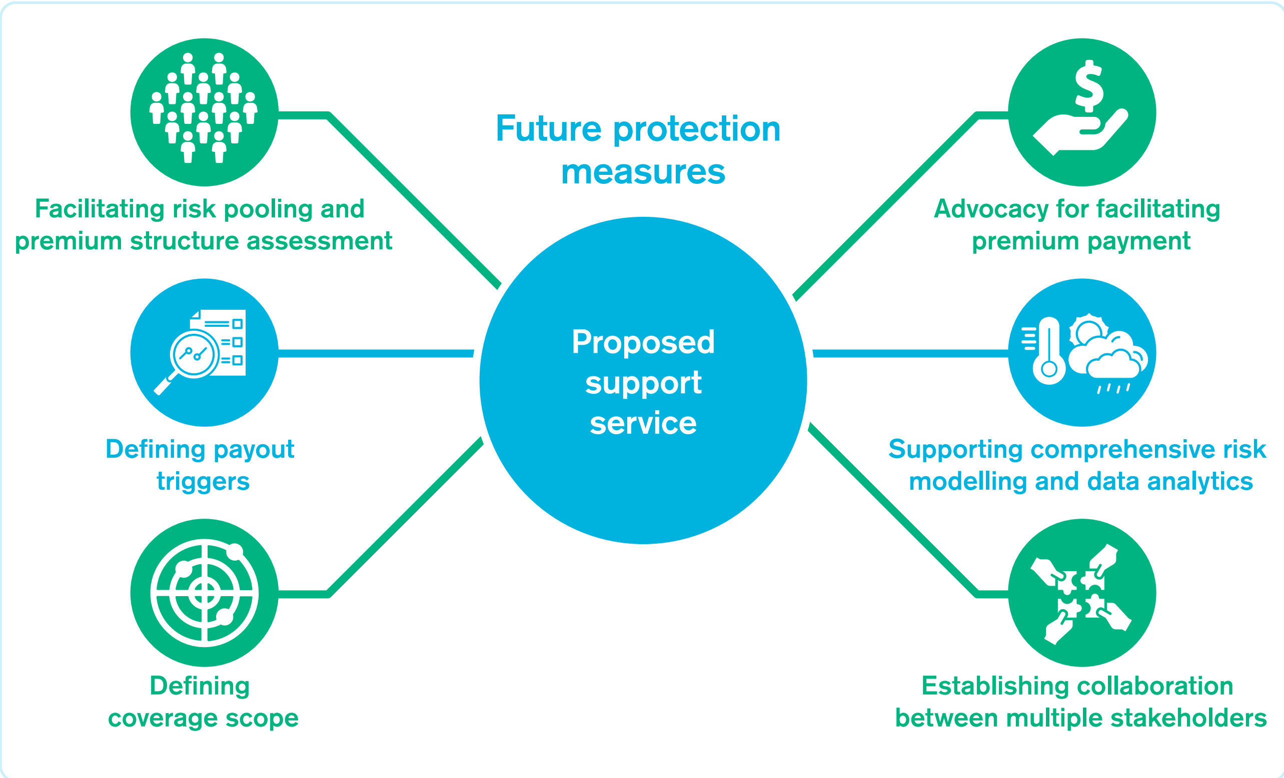


Figure 6 Proposed support service for future protection measures

The support (see Figure 6) to be provided as part of the future protection component will aim to enhance the resilience and financial stability of SIDS in the face of climate-related risks. The services under this component are designed to provide a systematic approach to risk management, insurance coverage and stakeholder engagement, as follows:

1. Facilitate risk pooling and premium structure assessment

The Support Service proposes to aggregate climate-related risks across SIDS to distribute potential financial burdens more evenly, making insurance premiums more affordable and sustainable. Some of the other countries and SIDS regions have already established insurance risk pools. In many cases, these programmes have been established to provide affordable insurance coverage for 'uninsurable' risks through private markets. In other cases, they promote solidarity by establishing regional risk pools to spread out the impact of losses. The Caribbean, Pacific Islands and African Union, for example, have set up the Caribbean Catastrophe Risk Insurance Facility, the Pacific Catastrophe Risk Assessment and Financing Initiative, and the African Risk Capacity Insurance Programme, respectively. The Support Service is designed to build on and bring together some of these existing pools with a view to creating a global risk pool.

By aggregating the climate-related risks of various SIDS, the initiative could distribute the potential financial burdens of climate disasters more evenly. This would mean that the occasional heavy payout to an individual Small Island Developing State due to a catastrophic event could be balanced out by periods with minimal or no payouts. This would help reduce the insurance premiums and cover events that are deemed as uninsurable. Over time, pooling could reduce the unpredictability of insurance payouts, leading to a more sustainable and affordable system. Such a system would become crucial, especially when considering that some SIDS might experience severe impacts infrequently but with devastating consequences when they do occur.

2. Define payout triggers

The agility of the insurance mechanism is determined by its payout triggers. The Support Service proposes the use of indexed triggers based on objective data, such as storm intensity or sea level rise, to initiate insurance payouts automatically. This approach ensures timely and predictable financial support after a disaster. A mechanism based on objective data would be more efficient to implement than relying on post-event assessments, which can be time-consuming.

3. Define coverage scope

Countries will need insurance protection against a full range of events. To provide this, insurance products will need to change how they consider climate modelling outputs. The Support Servicewill aim to refine insurance products to ensure comprehensive coverage against a wide range of climate events. The Support Service will aim to work with insurance providers and other stakeholders to move beyond average climate model outputs and provide insurance coverage that better reflects the range of potential impacts, including less likely but more catastrophic events. Similarly, the higher frequency of smaller disasters may also require coverage to help countries rebuild — because recurring moderate events can cause significant damage. This approach would acknowledge the varied nature of climate risks and seek to provide tailored financial protection.

4. Advocate for facilitating premium payments

Recognising the challenges faced by SIDS due to climate change despite contributing minimally to global emissions, the idea is for these premiums to be borne by international climate finance mechanisms or a dedicated global fund. The Support Service will advocate for getting funding commitments from international climate funds, philanthropies and the private sector, ensuring that SIDS are not unduly burdened. When pooling resources, the Support Service will explore the following: (i) what conditions would be attractive to insurers and reinsurers to keep premiums as low as possible? (ii) How can the risk pool work for a diversified portfolio of countries, given that some will be at higher risk than others and may need access to insurance support more often than others? (iii) What conditions would allow international climate finance to support risk pooling at scale? And (iv) how can the non-insurability of some events be addressed?

5. Support comprehensive risk modelling and data analytics

To support the pricing of insurance products and the design of effective coverage, risk analytics and modelling tools will be needed. However, the input data for such models are often unavailable or incomplete. Incomplete knowledge of hazard events and their impact means more uncertainty for insurance pricing. To address these needs and reduce uncertainties, the Support Service will focus on collecting and modelling hazard, exposure and vulnerability data. The data collection and models could be developed in collaboration with national meteorological and climate modelling experts. These could include academics, national meteorological, hydrological and geological services, and other government and non-governmental agencies that collect and maintain sectoral data, such as national bureaus of statistics. Such a process would help build capacity to promote sustainable maintenance of the risk data. Further, engaging in-country stakeholders would ensure that SIDS government needs and requirements are considered in the design of the triggers and thresholds. Finally, an inclusive approach will help ensure transparency regarding the source and analysis of risk parameters.

6. Establish collaboration between multiple stakeholders

Collective buy-in would be crucial to make future protection work. The Support Service will seek to engage SIDS governments, international financial institutions, the insurance industry, technical agencies and non-governmental organisations (NGOs). By fostering collective buy-in and cooperation, the Service aims to design insurance products and risk-pooling arrangements that offer optimum coverage and reflect the needs and vulnerabilities of SIDS.

3.3 Resilience investment

For SIDS, the challenge of climate adaptation and resilience is existential, and is exacerbated by the need to manage economic and natural disaster shocks. Investments in infrastructure, development and community-level resilience building efforts can fortify SIDS against future challenges, ensuring they not only survive but thrive in the face of global challenges. These investments would involve identifying opportunities for issuing resilience bonds, blue or green bonds aimed at funding climate resilience initiatives, while also exploring new solidarity-based resilience finance mechanisms.

At their core, these bonds offer direct financing for initiatives aimed at bolstering resilience to climate-induced impacts. This ranges from funding the establishment of robust infrastructure, such as storm-resistant housing and sea walls, to backing sustainable endeavours like renewable energy projects, reforestation efforts or biodiversity conservation. Resilience-building investments like these can help SIDS manage the immediate impacts of climate change and also pave the way for sustainable economic growth.

From an investment perspective, introducing these bonds would diversify the financing toolkit available to SIDS, offering an alternative to traditional loans or aid. This can alleviate some pressure from their already strained budgets. Introducing resilience bonds will be combined with existing measures to support access to climate finance for SIDS and build on the impact of the MVI in offering SIDS improved terms.

Some of the key services that will be provided under this component are shown in Figure 7 below.

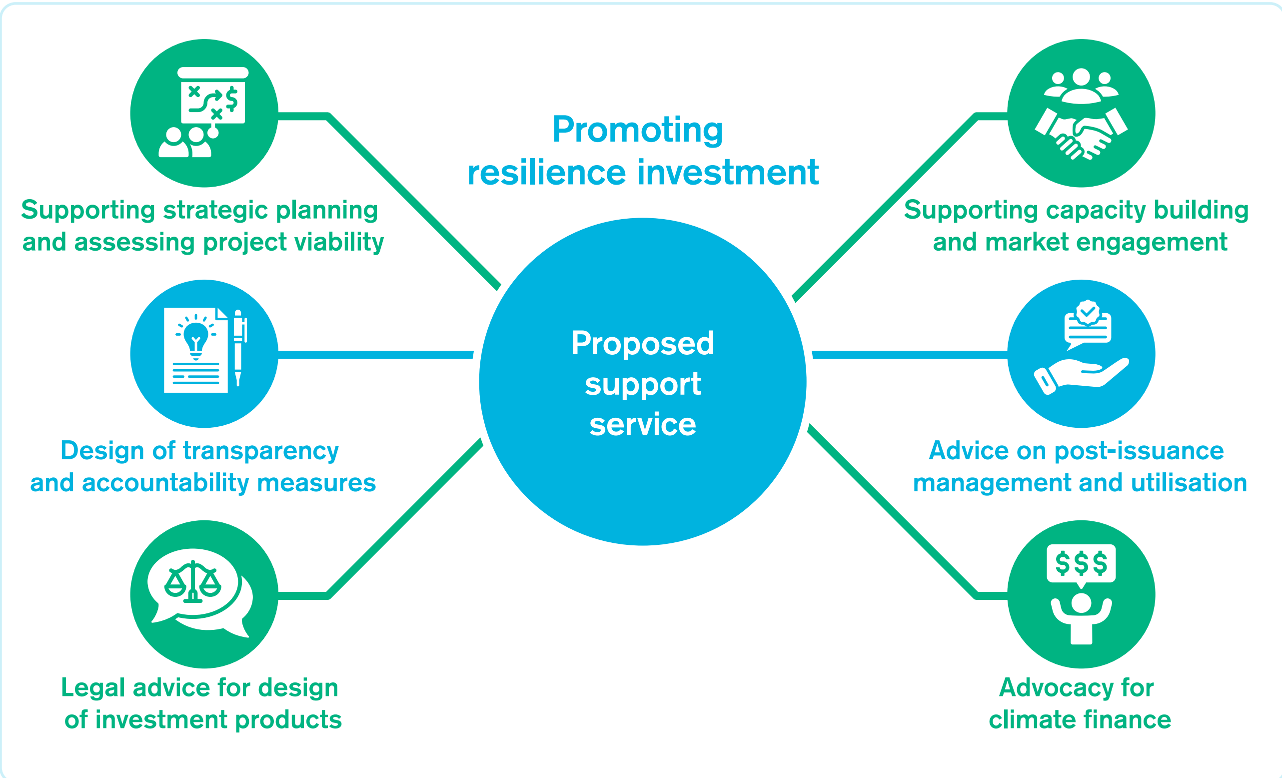


Figure 7 Proposed support service for promoting resilience investment

1. Supporting strategic planning and assessing project viability

Any resilience, blue or green bond initiative for SIDS will need a robust strategic plan anchored in clear objectives. This would involve ensuring that bond proceeds are earmarked exclusively for resilience building or environmentally friendly projects.

The Support Service will provide strategic advice and also help build the capacity of SIDS to carry out feasibility studies for the design of resilience and adaptation projects, including assessment of project viability, associated costs, timelines and anticipated outcomes, along with comprehensive risk assessment.

2. Supporting the design of transparency, accountability and certification in investment products

Transparency and accountability are the bedrock of any bond's success. Investors need assurance that their capital is being utilised ethically and effectively. The Support Service is intended to help SIDS integrate mechanisms that facilitate regular reporting, third party audits and ongoing monitoring of bond proceeds along with certifications from reputable entities to bolster investor confidence.

3. Providing legal advice on the design of investment products

Creating a conducive legal and regulatory environment will be essential. The Support Service will provide legal advice to SIDS to safeguard their interests. This would cover considerations such as the challenges of currency denomination choice and exchange rate fluctuations. These issues can significantly influence a bond's appeal to both domestic and foreign investors. Other aspects to be considered will be bond pricing and bond duration with a view to striking a balance, making it attractive for investors and feasible for SIDS in the context of investment needs.

4. Supporting capacity building and market engagement

The global bond market is intricate and for SIDS there is a steep learning curve. The Support Service design envisages capacity building initiatives embedded within the Support Service to empower SIDS and deepen their understanding of market dynamics, financial nuances and the effective management of bond proceeds. At the same time, there is a need for proactive market engagement. The Support Service will engage in raising awareness among potential investors about the particular challenges faced by SIDS and the multifaceted benefits of these bonds, which could help drive demand and foster a larger investor base.

5. Providing advice on post-issuance management and utilisation

Issuing a bond is only half the journey: the real challenge lies in post-issuance management. Efficient utilisation of funds and channelling them into designated projects are tasks that require proper oversight. The Support Service is intended to provide support to SIDS in designing a rigorous project management approach, with regional centres of excellence (see section 4) ensuring that SIDS are able to report on tangible development and resilience building outcomes.

6. Advocacy for climate finance

The Support Service will undertake targeted advocacy campaigns on climate finance to help SIDS access different climate finance windows. The focus would be particularly on the Green Climate Fund and the newly created UN Loss and Damage Fund for Developing Countries. The purpose would be to facilitate access to grant funds for resilience building and, where possible, use these funds to leverage additional concessional finance for SIDS.

3.4 Expert advisory and legal support

In the rapidly evolving global finance landscape, SIDS may find themselves at the intersection of vulnerability and opportunity. Many SIDS have limited capacity when it comes to navigating the intricate world of debt restructuring, credit agency negotiations and the broader financial ecosystem, which puts them in a disadvantageous position. The intricacies of international finance and debt negotiations, compounded by the nuanced economic and environmental challenges facing SIDS, often tilt the balance against them, resulting in less favourable terms or missed opportunities.

Increasingly, SIDS are also engaging with private creditors, who now hold a significant portion of SIDS debt. Private creditors often employ intricate loan agreements, which may contain terms that may not be immediately clear or favourable to the nations involved. For many SIDS, the fine print and long-term implications of such contracts are hard to decipher, given their limited expertise in this field.

This component will aim to offer specialised legal and commercial negotiation support to SIDS. It will also focus on building long-term legal and commercial capabilities within SIDS and regional hubs, equipping them with the skills and knowledge needed to navigate legal and commercial issues. The proposed support (see Figure 8) includes the following:

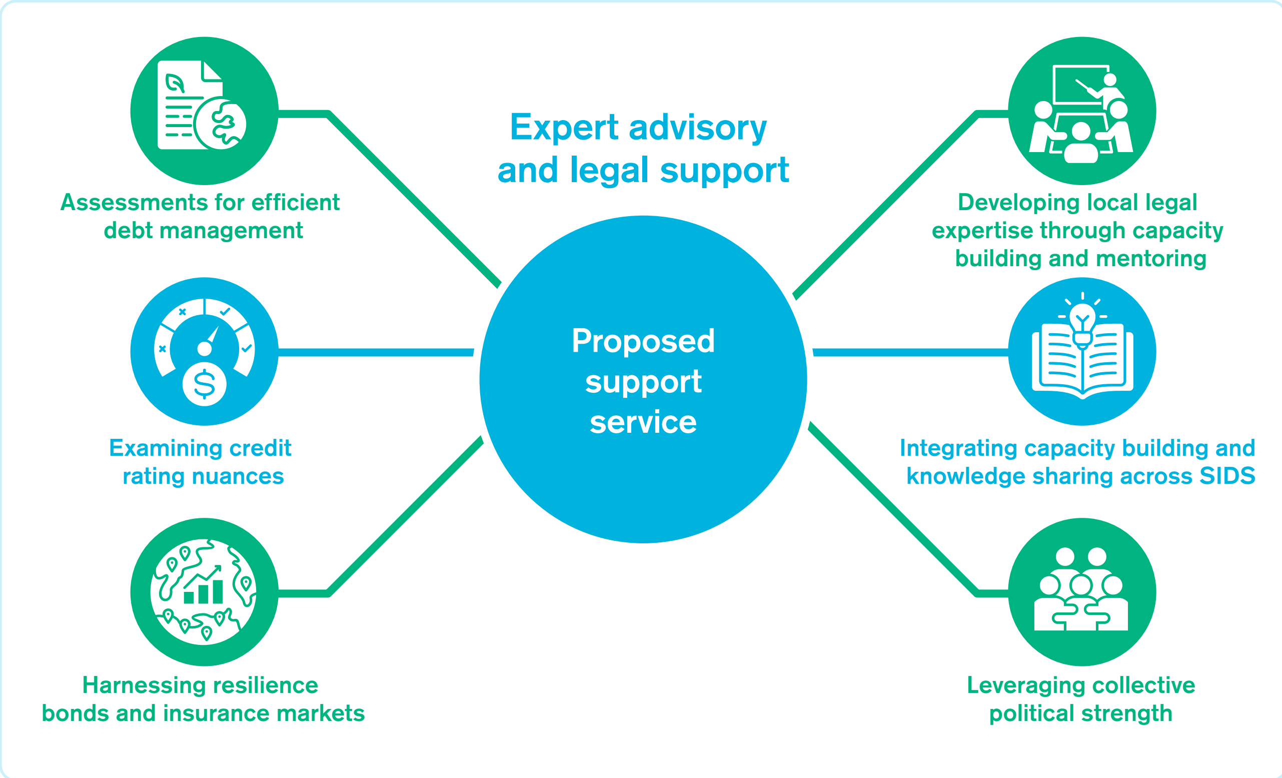


Figure 8 Proposed support service for expert advisory and legal support

1. Undertaking assessments for efficient debt management

The vulnerability of SIDS to climate impacts may be perceived as a high economic risk by creditors and they may accordingly reduce their credit scores. This can increase borrowing costs for SIDS. While some SIDS might have the expertise for negotiations with creditors to ensure they are not unduly penalised with poor ratings due to climate risk exposure, others may need support. The Support Service will offer advice, ensuring SIDS can secure favourable lending terms or debt relief agreements. The aim is to create a comprehensive database of all SIDS that can support data analytics, bringing in geopolitical insights and technical expertise to develop comprehensive strategies that resonate with the various challenges and the need for investment in resilience.

2. Examining credit rating nuances

The impacts of climate change and other risks on credit rating can be challenging to grasp. The Support Service would create a dedicated advisory platform for SIDS to serve as a bridge between SIDS and credit rating agencies, ensuring that the rating methodologies holistically capture the particular challenges facing SIDS using the MVI, instead of applying generic criteria that might overlook nuances.

3. Harnessing resilience bonds and insurance markets

The financing avenues of resilience bonds and insurance products, though beneficial, can be laden with complexities, such as the pricing of the products/ premiums and risk assessment. The Support Service will provide comprehensive guidance on leveraging these financial instruments tailored to the particular requirements of SIDS.

4. Supporting capacity building

The Support Service is designed to provide gradual capacity building for SIDS by enabling knowledge transfer, upskilling government negotiators, and providing mentorship through local legal teams, NGOs and advocacy organisations on topics such as debt management and investment negotiations, thereby fostering a self-reliant, sustainable ecosystem of expertise within SIDS.

5. Leveraging collective political strength

By unifying the collective interests of all SIDS, the Support Service will offer a consolidated voice and strategy in international negotiations, securing terms that truly resonate with SIDS' needs and aspirations.

Box 4. How will the proposed approach take SIDS towards resilient prosperity?

The Global SIDS Debt Sustainability Support Service design envisages an interconnected approach that addresses the multi-layered nature of SIDS challenges. By harmonising capacity building, financial strategy, policy coherence and stakeholder collaboration, as shown in the theory of change (Figure 9), the Support Service will not only improve protection for SIDS from the immediate impacts of climate change but will also steer them towards a future defined by resilient prosperity.

At the core of this approach is enhancing capacity, which comprises the development of technology and skills, and the provision of tools and guidance to SIDS. This foundational element directly links to the Support Service's commitment to fostering fiscal resilience through a layered debt strategy. By enhancing technological capabilities, SIDS can implement more efficient data management and financial planning. Skills development ensures that local professionals are equipped to handle complex financial instruments and legal challenges. Tools and guidance are important in applying these skills and technologies effectively, ensuring that policies and investments are well-informed and targeted.

This approach also underscores the importance of strong institutions and robust policy frameworks. Institutions will benefit from the Support Service's advisory and legal support components, bolstering their ability to manage debt and investments effectively. This reinforces the role of policy coherence, ensuring that SIDS can align their debt management strategies with their climate adaptation and mitigation goals. As these institutions strengthen and policies become more integrative, SIDS can better access and utilise finance options tailored to their needs, such as the suggested resilience bonds and risk-pooling insurance measures. The financial strategies developed through the Support Service will help SIDS manage and recover from climate impacts, preventing catastrophic economic losses and promoting sustainable growth.

Partnerships and governance structures, as depicted in the theory of change, are vital in linking the Support Service's aims with tangible outcomes. Stakeholder engagement and coordination enhance the collective efficacy of resilience measures. By advocating for equitable premium payments and utilising innovative risk modelling, the proposed approach aligns with the principles of shared responsibility and mutual benefit, which are key to resilient prosperity. Finally, research and development facilitated through the Support Service ensures that SIDS can make evidence-based decisions, fostering an environment where climate resilience is continuously improved through innovation and learning.

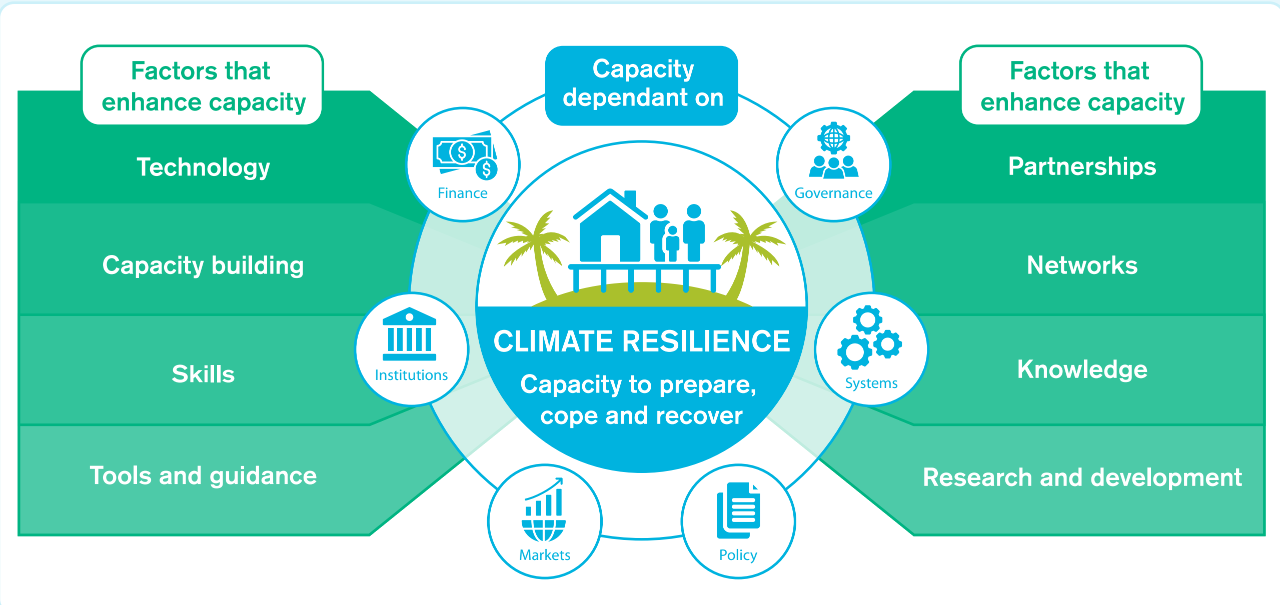


Figure 9 Theory of change for taking SIDS towards resilient prosperity

4. Governance arrangements, service structure and operational mechanisms

Given the diversity among SIDS — each with its unique set of resources, vulnerabilities and developmental goals — a one-size-fits-all solution cannot effectively address the varied challenges and needs of different countries. Accordingly, we propose a flexible, tailored approach to the governance and delivery of the Support Service so that it is adaptive and capable of being customised to meet the specific needs and aspirations of diverse SIDS, and ensures that every nation can access the support needed to help them meet their targets for resilience and prosperity. We propose the following governance arrangements and service structure.

4.1 Governance structure and approach

The governance structure and approach for the Global SIDS Debt Sustainability Support Service will be designed to embody the core principles of inclusivity, transparency, adaptability and collaboration (see Figure 10), ensuring that SIDS retain leadership and ownership over initiatives that influence their future. By promoting broad participation and integrating the unique perspectives and needs of SIDS into decision making, the approach aims to establish a dynamic and adaptable governance structure that can effectively respond to regional challenges.

Central to implementing this governance framework will be the creation of a Secretariat, complemented by regional mechanisms tailored specifically for the three SIDS regions — the Caribbean, the Pacific, and the AIS. Recognising that each region has distinct vulnerabilities and capacities, the governance arrangements will be developed during the operational phase by the SAG. The SAG will engage in comprehensive consultations with representatives from the three distinct SIDS regions. This consultative approach will ensure that the governance model integrates diverse regional insights and needs effectively. The engagement will not be limited to regional representatives but will also include a variety of stakeholders such as finance ministries, civil society and the private sector, fostering a broad-based, inclusive approach to decision making.

In addition to leveraging regional input, the Support Service is designed to build on the strengths of existing regional institutions and organisations that have a proven track record in aiding SIDS. By forming strategic partnerships with notable global institutions, the service aims to position its Secretariat as a powerful advocate for SIDS on the international stage. These partnerships are crucial for securing the necessary resources and support, thereby enhancing the Service's global impact. Such collaborations will not only extend a global network of support but also ensure that the initiatives remain firmly rooted in local realities and needs, promoting tailored and effective solutions that resonate with the unique circumstances of each SIDS region. This dual focus on local and global collaboration will amplify the impact and reach of the governance model, fostering sustainable development and enhancing the resilience of SIDS.

Figure 10 Proposed governance approach

IFIs: International Finance Institutions **MDBs:** Multilateral Development Banks

4.2 Service structure

A comprehensive approach to ensure accessibility, equitable support distribution and high quality service will be crucial. The Support Service structure will draw on global best practices and lessons from successful initiatives, such as the African Legal Support Facility, to create a model that is both inclusive and impactful.

Equitable access will be guaranteed by creating a regional mechanism to offer support services across different regions. This will include providing materials in multiple languages and offering various application methods to access the Support Service to accommodate varying levels of digital infrastructure in different countries. The quality of these services will be ensured through a comprehensive quality assurance framework, which will emphasise regular evaluations, capacity building and stakeholder feedback.

5. The future pathway to resilience

The Global SIDS Debt Sustainability Support Service is designed to play an important role in addressing the unique challenges faced by SIDS.

This initiative's multifaceted operational strategy, emphasising capacity building, knowledge exchange and partnership development, is designed to equip SIDS with the tools and resources necessary to navigate the complexities of their economic and environmental landscapes. By drawing on global best practices and fostering collaborations with international financial institutions, the private sector, legal experts and insurance providers, the Support Service aims to build a robust support network that can empower SIDS to achieve their resilience goals while maintaining their self-reliance and environmental integrity.

Central to the success of the Global SIDS Debt Sustainability Support Service will be the commitment to ensuring equitable access to all SIDS, promoting transparency and accountability in service delivery, and maintaining the highest standards of quality in all interventions.

With the continued support and engagement of SIDS communities, global partners and stakeholders across various sectors, the Global SIDS Debt Sustainability Support Service is expected to catalyse transformative change, driving progress towards a more resilient and prosperous future for SIDS.

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H.E. Gaston Alphonso Browne, Prime Minister, Antigua and Barbuda

Members

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Baran Han, Senior Economist, Operations Policy and Country Services and **Zehra Aslam**, Economist, Development Finance at the World Bank

Noelle O'Brien, Director, Climate Change, Asian Development Bank (or her nominee)

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Dr. Simona Anamaria Marinescu, Senior Advisor, Small Island Developing States, United Nations Office for Project Services (UNOPS)

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Knowledge Products

May 2024

Climate change

Keywords:
Climate resilience, social protection, loss and damage, climate finance, climate change justice, climate change governance, Small Island Developing States (SIDS), Least Developed Countries (LDCs), early warning systems

Small Island Developing States (SIDS) are experiencing increasingly frequent climate-related disasters with severe consequent economic impacts. These nations' financial stability is further compromised by escalating debt: more than 40% of SIDS are nearing or already in debt distress.

This document sets out the design for a Global SIDS Debt Sustainability Support Service, which will feature a layered approach to debt sustainability, future protection measures, resilience investment, and advisory and legal support.

The Support Service is a central component of the Antigua and Barbuda Accord for SIDS (ABAS), a ten-year plan for delivering a resilient future for SIDS.

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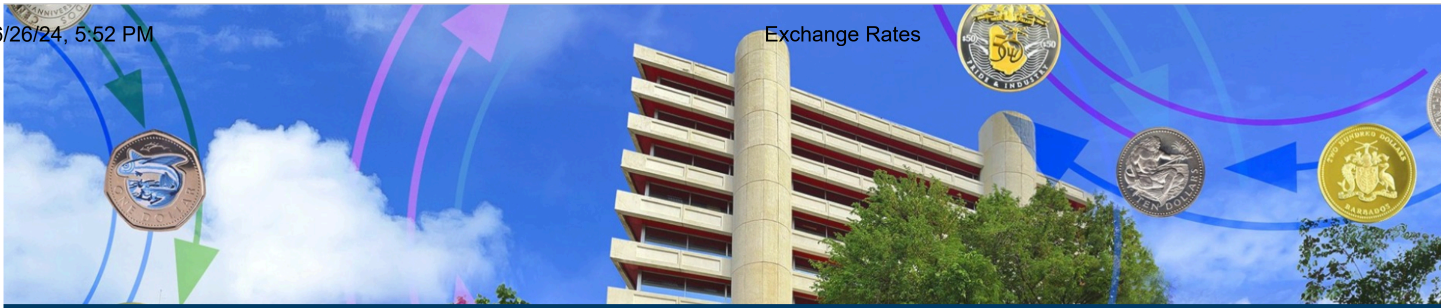
Annex 606

“Exchange Rates”, *Central Bank of Barbados*, 26 June 2024



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Exchange Rates

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26-Jun-2024

Currency	Buying	Selling
Belizean Dollar	1.000000	1.000000
East Caribbean Dollar	0.737040	0.744450
United States Dollar	1.980000	2.028570
Canadian Dollar	1.445880	1.488650
Pound Sterling	2.486740	2.591460
Euro	2.099200	2.187600

* Please note that rates are subject to change without prior notice.

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Annex 607

“2023 Financial Stability Report”, *Central Bank of Barbados and Financial Services Commission*, 2023

2023

FINANCIAL STABILITY REPORT

Central Bank of Barbados
Financial Services Commission

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Preface

The Central Bank of Barbados (the Bank), the Financial Services Commission (FSC), and the Barbados Deposit Insurance Corporation (BDIC) share oversight of the financial system in the form of a Financial Oversight Management Committee (FOMC). The Bank regulates commercial banks and finance companies, the FSC regulates credit unions, insurance companies, mutual funds, and occupational pension plans, while the BDIC provides a safety net for depositors at commercial banks and finance companies. The FOMC mandate is to maintain financial stability by overseeing the financial system, identifying and assessing vulnerabilities, and prescribing policies to bolster the system's resilience to possible adverse events.

Financial stability refers to the condition where a country's financial system operates effectively, efficiently, and resiliently, facilitating economic processes, mitigating risks, and absorbing shocks. This stability is characterised by solvent, well-capitalised, and well-managed financial institutions, efficient and reliable financial markets, and a robust financial infrastructure. Ensuring financial stability is crucial for promoting confidence among consumers, investors, and financial institutions, which in turn supports economic growth and development. Central banks and other financial regulators play a pivotal role in maintaining financial stability through various policy tools, regulations, and supervisory practices. As such, the Central Bank Act passed in December 2020 explicitly establishes financial stability as a core mandate of the Bank and recognises the need for macroprudential considerations in policymaking. The Act notes that "*where there is a perceived threat to the financial system, the Bank shall manage and control that risk by taking any steps it deems necessary.*"

This thirteenth issue of Barbados' Financial Stability Report (FSR) is a collaboration between the Bank and the FSC and provides an assessment of the risk exposures of domestic deposit-taking institutions (commercial banks, finance companies, and credit unions), insurance companies, mutual funds, and pension funds. The FSR serves as an instrument to hold the financial sector regulators accountable for the surveillance, risk management, and the smooth functioning of the financial system. The current report analyses the trends in financial stability indicators for financial institutions, as well as their balance sheets and income statements, with emphasis on the year 2023.

Abbreviations

ACH	Automated Clearing House
AFSI	Aggregate Financial Stability Index
ATM	Automated Teller Machine
BACHSI	Barbados Automated Clearing House Services Incorporated
BDIC	Barbados Deposit Insurance Corporation
BSI	Banking Stability Index
CAR	Capital Adequacy Ratio
CARTAC	Caribbean Regional Technical Assistance Centre
CBOE	Chicago Board Options Exchange
CRE	Commercial Real Estate
DIF	Deposit Insurance Fund
DSR	Debt Service Ratio
DTI	Deposit Taking Institution
FAO	Food and Agriculture Organisation
FOMC	Financial Oversight Management Committee
FSC	Financial Services Commission
FSI	Financial Soundness Indicators
GDP	Gross Domestic Product
GPW	Gross Premiums Written
IMF	International Monetary Fund
LTD	Loan-to-Deposit
LTV	Loan-to-Value
NFC	Non-Financial Corporation
NFPS	Non-Financial Private Sector
NIR	Net International Reserves
NOP	Net Open Position
NPL	Non-Performing Loan
POS	Point of Sale
ROA	Return on Assets
ROAA	Return on Average Assets
ROE	Return on Equity
RRE	Residential Real Estate
RSA	Interest Rate Sensitive Assets
RSL	Interest Rate Sensitive Liabilities
RTGS	Real-Time Gross Settlement
RWA	Risk-Weighted Assets
SIDS	Small Island Developing States
ST	Stress Testing
TCRM	Technology and Cyber Risk Management Guideline
YOY	Year-On-Year

Foreword

by the Governor of the Central Bank of Barbados and Chief Executive Officer of the Financial Services Commission

Dr. Kevin Greenidge
Governor
Central Bank of Barbados

Mr. Warrick Ward
Chief Executive Officer
Financial Services Commission

The FSR has been a crucial guide, providing invaluable insights on risk assessments specific to the Barbadian financial sector. This document has been instrumental in benefitting both local and global stakeholders. In a world characterised by dynamic economic landscapes and evolving financial ecosystems, the FSR's role in maintaining vigilance and foresight to safeguard financial stability cannot be overstated. Like many other countries, Barbados faces numerous challenges and opportunities in the realm of financial and economic stability. Our journey towards sustainable growth and resilience necessitates a deep understanding of domestic and global forces shaping our financial sector. As we navigate through these complexities, the Financial Stability Report serves as a beacon, illuminating the path forward with insights and analysis from dedicated experts at the Bank and FSC. The 2023 FSR continues to uphold this essential function, and we are pleased to declare the sustained health and stability of our financial ecosystem.

The year 2023 was marked by a complex macro-financial landscape, including bank failures in the United States and Switzerland early in the year. Despite these challenges, Barbados' financial institutions demonstrated commendable resilience. This resilience, coupled with sustainable economic growth and the robust performance of the tourism sector, has helped to insulate the Barbadian populace and business sector from the impact of the challenging international economic climate, instilling confidence in the stability of our financial sector.

The risk landscape is inherently dynamic, but after extensive discussions, this edition of the report focuses on three main risks: the impact of a greater-than-anticipated global economic slowdown on the local economy and financial system, the impact of climate shocks on financial system stability, and the potential for cyber-attacks to disrupt the financial system.

The persistence of inflation globally has meant that international interest rates remain elevated at rates last seen in 2007. This has implications both for visitors to the island as well as the affordability of foreign private sector investment projects that are crucial for growth.

Climate risk remains an existential threat to humanity, with small island states and their financial systems particularly at risk of catastrophic physical events. Both of our institutions have taken steps to build frameworks for assessing physical climate risk, and we expect to invest even more in the years ahead as we further develop this capacity.

Globally, all financial institutions have experienced an ever-increasing barrage of cyber-attacks. Participants in our domestic space have had to mitigate cyber-attacks of varying sophistication and scope. Our regulatory bodies have been vigilant in identifying and managing cyber risks within the prevailing regulatory infrastructure via guidelines and their inspection frameworks.

As we confront these challenges, we must remain steadfast in our resolve to mitigate risks, enhance resilience, and promote inclusive prosperity for all Barbadians. Our commitment to these principles is unwavering, and we are dedicated to ensuring the long-term stability and strength of Barbados' financial architecture, providing a strong reassurance for the future.

We commend the authors, contributors, and all those involved in preparing this report for their dedication and expertise. Their tireless efforts underscore our shared commitment to ensuring the stability and strength of Barbados' financial architecture.

The Bank and FSC stand unwaveringly in our dedication to implement prudent measures essential for perpetuating systemic stability. This approach may result in extending regulatory supervision to a broader spectrum of financial entities. Looking ahead, the impending finalisation of regulatory guidelines for the evaluation and licensing of payment service providers, along with the progress towards enabling deposit insurance for credit unions, will fortify our regulatory framework and effectively diminish risks to financial stability.

As we embark on the journey ahead, let us draw inspiration from past lessons, embrace the opportunities of the present, and chart a course towards a future defined by resilience, sustainability, and prosperity for generations to come.

Executive Summary

The robust health of the domestic financial sector was reflected in the domestic economic expansion observed in 2023. Outstanding credit balances experienced moderate growth, while credit quality improved due to greater business activity. The increased profitability in the banking sector led to an enhancement in the sector's capital adequacy ratios, while the profits of finance companies and capital adequacy were on par with the previous year. Credit to the non-financial private sector (NFPS) increased in 2023, building on the post-COVID expansion in 2022. Credit demand primarily originated from the private sector by way of project financing in the manufacturing, real estate, and transport, storage and communication sectors.

A primary concern for the domestic financial stability outlook emanates from the potential slowdown in the global economy and its cascading effects on the tourism sector and the broader macroeconomy. Firstly, there is the risk of a decrease in tourist arrivals and capital inflows from key markets, which could dampen domestic economic activity. Such a decline in tourist arrivals might adversely affect the revenue of businesses in critical economic sectors, potentially worsening their debt burden, and impairing their ability to repay debts.

If economic activity wanes and businesses weaken, households' financial positions are likely to suffer due to employment losses, leading to an increase in the unemployment rate. This concern encompasses two aspects: *direct* risks with the possibility of individuals defaulting on loans, especially in the face of rising interest rates or declining incomes, while *indirect* risks arise from cuts in household spending dampening overall economic activity and in turn, amplifying credit risk. Despite Barbados' household debt to deposit-taking institutions (DTIs) as a percent of GDP (48.2 percent in 2023) being higher than other Caribbean and emerging economies, the downward trend in this variable post-pandemic, abates household credit risk concerns (Figure J1).

The macroeconomic slowdown is likely to challenge the occupational pension sector. As many occupational pension plans exhibit significant exposure to foreign markets through their mutual fund investments, the potential slowdown will likely present much volatility to investment portfolios. Many defined-benefit pension plans face significant funding shortfalls, which heightened equity risks can exacerbate, thus threatening the stability of many pension plans in the sector.

In the event of a further escalation in geopolitical tensions, there is a potential for adverse consequences concerning the supply of energy and food commodities. Increases in energy and food prices resulting from geopolitical shocks may contribute to higher imported inflation and widened domestic current account deficits, which would negatively impact the most vulnerable segments of the population.

Persistent inflation can present a challenge for the insurance sector. If inflation remains elevated in many global economies, the insurance sector, particularly the non-life industry, will face higher repair and replacement costs when settling claims. Insurers, therefore, may encounter greater pressure to manage their risks and adjust pricing strategies effectively. Consequently, policyholders could see a further rise in premium rates for insurance coverage.

Changes in global interest rates and borrowing conditions can affect the cost of servicing Barbados' external debt, impacting Government's fiscal position and potentially straining financial stability. Despite a decrease in inflation rates across many jurisdictions in 2023, the key policy rates continue to exceed the targets established by the majority of global central banks. Market players anticipate a relaxation of monetary policy in the latter half of 2024 as the cumulative interest rate hikes of the last two years created restrictive monetary conditions to steer inflation back towards central banks' targets. Nonetheless, the persistence of global inflation levels above these targets could disrupt this expectation. Consequently, financing costs in the region could remain elevated.

Fluctuations in global interest rates are unlikely to affect domestic financial institutions significantly. The anticipated monetary policy easing in many global economies is projected to have a limited effect on the balance sheets of financial institutions due to their significant local investment holdings. This is particularly relevant for insurance companies, where a considerable portion of investments are retained domestically. As a result, changes in global interest rates are less likely to impact discount rate assumptions used for actuarial valuations of insurance liabilities.

The domestic financial system remains vulnerable to climate change. Physical climate risks such as rising sea levels, extreme weather events like hurricanes, droughts, flooding, and changing precipitation patterns, threaten the island's capital stock and macroeconomy. The potential adverse impact on tourism and other sectors of the Barbadian economy could place pressure on the financial sector, specifically in the case of a severe climatic event. While the insurance sector plays a critical role in minimising much of the financial impact of catastrophic losses, the country's protection gap remains a concern due to uninsurance and underinsurance, which needs further investigation.

Deposit-taking institutions continue to integrate climate risk assessments within their frameworks. Based on a 2024 survey, commercial banks and finance companies have prioritised Environmental, Social, and Governance (ESG) considerations in their corporate strategies. These institutions have been including climate risk assessments within their credit granting and borrower default frameworks. Also, these institutions have been minimising their carbon footprint by going paperless and using more energy-efficient equipment during their day-to-day operations (see Appendix E: Climate and Environmental Risk Management Survey Report for a more detailed analysis of the survey). Developing strategies to mitigate and adapt to climate risk is imperative for safeguarding the nation's economic and long-term financial stability.

As the threat of cyber-attacks continues to evolve worldwide, it poses a potential risk to the stability of Barbados' financial sector. Cyber-attacks can target financial institutions, disrupting their operations, compromising sensitive data, and undermining the overall trust in the financial system. In Barbados, like in many other countries, financial institutions are increasingly reliant on technology for various operations, including online banking, electronic transactions, and data storage. While these technological advancements bring efficiency, they also create vulnerabilities that malicious persons and/or institutions may exploit. Cyber-attacks, such as phishing, ransomware, and data breaches, can have severe consequences on the integrity and resilience of the domestic financial system. In 2024, the Bank conducted a cyber risk survey involving financial institutions, including commercial banks and finance companies. The results indicated that these institutions consider cyber risk as a top priority.[1]

The real estate market displayed stability in reported prices, posing no immediate threat to the soundness of the financial sector. While the overall market activity slightly lagged behind the previous year based on the number of new mortgages, DTIs indicate that property prices appear to have either grown or remained on par. Results from a real estate survey issued by the Bank reveal that DTIs have eased borrower-based lending standards on mortgages such as the loan-to-value (LTV), debt-to-income, and debt service ratios (DSR) in an attempt to spur buyer demand. Respondents also indicated a downward trending house-price to income ratio, suggesting improvements in mortgage affordability. One area of concern, however, is constrained supply in the tourism residential market.

The rise in competition within the DTI sector has led to a redistribution of deposits among its subsectors. The maximum interest rate offered on time deposits has increased. As a consequence, finance companies, whose funding is primarily composed of non-transferable deposits, have encountered increased funding pressures, despite the overall system maintaining a high level of liquidity. Commercial banks faced less pressure as transferable deposits represent the majority of their deposit liabilities.

Barbados' payments system and infrastructure remain robust and resilient. A country's payments systems play a crucial role in maintaining financial stability by facilitating the smooth and efficient functioning of the overall financial infrastructure. The payments system contributes to liquidity management, risk mitigation, building consumer and investor confidence, and facilitates the smooth functioning of financial markets and institutions. The Real Time Gross Settlement (RTGS) system witnessed increased activity as domestic economic activity expanded and there was greater participation in the securities market. The launch of the Real Time Processing (RTP) system by the Barbados Automated Clearing House Services (BACHSI)[2] in February 2023 brought about a noticeable transition from traditional direct electronic payments to the real-time processing of payments. Regulatory oversight and ongoing innovation are imperative to adapting payments systems to the dynamic and changing nature of the financial environment, thereby safeguarding their continual role in bolstering financial stability.

The implementation of the IFRS 17 Accounting Standard[3] can enhance risk assessments in the insurance sector. The FSC is currently engaged with the insurance industry and regional regulators regarding the conversion to the new IFRS 17 accounting standard. While significant changes to revenue recognition are expected, the standard will also provide more granular insight to the regulator and other stakeholders for more effective risk assessments.

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[1] See Appendix F: Cyber Risk Survey Report for further details.

[2] BACHSI facilitates the clearing of cheques, direct payments, and daily bank settlements in real-time.

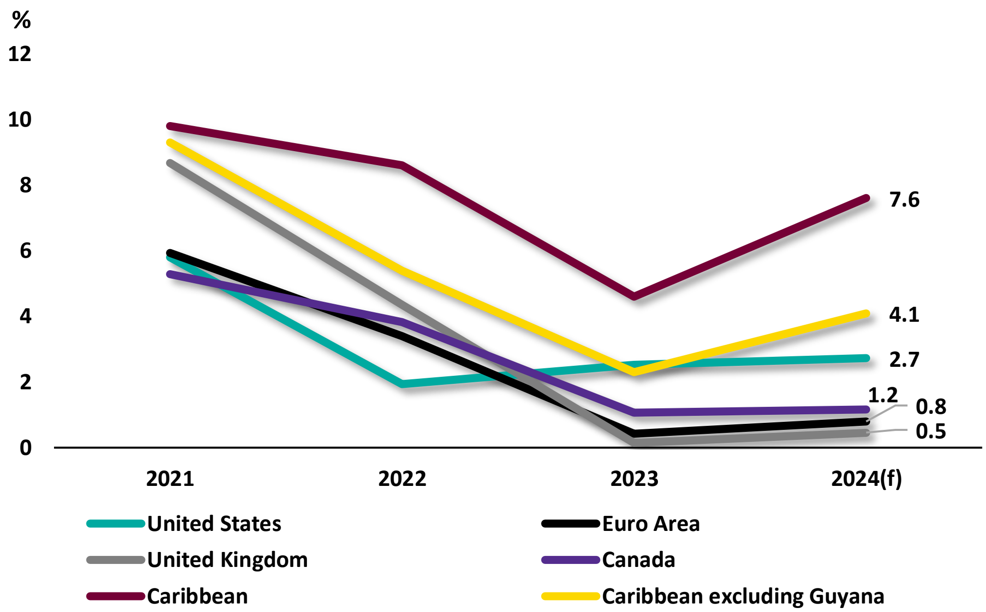
[3] IFRS 17 is an International Financial Reporting Standard issued by the International Accounting Standards Board (IASB) that establishes principles for the recognition, measurement, presentation, and disclosure of insurance contracts. It aims to provide consistent, transparent, and comparable financial information about insurance contracts to improve financial reporting.

1. Key Risks to Financial Stability

1.1 Global Macroeconomic Slowdown

A key concern for domestic financial stability is the potential for a global economic slowdown, impacting the tourism sector and broader macroeconomy (Figure 1). Despite tensions on the geopolitical front and a stringent monetary policy stance, global economic activity remained resilient in 2023. This resilience primarily stemmed from the gradual resolution of bottlenecks in the global production chain and the decline in energy and food commodity prices. Additionally, robust employment, a rebound in household purchasing power, sustained fiscal support initiatives, and, in some instances, the utilisation of savings accumulated during the pandemic, explained the resilience in global private consumption. In 2024, the global economy is expected to expand at the same pace as it did in 2023 (IMF World Economic Outlook, April 2024). Notably, this growth rate (3.2 percent) is subdued compared to historical norms. Although risks to the global outlook are broadly balanced, some downside risks remain. Among these include, price spikes stemming from geopolitical tensions and persistent core inflation alongside tight labour markets. Moreover, the likely implementation of fiscal consolidation measures aimed at reducing high government debt is anticipated to exert downward pressure on global growth (IMF World Economic Outlook, April 2024).

Figure 1: Real GDP Growth Rates of Barbados' Main Tourist Source Markets[1]



Source: International Monetary Fund (World Economic Outlook, April 2024), World Bank

[1] Guyana experienced a significant increase in its GDP after discovering and subsequently developing its offshore oil reserves. This development led to a surge in oil production and exports. In January 2020, the country started exporting oil, which marked a significant milestone for Guyana as it became a new player in the global oil market.

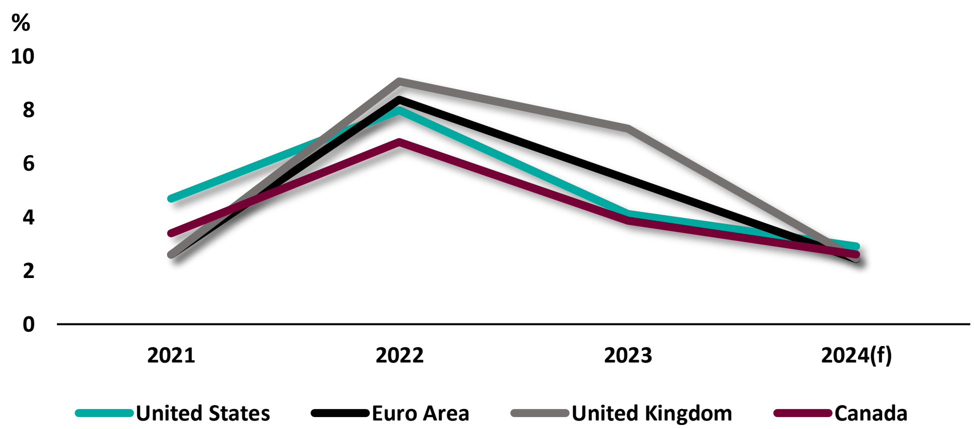
In 2023, the Barbadian economy experienced positive growth, propelled by tourism and modest enhancements in business sentiment. The financial sector remained stable as evidenced by increases in credit to households and businesses, a reduction in non-performing loans, and improved bank profitability and capital adequacy ratios.

In terms of the macroeconomic outlook for the Barbadian economy, the Central Bank moderated growth expectations for the latter half of 2024. Nonetheless, factors such as the stabilisation of energy markets and anticipated monetary policy easing in advanced economies would reduce the likelihood of a highly adverse scenario unfolding in Barbados.

Financial markets are revising the expected duration of restrictive monetary policies. Even though inflation decreased in many countries during 2023, rates still exceed the targets set by most central banks (Figure 2). In April 2024, the United States (US) Federal Reserve hinted that interest rate cuts may be delayed given the more-than-expected persistence in inflation.[4] Financial markets have noted that US inflation may take longer to recede and the five-year US treasury yield has already started to increase (Figure 3). Additionally, in early 2024, energy markets saw an uptick in prices (Figure 3) due to heightened geopolitical risks in the Red Sea shipping channel as well as elevated tensions in the region and (an extension in) voluntary production cuts from OPEC+. Also, following an ease in world food commodity prices in 2023, the Food and Agricultural Organisation's (FAO) Food Price Index increased for the first time in March 2024, following seven months of consecutive declines. Summarily, although markets expect rate cuts to occur during the latter portion of 2024, uncertainty around the most likely outcomes remains somewhat elevated.

As of mid-2024, both Europe and Canada have cut their respective policy interest rates. The European Central Bank (ECB) reduced its main refinancing rate, marginal lending rate, and deposit rate by 25 basis points, reflecting a response to economic conditions and inflationary pressures within the Eurozone. Similarly, the Bank of Canada also cut its policy interest rate by 25 basis points to address ongoing economic challenges and to help control inflation.

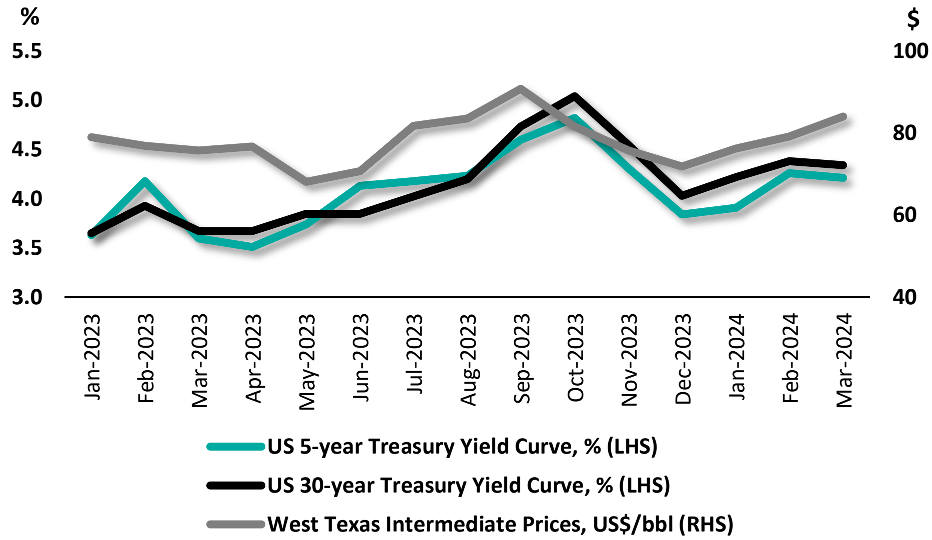
Figure 2: Inflation Rates for Advanced Economies



Source: International Monetary Fund (World Economic Outlook, April 2024)

[4] The March 2024 Consumer Price Index report showed a third consecutive month of elevated inflation after a rapid deceleration in 2023.

Figure 3: US Treasury Yield Curves and Crude Oil Prices

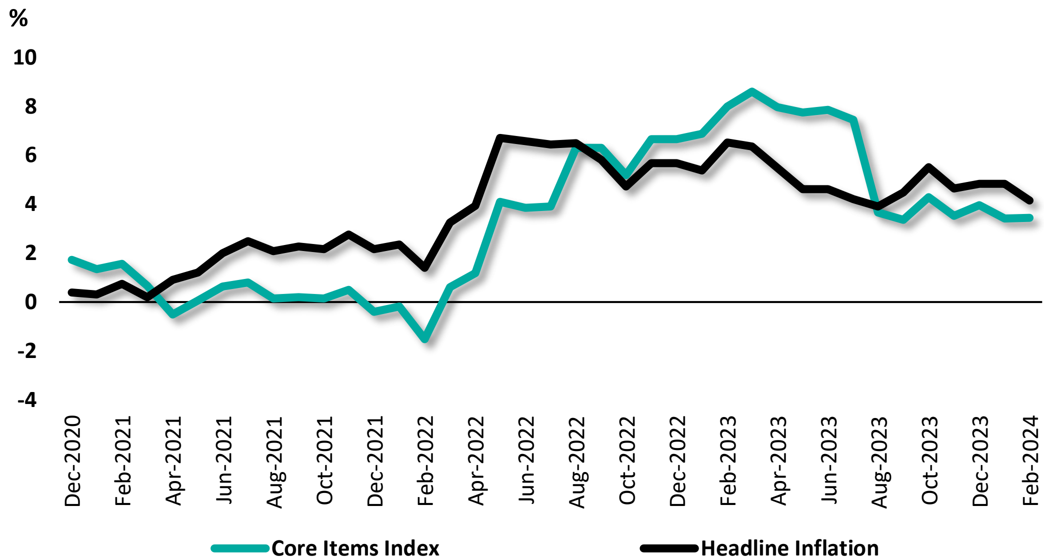


Sources: US Department of the Treasury and US Energy Information Administration

Increased foreign interest payments and variable interest rates related to sovereign debt can pose challenges, but the nature and terms of the debt may moderate the impact on financial stability. Heightened foreign interest payments strain the Government's budget, resulting in increased external debt service payments and potentially leading to cuts in other areas of fiscal spending. However, it is worth noting that most of Barbados' variable-rate debt comprises loans from multilateral financial institutions, which tend to have concessionary terms. Elevated global interest rates pushed up Barbados' expenditure on its external interest expense utilising crucial foreign exchange reserves. The negative impact of higher global interest rates on the fiscal balance was however stymied by increases in Government's revenue (particularly indirect taxes), which improvements in economic activity and rising local prices bolstered. Going forward, as global inflation is anticipated to gradually move downward with longer-term inflation expectations remaining stable, market expectations are that central banks in major advanced economies will lower policy rates in the latter part of 2024.

Domestic headline inflation is expected to steadily decline in 2024 as core inflationary pressures subside (Figure 4), but several downside risks remain. Price increases for energy and food commodities could arise from geopolitical shocks and may contribute to higher imported inflation and widened domestic current account deficits in Barbados, which could negatively impact the balance sheets of households and firms. Apart from geopolitical shocks, extreme weather events have the potential to lead to domestic shortages in certain crops and livestock production, which, in turn, would result in domestic inflationary pressures.

Figure 4: Barbadian Headline Inflation vs Core Inflation[1]



Source: Barbados Statistical Service
[1] Items related to Food, Beverages, and Energy are eliminated from headline inflation to calculate core inflation.

The Bank and the FSC incorporated the above-mentioned downside risks for financial stability into the moderate and severe scenarios of the macroeconomic stress tests for the domestic financial sector.[5]

1.2 Climate Risk

As a Small Island Developing State (SIDS), Barbados must address physical climate risks due to the island nation's susceptibility to the impacts of climate change. As a SIDS, Barbados faces heightened vulnerability to natural, economic, and health-related shocks beyond its domestic control. The growing frequency and intensity of climate shocks directly result from being in climate-sensitive areas or seismic zones, as well as the island's small size. It is expected that by the end of 2050, extreme climatic events could cost the Caribbean region an estimated US$22 billion (Global Americans, 2022).

Despite being a SIDS, Barbados often finds itself in a higher income category due to its relatively high GDP per capita, limiting its access to concessional funds. Many international climate change adaptation and mitigation funding mechanisms are based on income classifications. Given the escalating impacts of climate change, per capita GDP can be deceptive, as it fails to capture the unique challenges SIDS face. As a result, countries similar to Barbados encounter difficulties

[5] See section 2.1.1 Macroeconomic Stress Testing Assumptions.

securing the necessary financial support to effectively address and respond to the specific vulnerabilities they face in adapting to and mitigating the adverse effects of climate change.

Although governments are primarily responsible for combatting climate change, central banks can contribute to this effort. Central banks can assist in ensuring the resilience of the financial system during the transition to a low-carbon economy and in managing physical risks associated with climate change by enhancing the quality and accessibility of information regarding these risks for market participants. Climate stress tests are valuable in this regard, as they have the potential to illuminate climate risks that are currently obscured.

Given SIDS' increased vulnerability to the vagaries of climate change, stress testing becomes a crucial tool in assessing the resilience and vulnerability of financial systems, institutions, or, in this context, economies. By simulating various scenarios, policymakers can develop targeted strategies to enhance resilience, attract international support, and ensure sustainable development in the face of challenges.

Addressing this issue necessitates collaborative efforts, coordinated actions, and utilising expertise from diverse stakeholders who are well versed in the field of climate change.[6] Given the inherent complexity of climate-related challenges, engaging and involving all stakeholders is imperative. An analysis of past damages caused by natural disasters in the Caribbean reveal its detrimental impact on the region's capital stock, underscoring the significance of addressing physical risks effectively.[7]

In 2024, the Coastal Zone Management Unit assisted the Bank with designing relevant physical climate scenarios and estimating the associated damages. The Bank used its macroeconomic framework, credit risk satellite model, and a new stress testing tool to evaluate the economic and financial stability impacts of physical risks.[8] The results of the climate-risk assessment suggest that the financial system remains resilient even in the face of a severe storm surge damaging the financial system. The Bank will continue to enhance its climate assessment capabilities to better inform and equip financial institutions, thereby strengthening the country's financial stability. Additionally, the Bank conducted a survey to gauge the awareness and preparedness of financial institutions in case of a climatic event. Based on the survey results, commercial banks have incorporated climate risk into their risk assessment frameworks.

1.3 Cyber Risk

Cyber risks, with their systemic nature stemming from interconnections and interdependencies within the financial system and its operational systems, present a novel challenge to financial stability. While cyber risk has traditionally been viewed as an idiosyncratic operational risk impacting internal information and communication technology (ICT) infrastructure, it has also been under the purview of micro-prudential supervision. Dedicated regulatory

[6] In July 2024, the Bank will receive IMF CARTAC Technical Assistance training on climate stress testing.
[7] See Box 2: Potential Impact of Climate Change on Caribbean Economies
[8] See thematic article 2: A Climate Risk Assessment of the Barbadian Deposit-taking Financial Sector

frameworks and supervisory policies are in place and are being further developed in Barbados to deal with cyber risk from different angles.

In an effort to limit cyber risks, the Bank and FSC have both been enhancing their cyber risk supervisory frameworks. The Bank issued a Technology and Cyber Risk Management Guideline (TCRM) and a Major Cyber Incident Reporting Template (M-CIRT) and Classification Matrix (Matrix) to the industry in 2023. The Bank developed the TCRM Guideline by adopting international best practices documented by industry standard-setting bodies, and it provides guidance on the governance of cyber risk and the necessary controls needed to strengthen cyber security and resilience. The Bank developed the M-CIRT for licensees to report any major cyber incidents to the Bank in a uniform manner that facilitates the review and study of the root causes and potential problems that may result in a cyber incident. The M-CIRT helps ensure clarity and accuracy in reporting by outlining the specific details and data that are needed, such as the incident's impact, causes, and the licensee's response. The institution classifies a cyber incident as major once it satisfies the criteria for a high or critical incident as defined in the Classification Matrix, for example, an incident that has a material impact on the delivery of services or where critical systems have been extensively compromised. Licensees are required to classify cyber incidents in a timely manner, but no later than within 24 hours of its detection. The initial report should be submitted to the Bank within four hours of the moment the cyber incident has been classified as major.

The FSC undertook a similar process with the launch of its Technology and Cyber Risk Management Guidelines for entities the FSC regulates. These risk-based guidelines establish the FSC's expectations on board involvement, standard operating procedures relating to cyber incidents, staff training, and risk management frameworks for entities regulated by the FSC. Additionally, the FSC has developed cyber security questionnaires to be administered to the insurance, credit union, and security sectors. This initiative forms an integral part of the FSC's continuous efforts to evaluate the scope of its cyber security vulnerabilities. These questionnaires are slated for distribution in 2024.

Micro-prudential policies and vigilant supervision play a crucial role in enhancing overall operational and cyber resilience and mitigating the risk stemming from the collective impact of cyber threats at individual bank levels. The increasing reliance of the financial sector on ICT across various interconnected operational systems, which often perform essential functions, results in numerous dependencies and concentrations. This dependence elevates the likelihood that a cyber event could have significant repercussions for multiple financial institutions, potentially destabilising the entire financial system. Beyond financial implications, a major cyber incident could disrupt critical functions and erode confidence in the financial system's operation. Operational and financial contagion channels and the subsequent loss of confidence could magnify the initial shock and severely disrupt the smooth operation of essential financial services, ultimately impacting the real economy. Consequently, the Bank and FSC recognise cyber risk as a systemic threat and will continue to address this risk within a system-wide framework.

Existing macroprudential tools might not effectively address the systemic nature of cyber risk. While the traditional macroprudential toolbox primarily targets cyclical or structural systemic risks to financial stability, macroprudential tools may not be specifically tailored to counter cyber risk.

Although these tools can serve as relevant backstops and help mitigate the amplification of potential financial shocks resulting from a cyber incident, their capability to act as a systemic cyber risk mitigation tool is limited (IMF Global Financial Stability Report, October 2018). Implementing direct requirements aimed at enhancing cyber resilience, such as enabling the rapid restoration of operational systems, outside the macroprudential toolbox, may be more efficient in mitigating systemic cyber risk.

To calibrate potential systemic risks, the Bank relies on a thorough understanding of vulnerabilities related to systemic cyber risk and potential contagion channels within the financial system. As discussions on systemic cyber risk are evolving, a knowledge gap exists concerning these vulnerabilities, highlighting the necessity to enhance analytical and monitoring capabilities. Given this, the Bank launched a survey in 2024 to: i) obtain a comprehensive understanding of cyber risks faced by local financial institutions and ii) to develop an appropriate approach to mitigate these risks, which necessitates simultaneous efforts from both micro-prudential and macroprudential supervisory perspectives.[9] Notably, close attention should be paid to potential operational concentration risks and contagion channels within the financial system. Identifying systemically important nodes that provide critical financial or operational services offers initial insights into potential contagion channels and aids in comprehending network topology, interdependencies, and risk amplifiers. Moreover, it assists authorities in conducting risk assessments and formulating potential policy actions.

2. Financial Sector Risk Assessment using Stress Testing

In 2023, an IMF CARTAC Technical Assistance initiative aided the Bank and the FSC in formulating a multi-factor and multi-period solvency stress testing (ST) framework. This assistance resulted in the design of two new stress test tools: one for the Bank to stress test banks and finance companies, and another for the FSC to stress test credit unions. Both tools were customised to align seamlessly with the country's existing accounting, tax, and regulatory frameworks for these financial institutions. The team constructed the framework on macroeconomic scenarios that highlight the primary risks to domestic financial stability[10] and a newly developed credit risk satellite model for non-performing loans (NPLs) for all DTIs.[11] The macroeconomic scenarios, comprising baseline, moderate, and severe scenarios, incorporate the results of the credit risk satellite model to forecast credit losses. The stress test tools offer scenario-specific, macroeconomic-consistent projections of institutions' key balance sheet, profit and loss, and capital adequacy components over a period extending up to 12 quarters (March 2024-December 2026).

2.1 Deposit-Taking Institutions

2.1.1 Macroeconomic Stress Testing Assumptions

The Bank recognises stress testing as one of the most complex tools to assess the resilience of the financial sector. For the first time in 2024, the Bank implemented a multi-period (three years), multi-factor stress testing framework to assess the domestic financial sector's resilience against the

[9] See Section 4: Emerging Risks: Cyber Risk and Climate Risk and Appendix F: Cyber Risk Survey Report.
[10] Refer to Section 1: Key Risks to Financial Stability.
[11] See thematic article 1: Navigating Credit Risk Uncertainty: A Framework for Financial Stability Stress Testing.

potential adverse effects of a global macroeconomic slowdown. This framework encompasses three distinct scenarios: a baseline derived from the Bank's macro-model projections and two adverse scenarios – labelled as "moderate" and "severe" – to capture varying intensities of an economic recession. The macroeconomic scenarios are also based on the implementation of a newly developed credit risk satellite model.[12]

The baseline scenario aligns with the Bank's macroeconomic forecasts for 2024-2026 and serves as the foundation for the stress tests.[13] The baseline projections foresee economic growth, albeit at a slower pace, and unemployment is expected to rise slightly, though still remaining low from a historical perspective. Over the three-year period, domestic inflation is projected to ease based on the trajectory of international commodity prices.

On the other hand, the adverse scenarios aim to address potential risks to the baseline projections. In the adverse scenario, the Bank calibrated permanent shocks to key macroeconomic factors in the Bank's macro-model relevant to the scenario narrative. These shocks are statistically based on their respective historical developments and are inputted into to the stress testing tool to generate internally consistent "moderate" and "severe" scenarios. In the severe scenario, the global economic slowdown results in tourist arrivals falling by 50 percent in year one. This results in real GDP contracting by 4.3 percent in 2024, 4 percent in 2025, and 3.7 percent in 2026. These GDP growth rates are 8.3, 6.7, and 6.7 percentage points lower, respectively, compared to the baseline scenario. The moderate scenario captures a milder recession, with GDP growth values set as averages of the baseline and the severe scenario values (Figure 5A).

A key focal point for the adverse scenarios revolves around the subsequent impact of a potential deceleration in the global economy on the tourism sector and the broader economic landscape. Initially, the threat of a reduction in tourist arrivals would negatively impact the revenue of businesses in crucial economic sectors, exacerbating their leverage and impairing their ability to meet financial obligations. The narrative of the adverse scenarios also outlines the consequences which may occur in the event of heightened geopolitical conflicts. An intensification of geopolitical conflicts has unfavourable implications concerning the supply and prices of energy and food commodities, resulting in higher imported inflation (Figure 5B).

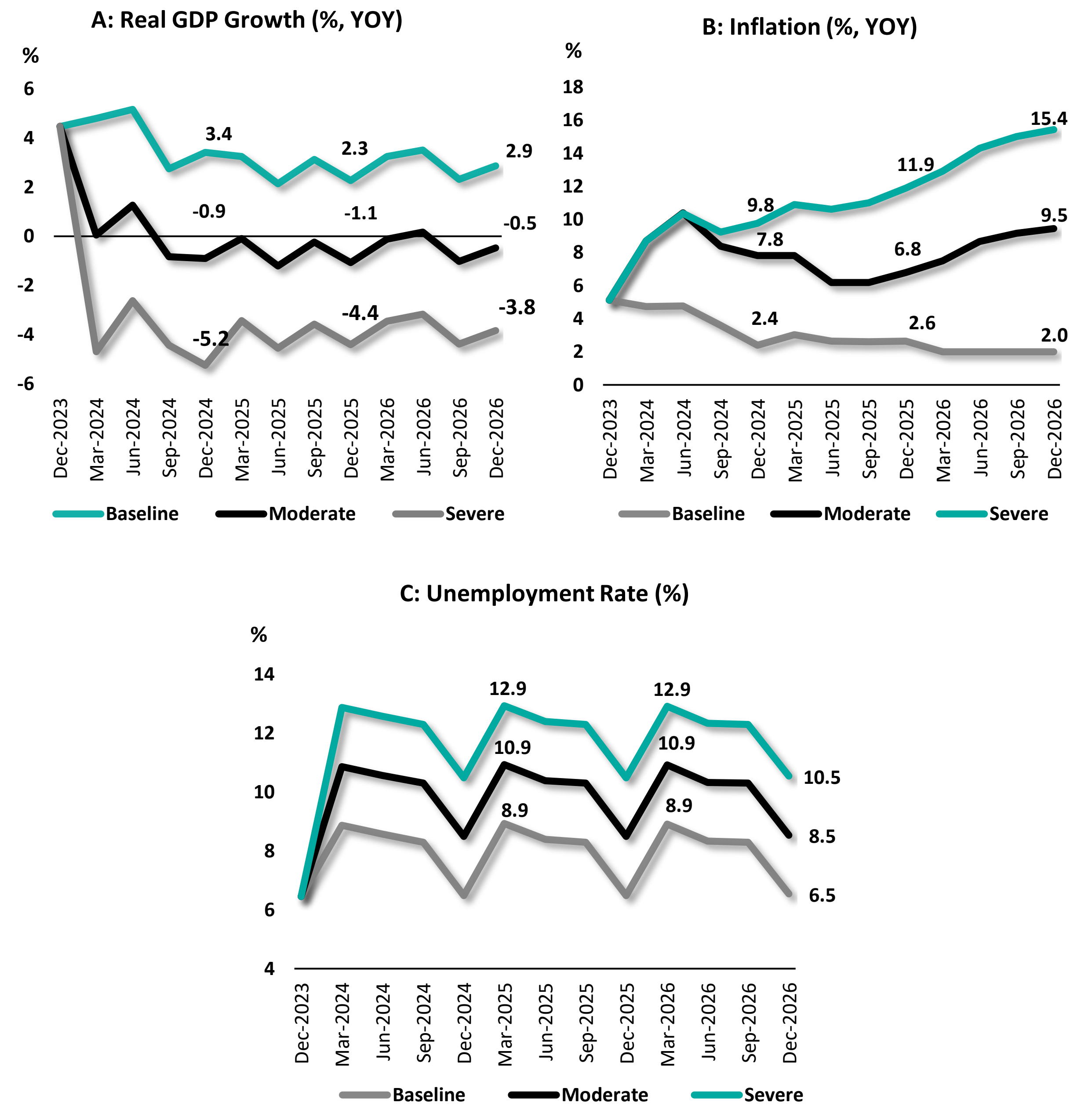
On the domestic front, risks to the baseline projections stem from investment (both private and foreign) falling short of expectations.[14] Should economic activity recede and businesses weaken, households may also face financial strain due to job losses, resulting in an uptick in the unemployment rate (Figure 5C). This, in turn, would affect private consumption. Subdued economic activity alongside higher unemployment will also be reflected in a decline in Government's revenue, especially from consumption and income taxes. The loss of revenue may restrict Government's ability to invest, causing GDP to contract even further.

Additionally, the increased risk premia would negatively affect households' and non-financial corporations' (NFCs) creditworthiness, which in turn would cause an increase in banks' NPLs

[12] See thematic article 1 Navigating Credit Risk Uncertainty: A Framework for Financial Stability Stress Testing.
[13] Forecasts were prepared in February 2024.
[14] See Key Risks to Financial Stability.

coupled with forgone interest income. Commercial banks in this scenario would face an increase in credit risk arising from borrowers' income losses, which would prompt banks to limit new lending to the private sector, both directly via credit rationing, as well as indirectly through an increase in lending rates.

Figure 5: Key Macroeconomic Variables[1]



Sources: Central Bank of Barbados' calculations and Barbados Statistical Service

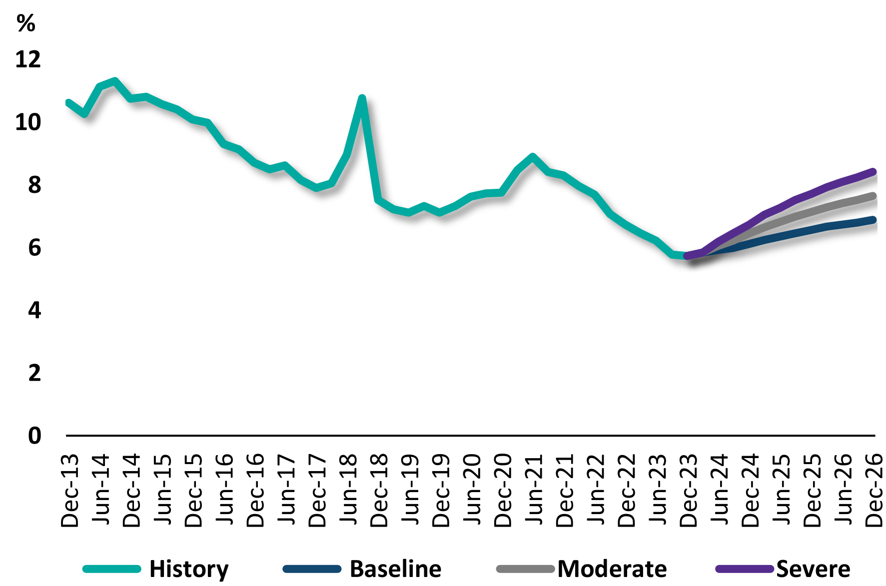
[1] Forecasts were prepared in February 2024.

2.1.2 Macroeconomic Stress Testing Results

The stress tests covered all DTIs, that is, commercial banks, finance companies, and credit unions.

For the stress tests of commercial banks and finance companies, the baseline scenario for NPLs assumes a continuous increase in NPLs amid the cautiously optimistic projection of economic growth in this scenario (Figure 6). For the severe scenario, the projected increase in the NPL ratio gradually reaches 8.4 percent, 1.5 percentage points higher than in the baseline. For the moderate scenario, NPLs are projected to be slightly above the baseline. Considering that the NPL ratio at the sectoral level would react differently to macroeconomic and financial variables, credit risk is estimated separately for mortgages, consumer loans, and non-mortgage loans to NFCs.[15]

Figure 6: NPL Ratios Used in the Stress Tests – Commercial Banks and Finance Companies



Source: Central Bank of Barbados' calculations

For commercial banks and finance companies, loan losses would be relatively small in the baseline scenario but would increase dramatically in the severe scenario. In the severe scenario, the stock of loan loss provisions would increase almost five times (4.7) over the three-year horizon, with an average annual credit loss rate[16] of around 3.8 percent per year. This contrasts with the baseline scenario's credit loss rate, which hovers around 1.2 percent per year.

With respect to the minimum Tier 1 ratio, commercial banks and finance companies also appeared to be resilient. In aggregate, the Tier 1 capital adequacy ratio for the sector would grow both in the baseline and the moderate scenarios. In the moderate scenario, one institution with a

[15] See thematic article 1: Navigating Credit Risk Uncertainty: A Framework for Financial Stability Stress Testing.

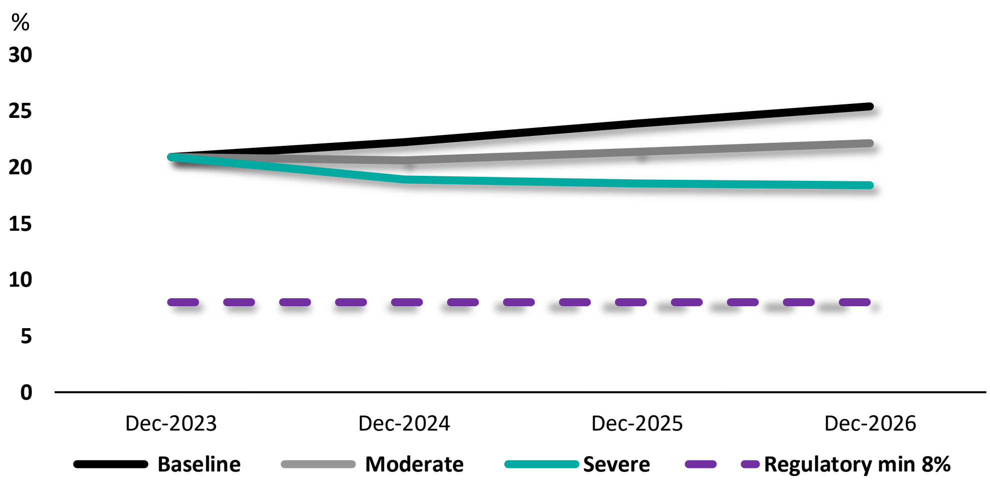
[16] Credit loss rate is defined as new provisioning booked in the Profit & Loss (P&L) over the initial stock of net loans.

small share in total assets of the sector would fall below the 4 percent Tier 1 capital adequacy minimum, and would require capital injections of around 0.2 percent of GDP. The sector's Tier 1 capital adequacy ratio (CAR) would only decline in the severe scenario, but still remains above the limit, with two institutions falling below the minimum that would require capital injections of 0.4 percent of GDP.

The results suggest that commercial banks and finance companies are generally resilient to economic stress given their relatively high initial capital adequacy and good pre-provision profitability. Notwithstanding, the aggregate CAR of the sector would grow both in the baseline and moderate scenarios due to continuing profitability, with all the earnings retained given no dividend pay-outs (Figure 8). In the moderate scenario, one institution with a small share in total assets of the sector would fall below the 8 percent CAR minimum requirement and would require capital injections of less than 0.2 percent of GDP. The sector's CAR would only decline in the severe scenario, but still remains above the limit, with two institutions below the minimum and requiring capital injections of 0.5 percent of GDP (Figure 7). The contribution of the individual factors in all scenarios over a three-year horizon is shown in Figure 8. A few banks would, on average, become loss making only in the moderate and severe scenarios.

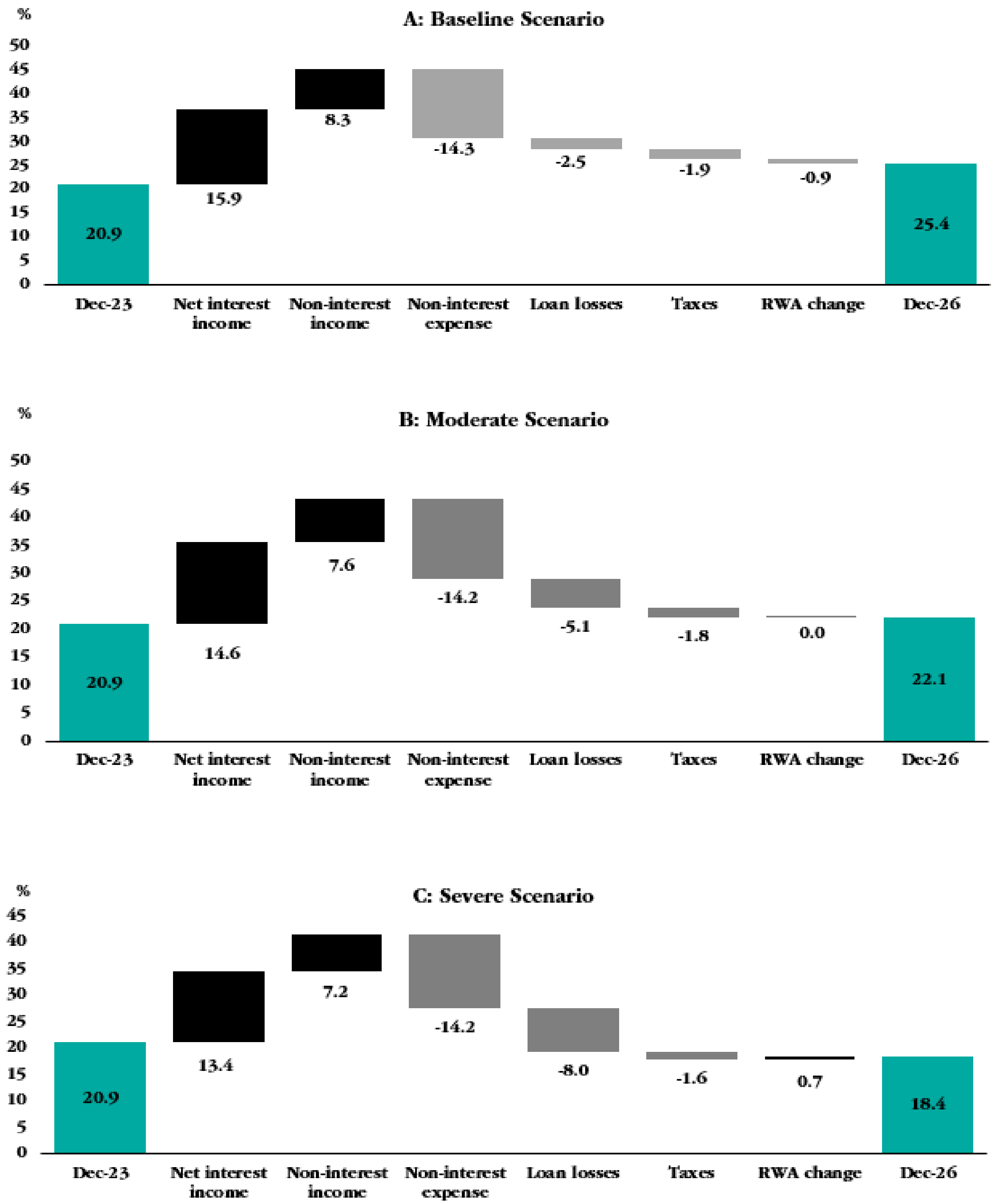
In general, commercial banks and finance companies have sufficient pre-provision buffers and can weather the shocks despite the need to pay the asset-based tax of 0.35 percent of assets and, if profitable, the 5 percent corporate income tax. Among the least five capitalised institutions, two of them fall below the 8 percent CAR limit in the severe scenario. Notably however, the results for all scenarios are contingent on the assumption of no failure by the largest borrowers (concentration risk) and no losses on Government bonds (sovereign risk).

Figure 7: Average Capital Ratios in the Stress Test – Commercial Banks and Finance Companies



Source: Central Bank of Barbados' calculations

Figure 8: Factors Contributing to Changes in Capital Adequacy – Commercial Banks and Finance Companies

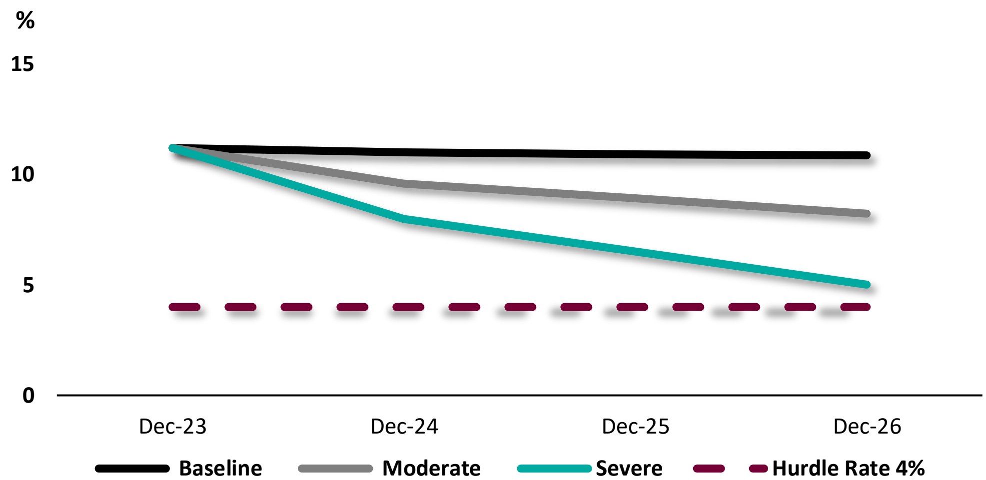


Source: Central Bank of Barbados' calculations

The credit union sector is generally resilient to adverse economic developments as capital levels remained above the hurdle rate.[17] In the baseline scenario, the sector maintained a stable capital position, evidenced by a relatively unchanged capital ratio due to continued profitability (Figure 9). Nonetheless, credit union profitability remained modest compared to banks and finance companies, limiting the amount of surplus retained.

Despite the sector incurring losses under the moderate and severe scenarios, leading to decreased capital levels, the sector's capital ratio remained above the 4 percent hurdle rate. One credit union fell below this threshold in the moderate scenario and would require capital injections of 0.03 percent of GDP by the end of the projected period to reinforce its capital position. In the severe scenario, two credit unions fell short of the hurdle rate and would collectively require capital injections equivalent to 0.4 percent of GDP to align with expected capital requirements.

Figure 9: Average Capital Ratios in the Stress Test – Credit Unions



Source: Financial Services Commission's calculations

2.1.3 Large Exposure Stress Test

According to the results,[18] **the capital adequacy ratio (CAR) of three banks dropped below the prudential requirement from the initial round at 50 percent provisioning, resulting in the complete depletion of capital in both instances.** Similar to the previous year, the exercise conducted as of December 2023 includes Government exposure. Additionally, even with 50 percent provisioning, one finance company failed to meet requirements from the first round, a trend that persisted throughout all five rounds. This implies that, with 50 percent provisioning, the remaining two banks and three finance companies can endure the default of their five largest borrowing

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[17] Capital adequacy in the credit union sector is assessed using the minimum Tier 1 Leverage ratio (total capital as a percentage of non-risk weighted assets) of 4 percent, consistent with the Basel standards.

[18] Large exposure stress tests examine the resilience of financial institutions to losses due to credit and liquidity shocks from large account holders. This test assumes that the five largest borrowers in each institution will sequentially default on their debts, starting with the largest borrower. Each round represents an additional default by one of the borrowers.

customers. The same outcome is observed with 100 percent provisioning, except in the fifth round, where a fourth bank drops below the 8 percent CAR limit (Table 1).

Under the capital-to-assets method, only one bank and three finance companies are able to withstand the total loss of their five largest credit exposures. With 10 percent provisioning and a 4 percent minimum requirement, no bank or finance company failed in any of the five rounds. With 50 percent provisioning, three banks and one finance company fell below the required 4 percent capital to assets ratio after round two. While at 100 percent provisioning, three banks and one finance company failed from round one, and four banks and the same finance company failed in round five. (Table 1).

The credit unions faired significantly better than the commercial banks with only one of them falling below the 4 percent hurdle rate throughout all of the rounds of the large exposure stress test. Given the nature of their business model, lending more to private individuals instead of large corporate clients, credit unions do not carry the level of large individual credit exposures as do their banking counterparts. Therefore, in times of adversity or shock where their five largest credit customers fail to repay their loans, even with a 100 percent loss, this would result in only one credit union falling below the total capital to total assets ratio benchmark of 4 percent (Table 1).

Table 1: Results of Large Exposure Shocks

Scenario	10% Provisioning			50% Provisioning			100% Provisioning		
	No. of Banks	No. of Finance Companies	No. of Credit Unions	No. of Banks	No. of Finance Companies	No. of Credit Unions	No. of Banks	No. of Finance Companies	No. of Credit Unions
	Capital Adequacy Ratio < 8%								
Round 1	0	0		3	1		3	1	
Round 2	0	0		3	1		3	1	
Round 3	0	0		3	1		3	1	
Round 4	0	0		3	1		3	1	
Round 5	0	0		3	1		4	1	
	Capital-to-Asset Ratio < 4%								
Round 1	0	0	1	2	0	1	3	1	1
Round 2	0	0	1	3	1	1	3	1	1
Round 3	0	0	1	3	1	1	3	1	1
Round 4	0	0	1	3	1	1	3	1	1
Round 5	0	0	1	3	1	1	4	1	1

Source: Central Bank of Barbados' calculations

2.1.4 Liquidity Risk

Low deposit rates have blurred the line between time and demand deposits, reducing the penalty for early withdrawal. With current interest rate dynamics, this liquidity test evenly assesses all deposit categories. Assuming that 95 percent of liquid assets in banks, finance companies, and credit unions could be converted to cash instantly, 5, 10, and 15 percent runs on all domestic-currency deposit accounts were examined. Additionally, for credit unions, shares, which members can withdraw on demand without notice, were also considered 95 percent convertible to cash.

During daily five percent deposit runs, while banks remained stable without needing liquidity support, there was a slight deterioration observed in finance companies compared to the previous year. One finance company required liquidity support on day one, three on day two, and all four from day three compared to only two requiring liquidity support from day four in 2022's results. Additionally, during daily five percent runs, only one credit union required liquidity support from day three, and three credit unions from day five (Table 2).

The results of the daily 10 and 15 percent deposit runs align with those of the previous year. Using daily 10 percent deposit runs, two banks required liquidity support from day three and three banks from day five, compared to two banks from day four last year; while all four finance companies required support from the first day of this test, compared to two finance companies from day two in the 2022 test. Also, at 10 percent daily runs, two credit unions required liquidity support from day two, four from day three, six from day four, and seven from day five.

With daily 15 percent runs, two banks required liquidity support from day two, three banks from day four, and four banks from day five; while four finance companies required liquidity support from day one and for the rest of the testing period. One credit union needed liquidity assistance from day one, five from day two, seven from day three, and all eight of the largest credit unions from day four. A comparison with 2022's liquidity stress test reveals that the credit unions have performed marginally better in some instances. In 2022, one credit union required liquidity support from day one, six from day two, eight from day three, and nine from day four.

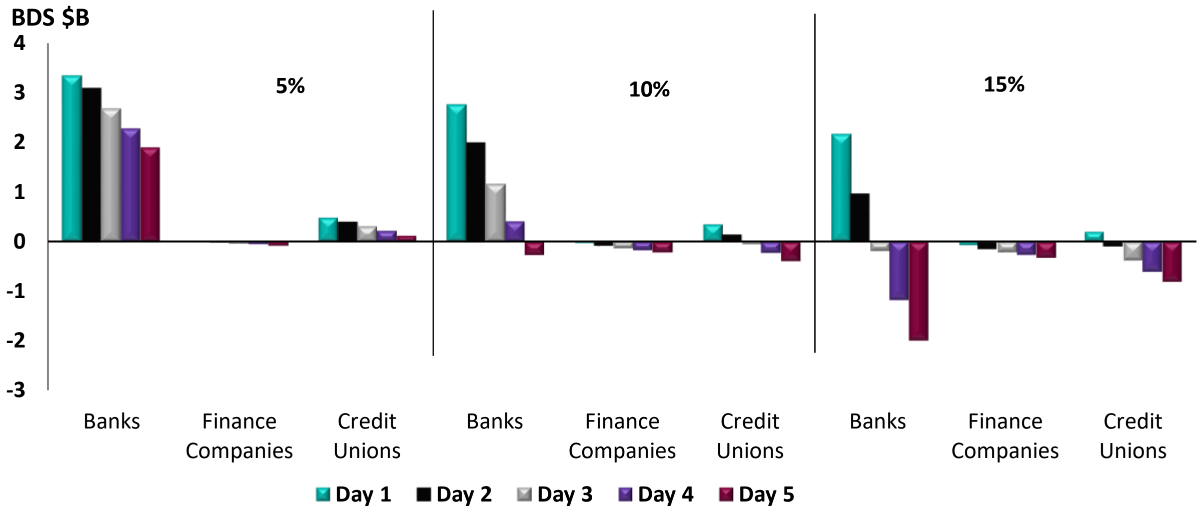
Table 2: Results of Deposit Runs

Scenarios	At 5%			At 10%			At 15%		
	No. of Banks	No. of Finance Companies	No. of Credit Unions	No. of Banks	No. of Finance Companies	No. of Credit Unions	No. of Banks	No. of Finance Companies	No. of Credit Unions
Day 1	0	1	0	0	4	0	0	4	1
Day 2	0	3	0	0	4	2	2	4	5
Day 3	0	4	1	2	4	4	2	4	7
Day 4	0	4	1	2	4	6	3	4	8
Day 5	0	4	3	3	4	7	4	4	8

Source: Central Bank of Barbados' calculations

Figure 10 below shows the results of the deposit runs, that is, the net cash flow following each scenario. Each bar represents one day's net cash flow. A positive net cash flow (bars above the zero line) means that liquidity support was not required for that day while the opposite is true for a negative cash flow. Under the five percent daily runs scenarios, the banks and credit unions generally had positive net cash flows and would not require liquidity support. The finance companies experienced marginal negative net cash flows and would require a limited amount of cash support, with five percent daily deposit runs. As the amount of cash extracted in the daily deposit runs increase to 10 percent and then to 15 percent, there is a gradual and consistent deterioration in the net cash flows of all three groups of financial institutions. Banks would require liquidity support from day five with 10 percent deposit runs and from day three during the 15 percent deposit runs. Meanwhile, finance companies would require more liquidity support. Credit unions would require liquidity support from day three of the 10 percent deposit runs and day two of the 15 percent deposit runs.

Figure 10: Results of Deposit Runs (Net Cash Flow)



Sources: Central Bank of Barbados' calculations

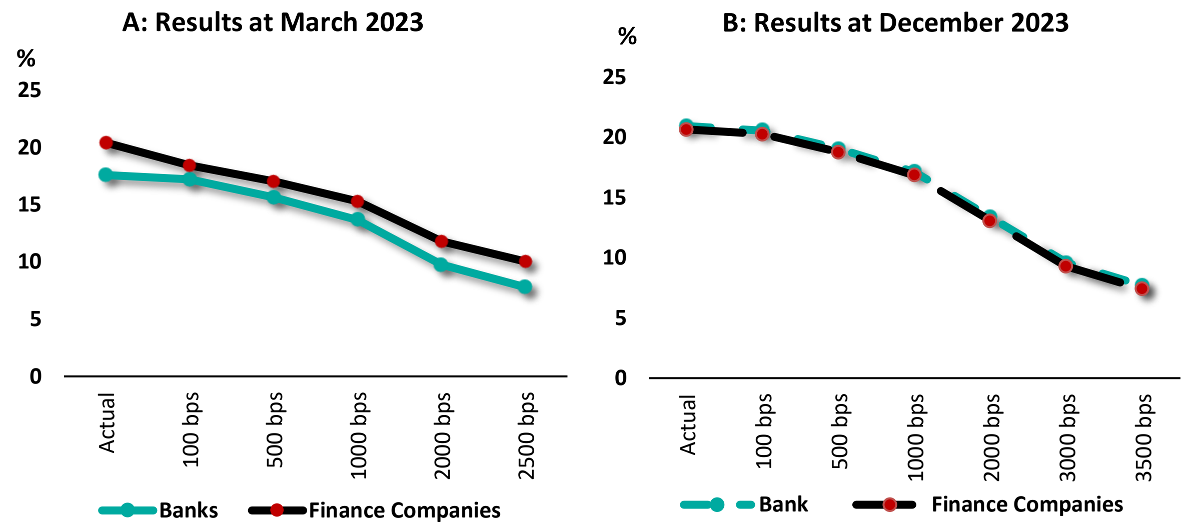
2.1.5 Funding Risk

Based on a review of the short-term maturity gap,[19] banks and finance companies' capital buffers have improved. At December 2023, the aggregate CAR of banks and finance companies had increased to 20.9 percent and 20.6 percent, respectively, compared to 17.6 and 20.4 percent at March 31, 2023 (Figure 11A). Since banks and finance companies started with similar CAR levels, the results of this short-term maturity gap analysis are nearly identical for both groups of institutions and appear as one line in Figure 11B.

This improvement shows that banks and finance companies could withstand interest rate shocks in excess of 30 percent (3000 basis points), before interest rate related losses could lead to capital adequacy breaches. Put simply, assuming all other balance sheet items remain constant, banks and finance companies would need to increase the interest rates paid on deposits by over 30 percent compared to their levels at December 31, 2022. This increase of over 30 percent in deposit interest rates would result in net interest losses, surpassing the interest income from interest-bearing assets. Consequently, these losses would deplete the capital of these institutions below the regulatory benchmark of 8 percent. At the institutional level, it would require a 20 percent (2000 basis points) increase in interest rates on deposits to lead to net interest losses, which would erode the CAR of two banks and one finance company below the 8 percent prudential requirement.

[19] The maturity gap is the difference between the total market values of interest rate sensitive assets (RSA) versus interest rate sensitive liabilities (RSL) that will mature or be repriced over a given range of future dates and is used to assess institutions' vulnerabilities to funding costs and profitability.

Figure 11: Interest Rate Impact on CAR



Source: Central Bank of Barbados' calculations

2.2 Insurance

2.2.1 Underwriting Risks

Increased claims activity amplifies underwriting risks, pressuring liquidity levels throughout the insurance sector.[20] With each rise in claims, insurers face reduced profits and declining cash balances as they look to settle claims. As cash reserves become strained, insurers will likely liquidate investments to address liquidity shortfalls and/or delay claims settlement (Booth, Fulcher, Vosvenieks, & Ward, 2019).[21] While general insurers maintain higher cash reserves to address short-term claims, life insurers' cash reserves are lower due to their long-term obligations. Nonetheless, insurers typically rely on reinsurance arrangements to reduce the potential financial impact of unexpected claims on cash reserves and overall liquidity levels.

Despite higher capital levels this year, insolvency cases remain the same. At the extreme, with a 200 percent increase in claims in the general insurance industry, the average solvency margin fell to 148 percent, and seven insurers were deemed insolvent (Table 3). A 500 percent increase in claims for the life insurance industry caused the average solvency margin to fall to 188 percent, with two insurers falling below the solvency requirement (Table 3).

Table 3: Results from Underwriting Risk Test (Claims Increase)

[20] The test for underwriting risks assesses the sector's sensitivity to a simultaneous increase in claims across all lines of business by incremental amounts. However, it does not account for reinsurance recoveries.
[21] Booth, Claire; Fulcher, Paul; Vosvenieks, Fred; Ward, Russell (2019). Liquidity Risk Management: An Area of Increased Focus for Insurers. Milliman White Paper.

General Insurance			Life Insurance		
Claims Increase	Avg. Solvency Margin	No. Insolvent Insurers	Claims Increase	Avg. Solvency Margin	No. Insolvent Insurers
Baseline	623%	1	Baseline	218%	0
25%	564%	1	100%	212%	1
50%	504%	2	200%	206%	2
100%	396%	3	300%	200%	2
150%	267%	4	400%	194%	2
200%	148%	7	500%	188%	2

Source: Financial Services Commission's calculations

2.2.2 Macroeconomic and Catastrophic Risks

Stress test results demonstrate the insurance sector's ability to withstand adverse economic conditions. The economic downturn scenario assesses the insurance sector's resilience to plausible economic changes, such as a 300-basis point downward shift in the yield curve, a 25 percent loss in real estate and mortgage values, and a 30 percent drop in equity security prices. Following these shocks, the equity securities within the investment portfolios of general insurers were primarily affected. Life insurance companies were, however, more sensitive to the decline in interest rates, which increases the value of the industry's technical reserves (actuarial liabilities) due to their negative duration gap.[22] Nevertheless, all insurers remained solvent in the stressed scenario, except for the lone general insurer deemed insolvent at baseline and prior to economic shocks (Table 4).

The emergence of additional shocks poses heightened risks to the insurance sector. The multiple shock scenario is an extreme scenario considering multiple vulnerabilities to the insurance sector, including an economic downturn, pandemic, and hurricane. It combines the assumptions from the economic downturn scenario with higher technical provisions, increased operating expenses, related-party defaults, and additional claims. Along with the investment losses induced by the adverse economic shifts, general insurers faced significant underwriting losses as claims rose, restricting overall profits and retained earnings. Under this scenario, the average solvency margin for the general insurance industry fell to 180 percent (Table 4), with five insolvent insurers requiring capital injections totalling 0.3 percent of GDP. The most severe impact to the life insurance industry was in the investment portfolio, as related-party investments represent more than half of the industry's invested assets. Like the economic downturn scenario, the test also impacted technical reserves. The life industry's average solvency margin decreased to 143 percent, and two insurers failed to meet the solvency threshold. These insurers would collectively need capital injections equivalent to 0.1 percent of GDP to restore solvency positions.

Table 4: Results from Macroeconomic and Catastrophic Risks

	General Insurance		Life Insurance	
	Avg. Solvency Margin	No. Insolvent Insurers	Avg. Solvency Margin	No. Insolvent Insurers
Baseline	623%	1	218%	0

[22] Duration measures the sensitivity of the value of assets and liabilities to changes in interest rates. A negative duration gap occurs when the duration of a company's liabilities is longer than the duration of its assets.

Economic Downturn Scenario	479%	1	175%	0
Multiple Shock Scenario	180%	5	143%	2

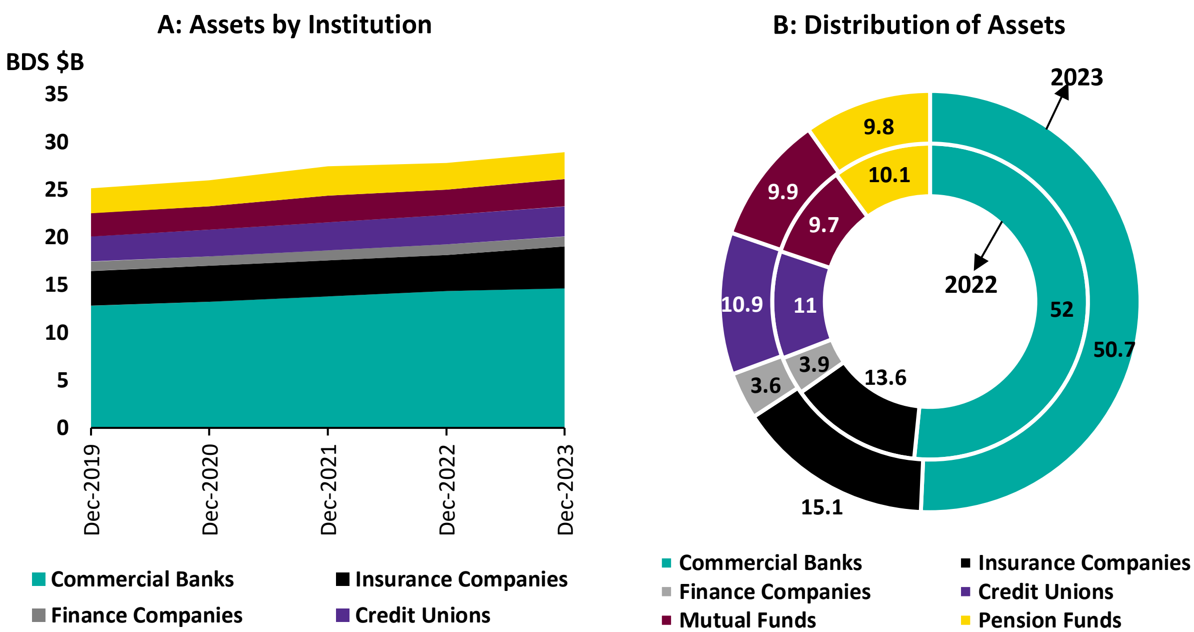
Source: Financial Services Commission's calculations

3. Analysis of the Financial System

3.1 Structure of the Financial System

Given the economy's post-pandemic recovery, total assets of the financial system expanded but asset distribution remained unchanged. At the end of 2023, total assets grew by 4 percent, reaching 226.4 percent of GDP (Figure 12A). Unlike the other financial institutions, finance companies witnessed a decrease. Nonetheless, the distribution of assets in the financial system remained relatively unchanged with banks remaining as the dominant holder of assets in the financial sector (Figure 12B).

Figure 12: Assets of the Financial System



Sources: Central Bank of Barbados and Financial Services Commission

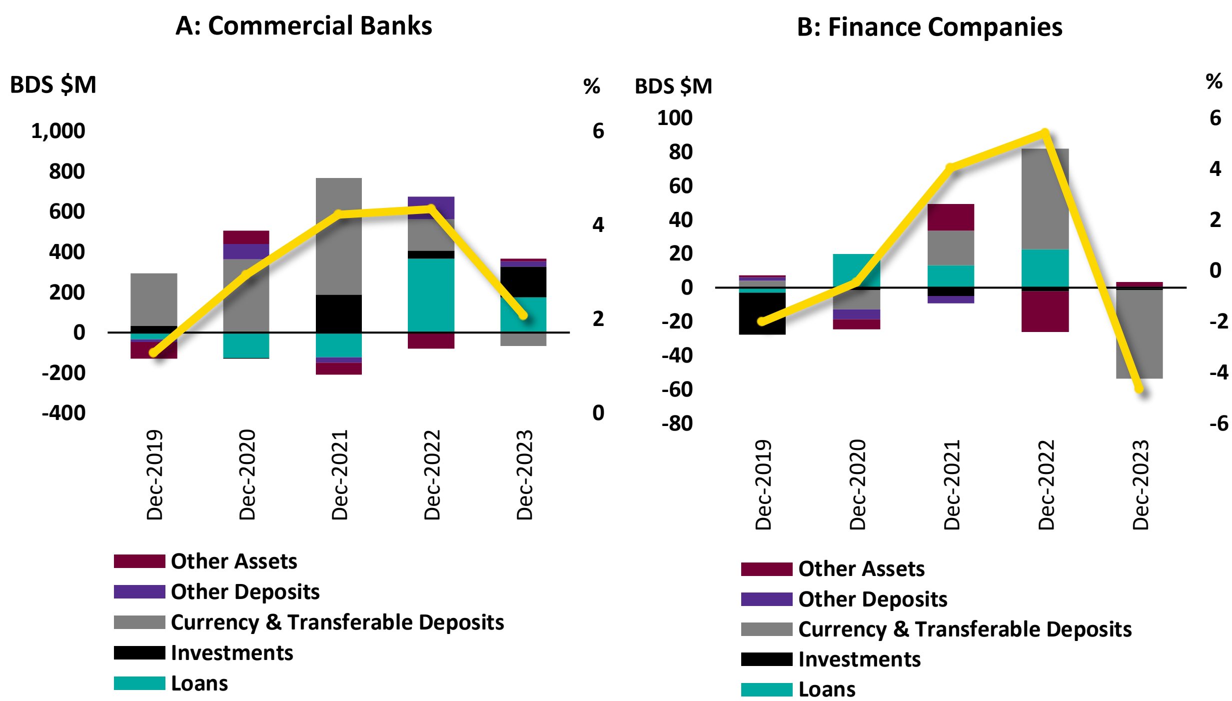
3.2 Deposit-Taking Institutions

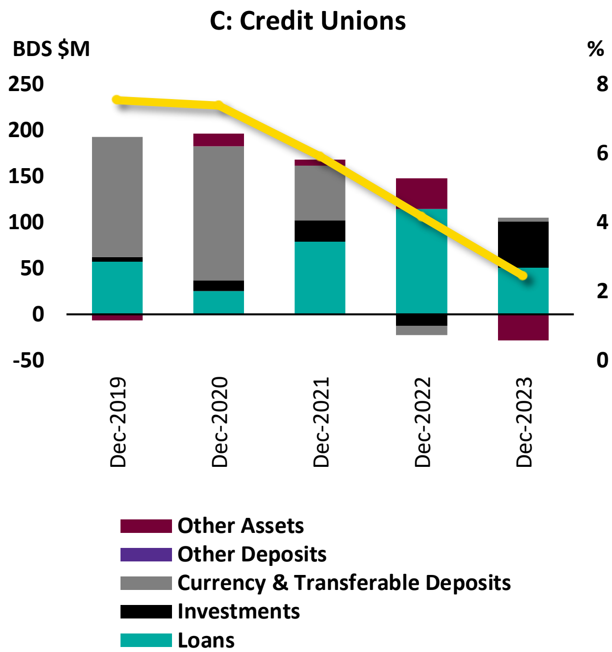
3.2.1 Asset Trends

A potential global macroeconomic slowdown will have implications for DTIs' asset choices as management of these institutions may adopt a low-risk stance and choose to direct funds towards higher-yield assets abroad.

Commercial banks' and credit unions' assets expanded moderately in 2023, while that of finance companies contracted. Banks' and credit unions' assets grew at a more moderate pace relative to 2022, supported by increased lending and investments (Figure 13A and Figure 13C). As a few large non-transferable deposits of finance companies matured, their reserves at the Bank declined while their lending capacity was constrained. Consequently, the assets of finance companies declined (Figure 13B). Notably, the pace of credit growth slowed significantly, but loans continued to dominate DTIs' asset portfolio and represent a significant exposure for DTIs (Figure J2 and Figure 14A).

Figure 13: Asset Growth





Sources: Central Bank of Barbados and Financial Services Commission

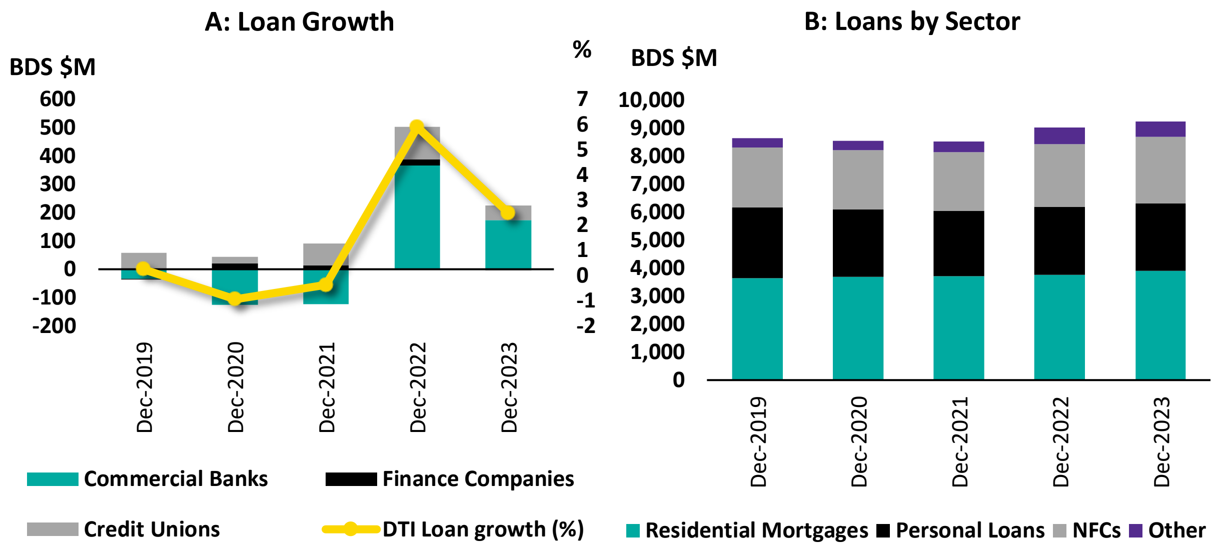
3.2.2 Loans

The risk of a global economic slowdown impacting local activity threatens to stifle loan growth. Notwithstanding, repayment volumes in 2023 remain high and loan delinquency rates declined, suggesting that borrowers will continue meeting their credit obligations in the short to medium term.

Credit growth slowed in 2023. Credit growth peaked in 2022 due to a $146.5 million "blue" loan to the Government and the implementation of business projects as economic activity recovered post-pandemic. However, credit growth in 2023 declined from this peak of 5.9 percent to 2.5 percent as growth across categories normalised (Figure 14A). In 2023, lending to NFCs increased primarily as a result of lending to the manufacturing and real estate sectors. Residential mortgage balances grew by 4.2 percent, while personal loans declined by 1.6 percent (Figure 14B).

Historical data over the last decade suggest that new credit growth has been sluggish (Figure J3). At the end of 2023, the growth in new credit was lower than pre-pandemic and 2022 levels. If new credit growth remains slow, DTIs will face negative implications on their ability to generate interest income, which constitutes a significant proportion of their revenue. However, given the favourable economic projections for the Barbadian economy, it is expected that the confidence demonstrated by the business sector post-pandemic will continue, positively impacting new credit extended.

Figure 14: Loans



Sources: Central Bank of Barbados and Financial Services Commission

Slow to moderate credit growth is expected in the short and medium term. Forecasts predict modest improvements in the macroeconomy, which are expected to result in increased credit to non-financial sector of 2.5 percent for 2024. The main expected drivers of short-term economic growth and the credit expansion are from construction, tourism, and manufacturing sectors which are set to benefit from the hosting of the ICC World Cup matches. The expected increase in economic activity around the ICC World Cup will also see positive spill-overs in the wholesale & retail, transportation, and other ancillary sectors, which are expected to propel the demand for credit. However, a projected global economic slowdown and prolonged geopolitical conflicts present downside risks to the forecast.

3.2.3 Credit Quality

With loans constituting a large majority of DTIs' assets, credit risk is the major source of risk for the financial system. Heightened credit risk can materialise in a global macroeconomic slowdown as lower economic activity dampens the earnings of borrowers, increasing the likelihood of defaults. It is therefore important to continue to monitor the development of NPLs in the economy.

There were broad-based improvements in NPLs during 2023. Heightened economic activity and favourable employment conditions have strengthened borrowers' balance sheets and debt repayment capacity (Figure 15A). The stock of commercial banks' and finance companies' NPLs declined by a similar rate of approximately 13 percent, resulting in improved NPL ratios (Figure 15B). The household and real estate sectors continue to drive the improvement of NPLs.

In contrast to NPL improvements in banks and finance companies, credit unions' stock of NPLs increased. Differences in the customer profile of credit unions are a key reason for the contrasting movement in NPLs. The credit union sector is significantly exposed to the lower-to-middle-income demographic, with approximately 70 percent of deposit accounts measuring below $1,000.

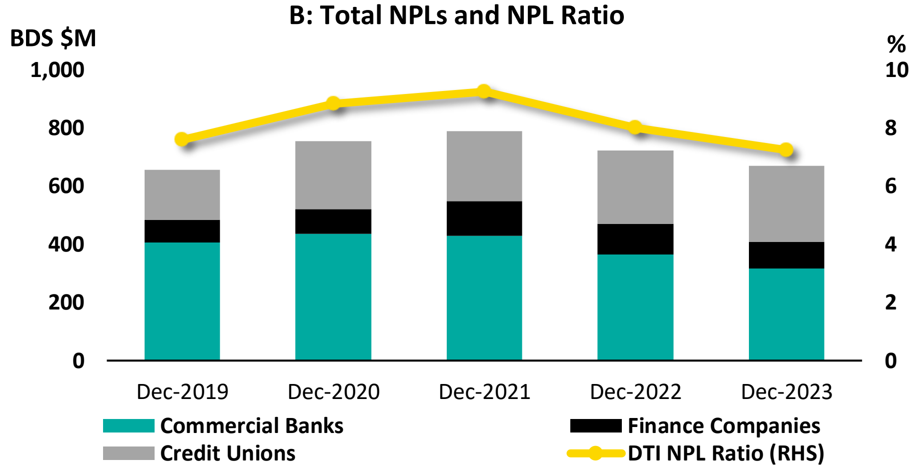
Figure 15: Non-Performing Loans

A: NPL Movements by Sector (BDS $M)

	Commercial Banks		Finance Companies	
	Dec 2019- Dec 2023	2023 vs 2022	Dec 2019- Dec 2023	2023 vs 2022
Households		▼ -$30.2		▼ -$5.8
Of Which: Mortgages		▼ -$21		▼ -$3.8
Non-Financial Private Sector		▼ -$14.5		▼ -$7.9
Of which:				
Construction		▼ -$1		▼ -$0.1
Distribution		▲ $5.1		▼ -$0.2
Real Estate & Other Professional Services		▼ -$13.4		▼ -$5
Hospitality		▼ -$2.8		▼ $0
Other		▼ -$2.5		▼ -$0.3

Source: Central Bank of Barbados

B: Total NPLs and NPL Ratio



Sources: Central Bank of Barbados and Financial Services Commission

Commercial banks and finance companies hold adequate provisioning. In line with DTIs' positive outlook, provisions accumulated during the pandemic continue to be reduced. Despite this, the commercial banking sector continues to hold almost double the required provisions while finance companies are marginally above the required levels (Figure 16). The stress test results show that despite lower initial provisioning coverage, credit unions and finance companies are able to withstand a substantial shock.[23]

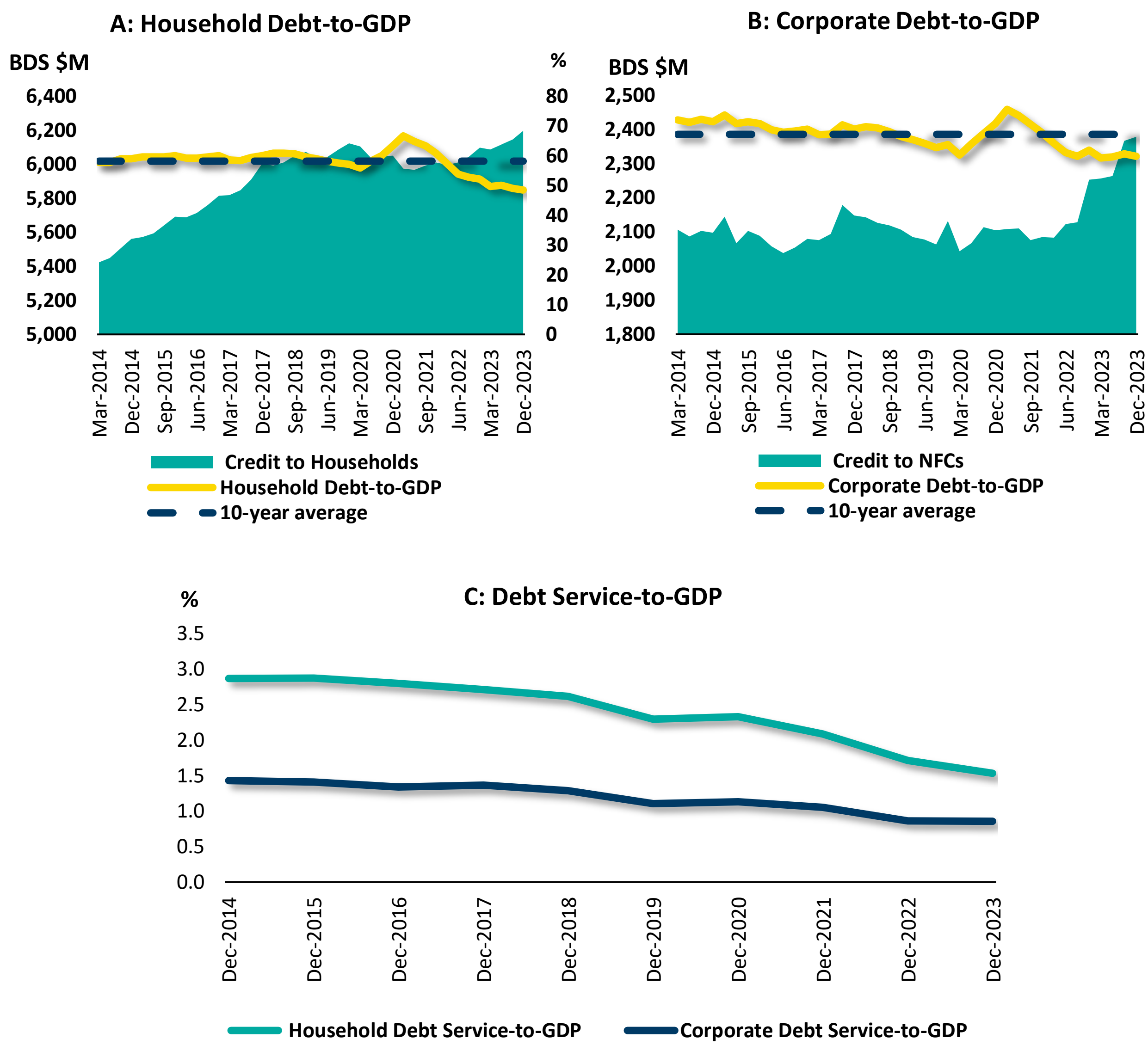
Figure 16: Provisions-to-NPLs

Sources: Central Bank of Barbados and Financial Services Commission

[23] See Macroeconomic Stress Testing Results.

Downward trending indebtedness of the non-financial private sector to DTIs as a percent of GDP could dampen the potential severity of an economic downturn on the financial sector. Weaker credit demand, faster repayments, and the expansion of economic activity have resulted in downward trending debt-to-GDP and debt service-to-GDP ratios (Figure 17). The former has fallen below its 10-year average for both households and businesses, with the contraction being greater in the case of households. Households' repayments to banks and finance companies have also been trending upwards, measuring 5.1 percent (or $179.5 million) above its 10-year average by the end of 2023. A combination of lower credit uptake and higher repayments by households potentially signal a weaker debt appetite. Nonetheless, with more robust financial positions, the deterioration of DTIs' asset quality will not be as severe or rapid as it could be if borrowers hold a weak financial position before a downturn.

Figure 17: Indebtedness Ratios of the NFPS



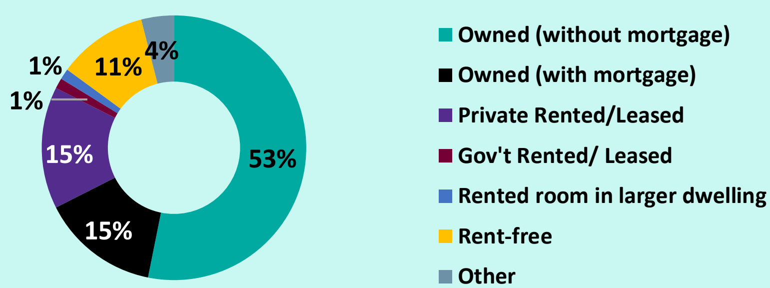
Source: Central Bank of Barbados

Box 1: Real Estate Sector Analysis

Written by Pinky L. Joseph, Economist, Research and Economic Analysis Department of the Central Bank of Barbados. Email: pinky.joseph@centralbank.org.bb.

Barbados' real estate market comprises both commercial and residential offerings, including offerings for non-residents. The housing market in Barbados is characterised by outright ownership (53.2 percent) but a substantial proportion of persons (32 percent) are either paying a mortgage or renting (Beuermann, Alvarez, Hoffmann, & Vera, 2021) (Figure 1). The residential real estate (RRE) market can be segmented into a local market and a tourism market. The latter encompasses real estate located in prime tourism areas along the coast, typically commanding higher prices, while the local market encompasses inland real estate properties. House prices in both of those markets tend to move in tandem (Belgrave & Wilson, 2022). Overall, size, location, and the number of bedrooms have been empirically found as key determinants of house prices in Barbados (Belgrave, Grosvenor, & Lowe, 2016).

Figure 1: House Ownership in Barbados

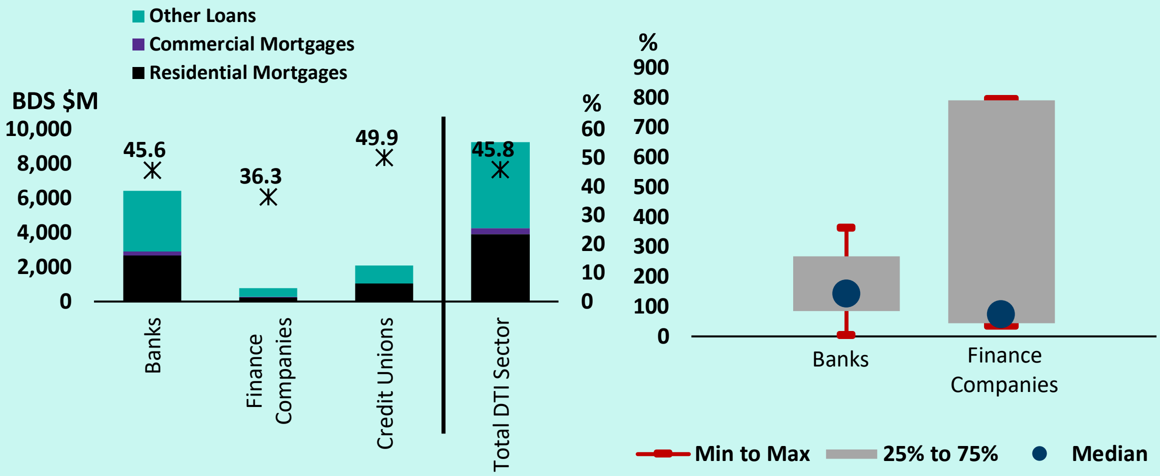


Source: Covid-19 Household Survey Round 2 (2021)

Deposit-taking institutions (DTIs) are highly exposed to Barbados' real estate market, especially the RRE market. Mortgages represent nearly half (45.8 percent) of the sector's loan portfolio and the median mortgage to Tier 1 Capital ratio nears 150 percent for banks and 75 percent for finance companies (Figure 2). In line with historical trends, the DTI sector carries greater exposure to the RRE market with the sector carrying $3,824 million of residential mortgage lending. In contrast, DTIs only carry $306 million in commercial real estate (CRE) lending. The credit union sector had the highest exposure, with mortgages representing 49.9 percent of total loans, followed closely by commercial banks (45.6 percent) (Figure 2). With this significant exposure, the potential global macroeconomic slowdown could result in high mortgage defaults as labour market conditions and consumption activity dampen. The CRE market, despite its minor significance in the asset and loan portfolio of DTIs, can act as an amplifying factor in the event of a wider shock as losses in the commercial sector could result in a negative shock to households' income.

Figure 2: Mortgage Exposure

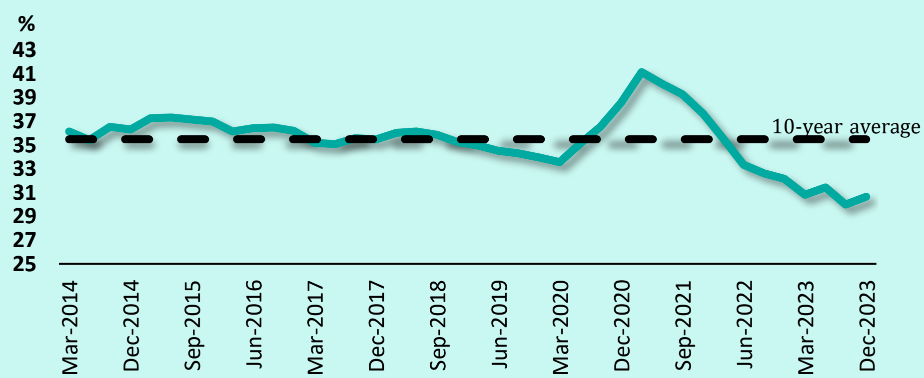
A: Mortgages as a Share of Total Loans **B: Mortgages as a Share of Tier 1 Capital**



Sources: Central Bank of Barbados and Financial Services Commission

Activity in the real estate market during 2023 was below 2022 levels. The number of new mortgages extended was approximately 10 percent lower, falling from 2,070 in 2022 to 1,850 in 2023. A sectoral breakdown of new mortgages reveals that the decline was recorded in the RRE market, where new mortgages were 242 fewer. Consequently, mortgage depth (the ratio of residential mortgages to GDP) fell and has remained below its 10-year average since June 2022 (Figure 3). In contrast, the demand for CRE mortgages increased from 42 to 65 mortgages in 2023, signalling private corporate sector confidence in the sustained growth of the economy. With the new demand for CRE, total mortgage balances of DTIs increased by $127.2 million or 3.1 percent relative to 2022.

Figure 3: Mortgage Depth (Residential Mortgages as a % of GDP)

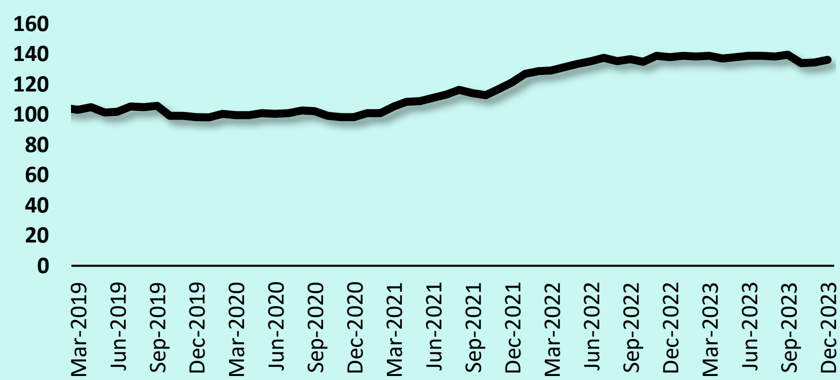


Sources: Central Bank of Barbados and Financial Services Commission

The DTI sector has eased its lending standards on new mortgages in the RRE and CRE markets. Results from a real estate survey issued to banks and finance companies indicate that they have eased their debt-to-income ratio, debt service ratio (DSR), and loan-to-value (LTV) ratio post-pandemic as a means of combatting the relatively lower demand for RRE mortgage. The DSR limit ranges from 40 percent to 45 percent in the RRE market while commercial borrowers' cashflow must be at least 1.25 times their debt- service costs. While most institutions eased lending standards across households and corporates at different income levels, a few institutions indicated that the extended limits depend upon the risk profile of customers. In the face of a global macroeconomic slowdown, mortgage demand can dampen even further, thereby placing pressure on DTIs to ease lending standards even further and increase their risk tolerance.

Heightened costs of building materials could challenge lending standards in the DTI sector and further dampen buyer enthusiasm in the RRE market. The price index of building materials has risen steadily since the second quarter of 2021 as the world grappled with shortages and supply chain issues (Barbados Statistical Service 2023). During 2023, the index was stable but stayed elevated, with prices up more than 20 percent since 2019 (Figure 4). Elevated prices can be reflected in higher construction costs, which means DTIs may face demand for larger mortgages, pushing LTV ratios closer to or above their institutional limits. Additionally, higher costs place further strain on potential borrowers' income, stifling new buyers. If lending conditions do not adjust then the availability of credit tightens and the demand for mortgages will likely remain subdued. This has further negative implications for credit growth and interest income of DTIs.

Figure 4: Building Materials Index



Source: Barbados Statistical Service

Although the majority of mortgages have a variable interest rate, the risk of sudden increases in interest rates is minimal. RRE and CRE mortgages are generally issued with variable interest rates, leaving borrowers exposed to rising interest rates. Nevertheless, historically, despite fluctuations in global interest rates, the average mortgage interest has been gradually decreasing.

Currently, there is no evidence of a buildup of a real estate bubble, but constrained supply in the tourism residential market could push prices further up in the medium term. One DTI that provides a substantial share of mortgages in the economy, reported that prices of reappraised commercial and residential properties have increased in the last five years. A leading industry player, identified constrained supply of beachfront properties along a prime tourism area (Cathrow & Hutson, 2023), which, according to Belgrave & Wilson (2022), has the potential to exert upward price pressure on the entire RRE market.

The disparity between income and mortgage affordability is narrowing in the RRE market but normalising when CRE is considered. Previous research highlights a mismatch between the supply of and demand for affordable housing and that house prices grew at a faster pace than average wages (Belgrave & Wilson, 2022). However, survey results from commercial banks indicate a downward trending median house price to income ratio in the residential market. The ratio declined from a peak of 6.4 times annual income in 2020 to 5.4 times in 2023, nearing the pre-pandemic ratio of 5.1 times. The trend, however, is different for institutions with both CRE and RRE portfolios. One such institution reported a reduction from 7.7 times annual income in 2019 to a low of 7 times in 2020. This contraction during the initial phase of the pandemic is in line with global trends (Deghi, Natalucci, & Qureshi, 2022) and was underscored by the global lockdowns. Since then, the ratio has been on the mend, increasing to 8 times by the end of 2023. Mortgage affordability is also buoyed by the gradually declining average mortgage interest rates.

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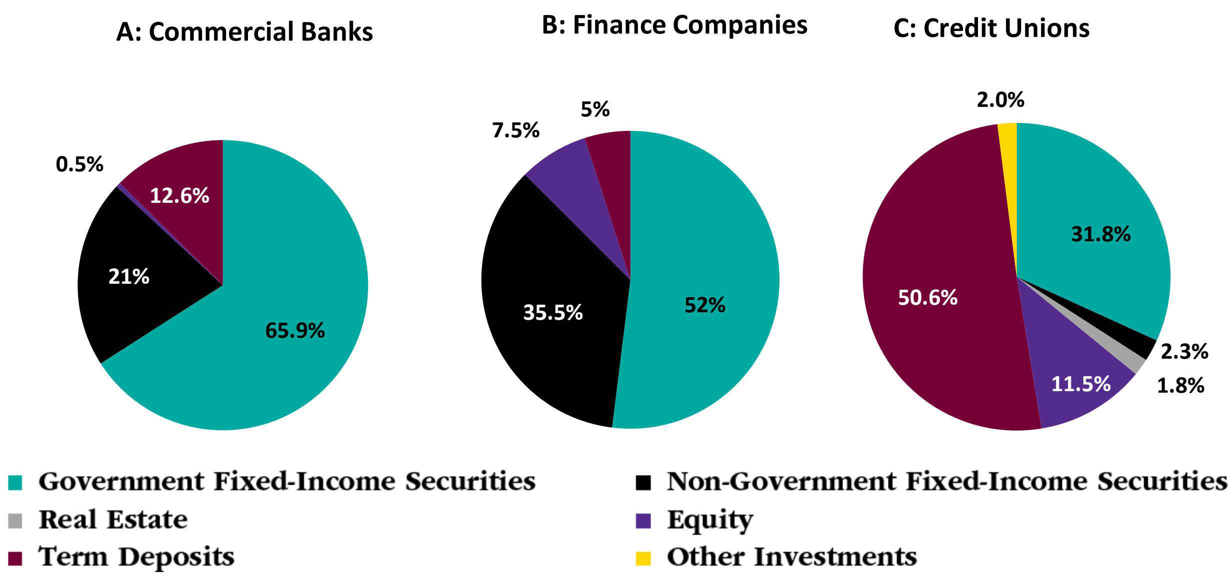
3.2.4 Investments

DTIs' exposure to market risk is quite limited relative to credit risk. Investments account for nearly 20 percent of DTIs' assets, with this proportion below double-digits for finance companies and credit unions. Most of these investments are local-currency denominated. Hence, any interest rate volatility arising from the potential global macroeconomic slowdown is not expected to have a significant effect on the balance sheet of DTIs.

DTIs' investment portfolio remains concentrated in government debt securities. Government debt securities of mainly the Barbadian and United States governments, which are zero-risk-weighted assets under the existing regulatory framework, constitute the principal investment of banks and finance companies. Term deposits account for the largest share of credit unions' portfolio (Figure 18). Notably, the sovereign exposure of banks was lower in the last quarter of 2023 due to maturities of some domestic government bonds and US treasury bills (Figure J4).

Figure 18: Investment Portfolio



Sources: Central Bank of Barbados and Financial Services Commission

The DTI sector's vulnerability to domestic and international fiscal conditions (particularly the United States of America) via their investment portfolio is expected to persist. The upgraded credit rating for Barbados by CariCRIS[24] abates concerns regarding domestic sovereign debt defaults. However, tightening international financial conditions and downgraded credit ratings for the US during 2023 raised fiscal concerns. DTIs are less susceptible to interest rate risk as they hold short-term US investments. Maturity gap analysis[25] at December 2023 reveal that increases in US rates between one to 12 months will boost banks' net interest income but the cost of liabilities will rise faster for finance companies in the three to six months maturity period (Figure J5).

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[24] CARICRIS upgraded Barbados' rating by two notches from CariBB in December 2021 to CariBBB- in December 2023.
[25] See footnote 18 for a definition.

3.2.5 Foreign-Currency Exposure

Foreign-currency exposure is similar to last year, with exchange rate risk remaining low. The proportion of foreign-currency assets to total assets and foreign-currency liabilities to total liabilities remained stable for both commercial banks and finance companies despite the maturity of foreign-currency investments and slower liquidity growth (Figure J6). The net open position (NOP) of both banks and finance companies also remain at similar levels with the largest NOP in USD currency to which the Barbadian dollar is pegged (Figure J7).

3.2.6 Interest Rates

The financial system in Barbados remains largely unaffected by trends in global interest rates. The interest rate spread of commercial banks remained similar to 2022 and shows little signs of changing. Both the weighted average loan rate and deposit rates were virtually unchanged relative to 2022, maintaining the interest rate spread of approximately 5.4 percentage points (Figure J8). Given the persistence of elevated liquidity conditions and subdued credit demand, it is highly unlikely that the interest rate spread will change in the near term.

3.2.7 Liquidity

Deposit growth slowed during 2023. In 2023, deposits at DTIs experienced a slower growth rate of 1.2 percent compared to 5.2 percent recorded in the previous year (Figure J9). This slower growth can be attributed to withdrawals for loan repayments, overseas travel, and the purchase of Government securities. Unlike banks and credit unions, finance companies saw a decline in deposits (Figure J10).

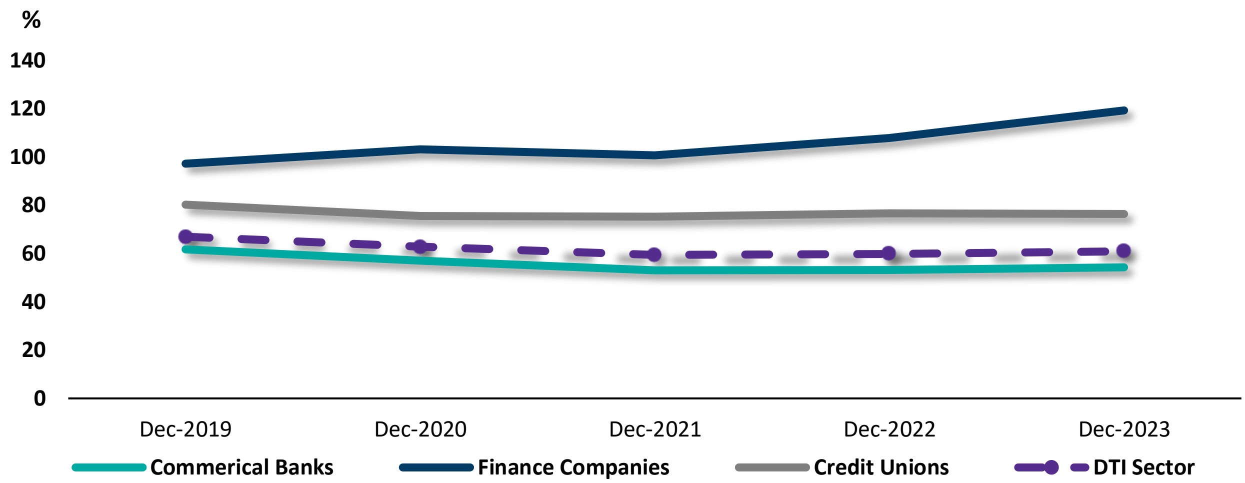
Deposit growth rates were slower across domestic and foreign-currency deposits. Domestic-currency deposits within DTIs increased by 1.3 percent throughout the year (Figure J11). Transferable deposits, which constitute a significant portion of domestic-currency deposits, grew by 2.3 percent, while other long-term deposits decreased by 5.7 percent. This reflects customers' preference for more liquid accounts due to relatively low interest rates. Foreign-currency deposits recorded a marginal decline of 0.2 percent (Figure J12) and amounted to 7.1 percent of total deposits relative to 7.2 percent in the previous year.

Competitive pressure has surfaced for non-transferable deposits. The maximum weighted time deposit rate rose from 1 percent in 2022 to 2.2 percent in 2023, resulting in a redistribution of deposits among DTIs. The competitive pressure is more concerning for finance companies as their funding is mainly made up of non-transferable deposits. Given the high-liquidity environment, it is not expected that other institutions will be compelled to increase their rates.

Liquid assets trended downward slightly at the end of 2023 (Figure J13). As at December 2023, total cash and transferable deposits of the DTI sector stood at BDS$4,359 million (50 percent of December 2023 GDP). This current level of cash and transferable deposits represent a decline of 2.7 percent from 2022. Both commercial banks and finance companies saw reductions in their balances of cash and transferable deposits year-on-year, while credit unions saw an increase of 0.6 percent. The decline in commercial banks cash and transferable deposits coincided with marginal increases in commercial banks' holdings of foreign and domestic treasury bills. However, these changes had little impact on the sector's liquid assets to total assets ratios, as this mainly resulted in reclassifications within the class of liquid assets.

The loans-to-deposit ratio signalled no heightened liquidity risk concerns for banks and credit unions, while finance companies face increasing but still immaterial liquidity risk to the sector. The loans to deposit (LTD) ratios moved upwards in banks and finance companies, but declined slightly in credit unions. The increase in commercial banks' LTD ratio was the first since 2015, and was a result of slow deposit growth relative to that of loans in 2023. However, the general eight-year trend in the LTD ratio for banks and credit unions is downward, reflecting strong historical growth in deposit liabilities (Figure 19). The LTD ratio of finance companies remains the highest in the DTI sector as they have lower volumes of deposits relative to the size of their loans when compared to banks and credit unions. Despite the liquidity risks for finance companies being higher, these risks are contained due to the fact that the deposits of finance companies are fixed deposit type instruments, and their loans are mainly small well-collateralised consumer loans.

Figure 19: Loans-to-Deposits Ratio



Sources: Central Bank of Barbados and Financial Services Commission

In 2023, the Deposit Insurance Fund[26] (DIF) experienced significant growth. The total value of the DIF expanded by 11.1 percent, supported by an increase in interest earned on both investments and premiums, which outweighed the fund's operational costs. Additionally, as the level of domestic deposits increased throughout the year, the DIF as a ratio of total eligible deposits rose, further underlying the positive trajectory of the DIF (Figure J14).

The DTI sector continues to operate with high levels of liquidity. Funding risks for financial institutions remain low as they maintain a large stock of cash and transferable deposits relative to

[26] The Barbados Deposit Insurance Corporation (BDIC) guarantees each depositor at commercial banks and finance companies up to $25,000 on domestic currency accounts.

their funding needs. As a result, concerns of liquidity risks materialising in the sector are limited and DTIs are well placed in terms of funding, to further support Barbados' economic growth efforts.

Funding sources of DTIs are mostly domestic, stable, and growing. DTIs main source of funding continues to stem from inflows of domestic deposits, leaving the DTI sector shielded from liquidity shocks stemming from international funding markets. Risks from a slowdown in local funding sources are also limited, as deposits are likely to grow with expected improvements in the tourism sector and the macroeconomic environment in the short to medium term.

3.2.8 Profitability

A slowdown in the global economy could lead to decreased economic activity in Barbados, resulting in lower demand for loans and financial services. DTIs may experience reduced lending volumes, leading to a decline in interest income, which is a key driver of profitability. This reduction in revenue could weaken DTIs' profitability and erode their ability to withstand any potential shocks to their balance sheets and maintain capital adequacy. In 2023, the profitability of commercial banks improved, while profitability waned for finance companies and credit unions.

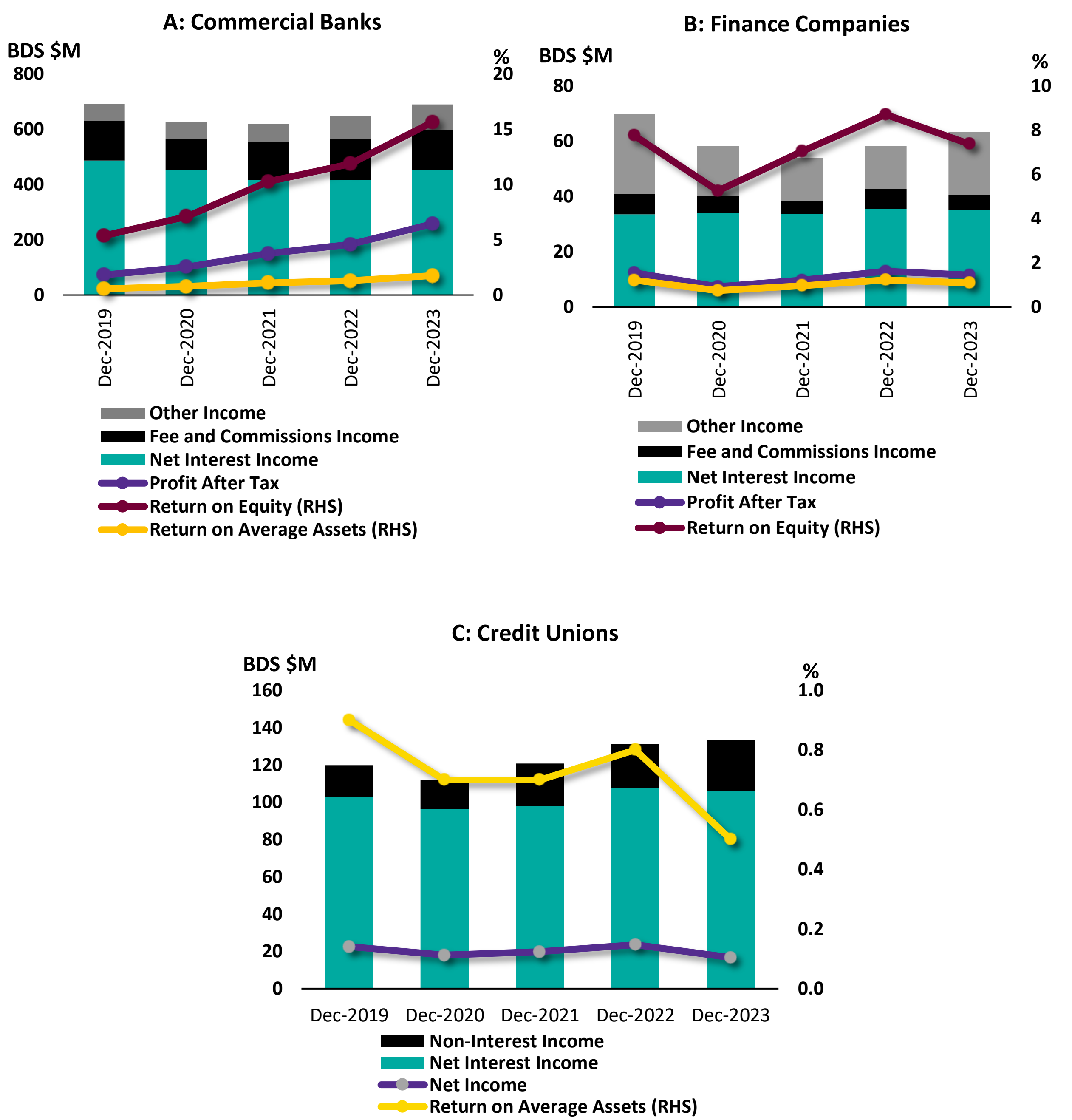
Despite a decline in credit growth, commercial banks' profitability improved in 2023 due mainly to a $50 million decline in provisions for bad and doubtful debts and a $34.3 million reduction in taxation. After-tax profits of commercial banks increased in 2023 by more than twice the increase in 2022. Return on Average Assets (ROAA) moved to 1.8 percent in 2023, while the Return on Equity (ROE) was 15.7 percent (Figure 20A). The net interest income increased by 8.7 percent compared to the previous year, mainly due to higher interest income on foreign currency loans, deposits, and investments, which more than doubled due to high sustained international interest rates.

Over the last 10 years, the share of non-interest income to total income grew from 23 percent to 33 percent. This expansion implies that banks are relying more on various types of fee income from across their range of services to increase or maintain their profitability. This increased reliance on fee income, combined with the removal of the minimum deposit rate which eliminated most of their interest expense on deposits, has allowed banks to maintain profitability in an environment with minimal loan growth. The higher fee income has provided banks with a low-risk means of stabilising profitability in the face of weak credit growth.

The profitability of finance companies declined in 2023. The sector's ROAA moved from 1.2 percent in 2022 to 1.1 percent in 2023, while the ROE moved from 8.7 percent in 2022 to 7.4 percent in 2023. The after-tax profits weakened slightly to $11.6 million in 2023 (Figure 20B). This marginal decline in profit was mainly due to uneven declines in total interest income and total interest expenses, coupled with even increases in non-interest income and non-interest expenses of $4.9 million.

Net income of the credit union sector declined by $6.9 million year-on-year due to substantial increases in other expenses and staff costs, despite reductions in provisions for bad and doubtful loans. Following a year of flat loan growth, the credit union sector recorded less than one percent growth in total income. This performance along with increases in other expenses and staff costs, resulted in a decline in net income to $16.6 million (Figure 20C). The decline in NPLs and the attendant $1.2 million reduction in provisions for bad and doubtful loans lessened the impact of the higher expenditure and flat loan growth. The sector also managed to reduce interest paid on deposits, despite a significant increase in total deposits held by credit union members.

Figure 20: Contribution to Profit by Source



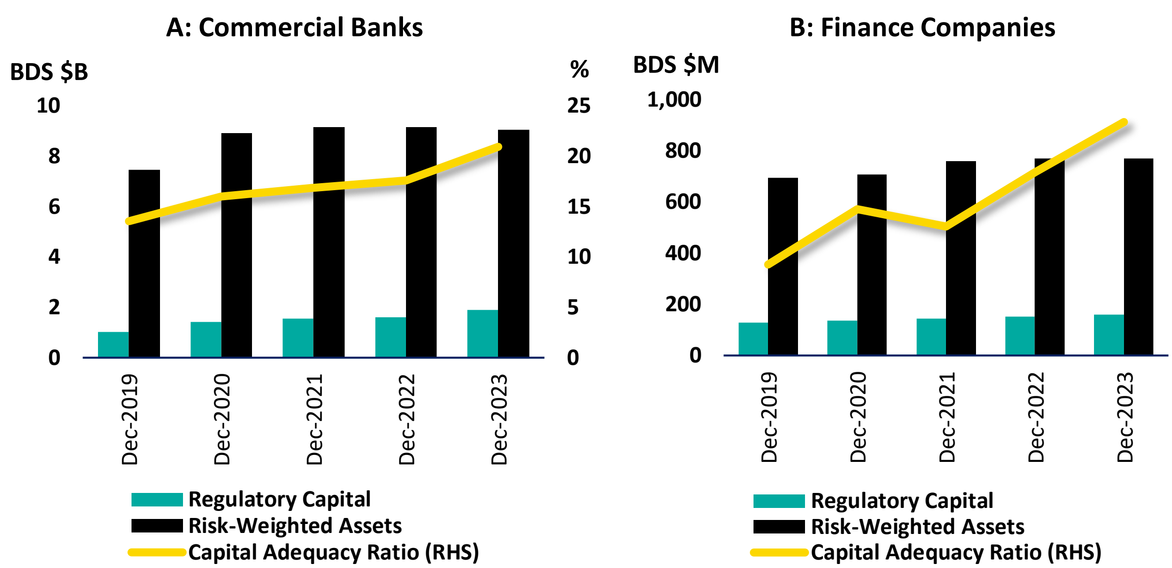
Sources: Central Bank of Barbados and Financial Services Commission

3.2.9 *Capital Adequacy*

The capital adequacy ratio is an important financial indicator used in assessing the health of DTIs. Considering the main identified financial stability risk related to potential global economic slowdown, the ratio is imperative in determining the ability of these institutions to absorb losses on their balance sheets, along with settling any financial obligations.

The level of capital held by DTIs increased throughout 2023. For banks and finance companies, their level of regulatory capital increased by 17.9 and 5.2 percent, respectively, in 2023 (Figure 21), staying well above the required amount for each type of institution. The substantial increase in Tier 1 Capital was due primarily to higher earnings and profitability during the year, as the economy continued to improve post-pandemic.

Figure 21: Capital Adequacy Ratios

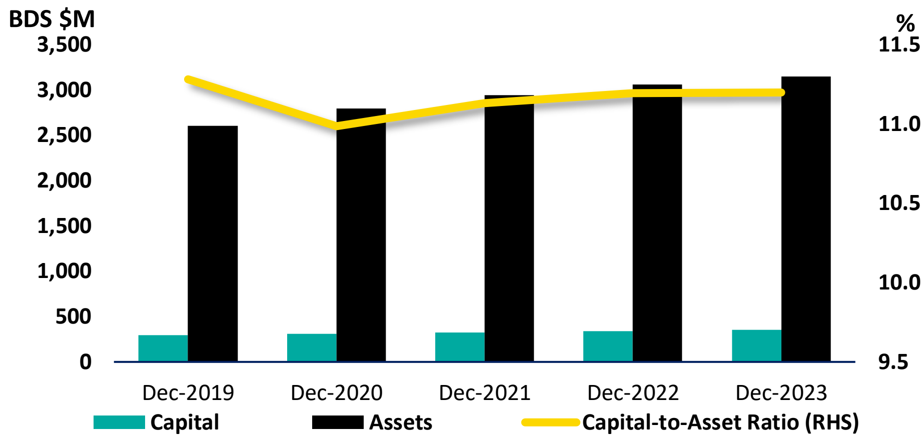


Sources: Central Bank of Barbados and Financial Services Commission

If economic conditions continue to strengthen, there is likely upside risks to the level of capital, but this could be reversed if the economy experiences any economic downturns in the future. The macroeconomic stress test results reveal that deposit-taking institutions remain resilient throughout different levels of adverse scenarios**.** Under the baseline scenario where economic activity is driven by the sustained performance in the tourism sector, it is expected that DTIs would have higher levels of regulatory capital leading to elevated capital adequacy ratios. With moderate and severe scenarios, especially in the cases of geopolitical tensions or severe climatic events, credit growth is expected to decline due to contractions in economic activity. As a result, banks and finance companies would likely increase their loan provisions contributing to further contractions in profitability. As a result, the CAR for both types of scenarios would be lower than in the baseline scenario. Notwithstanding this, the CAR would be still above the minimum rate required.

For credit unions, the capital-to-assets ratio remained relatively unchanged in 2023. Given the small contraction in profitability in 2023 of 0.3 percent, the capital-to-assets ratio stayed on par with the previous year (Figure 22).

Figure 22: Capital-to-Assets Ratio for Credit Unions



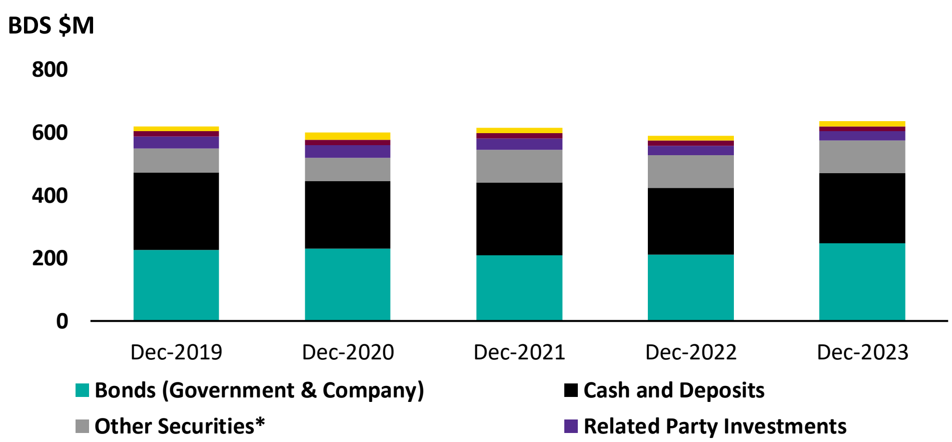
Source: Financial Services Commission

3.3 Insurance Sector

3.3.1 General Insurance Industry

The general insurance industry experienced an increase in the asset base, in contrast to the prior year. Total assets grew by 13.4 percent, as insurers increased their holdings of Government securities following increased premium revenue. The portfolios of general insurers remained concentrated in local Government securities at 29 percent (Figure 23). The industry's penetration rate[27] stood at 9.1 percent, an increase from 8.8 percent in 2022.

Figure 23: General Insurance Classes of Investments



*Mutual Funds, Shares, Unit Trusts

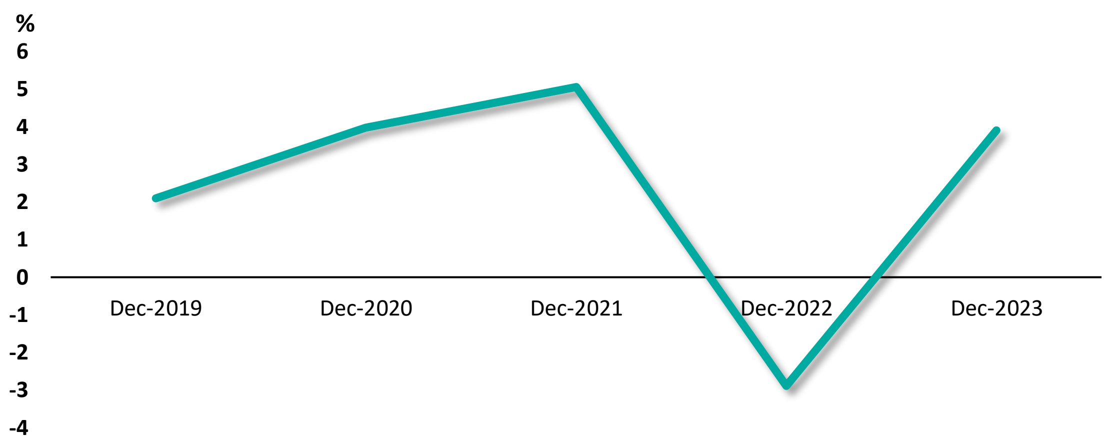
[27] Insurance penetration is defined as total assets compared to Gross Domestic Product (GDP).

Source: Financial Services Commission

Future premium growth could be limited by the potential global macroeconomic slowdown. Premium revenue expanded by 12.7 percent, as many general insurers increased premium rates during the year, which led to improved solvency position across the industry. However, insurance business relative to economic activity remained largely unchanged, maintaining an average penetration rate of 4.8 percent over the past five years. The potential global economic slowdown could limit further growth in the industry, as it could reduce consumer demand for insurance coverage leading to increased levels of underinsurance and uninsurance. At year-end, the industry recorded a return on assets (ROA) of 3.9 percent compared to -2.9 percent in 2022 (Figure 24), resulting primarily from positive gains from underwriting activities and, to a lesser extent, investment performance.

Inflationary pressures and evolving market dynamics have forced the industry to tighten underwriting strategies. Though the industry has maintained an average loss ratio of 63 percent in recent years, many general insurers have consistently struggled with underwriting losses. The persistence of core inflation in global economies has resulted in high operating and claims settlement costs. Additionally, the "hardened" global reinsurance market has brought escalating costs for third-party coverage.[28] These developments have prompted the industry to implement further rate hikes, particularly in the property and motor lines, to enhance financial resilience to the heightened risks.

Figure 24: General Insurance Return on Assets (ROA)



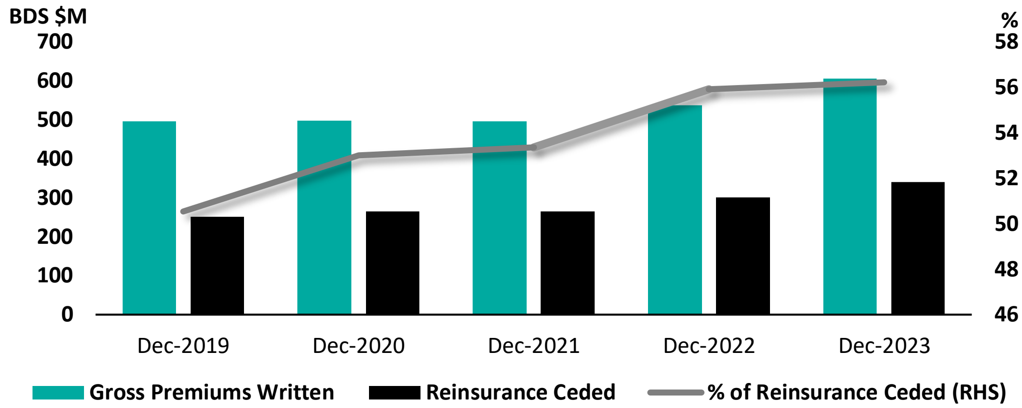
Source: Financial Services Commission

The evolution of climate risks makes it increasingly difficult to secure adequate coverage within the region. In 2023, an estimated 56.2 percent of total business was transferred to reinsurers (Figure 25), with the most ceded risks being property insurance. Though the industry utilises a combination of proportional and non-proportional treaties to limit financial losses, excess-of-loss

[28] A hard reinsurance market is a situation in which certain reinsurance coverage is limited, and the resulting costs of the available coverage are expensive. Reinsurers may tighten their standards, increase costs, and require more stringent conditions to access coverage.

treaties are generally employed to provide further protection against catastrophic events.[29] However, given the region's vulnerabilities, insurers are finding it difficult to secure adequate reinsurance coverage, thus limiting their capacity to underwrite property business. Whilst this may not be a direct financial stability concern, it presents implications for the broader economy as the country's protection gap widens, increasing strain on state resources should an event materialise.

Figure 25: General Insurance Gross Premiums Written vs. Reinsurance Ceded[1]



Source: Financial Services Commission

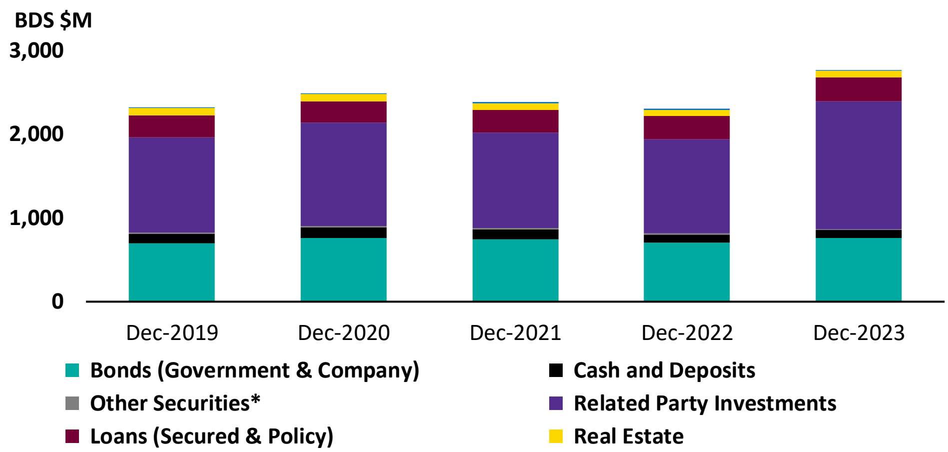
[1] Reinsurance ceded refers to the portion of risk that an insurance company (the ceding company) transfers to a reinsurance company. This process involves the ceding company purchasing reinsurance to protect itself from significant losses by spreading the risk. In return, the reinsurer receives a portion of the premiums paid by the policyholders of the ceding company.

3.3.2 Life Insurance Industry

The life insurance industry continued to experience positive growth in 2023. The size of the sector relative to economic activity for the year was 25.2 percent compared to 23.7 percent in the prior year. Industry assets grew by 16.1 percent driven primarily by related-party investments and increased holdings in Government securities (Figure 26). Similarly, gross premiums written for the industry grew by 4.3 percent over the prior year. Much of this growth stemmed from ordinary life business, accounting for almost 60 percent of total industry activity. Despite the industry's positive performance, profitability declined at year-end as the ROA fell from 4 percent to 1.1 percent in 2023 (Figure 27).

[29] Reinsurance arrangements typically have short durations, which allows the reinsurance market to quickly incorporate the latest findings from scientific research and risk assessments into pricing.

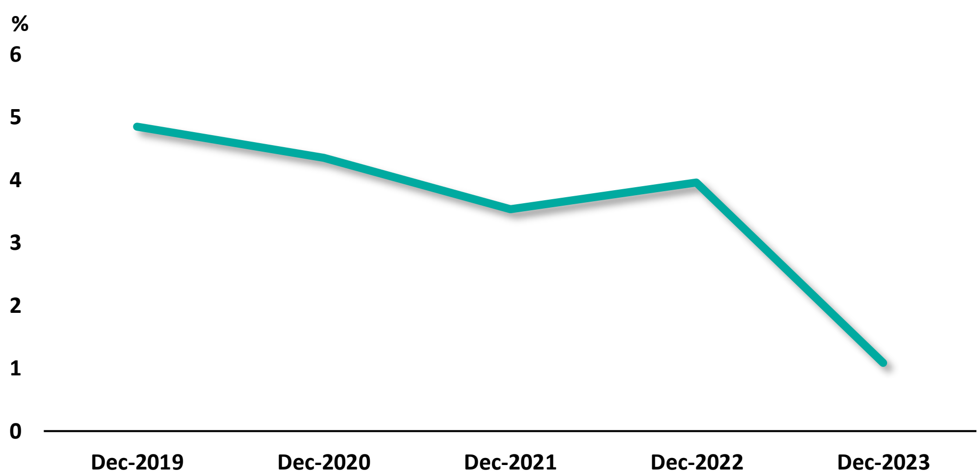
Figure 26: Life Insurance Classes of Investments



*Mutual Funds, Shares, Unit Trusts

Source: Financial Services Commission

Figure 27: Life Insurance Return on Assets (ROA)



Source: Financial Services Commission

The potential global economic slowdown may limit further growth in the life insurance industry. As the global economy slows, premium growth from new business is expected to slow due to lower consumer demand. Additionally, the industry may experience increased policy lapses and surrenders as consumers navigate the effects of reduced global economic activity. Further, with more than half of total investments in related parties, the possible global economic slowdown could negatively impact the value of these investments in the portfolio as related-parties encounter financial strain. The industry may need to adjust its portfolios to lessen its exposure to this potential risk.

Anticipated monetary policy easing in advanced economies is expected to have a limited impact on life insurers' balance sheets.[30] Changes in interest rates generally impact investment portfolios and discount rate assumptions used in actuarial valuations.[31] Given life insurers' negative duration gap, liabilities tend to be more sensitive to interest rates through discounting. However, as most investments are held locally, global interest rate movements are expected to have little impact on insurer portfolios and, thereby, discount rate assumptions.[32] Therefore, solvency margins are expected to remain stable as life insurers continue to maintain adequate capital buffers to meet future commitments.

3.4 Securities Sector

Barbados' securities sector features a mutual funds sub-sector serving as an investment vehicle for local pension plans. The sector comprises 19 mutual funds licensed to conduct business directly with the Barbadian public.[33] The mutual funds sector acts as a prominent investment intermediary for other economic sectors, giving rise to growing levels of interconnectedness within the financial system. Specifically, three of the largest mutual funds, constituting approximately 54.9 percent of the net assets, offer direct exposure to the occupational pensions sector.

The mutual funds sector remains most significantly exposed to equity risks from international markets, with interest rate risk being less of an issue. The sector recorded a modest 5.3 percent year-on-year growth in net assets under management (NAUM), driven primarily by funds with high equity exposure (Figure 28). As most funds are exposed to international equity markets, the potential economic slowdown would negatively impact equity prices, impeding future fund growth. However, the sector's exposure to global interest rate volatility is subdued, given that much of the fixed-income securities are held in local government paper.

The mutual funds sector maintained high levels of liquidity, demonstrating its ability to meet investor demands without significant market disruptions. Most of the funds in the sector are "open funds",[34] which continuously allow shares to be issued and redeemed based on investor demand. Historically, the sector has maintained cash reserves well above redemption levels, signalling its ability to meet investor obligations (Figure 30). While the gap between cash reserves and redemptions has been shrinking in recent times, the sector maintains an adequate stock of liquid investments.

[30] The Financial Services Commission Guideline No. 5 stipulates that most financial assets should be valued using the fair market value approach. Insurers conduct valuations frequently (monthly or quarterly), so changes to insurer balance sheets are considered market-consistent upon reporting.

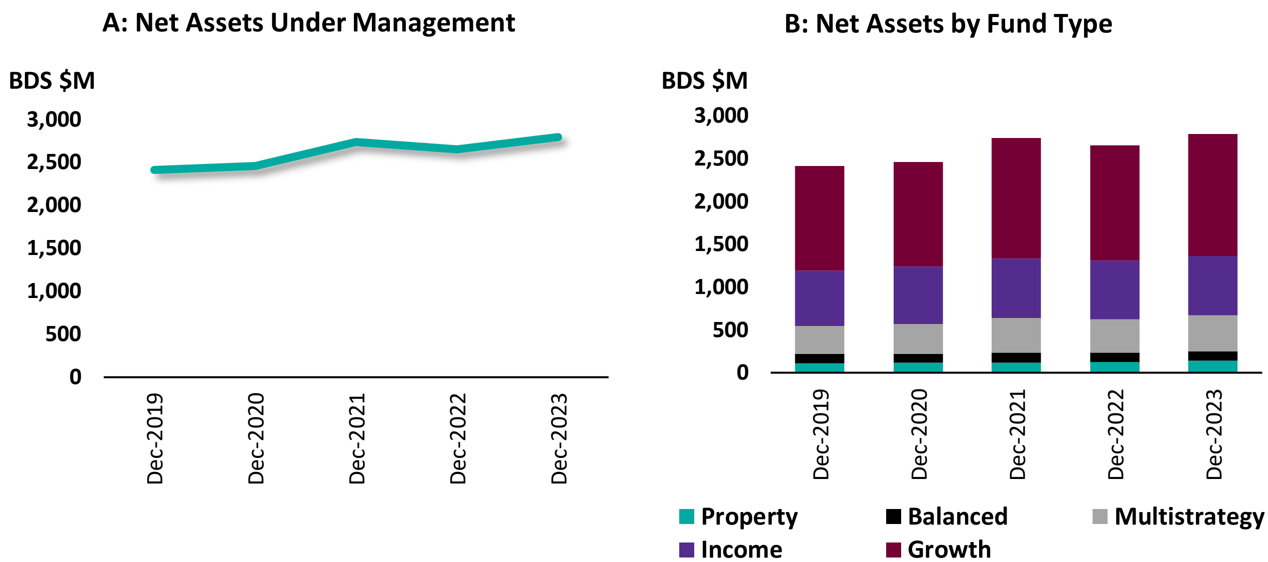
[31] Discount rates are usually reviewed quarterly and changes in the risk-free rate are considered. Actuarial valuations also consider assumptions about mortality, morbidity, and lapse rates, etc.

[32] The Insurance Act, CAP. 310 Section 34 (1) outlines "Every company shall invest in Barbados an amount equal to at least 80 percent of the value of the assets in each statutory fund."

[33] The mutual funds subsector comprised seven growth funds, six income funds, three property funds, and three balanced and multi-strategy funds as of December 31, 2023.

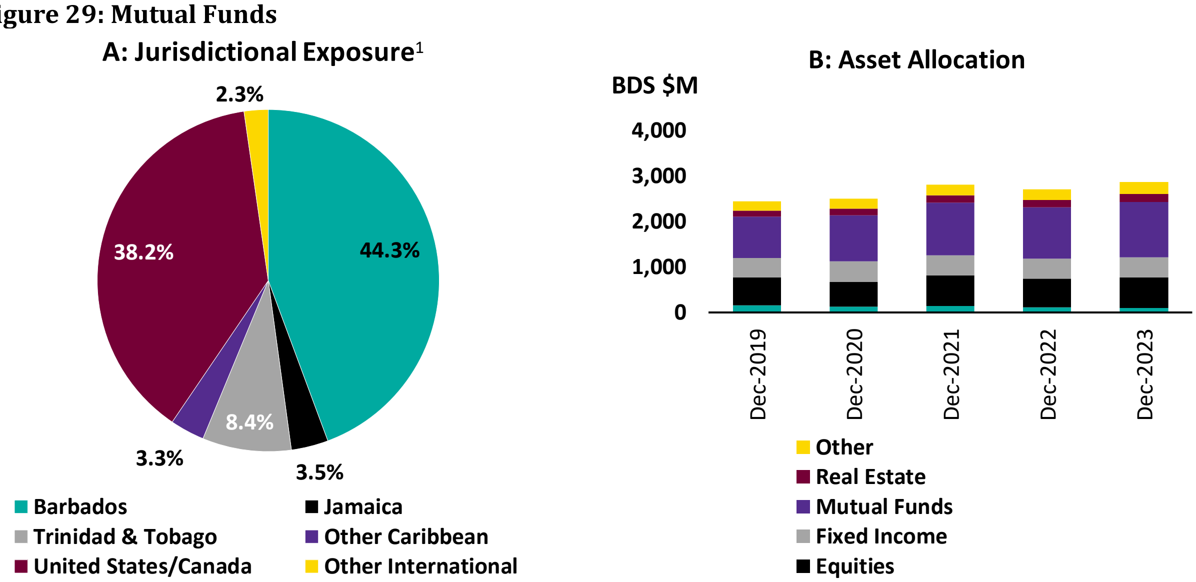
[34] More than 90 percent of registered mutual funds are open funds, with only two registered closed funds.

Figure 28: Net Assets



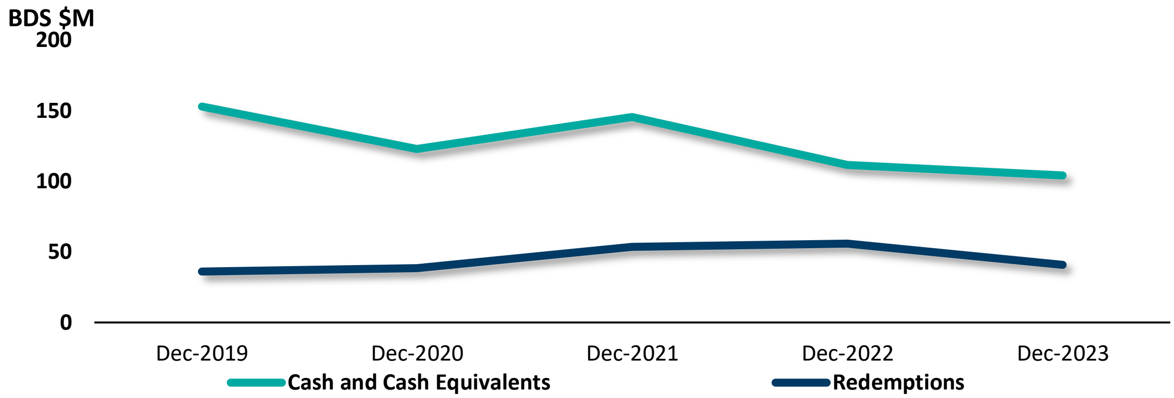
Source: Financial Services Commission

Figure 29: Mutual Funds



Source: Financial Services Commission
Jurisdictional exposure is based on the statutory reports from regulated mutual funds however the location of underlying investments may differ from reported. The FSC continues to conduct research on the true location and jurisdictional exposure of investment instruments held by mutual funds.

Figure 30: Mutual Funds' Cash Reserves vs. Redemptions



Source: Financial Services Commission

3.5 Occupational Pension Sector

Pension coverage continued to decline as wind-ups outpaced new registrants over the past five years.[35] The sector is comprised 245 occupational pension plans, of which 58 percent are defined-contribution (DC), 32 percent are defined-benefit (DB), and 10 percent are hybrid (DB+DC combined) pension plans. Since 2019, 39 pension plans within the sector have wound-up, primarily originating from within the financial, services, tourism, and sales/distributions sectors. While the sector has experienced eight wind-ups over the past year, the global slowdown will likely impact these economic sectors and threaten the viability of occupational pension plans. The sector's size relative to the economy stood at 22.1 percent at year-end compared to 24.1 percent in the prior year.

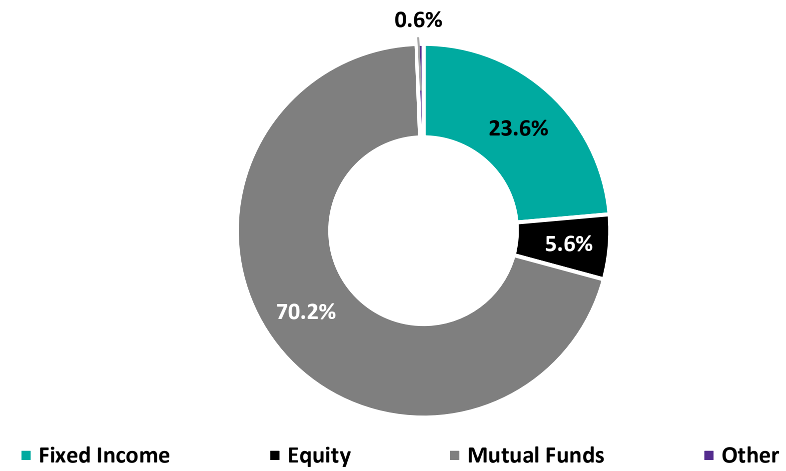
Defined-benefit pension plans have greater systemic implications for financial stability. Even though the number of DC plans is greatest, DB plans constitute a higher proportion of the sector's assets at 50.6 percent. DB plans are of greater concern for financial stability due to the inherent guaranteed element of expected benefits and promised annuity payments upon retirement. Therefore, underfunding presents significant solvency implications for these types of funds. Approximately 28.2 percent of the total DB plans were underfunded on a solvency basis,[36] with an average funding ratio of 84.1 percent. Similarly, 29.2 percent of hybrid plans were underfunded with an average funding ratio of 66.3 percent. Consequently, many employers have found themselves burdened by the challenges of administering and funding pension plans and there has been a gradual shift from DB structures towards DC pension plans.

Barbados' occupational pensions sector continues to be exposed to developments in the mutual funds sector. The industry continued to rely significantly on local mutual funds, which comprised the largest portion of the portfolio (Figure 31). The investments were mainly concentrated in three mutual funds, which together, had high exposure to international equity

[35] Density ratio which represents the ratio of total plan members to the total population.
[36] Solvency Basis: This valuation basis assumes that the pension fund will be wound up or terminated as of the valuation date. All assets and liabilities are at market value.

markets. In contrast, the exposures to fixed-income securities were relatively lower and constant across the three funds, with the majority of holdings in local government debt. As such, a slowdown in the global economy would increase volatility in equity markets, with potential negative impacts on pension investments. As a result, declining investment portfolios could further exacerbate solvency deficits.

Figure 31: Distribution of Pension Funds Investment Portfolio



Source: Financial Services Commission

4. Emerging Risks: Cyber Risk and Climate Risk

The financial system, specifically banks and finance companies, have shown awareness and, to a certain extent, have integrated climate risk into their risk management frameworks. One key finding from a survey the Bank administered to these institutions in 2024 was that institutions included climate-related risks within their assessment of financing requests from customers. Regarding borrowers' default risk, only three banks implemented climate risks factors in relation to borrowers' default. Taking into consideration that the country is faced with potential severe weather systems every year, some DTIs have built-in the impact of climate change with respect to the valuation of collateral.

Cyber-attacks have become an increasing area of concern for commercial banks and finance companies in Barbados. Analysis of the results from a financial stability survey of DTIs administered by the Bank, revealed that these institutions are treating cyber-attacks as a top priority.[37] With the increase in cyber-attacks since the pandemic period, both domestically and globally, institutions have integrated cyber risk policies into their respective corporate strategies. In 2023, the majority of attacks which the banks and finance companies in Barbados experienced were via spam and phishing attacks.[38] Continuous training of employees, retaining and attracting cyber

[37] See Appendix F: Cyber Risk Survey Report.

[38] Spam is defined as unsolicited and unwanted emails and messages, which are generally used as a malicious attempt to gain access to the victim's computer system. Phishing is communication, that in most instances, is

security experts, and improving both corporate governance and communications are seen as ways to enhance institutional resilience and preparedness against current and future cyber-attacks. Additionally, most institutions surveyed, implemented internal risk mitigation frameworks to regularly test and assess their readiness.

Generally, the survey results suggest that financial institutions in Barbados consider cyber risk a priority, including it as part of their corporate strategy. Based on the growing number of attacks that these institutions face on a day-to-day basis, it is imperative that they continue to rely on their cyber risk management frameworks, aligned with the Bank's Technology and Cyber Risk Management Guideline,[39] to promote cyber resilience and preparedness.

Box 2: Potential Impact of Climate Change on Caribbean Economies

Written by Christopher L.A Kinch, Senior Economist, Research and Economic Analysis Department of the Central Bank of Barbados. Email: christopher.kinch@centralbank.org.bb

Caribbean nations are becoming increasingly concerned with the impact of climate change on their economies. According to Rudebusch (2021), climate change can be defined as the long-term shift to higher surface temperatures along with a change in environmental patterns such as rising sea levels, more severe weather systems such as storms, increased flooding, and more frequent and extreme heat waves. Economies within the Caribbean are highly vulnerable to both the direct and indirect effects of climate change, based on their location and size. Over the years, these territories have experienced the negative impacts of more severe and frequent climatic events such as hurricanes and tropical cyclones, recurring droughts, increasing floods, and declining shorelines due to increased sea levels (Fuller, Kurnoth and Mosello, 2020).

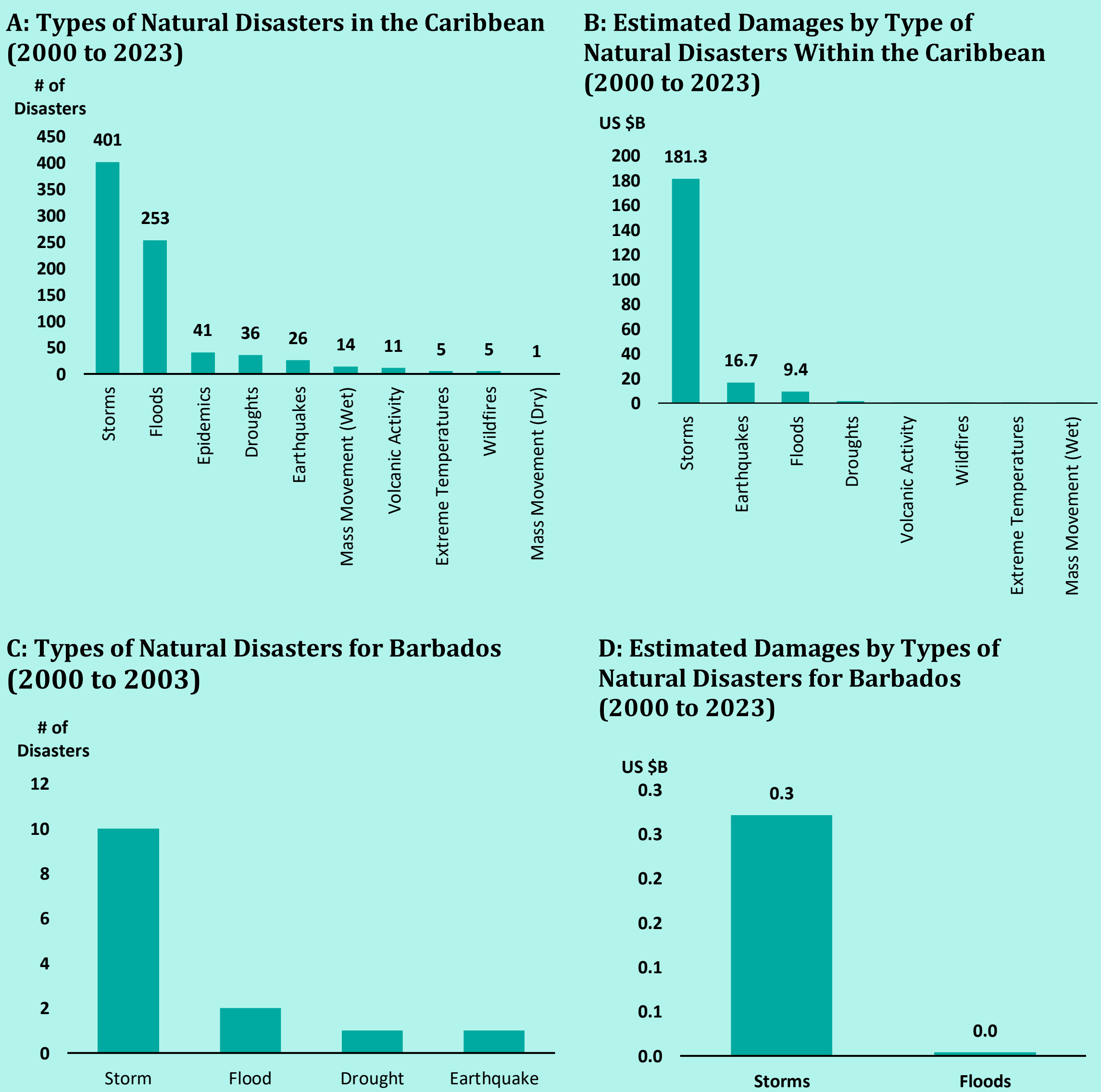
Hurricane Dorian, a category 5 hurricane, was one of the strongest hurricanes to impact any Caribbean country, reaching maximum wind speeds of 185 miles per hour. This hurricane resulted in US$3.4 billion in damages to The Bahamas in 2019, worsening the country's fiscal balance and increasing debt levels (Economic Commission for Latin America and the Caribbean 2022). In 2017, Hurricane Maria ravaged Dominica. The economic losses from this hurricane were estimated at 226 percent of GDP, compounding the US $483 million economic losses from Tropical Storm Erika in 2015 (International Monetary Fund, 2021).

The Caribbean has experienced a significant number of natural disasters over the years. Between 2000 and 2023, there were 793 climatic events impacting the region, with tropical storms and floods accounting for 50.6 percent and 31.9 percent of the total, respectively (Figure 1A). Tropical storms accounted for US$181.3 billion of the total estimated damages, followed by earthquakes and floods, which represented the majority of the remainder (Figure 1B). For the same period, Barbados registered 14 natural disasters, where storms represented 71.4 percent of the total (Figure 1C). For Barbados, total economic losses amounted to US$ 0.3 billion (Figure 1D).

https://www.cisco.com/c/en/us/products/security/spam-vs-phishing.html

[39] Available at https://www.centralbank.org.bb/Technology-and-Cyber-Risk-Management-Guideline.pdf.

Figure 1: Types and Estimated Cost of Natural Disasters Within the Caribbean



Source: Emergency Events Database (EM-Dat): The International Disaster Database

Based on their level of vulnerability, many countries within the region, including Barbados, are heavily exposed to the external risks that natural disasters pose. In 2020, the World Bank published natural disaster risk profiles for Barbados and many other countries across the Caribbean. The total projected economic losses to capital was US$1,127.4 billion if a natural disaster impacted each Caribbean economy (Figure 2A). For Barbados, the total macroeconomic loss to the capital stock from a natural disaster was an estimated US$14 billion

(Figure 2A). Due to the diverse exposure of countries in the region, natural disasters can cause highly varied levels of economic losses (Figure 2A).

Figure 2: Estimated Damage to Capital Stock for Caribbean Economies

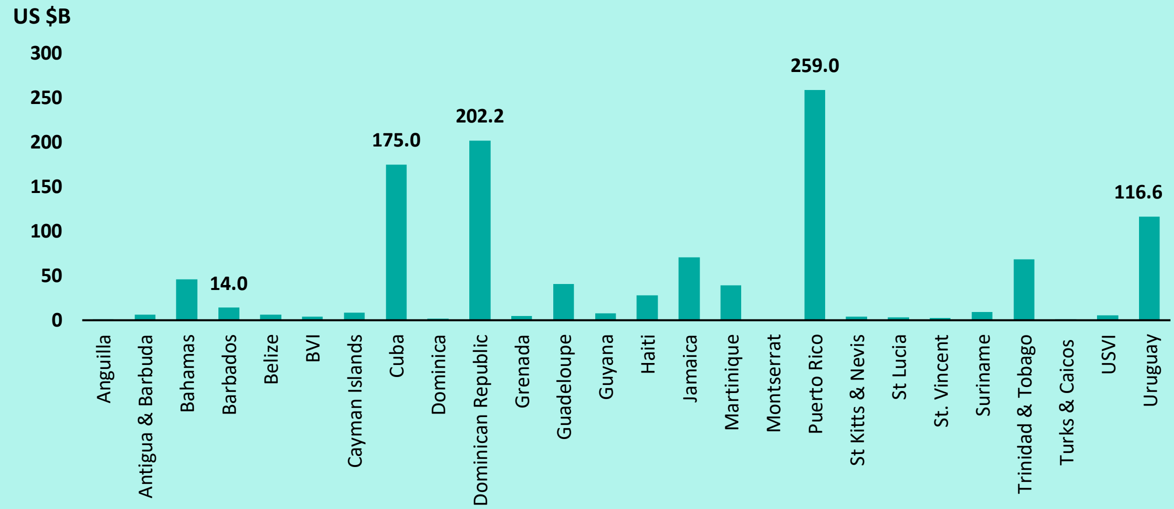
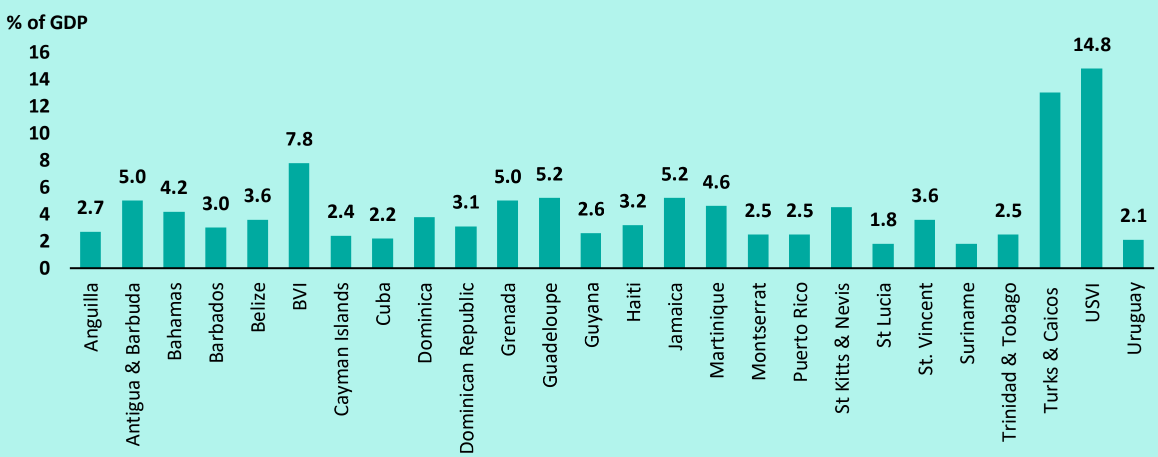


Figure 3: Estimated Damage to Capital Stock as a Percentage of GDP



Source: World Bank Risk Viewer

Although climate change can negatively impact an economy, it also has the potential to impact the stability of the financial system. According to Battiston, Dafermos and Monasterolo (2021), the ever-increasing threats posed by natural disasters and other climate-related events have pushed central banks and other financial regulators across the globe to assess climate risks to economies.

Within the Caribbean, some central banks have started to investigate the climate-related risks to financial stability within their economies. The Central Bank of Trinidad and Tobago (CBTT) has sought to address the data gaps that exists in terms of monitoring climate risks related to financial stability (Central Bank of Trinidad and Tobago, 2023). The data gap will be strengthened through the collection of climate-related data, and the CBTT will include climate-related policies in their macroeconomic framework over the medium-term.

The Bank of Jamaica (BOJ) outlined plans to integrate climate-related financial risks into their financial stability framework, which will help with the assessment of these risks among supervised institutions (Bank of Jamaica, 2023). In the future, the BOJ wants to include climate risks in its supervisory framework and macroeconomic policy decisions.

For Caribbean islands, physical risks are the main type of climate-related financial risks. Physical risks are defined as the damage to infrastructure and the associated financial losses caused by events such as tropical storms, hurricanes, floods, extreme heat, and wildfires (Kirova, 2021). This type of risk can be either acute or chronic in nature, but still has an impact on the economy in either scenario. Physical risks from climate change can translate into some of the following effects on financial markets: "decline in real estate prices, increase in risk premiums, increase in NPLs, revenue losses, reduced profits, contraction in the prices within the equity and bond markets, and carbon asset write-offs." (Rudebusch, 2021; Oesterreichische Nationalbank, 2019). Therefore, the impact on the financial sector is dependent on the severity of the damage caused, especially in terms of the capital stock.

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5. Payments Systems Developments

In 2023, Barbados' payment systems and infrastructure remained robust and resilient, while improvements to the domestic payments infrastructure led to an increase in electronic payments. Payment systems play a crucial role in ensuring financial stability and are an integral part of the overall health of the financial system. Efficient payment systems ensure smooth fund transfers, reducing the risk of transaction delays and disruptions. Payment systems also mitigate counterparty risk, particularly in large-value transactions, and facilitate effective liquidity management in financial markets, ensuring institutions can access necessary funds. Additionally, robust payment systems enhance market confidence, thereby fostering participant engagement. By reducing systemic risks through the timely settlement of transactions and risk management, payment systems prevent the spread of financial distress. Moreover, well-functioning, secure, and regulated payment systems like those operating locally significantly contribute to domestic financial stability, mitigating risks that could lead to broader systemic disruptions.

Throughout 2023, there was a notable increase in the aggregate volume and value of electronic transactions, including both large-value and retail payments, as the economy continued to recover from the COVID-19 pandemic. This was particularly evident in the higher activity witnessed within the Real-Time Gross Settlement System (RTGS),[40] the Barbados Automated Clearing House Services (BACHSI),[41] and credit card transactions. There was a marked resurgence in consumer behaviour, with people returning to dining out and higher demand for retail goods such as clothing and household furnishings. This contributed to an overall boost in the value of electronic payments. Partly responsible for this increase was the launch of real-time payment capabilities by the BACHSI system in February 2023. The introduction of instant payment alternatives for both households and businesses led to a noticeable shift from the conventional direct electronic payment method to the real-time payment option.

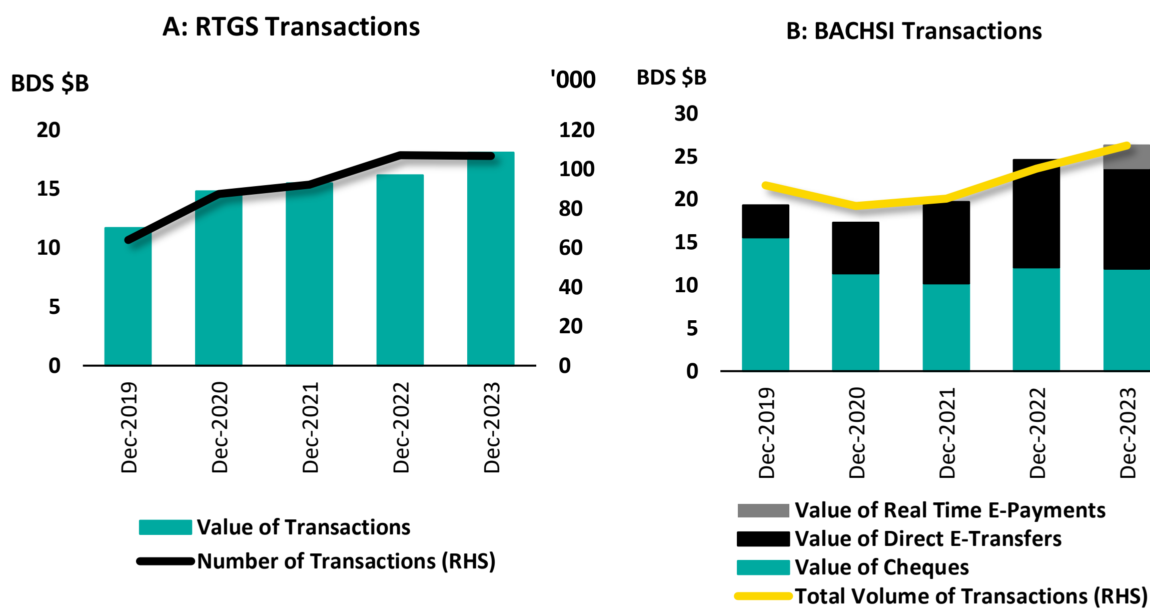
Although the volume of transactions completed through the RTGS system contracted by 0.4 percent in 2023, the value of transactions expanded by 11.9 percent (compared to an expansion of 4.4 percent in 2022) (Figure 32A). The latter contributed to the average value per transaction growing by 12.3 percent, amounting to $169,558.00. Increased domestic economic

[40] RTGS processes large value and/or time sensitive payments between the domestic banking system and the Central Bank.
[41] BACHSI facilitates the clearing of cheques, direct payments, and daily bank settlements.

activity, greater activity within the securities market, and higher settlement of payments related to goods and services propelled the growth in the value of transactions processed through the RTGS system.

In 2023, the total value of payments transferred through the BACHSI system rose by 7 percent to $26.2 billion, mainly on account of the expansion in the value of electronic transfers. For a second consecutive year (since the inception of the automated clearing house), electronic fund transfers surpassed paper-based payments (cheques) accounting for 54.7 percent of all automated clearing house transactions. The total value of electronic funds processed expanded by 15 percent (Figure 32B), which was partly due to the processing of transactions through the new instant payment method, real-time processing (RTP), which was initiated in February 2023. With the greater shift towards the use of electronic settlement of payments, the number of cheques processed decreased by 7.9 percent. Meanwhile, with the introduction of the instant payment option, there was a noticeable shift from the standard direct e-payment method to the RTP option as the number of direct payments fell by 6.3 percent. The increased activity within the BACHSI system was indicative of improved economic conditions, in conjunction with the upgrades of the system to handle instant payments.

Figure 32: RTGS and BACHSI Transactions

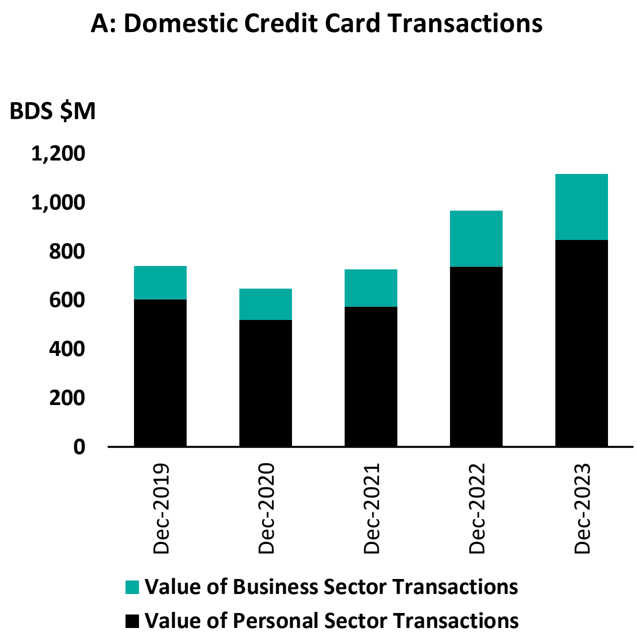


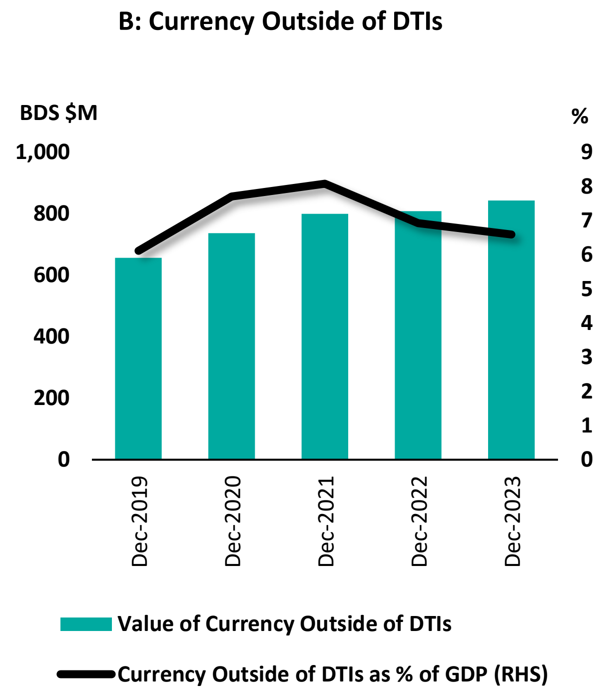
Source: Central Bank of Barbados

The value of domestic credit card payments grew by 15.5 percent in 2023. As economic activity continued to expand, domestic credit card transactions increased by $150 million (Figure 33A). The household sector accounted for about 75.8 percent of the total value of credit card transactions. Higher usage by both households and NFCs led to the increase in the value of domestic credit card transactions. The value of household credit card transactions increased by 14.8 percent, while private sector credit card transactions increased by 17.5 percent.

Unlike the previous year,[42] the reliance on cash as a payment method increased during 2023. The demand for cash (currency in circulation outside of DTIs) increased by 4.3 percent, amounting to $843 million by the end of 2023 (Figure 33B). However, in line with sustained economic growth and a shift towards electronic payments, currency holdings by the public as a percent of GDP decreased to 6.6 percent in 2023, down from 6.9 percent in the previous year.

Figure 33: Domestic Credit Card Transactions and Currency Outside of DTIs





Source: Central Bank of Barbados

[42] Growth in currency in circulation outside of DTIs slowed to 1.2 percent in 2022 after growing by 8.4 percent in 2021.

6. Thematic Articles

Navigating Credit Risk Uncertainty: A Framework for Financial Stability Stress Testing

Written by Anton D. Belgrave[43] and Saida Teleu[44]

Abstract

This paper addresses the issue of model uncertainty in stress testing frameworks used by financial institutions. We focus on the use of satellite models linking risk parameters with macroeconomic and financial factors. Our research highlights the potential for underestimating risk parameter responses, leading to an overestimation of banks' ability to absorb losses. To mitigate this, we propose the adoption of Bayesian Averaging of Classical Estimates (BACE) methodology. Our findings underscore the importance of addressing model uncertainty to enhance the reliability of stress testing frameworks and improve financial stability and resilience.

Introduction

Stress testing has become a conventional tool over the past decades for evaluating the resilience of financial institutions to hypothetical macro-financial stress scenarios.

The paper aims to address a crucial aspect present in all stress tests: the use of auxiliary equation systems to translate macro-financial shock scenarios into risk parameters at the bank level, whether conducted internally by financial institutions (in a bottom-up fashion) or overseen by central authorities (in a top-down fashion). These models, often referred to as satellite models, are employed to forecast the trajectory of the bank's balance sheet under baseline, moderate, and adverse scenarios. Extensive literature is available that presents empirical satellite models for different types of risks, notably credit and interest rate risks. However, most papers written on credit risk for the Caribbean area tend to overlook the presence of model uncertainty. Despite the apparent solidity of the bridge equations for a specific risk parameter at the bank level from economic and econometric perspectives, there exists a potential for underestimating the reaction of the risk parameter. Consequently, this could result in an overestimation of the bank's ability to absorb losses. The selection of equations, leading to excessively optimistic scenario forecasts, might be influenced by explicit incentives for banks to minimise risk costs or might occur inadvertently.

To address these concerns, we advocate for the adoption of satellite model methodologies that encompass a pool of equations rather than relying on a single equation. Specifically, we propose the utilisation of Bayesian Averaging of Classical Estimates (BACE) for stress test modelling purposes. In addition to the aforementioned reasons for the utility of model averaging, two further aspects support this approach. Firstly, there exists significant uncertainty regarding the drivers of credit risk dynamics, making an agnostic approach and model averaging beneficial. Secondly, the short time

[43] Anton Belgrave, Director, Research and Economic Analysis Department, Central Bank of Barbados. Email: anton.belgrave@centralbank.org.bb.

[44] Dr. Saida Teleu, Chief Research Economist/Deputy Director, Research and Economic Analysis Department, Central Bank of Barbados. Email: saida.teleu@centralbank.org.bb.

The views expressed in this thematic article are those of the authors and not necessarily the views of the Central Bank of Barbados.

series for credit risk measures such as default rates makes it impractical to construct a comprehensive multivariate model, rendering general-to-specific model structuring methods potentially inferior.

It's worth noting that stress tests carried out by financial institutions are not just considered helpful, but are also indeed mandated by regulatory standards, as outlined in the Basel accords. Pillar II, which holds significant relevance to our paper's focus, requires banks to utilise stress testing methodologies to evaluate their capacity to withstand hypothetical, severe macroeconomic stress scenarios. Specifically, as highlighted in the Basel Committee on Banking Supervision (BCBS) (2006), paragraph 775 emphasises the necessity for banks' management to conduct periodic stress tests on their major credit risk concentrations. These tests ensure that banks can analyse and respond to potential changes in market conditions that could negatively affect their performance. Additionally, paragraph 777 underlines the supervisory responsibility to take appropriate measures if risks stemming from a bank's credit risk concentrations are inadequately addressed by the bank.

Literature Review

The banking sector in the Caribbean region has attracted considerable attention from researchers due to its unique characteristics and vulnerabilities. The presence and impact of non-performing loans (NPLs) within these markets have been a focal point of various studies aiming to understand their determinants and implications for financial stability and growth.

A seminal IMF technical note (2009) on stress testing the banking system in Barbados provided valuable insights into the macroeconomic variables affecting NPLs. However, the focus on aggregate projections overlooked idiosyncratic effects. Furthermore, Greenidge and Grosvenor (2010) provided early insights into the dynamics of NPLs for Barbados, laying the groundwork for subsequent research in this area. Their analysis offered valuable perspectives on the drivers of NPL accumulation and resolution challenges, setting the stage for further investigation into this critical aspect of Barbadian banking sector performance.

Tracey and Leon (2011) delved into the dynamics of NPLs in the context of loan growth, focusing on Trinidad and Tobago and Jamaica. Their findings shed light on the interplay between NPL levels and the expansion of loan portfolios, highlighting the importance of asset quality in driving banking sector performance.

Similarly, Jordan and Tucker (2013) explored the relationship between NPLs and economic growth, particularly in The Bahamas. Their analysis revealed the intricate connections between NPL trends and broader macroeconomic conditions, emphasising the significance of banking sector stability for overall economic resilience.

Building upon these initial insights, Beaton et al. (2016) conducted a comprehensive study on NPL determinants in the Eastern Caribbean Currency Union (ECCU). Employing panel data analysis and dynamic regression models, they identified both macroeconomic and bank-specific factors influencing asset quality. Their findings underscored the importance of foreign ownership and profitability in mitigating NPL risks, while also highlighting the impact of regional economic trends on banking sector performance.

Beaton et al. (2017) used dynamic panel regressions to analyse the determinants of NPLs using both country data and detailed bank-level data for 16 Caribbean countries. Their results suggested that deteriorating asset quality can be attributed to both macroeconomic and bank-specific factors. These authors found that NPLs are affected by the business cycle: low economic growth weakens asset quality, particularly in tourism-dependent economies. After controlling for endogeneity between NPLs and bank fundamentals, results from similar regressions with a novel bank-level data set also suggest that banks with weaker fundamentals (lower profitability, capital adequacy, and efficiency) also tend to suffer from weaker asset quality.

Wood and Skinner (2018) extended this line of inquiry by examining the broader implications of NPLs for banking stability in the Caribbean. Their research emphasised the systemic risks associated with deteriorating asset quality, emphasising the need for proactive measures to address NPL accumulation and resolution challenges.

Noel et al. (2021) examines the relationship between sovereign credit ratings and non-performing loans (NPLs) in Central America and the Caribbean (CAC). Analysing data from 1999 to 2014 involving 177 banks across 24 countries, the study finds that sovereign rating downgrades anticipate NPL increases, emphasising the significance of understanding sovereign risk's impact on NPL trends. Nations with low foreign currency reserves, limited financial transparency, and weak central bank independence, exhibit heightened effects of sovereign risk spill-overs on NPLs.

Our paper highlights the widespread use of single-equation satellite models by financial institutions and scholars to connect risk parameters at the bank level with macroeconomic and financial variables at the national level. Termed handpicked equations, these models are chosen from a range of options that individually meet economic and econometric criteria for internal risk management or regulatory approval. Institutions can incentivise to select equations that minimise provisioning needs and capital requirements under specific scenarios, while still meeting basic standards of economic and statistical validity. According to Gross and Población (2015), the use of handpicked equations poses two main risks: firstly, the potential for underestimating risk parameter responses to adverse scenarios, leading to insufficient loss absorption capacity; and secondly, the possibility of skewed risk assessments across different portfolios and regions within an institution, affecting both adverse scenario planning and baseline outlooks for business decisions. Additionally, banks with similar risk profiles using different handpicked equations may appear to have varying sensitivities to macroeconomic conditions, contrary to their actual risk dynamics. Conversely, banks with different risk profiles might coincidentally select models suggesting similar sensitivities to macro-financial conditions. To tackle these concerns, we propose adopting satellite model methodologies, such as Bayesian Averaging of Classical Estimates (BACE), for stress test modelling.

An additional reference pertinent to our discussion is Hardy and Schmieder (2011), which advocates for stress testing to involve simple yet robust rules of thumb, particularly in the context of satellite modelling. They emphasise the importance of considering model uncertainty, a principle aligned with our aim of promoting model averaging methodologies to develop simple and robust models.

Methodology and Data

The credit risk model of the Central Bank of Barbados' macro-stress test framework has been revised on the basis of newly-developed specifications for the projections of the NPL ratio for deposit-taking institutions (DTIs). Given that domestic banks follow the Standardised Approach, the probability of default (PD) and loss given default (LGD) are not part of banks' regulatory reporting requirements. Instead, the NPL ratio is projected at bank level based on a set of macroeconomic and financial variables, under the baseline, moderate, and the adverse scenarios defined earlier. Moreover, considering that the NPL ratio at portfolio level would react to different macroeconomic and financial variables, credit risk is estimated separately for mortgages and loans to NFCs.

In both cases, the estimation is based on quarterly bank-by-bank NPL ratios computed from the CBOSS9 reporting, whilst the macroeconomic and financial variables are sourced from the Central Bank of Barbados. The sample considered in the analysis spans from 2013Q1 till 2023Q4.

The NPL ratio is transformed using a logistic transformation to ensure that the projected NPL ratios at the bank level fall in the zero-to-one range for both mortgages and NFCs. This ensures that potential non-linear relationships between the dependent variable (NPL ratio) and the independent variables (macroeconomic and financial variables) in the specifications are captured.

All equations in the model were individually estimated and aggregated in the posterior model space for each segment. Individual equations were formed based on the autoregressive distributed lag model (ARDL) structure, where the dependent variable Y_t is a dependent variable and a function of its own lags as well as contemporaneous, and possibly further lags of a set of predictor variables.

$$Y_t = \alpha + \alpha_1 Y_{t-1} + \alpha_2 Y_{t-2} + \sum_{s=1}^{s_i} (\beta_0^k X_t^k + \ldots + \beta_q^k X_{t-q}^k) + \varepsilon_t \qquad (1)$$

A common set of macroeconomic predictor variables cited in the literature are included in the analysis including the rate of growth of GDP, tourist arrivals, the rate of inflation, and unemployment. While non-exhaustive, Bayesian Averaging of Classical Estimates (BACE) is relatively robust to model misspecification, especially in the context of prediction purposes (Hoeting, J.A. et al, 1999). The model selection for the model space follows several criteria to determine the best specification for each model: a relatively high R-square, the Durbin Watson statistics between 1.5 - 2.5, number of significant variables, and a small root-mean-square-error. Additionally, sign restrictions are imposed with respect to the long run multiplier, excluding the equations in the posterior model that do not correspond to the classical economic relations between the variables. Part of multimodal inference is to rank the fitted models based on the standard Bayesian information criterion (BIC).

Furthermore, we set the 85 percent threshold for superior model. In case none of the model is superior, we compute the posterior coefficient mean by weighting individual equations' coefficients by $P(M_i|y)$, which is the BIC. The Bayesian model averaged predictor of y follows:

$$E(\beta|y) = \sum_{i=1}^{I} P(M_i\,|y)\widehat{\beta_\iota} \qquad (2)$$

where $\widehat{\beta_\iota}$ being the posterior mean under model M_i.

In addition to the parameters of the posterior model, there is a key focus on the likelihood of a specific predictor being incorporated into the model space, known as the posterior inclusion probability. This probability is calculated by summing up the posterior model probabilities that include the specific predictor. It is important to highlight that a predictor variable is considered significant in the posterior model if its corresponding posterior inclusion probability exceeds the prior inclusion probability.

Results

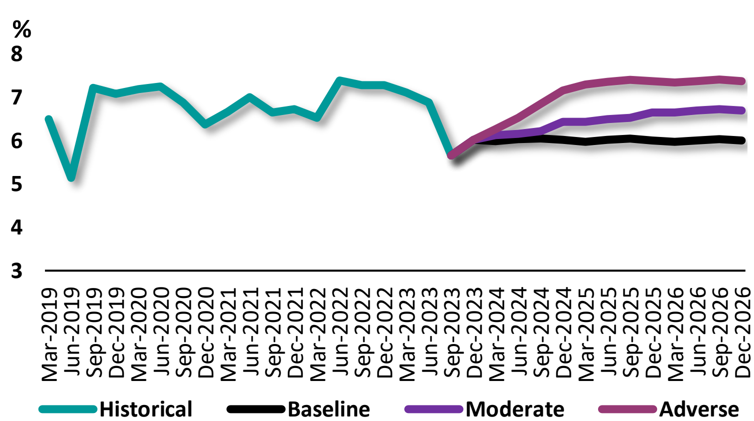
In this study, we explore the dynamics of non-performing loans (NPLs) across various sectors by incorporating lagged effects of both the dependent variables and select economic indicators. Four distinct models were evaluated for each type of NPL: Total NPLs, Mortgage NPLs, NFC (Non-Financial Corporations) NPLs, and personal NPLs. The models integrate immediate and lagged effects of Gross Domestic Product growth, inflation, unemployment, and tourist arrivals, providing an understanding of economic influences on loan performance.

All predictor variables that relate to economic activity (GDP, tourist arrivals) were assigned a negative sign constraint to reflect that an economic downturn should induce NPLs to increase. The opposite holds true for inflation and unemployment, and these variables were assigned a positive constraint.

Given the number of potential predictor variables (4) and the setting for the maximum model dimension (maximum two lags of exogenous variables beyond their contemporaneous inclusion), the number of equations in the model space for each sector equals 24.

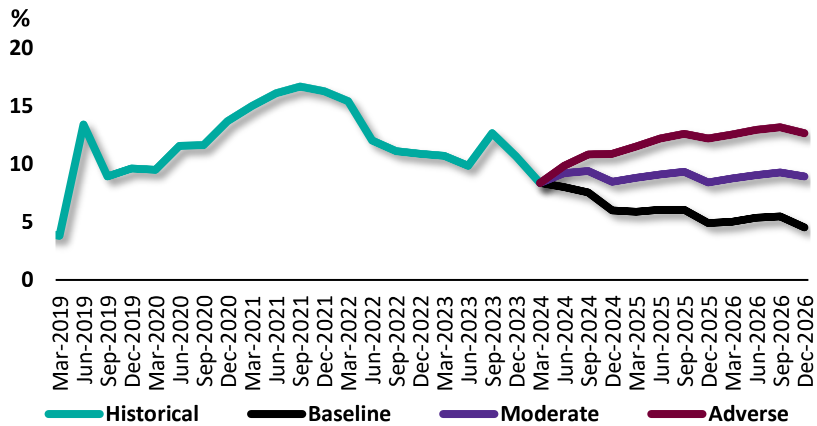
In terms of the structure of the posterior models across the sector, variables that appear more prominently as relevant predictors of NPLs are some measure of real activity, in particular GDP and employment. The model for mortgage NPLs underscores the direct effects of economic growth and tourist arrivals on mortgage NPLs. Economic performance and labour market conditions are integrally linked to the financial health of non-financial corporations (NFCs), with GDP, unemployment, and inflation playing critical roles.

Figure 1: Total Mortgage NPLs



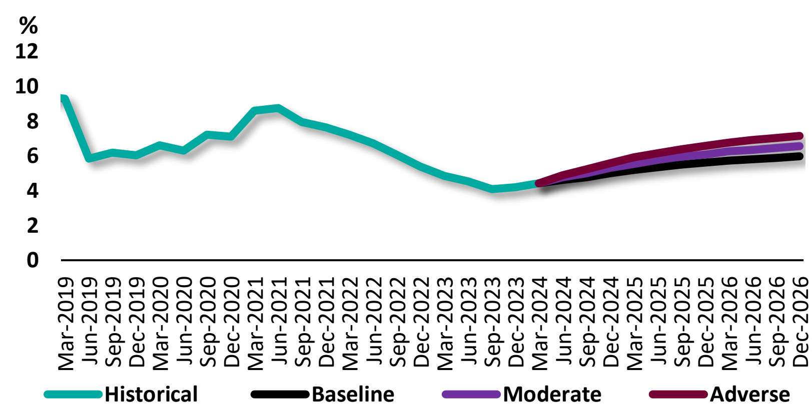
Source: Central Bank of Barbados

Figure 2: Personal NPLs



Source: Central Bank of Barbados

Figure 3: Non-Financial Corporations NPLS



Source: Central Bank of Barbados

Over the next three years, there is a prevailing expectation of a global macroeconomic slowdown, which could lead to detrimental effects on non-performing loans (NPLs) across various key sectors if realised in terms of a slowing in local tourist arrivals. This slowdown could manifest in increased difficulties for borrowers in meeting their repayment obligations, resulting in higher levels of NPLs. Sectors particularly vulnerable to this trend include personal loans (Figure 1,2,3), where borrowers may face challenges in maintaining timely payments due to economic uncertainties.

Conclusion

The study concludes by emphasising the critical role of comprehensive modelling approaches in stress testing frameworks to predict non-performing loans (NPLs) effectively. By integrating Bayesian Averaging of Classical Estimates (BACE) into the satellite models, financial institutions can address the prevalent underestimation of risk parameter responses, thereby enhancing their capacity to absorb potential losses during adverse economic conditions.

Our examination of the dynamic relationships between economic indicators – such as GDP, unemployment, inflation, and even external factors like tourist arrivals and NPLs – highlights the nuanced ways in which economic shifts impact bank stability. The models demonstrate that while GDP consistently influences NPL outcomes across all categories, the effects of other variables like tourist arrivals and inflation are more pronounced in specific sectors such as mortgages and NFCs loans.

Ultimately, the paper advocates for a methodological refinement in stress testing practices mandated by regulatory standards under frameworks like the Basel accords. By adopting more robust and diversified modelling approaches, banks can better navigate the complexities of financial markets and enhance their resilience against macro-financial shocks. This research contributes to the ongoing dialogue on improving financial stability and offers actionable insights for both policymakers and financial institutions aiming to fortify their risk assessment.

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A Climate Risk Assessment of the Barbadian Deposit-taking Financial Sector

Written by Anton D. Belgrave[45], Jamila Beckles[46], Pinky Joseph[47],and Saida Teleu[48]

Abstract

We conduct the first climate risk assessment for Barbados involving the deposit-taking financial sector (individual commercial banks, individual finance companies, and the credit union sector as a whole) by adopting a macro-approach. The assessment is completed in two stages: First, we determine the macroeconomic impacts of the climate scenarios by reducing the hotel stock under each scenario, and then, utilising a ratio of hotel capital stock to tourist arrivals, to estimate its impact on GDP growth. Secondly, we determine the impact on the financial system using a Bayesian averaging credit risk satellite model and a dynamic balance sheet stress testing tool. The results indicate that in the face of the most severe scenario (one-in-100-year storm surge), the NPL ratio peaks at 11 percent compared to 7 percent in the baseline scenario and the proxy probability of default almost doubles. Additionally, all but two institutions register losses in the initial year when the climate event occurs. The overall deposit-taking institutions sector remains resilient with a CAR above the 8 percent requirement but measuring 6.4 percentage points below the baseline scenario.

Introduction

Climate change is increasingly a major issue for the financial system. The Basel Committee on Bank Supervision (BCBS) (2020) describes climate-related financial risks as potential risks emanating from climate change that could disrupt institutional and system-wide financial soundness and stability (Basel Committee on Bank Supervision, 2020). The financial system is intricately linked to the climate change agenda through its intermediation function, channelling funds towards the transition of economies to net-zero and away from brown-industries. Bank credit and insurance compensation also play a critical role in economic recovery post-climatic events.

With the prominent threat of increased frequency and intensity of severe climatic events, physical risk is paramount. Assuming no policy action to combat rising global temperatures, it is likely that the severity and frequency of natural disasters will increase. The emanating “damages to facilities, operations, and assets” are referred to as physical risk (Belgrave 2023). With the loss of infrastructure and business operations, an economy loses a significant amount of its productive capacity, which increases counterparty risks for banks. Corporate borrowers lose their revenue generating capacity, while households find themselves with the loss of employment from the

[45] Anton Belgrave, Director, Research and Economic Analysis Department, Central Bank of Barbados. Email: anton.belgrave@centralbank.org.bb.

[46] Jamila C Beckles, Senior Economist, Research and Economic Analysis Department, Central Bank of Barbados. Email: jamila.beckles@centralbank.org.bb.

[47] Pinky L Joseph, Economist, Research and Economic Analysis Department, Central Bank of Barbados. Email: pinky.joseph@centralbank.org.bb.

[48] Dr. Saida Teleu, Chief Research Economist/Deputy Director, Research and Economic Analysis Department, Central Bank of Barbados. Email: saida.teleu@centralbank.org.bb.

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corporate sector. Together, those impacts result in heightened credit risk manifested as higher non-performing loans, higher loan losses, and higher probabilities of defaults across sectors.

Some central banks around the world (European Central Bank, US Federal Reserve) and key financial stability-related organisations such as the Network for Greening the Financial System (NGFS) have utilised climate risk stress tests to assess the impact of plausible extreme climate events on the macroeconomy and financial sector outcomes. The results of those stress tests indicate the resilience of the respective financial sector to physical climate risk. Despite the Caribbean being one of the most vulnerable related to natural disasters, climate risk assessments from a macroprudential perspective are lacking in the region to date. To contribute to this research gap in the region, we conduct the first climate risk assessment on Barbadian deposit-taking institutions, a precursor for future stress testing work. This climate-risk assessment examines the impact of a one-in-50-year and a one-in-100-year rainfall flooding, wind, and storm surge scenarios on the macroeconomy and the banking sector.

The rest of the paper is organised as follows. In the next section, we review existing literature on the transmission of physical risk to the banking sector, drawing on the experience and guidance of international central banks that have conducted climate-related stress tests. The methodology is presented in Section 3 and the climate scenarios are described in Section 4. The results are provided and discussed in Section 5 and finally, Section 6 concludes.

Literature Review

Climate change is an urgent concern within the realm of financial stability. The physical and transition risks emanating from climate change have the potential to present themselves as traditional bank risks and amplify any existing vulnerabilities within the system (Belgrave, Climate Risk and the Financial Sector, 2023). Assessing the impact of physical risks is extremely relevant as increased intensity and frequency of natural disasters are monumental threats of climate change. Furthermore, results of the economy-wide European Central Bank stress test indicate that the damage from physical risk is much greater than the impact of transition risks, further underscoring the gravity of physical risk (European Central Bank, 2021). Transition risks resulted in a positive 2 percent impact on GDP while physical risk resulted in a 10 percent decline in GDP. The larger impact on GDP mainly stems from the loss of productive capacity across numerous sectors due to physical damage (European Central Bank, 2021). When considering physical risk, geographical location is critical in determining the vulnerability of various economic entities (such as households and corporates) to natural disasters (European Central Bank, 2021). For example, coastal properties would be more vulnerable to a sea level rise climate scenario.

How can those physical risks impact the banking sector? Schüwer, Lambert, & Noth (2019) and Brei, Mohan, Barahona, & Strobl (2023) provide insights on the effects of natural disaster shocks on the banking sector in the US and the Caribbean, respectively. Foremost, physical damage (for example, to housing, inventory, equipment or infrastructure) reduces borrowers' capacity to repay their debts which results in heightened credit risk, probability of defaults, and loan losses. Additionally, banks may also face immediate deposit withdrawals, which dampen liquidity and also choose to limit their exposure to non-financial firms through lower lending or loan sales. Moreover, physical damage is likely to have second round effects through disruptions to transportation, electricity, and supply chains (OECD, 2018). While Schüwer, Lambert, & Noth (2019) speak to the strengthening of capital ratios post hurricane Katrina, the transmission channels described do not examine the likely increase in the provisioning levels of banks. As the environment becomes riskier after a natural disaster, banks may choose to boost their provisioning against likely loan losses and this has implications for the profitability of banks and in turn, their ability to strengthen their capital buffers. Moreover, Belgrave (2023) speaks to the fact that the occurrence of physical damage can also manifest as heightened claims on the insurance sector.

Deposit-taking institutions in less developed and small countries are more vulnerable to natural disasters since they manage portfolios with greater geographic and sectoral concentration (BCBS, 2010). Moreover, the banking sector in such countries also faces higher counterparty risks because fewer households and firms are insured against weather related damages, lower quality of infrastructure, and smaller social safety nets compared to advanced economies (Lashley, 2012, Bueno et al., 2008, Pelham et al., 2011). Despite its heightened vulnerability, there has been far too little research and action in the Caribbean related to investigating whether deposit-taking institutions can absorb possible damage from various climate scenarios. While Brei, Mohan, Barahona, & Strobl (2023) and Brei, Mohan, & Strobl (2019) were able to decipher the impacts of previous tropical storms and hurricanes in the Caribbean on the banking sector, it is forward-looking assessments such as the climate risk assessment presented in this paper that will allow regulators to identify vulnerabilities in the financial sector and implement corrective action to build resilience before a natural disaster. This stress-testing exercise is also the first of its kind in the Caribbean.

The existing methodological frameworks to assess physical risk rely on: 1. the design of relevant and plausible scenarios for the country (exogenous shocks), 2. translating the climate state in each scenario to quantified impacts on macroeconomic variables, 3. linking the macroeconomic variables to financial outcomes. Reinders, Schoenmaker, & Dijk (2023) and Acharya, et al. (2023) propose the inclusion of feedback effects so that climate stress testing results can capture second-round effects that can amplify the initial shock.

Climate change scenarios for physical risk are generally presented as what if scenarios, whose impacts are compared to a baseline. It is not only important that climate scenarios should be relevant to the country, but also the time horizon of the scenario must be adequate to capture the long-term impacts of the natural disaster shocks (European Central Bank, 2021). The impact on macroeconomic outcomes are estimated within a macroeconomic model, which is then linked to financial outcomes via satellite models as macro-financial linkages are not usually present in the macroeconomic model. Reinders, Schoenmaker and Dijk. (2023), the European Central Bank (2021) and Hallegatte, et al. (2022) completed more comprehensive and advanced climate stress tests that adopt a micro-approach and utilise damage functions to explore the impact of climate scenario at a corporate and sectoral level. In the literature, a damage function is defined as a relationship between a climate variable and an economic variable such as output or productivity (Roson, 2013). Due to data challenges in the Caribbean, this advanced approach cannot be adopted as yet and hence, a more aggregative approach was utilised in this paper. Nonetheless, the dynamic stress testing tool employed in this research allows for sectoral NPL add-ons to capture elevated credit risk in the economic sectors.

The forecasted increase in the frequency and intensity of natural disaster shocks is critical for the financial sector as physical risks have severe negative implications for the macroeconomy and financial outcomes, even more than transition risk. With greater vulnerability for small economies like ours, the Bank has taken the first step in the Caribbean to assess the resilience of deposit-taking institutions to acute climate change-induced events. Effective climate stress testing relies on appropriate scenario design and capturing the resulting macroeconomic and financial outcomes. While those core elements are present in this climate-risk assessment by the Bank, the framework can be further improved by estimating sectoral damage functions used by the European Central Bank (2021) and Hallegatte, et al. (2022), as well as accounting for feedback effects as proposed by Reinders, Schoenmaker, & Dijk (2023).

Methodology

Designing relevant and plausible climate scenarios is at the core of any climate risk assessment. The most recent climate risk profile for the Caribbean highlight increased hurricane intensity and sea level rise among other natural disasters as key realised climate threats for the region (USAID, 2021). Given this, along with greater negative effects of physical risks (European Central Bank, 2021), physical climate stress scenarios are designed for the Bank's stress testing exercise. The climate scenarios of high windfall, rainfall flooding, and storm surges are selected because those climate events are prevalent in the Caribbean and are also the triggering events for the Caribbean Catastrophe Risk Insurance Facility (CCRIF). Moreover, as explained in the stress test results of the ECB, geographical location can amplify the vulnerability to physical risks. In the scenarios designed, coastal properties face extreme vulnerability to storm surges, rainfall flooding, and even on shore winds. One known fact for Barbados is that tourism properties occupy the majority of its coast (Belgrave & Wilson, 2022). The tourism sector is also the principal economic driver of the country, accounting for approximately 12 percent of GDP directly and is estimated to account for as much as 30-40 percent of GDP when indirect and induced effects are considered. With this in mind, we find it appropriate to consider the impact of the climate scenarios on the hotel stock. The climate scenarios solely consider physical risks, implying that there is no climate change policy action by government or financial institutions

This climate risk assessment utilises both the Bank's in-house macroeconomic framework and a dynamic macroprudential stress testing tool for banks' balance sheets. As iterated in the literature review, a key element of a climate stress test is the translation of the climate state to macroeconomic impacts (Reinders, Schoenmaker, & Dijk, 2023). The varying levels of the adverse shock to the hotel stock is applied via the Bank's macro-economic model (hereinafter referred to as the Model). The Model employs a combination of econometrics and an accounting framework in Excel spreadsheets to provide estimates and forecasts of economic activity over both the medium "five-years"- and the long-term horizons (currently up to 2040). The core of the model is built upon the calculation of nominal GDP. In terms of the scenarios, the estimated damage to the hotel stock under each scenario is derived using a probabilistic hazard assessment process. The damage is placed in the Model by assuming a contraction is the supply of rooms, manifested as a commensurate reduction in bed nights and tourism value-added. Utilising a ratio of the hotel capital stock to tourist arrivals, the impact on tourist arrivals is estimated and this has a direct impact on GDP growth and in turn credit growth within the Model. Further work by the Bank on estimating damage functions will allow us to assess the spill overs on other sectors such as agriculture.

Furthermore, a satellite credit risk model is used to estimate credit risk shocks under each scenario using Bayesian averaging of classical errors. Quarterly NPL ratios are projected based on a set of macroeconomic and financial variables. The potential non-linear relationships between the NPL ratio and the independent variables (macroeconomic and financial variables) are captured through logistic transformation of the NPL ratio. The individual equations were formed using an ARDL model, and the best model specification was selected based on a variety of criteria.

The projected NPL ratios from the satellite model are applied to the DTIs' balance sheet via the dynamic stress testing tool. Noting that there was no significant deterioration in the credit quality of the hotels and restaurant segment after Hurricane Elsa and Tropical Storm Bret (most recent adverse weather events affecting Barbados), an add-on credit shock was not applied to the segment. In addition to the NPL ratios, the scenario-specific GDP growth and credit growth paths from the Model are fed into the dynamic stress testing tool as a severe scenario. The growth of loan stocks and other assets (risk and zero risk-weighted assets) of individual institutions follow the credit growth. Higher provisioning rates and NPL write-off rates are applied under the various climate scenarios, reflecting the worsened recovery of bad loans due to the loss of productive capacity and revenues. This places downward pressure on the profitability of banks. Other profitability measures such as the net interest margin and the change in the non-interest income are also assumed to decline under the climate scenarios due to the elevated credit risk. Non-interest expenses are held constant as the literature only speaks to the operating expenses of corporates increasing due to a natural disaster (European Central Bank, 2021).

Scenarios

The climate risk assessment team at the Bank alongside the Coastal Zone Management Unit (CZMU)[49] of Barbados designed one-in-50-year and one-in-100-year rainfall flooding, windfall and storm surge scenarios. The climate scenarios estimate the impact of infrastructural damage on the demand for the country's tourism product. To simplify the analysis, the percentage loss in the country's hotel stock as a result of a weather-related shock is used to estimate the loss in tourist arrivals. In this instance, the rainfall flooding and wind speed scenarios are classified as moderate scenarios with an estimated reduction of the hotel stock ranging from 4 percent to 9 percent. On the other hand, the storm surge scenarios are classified as severe scenarios and assumes a reduction of the hotel stock between 22 percent and 53 percent. The recovery period depends on the severity of the weather shock and ranges from one year in the least severe wind speed scenario to five years in the case of the severe storm surge scenario. A unique assumption in the severe scenario is that the Government faces significant deterioration of its fiscal position and activates its natural disaster clause.[50]

[49] The Bank extends appreciation to the CZMU team for the provision of critical inputs that facilitated the implementation of this crucial climate-risk assessment.

[50] Barbados' natural disaster clause allows for a two-year deferral of debt payments in the event of a major natural disaster, which can include earthquakes, hurricanes, or heavy rainfall. The natural disaster clause is

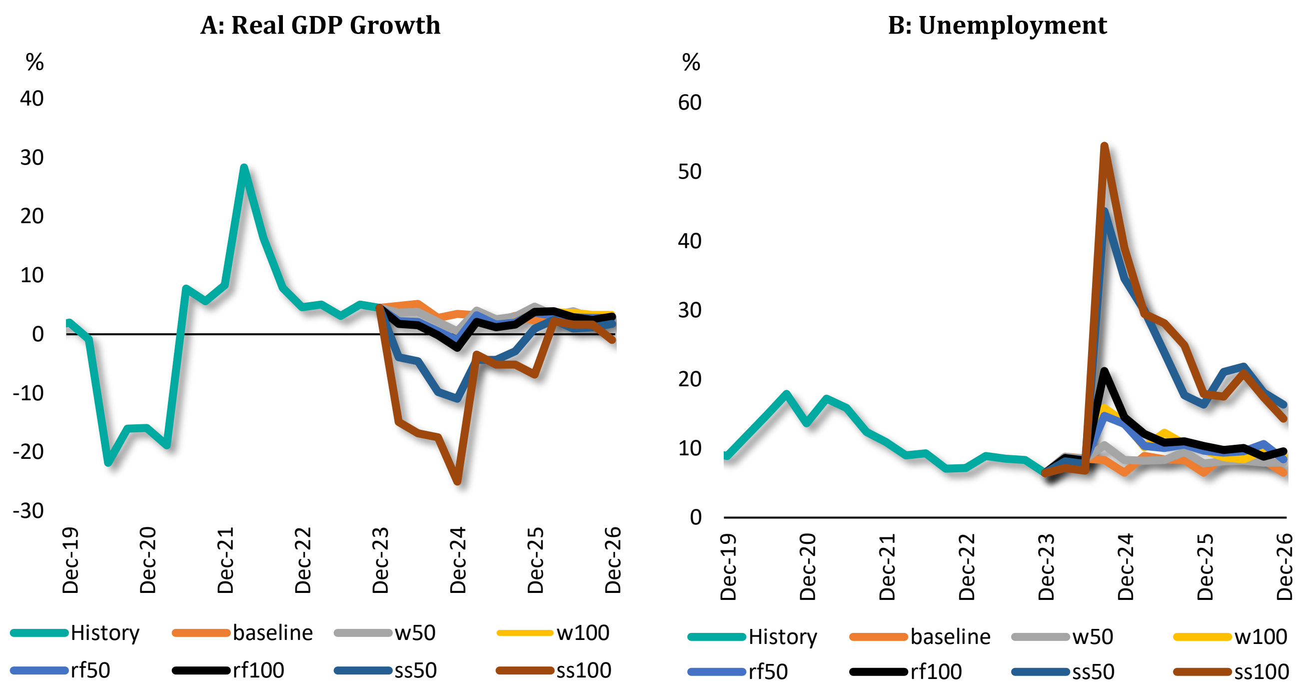
A fall in the hotel room stock resulting from a natural disaster limits the accommodation options for tourists, thereby causing a reduced appetite for the country's tourism product. The reduction in tourism activity also dampens the demand for goods and services in the non-traded sector, which will constrain growth in sectors such as wholesale & retail, transportation, and service industries dependent on tourism, including tour operator activities, motor vehicle renting and leasing, as well as entertainment services.

A fall in GDP as a result of reduced activity in the traded and non-traded sectors creates a domino effect, which will lead to higher unemployment and negatively impact a number of macroeconomic indicators. The contraction in economic activity reduces income levels for individuals and businesses, which erodes tax revenues and widens the Government's fiscal deficit. The combination of reduced growth and increased fiscal deficits results in an expansion of the country's debt-to-GDP ratio. Furthermore, the reduction in tourist arrivals triggers a drop in travel credits, thereby widening the current account deficit and constraining foreign-currency earnings. Credit growth is also likely to decrease as consumers and businesses become less inclined to borrow during crisis periods. Additionally, a decline in GDP (Figure 1A) often leads to increased defaults on loans as individuals and businesses struggle to settle outstanding debt obligations during economic downturns. Consequently, this failure results in a rise in non-performing loans (NPLs) for banks, which puts pressure on their balance sheets and potentially causes financial instability if not managed effectively. The results and macroeconomic linkages from the climate risk scenario are presented in Table 1.

Generally, in the scenarios, economic downturns are experienced in the first four quarters and then recovery ensues as a result of rebuilding efforts. GDP contractions in the wind and rainfall flooding fall slightly below the baseline, and then return to the economic growth path. As expected, the macro economic shocks are more severe in the storm surge scenarios as a substantial amount of the hotel stock is damaged. In the SS100 event, GDP is forecasted to contract by 25 percent in December 2024, a slightly larger contraction than during the pandemic.

applied when the country receives an insurance policy pay-out from the Caribbean Catastrophe Risk Insurance Facility, which is set at US$5 million for an earthquake or rainfall event and at US$7.5 million for hurricanes.

Figure 1: Real GDP Growth and Unemployment



Source: Authors' Calculations

Table 1: Summary of Scenario Design and Results

	Scenario	2019 Value of Capital Stock BDS M$	2024 Value of Capital Stock after Natural Disaster	% Change in Capital Stock & Tourist Arrivals	Recovery Period	2024 Results Post-Shock versus Baseline*
Moderate Scenarios	Wind 50 year (W50)	3,280.2	3,154.7	4%	1 year	GDP growth slows by 1.5 percentage points (pp), primary surplus (%GDP) falls by 0.1 pp, debt-to-GDP increases by 1.4 pp, external current account worsens 6.6%, credit growth slows by 0.36 pp.
	Wind 100 year (W100)	3,280.2	3,006.4	8%	2 years	GDP growth slows by 3.1 pp, primary surplus (%GDP) falls by 0.3 pp, debt-to-GDP increases by 3.0 pp, external current account worsens, credit growth slows by 0.75 pp.
	Rainfall Flooding 50 year (RF50)	3,280.2	3,020.9	8%	2 years	GDP growth slows by 3.1 pp, primary surplus (%GDP) falls by 0.3 pp, debt-to-GDP increases by 3.0 pp, external current account worsens by 13.7%, credit growth slows 0.74 pp.
	Rainfall Flooding 100 year (RF100)	3,280.2	2,989.8	9%	2 years	GDP growth slows by 3.5 pp, primary surplus (%GDP) falls by 0.4 pp, debt-to-GDP increases by 3.4 pp, external current account worsens by 14%, credit growth slows 0.85 pp.
Severe Senarios	Storm Surge 50 year (SS50)	3,280.2	2,550.9	22%	4 years	Percentage change in GDP contracts by 11.3 pp, primary surplus (%GDP) falls by 1.6 pp, debt-to-GDP increases by 13.7 pp, external current account worsens by 28%, percentage change in credt declines by 2.72 pp.
	Storm Surge 100 year (SS100)	3,280.2	1,547.4	53%	5 years	Percentage change in GDP contracts by 22.6 pp, primary surplus (%GDP) falls by 5.2 pp, debt-to-GDP increases by 27.7 pp, external current account worsens 89.8%, percentage change in credt declines by 5.48 pp.

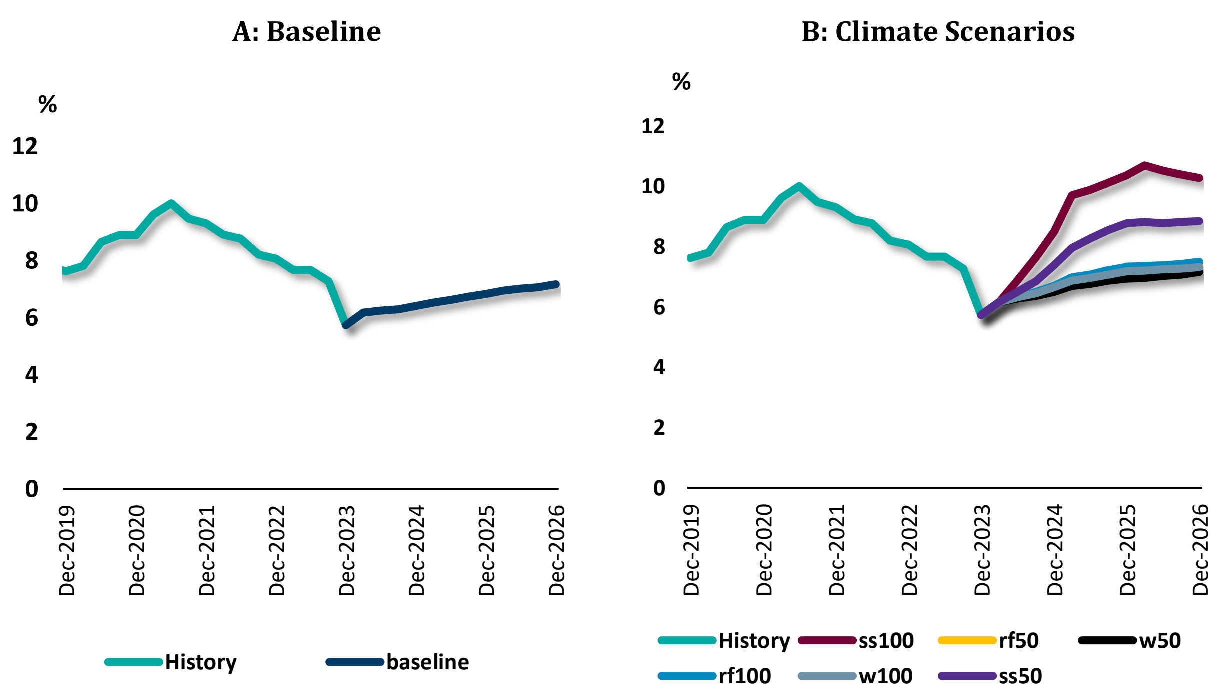
Source: Coastal Zone Management Unit and authors' calculations

Results

The Bank conducted its first ever climate risk assessment, assessing the potential impact of various climate change scenarios on the balance sheet of DTIs. Climate risk persists as a critical issue for financial stability. Barbados' hotel stock is positioned at the forefront of the climate crisis, as it is primarily situated along the island's coast and is poised to suffer significant damage in the event of climate change-induced events such as rising sea levels. The physical damage of the hotel stock would have negative implications for Barbados' core economic driver, tourism, which could manifest as impaired collateral value and asset quality for DTIs. In view of this, the principal aim of this exercise is to investigate DTIs'[51] resilience in the face of climate change-induced events. That is, whether DTIs are adequately capitalised to absorb losses emanating from the various climate scenarios.

Credit quality deteriorates during the climate scenarios. Damage to the hotel stock impairs borrowers' balance sheet as hotel operators lose their means of generating revenue and households lose their source of income. In the baseline scenario, the NPL ratio is expected to follow a gradual increase to 7.2 percent (Figure 2A). In the moderate scenarios, the NPL ratio is projected to increase to only slightly above the baseline while rising at a much faster pace in severe scenarios (Figure 2B). The severe scenario is characterised by an average peak unemployment rate of 49.1 percent and an NPL ratio of approximately 10.3 percent, which is on par with the peak of 10 percent recorded during the pandemic. This ratio has the potential to be lower if a forbearance policy is implemented as was the case during the pandemic.

Figure 2: NPL Ratios



Source: Authors' Calculations

[51] The credit union sector was not stressed by institution but as an aggregate.

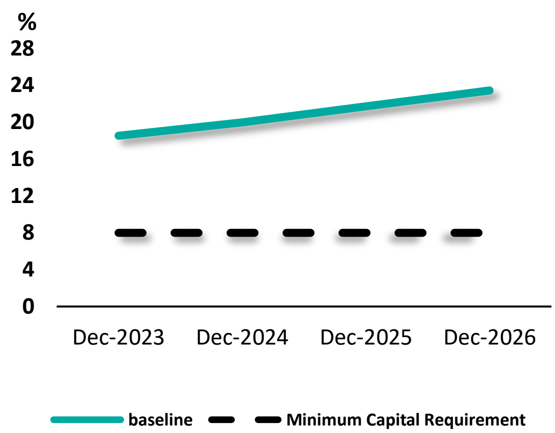
Loan loss provisions increase significantly during the severe climate scenarios. As economic conditions worsen after climate shocks, borrowers' likelihood of default increases. The proxy probability of default utilised in the climate risk assessment rose from 1.3 percent in the baseline to 1.8 percent in moderate scenarios and 2.4 percent in the severe scenarios. With the deterioration of credit quality during the climate scenarios, it is expected that more NPLs will end up in the more-provisioned (based on IFRS 9 expected credit loss provisioning) NPL categories of doubtful and loss. The results of this climate-risk assessment indicate that the stock of provisions more than doubles in the least severe scenario (w50) and more than triples in the most severe scenario (ss100). Additionally, the increase in loss loans is expected to trigger greater write-offs as the existing regulation states that loss loans need to be written-off within three months. Consequently, the write-off rate is shocked by 15 percent in the moderate climate scenarios and 20 percent in the severe scenarios.

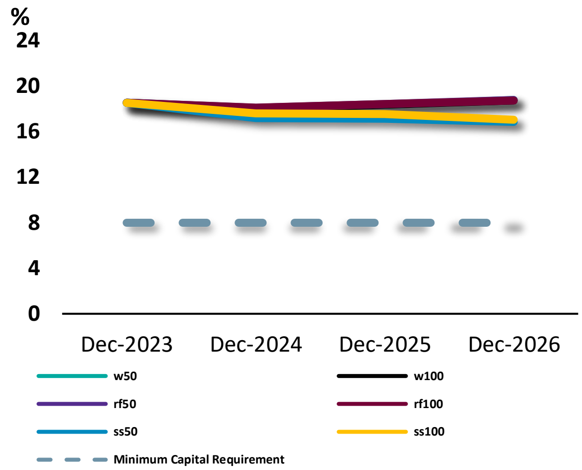
Heightened provisions and lower credit growth during the initial economic downturn negatively impacted the profitability of the sector. Interest income accounts for the majority of the institutions' revenue and hence in periods when credit contracts, their profitability is adversely affected. In line with the initial contraction of credit during the first four quarters of all scenarios, all institutions except two face losses despite recording profits in the initial period. However, as the economy returns to recovery, and credit expands due to rebuilding efforts, profitability of the sector improves.

Ultimately, the results show that the overall DTI sector is resilient, but a combination of weak profitability and low credit quality pre-shock can reduce resilience. The overall DTI sector remained resilient across all climate scenarios with the sector's ending CAR reaching 17.6 percent in the most severe scenario of ss100 (Figure 3A and 3B). From the first year, one institution fell below the minimum capital adequacy requirement of 8 percent. This institution began the exercise with below-average profitability and credit quality when compared to other DTIs. In the last year, an additional institution also falls below the requirement. Those two institutions would require a capital injection of 0.4 percent of GDP.

Figure 3: Capital Adequacy Ratios

A: Baseline **B: Climate Scenarios**





Source: Authors' Calculations

Conclusion

Climate risk, especially physical risk, is expected to remain a critical financial stability issue. Physical risk has significant repercussions for the Barbadian economy, especially for the hotel stock, which is primarily positioned along the coastline. Damage estimates from the CZMU range from 4 percent to 9 percent in moderate scenarios and 22 percent to 53 percent in the severe scenarios. In line with this, GDP contracted more negatively in the severe scenarios ranging between an 11.6 percent and 22.6 percent contraction.

Results from a satellite credit risk model indicate that credit quality measures significantly worsen during and post climatic scenarios, with the NPL ratio reaching a peak of 10.3 percent and taking relatively longer to return to the baseline trajectory. Additionally, the probability of default almost doubles in the severe scenario, requiring institutions to hold more than three times the provisioning levels than in the baseline scenario.

With such implications, policymakers must consider mitigative policy actions such as the forbearance policy, which was implemented during the pandemic to ease the costs of poor credit quality. Nonetheless, the results indicate that the overall DTI sector remains resilient, maintaining a CAR above the requirement, but institutions with weak profitability and credit quality pre-shock are the most vulnerable. This also signals to policymakers the need to examine the resilience of individual institutions and not just the overall sector. The Central Bank of Barbados plans to continue improving the methodology applied in its climate risk assessments, expanding its scope to include the insurance sector, feedback effects, and other satellite models.

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Appendix A: Macroeconomic Stress Testing Methodology

Following the IMF 2023 Technical Assistance recommendations, the macroeconomic stress test framework has been implemented on the basis of newly developed specifications for the projections of the sectoral NPL ratio for deposit-taking institutions' (DTIs): commercial banks, finance companies, and credit unions.[52] The stress test tool uses existing accounting, tax, and regulatory rules for DTIs. In particular, the projected loan loss provisions were based on the IFRS 9 Expected Credit Loss concept. These provisions entail time-varying provisioning rates across various credit quality classes of loans. Such rates increase during periods of economic downturns and decrease during periods of economic prosperity. This dynamic reflects an additional channel through which adverse economic conditions impact DTIs. Furthermore, adherence to the definition of regulatory capital for banks, including the limits on the inclusion of selected Tier 2 items (such as general provisions), is ensured. This encompasses compliance with distinct minimum capital adequacy ratio levels for Tier 1 and total regulatory capital. For credit unions, capital adequacy is assessed using the minimum Tier 1 Leverage ratio (total capital as a percentage of non-risk weighted assets) of 4 percent, consistent with Basel standards. Finally, the stress test tool includes both corporate income tax and the recently introduced tax on assets.

The stress test framework is based on explicit calibrated macroeconomic scenarios – one baseline and two adverse. The baseline scenario reflects the Bank's most recent macroeconomic forecast, while two adverse scenarios (titled "moderate" and "severe") were calibrated to capture different intensities of an economic recession. The macroeconomic projection framework that was used for the baseline scenario includes various interlinkages among key macroeconomic variables and economic sectors, which ensures internal consistency and was used to project macroeconomic variables at a quarterly frequency for the next three years (2024-2026). The scenario-specific macroeconomic projections were used to predict non-performing loans (NPLs) via a sectoral credit risk satellite models for banks, finance companies, and credit unions. For each sectoral institution, the absolute change in the projected aggregate NPL ratio is applied onto the starting NPL ratio level in each of the loan segments. Using absolute rather than relative changes ensures that even institutions with a 0 percent starting level of the NPL ratio in some loan segments are hit by new NPLs in times of adverse economic developments.

In addition to the NPL ratio, the stress test tool projected the special-mention-to-performing loans ratio for each institution and each segment. Banks and finance companies use IFRS 9 to create provisions and provisioning rules are different for the three IFRS 9 credit quality "stages". As the breakdown by IFRS 9 stages is not currently collected by the Bank, the stress test tool approximates the provisioning with the credit quality classes reported to the Bank by banks (good/pass loans represent the Stage 1, special mention loans represent Stage 2, and non-performing loans represent Stage 3). In times of adverse economic conditions, the proportion of special mention (Stage 2) loans in performing loans typically increases, too, along with the NPL ratio. Instead of estimating a separate model, the projection for special-mention-to-performing loans ratio is linked to the projection of the NPL ratio, using an elasticity specified as a parameter that is set by expert judgment. The loan growth projection calibrated as part of the scenario and, for simplicity, applied

[52] The stress test was used separately for commercial banks/finance companies and credit unions.

equally across all loan segments and institutions, would then jointly with the credit risk projections (NPL ratio, special-mention-to-performing loans ratio) determine the paths of the good, special mention, and non-performing loan exposures.

Projection of loan loss provisions is based on the assumptions about the provisioning rates for the three credit risk classes, approximating the IFRS 9 Expected Credit Loss (ECL). The NPL provisioning levels are institution- and segment-specific, constructed for each year of the horizon as the starting NPL provisioning rate of the institution in that segment plus an assumed increase of around 10-20 percentage points (cumulative) in both adverse scenarios (typically no change from the starting level for the baseline scenario). This shock reflects a worsened recovery of bad loans, for example due to a decrease in the value of collateral. This change of the NPL provisioning level is then used as a proxy for a change in the Loss Given Default (LGD), which is needed to approximate the changes in provisioning for Stage 1 (one-year ECL) and Stage 2 (lifetime ECL) loans. The other key credit risk parameter needed for the ECL is the probability of default (PD), which is – as a proxy – derived from the NPL ratio projections, assuming a particular level of NPL write-offs. The changes in PD and LGD are then used jointly to project changes from the initial provisioning rates for Stage 1 and Stage 2 loans, with an additional expert adjustment using a pre-defined (and changeable) passthrough elasticity to safeguard relatively smooth changes over time. Provisions created for good loans are considered general provisions and qualify as Tier 2 regulatory capital up to 1.25 percent of credit risk-weighted assets, in line with Basel standards. Final loan loss provisions impacting the P&L are derived from the projected stocks, considering scenario- and year-specific NPL write-offs. These are calibrated by expert judgment using the information about past write-offs in the banking sector.

A shock to NPL provisioning rate (which serves as a proxy for the loss given default, LGD) of 10 percentage points in the moderate scenario and of 20 percentage points in the severe scenario was assumed and applied in the first period of the horizon (the increased NPL provisioning rate was kept for the next two years). On average, the starting NPL provisioning was 5.3 percent (end-2023). For the severe scenario, these rates increase to about 33 percent. The NPL write-off rate was set to equal 10 percent for the baseline, 15 percent for the moderate, and 20 percent for the severe. The assumed increase in the NPL write-off rate was in keeping with the severity of the economic recession and reflects the regulation that requires banks to write off loans that are in the loss category (i.e., more than 360 days past due).

No market risk impact is assumed. This reflects the common practice of banks in Barbados to not mark-to-market the securities held in their balance sheets to account for market interest rate developments. Banks hold government securities, which are an important source of interest income, but they are not revalued.[53] For the foreign exchange risk, the long-standing peg of the Barbadian dollar to the US dollar virtually removes the exchange rate risk in the institutions' balance sheets and was thus not considered an item to be stressed.

Pre-provision income is projected as a sum of net interest income and non-interest income minus non-interest expenses, serving as the first line of defence against credit losses. Net interest income is a product of the institution-specific net interest margin (defined as the initial ratio of net interest income to interest bearing assets adjusted for a possible haircut in adverse scenarios)

[53] Licensees report the book value of investments (foreign and local) to the Bank.

and scenario-specific interest-bearing assets, which typically decline in adverse scenarios amid the migration of performing loans to NPLs. Non-interest income and expenses are projected to be a product of the institution-specific starting point and a haircut set by expert judgment. The net interest margin was assumed to remain at the initial institution-specific levels, but the underlying interest-bearing assets are in general, lower in the adverse scenarios, leading to a lower net interest income. This is driven mainly by the evolution of performing loans (which decline given their move to the NPL category), as the additional asset items that might bring interest income such as debt securities, reserves at the Bank (for commercial banks), and claims on banks were assumed to remain at initial levels. The non-interest income was assumed to remain at the previous year's level in the baseline and then drop by 5 percent and 10 percent in the moderate and the severe scenarios, respectively. Non-interest expenses are assumed to remain stable in all scenarios.

Capital is projected consistently with the existing regulatory framework, changing over the horizon as a function of net income. Negative net income – accounting losses – decreases capital, while positive net income is first subject to the distribution decision so that only the retained part (after the dividend pay-outs) is topping up the capital. The assumptions about dividend pay-outs are institution-specific, reflecting their typical dividend pay-out behaviour. Banks do not *typically* pay dividends, so this parameter was set to zero.

Total assets are projected as the sum of time-varying net loans and other financial assets, while credit risk-weighted assets (RWAs) are projected as a function of net exposures and the initial average risk weight. RWAs for market and operational risk were kept constant. Total assets and also RWAs will thus be driven by credit growth, the evolution of the NPL ratio, and provisioning, and both would typically decline in adverse scenarios amid very low or negative gross credit growth, migration of a large part of loans to NPLs, and higher average NPL provisioning, bringing the net value of loans down.

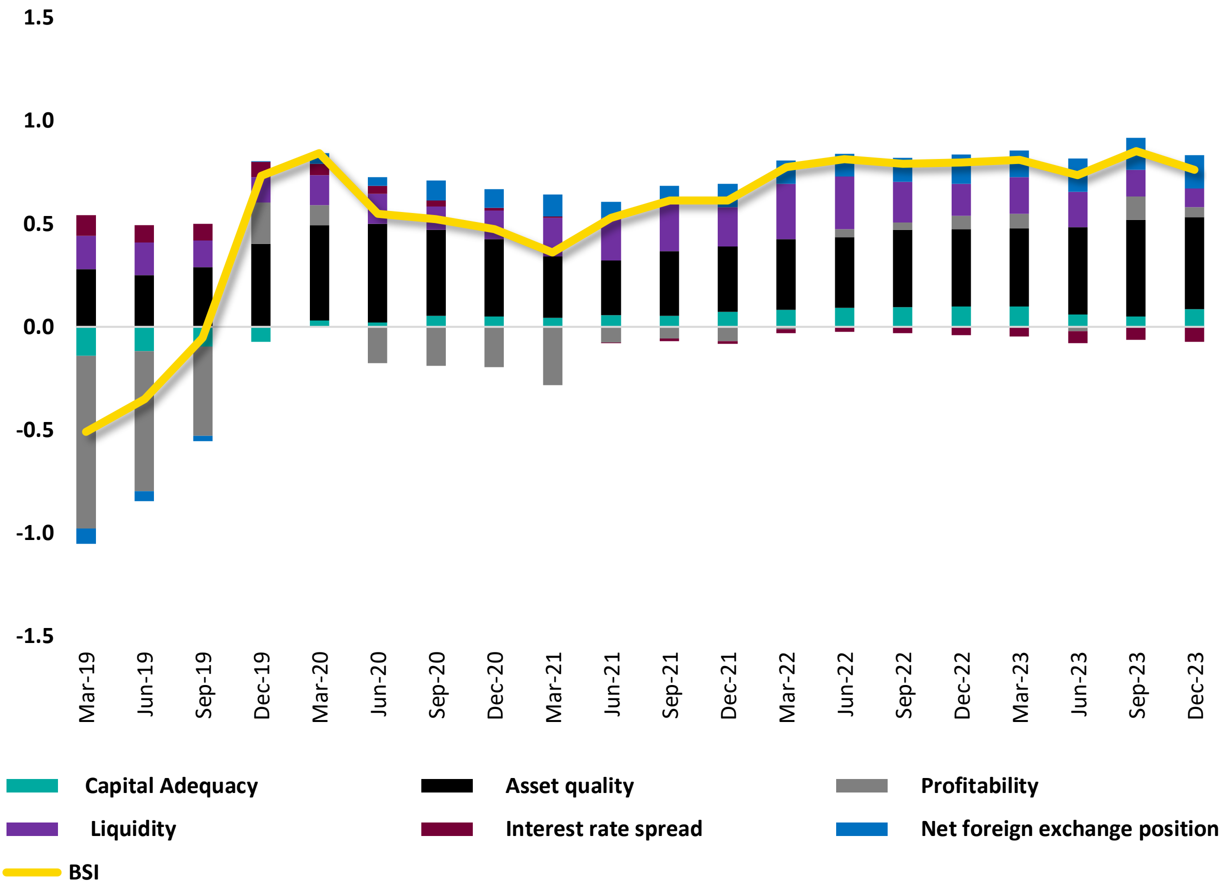
The tool reports the key results based on capital ratios. Apart from the scenario-specific evolution of the capital adequacy ratio for banks and finance companies, the tool shows the factors that contribute to the changes in the capital (adequacy) ratio such as net interest income (+), other income/expenses (+/-), credit losses (-), dividend pay-outs and taxes (-), and the change in the denominator of the ratio, that is, (risk-weighted) assets (+/-). Also, a number of institutions in each year and scenario that are below a specified hurdle rate for the total capital (adequacy) ratio (and Tier 1 ratio for banks) and their share in the sector's assets is reported, together with capital injections (expressed as a percentage of GDP) that are needed to bring all institutions to at least the minimum capital (adequacy) ratio.

Appendix B: Macroprudential Indicators

Banking Stability Index (BSI)

Despite improvements in NPLs and ROA during 2023, the Banking Stability Index (BSI) declined marginally. The BSI, a composite indicator of bank performance, reflects the stability of the financial system. With lower NPLs, the asset quality component recorded the largest improvement. In contrast, the liquidity, return on equity, and interest rate spread were all lower relative to the end of 2022 and this resulted in the BSI score declining slightly from 0.85 in 2022 to 0.76 at end 2023 (Figure B1).

Figure B1: Partial Indicators for Banking Stability Index



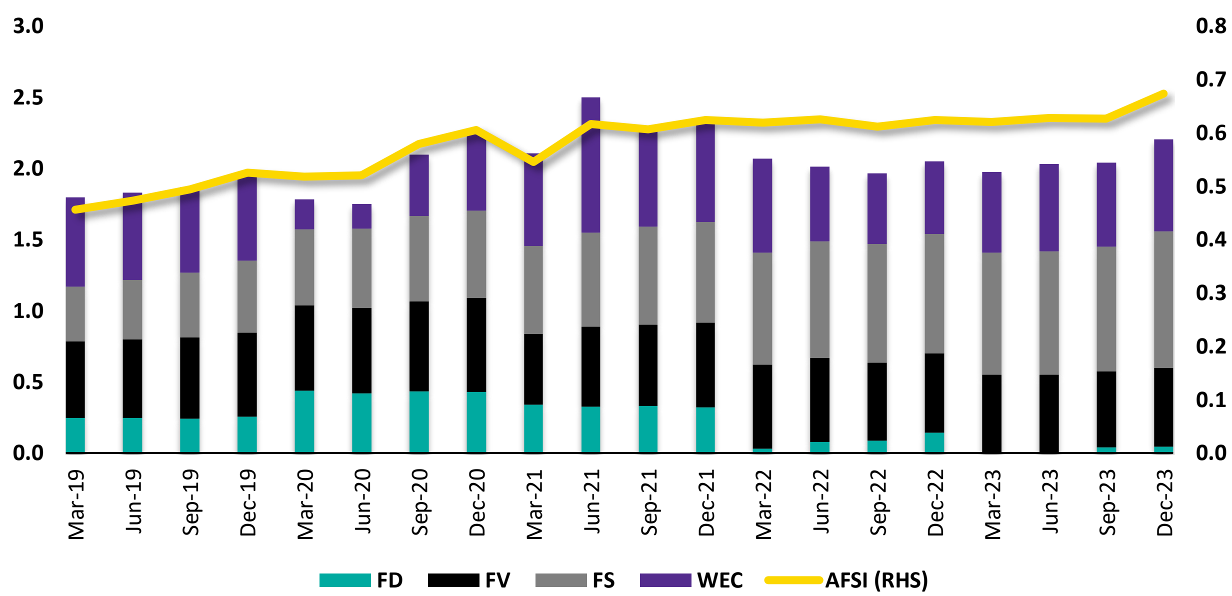
Source: Central Bank of Barbados

Aggregate Financial Stability Index (AFSI)

The Aggregated Financial Stability Index (ASFI) is a composite measure evaluating the stability of the commercial banking sector. It is derived as a weighted average of normalised macroeconomic and financial statement variables, with four key sub-indices: financial development (FD), financial vulnerability (FV), financial soundness (FS), and the world's economic climate (WEC). Each variable is normalised so that an increase denotes an improvement in financial stability. The sub-indices are equally weighted, and the ASFI is a weighted sum of these variables.

Figure B2 illustrates that the ASFI improved in 2023, particularly in the final quarter. This enhancement was driven by steady global economic growth, reduced volatility in the US stock market, better non-performing loan ratios, and stronger capital positions of local banks. Given this, movements in the WEC and FS sub-indices were the major contributors to the progress in the AFSI. The ASFI averaged 0.64 in 2023, up from an average of 0.62 in 2022, while the WEC and FS sub-indices averaged 0.55 and 0.82, respectively, in 2022 compared to 0.60 and 0.89, respectively, in 2023.

Figure B2: Aggregate Financial Stability Index



Source: Central Bank of Barbados

Appendix C: Financial Development Indicators

Table C1: Key Indicators of the Structure of the Financial System

	2017	2018	2019	2020	2021	2022	2023
Number of:							
Total DTIs	46	45	43	42	41	38	37
Commercial Banks	5	5	5	5	5	5	6
Finance Companies	8	7	5	5	4	4	4
Credit Unions	33	33	33	32	32	29	27
Insurance Companies	23	22	22	22	20	20	20
Life	7	7	7	6	6	6	6
Non-Life	16	15	15	16	14	14	14
Pension Plans	287	274	260	261	251	248	245
Mutual Funds	16	16	16	16	18	19	19
Assets to Total Financial System Assets (%)							
Total DTIs	67.9	66.6	65.4	65.5	64.7	66.7	65.2
Commercial Banks	53.0	52.4	51.2	51.0	50.2	51.8	50.7
Finance Companies	6.2	4.2	3.9	3.8	3.8	3.9	3.6
Credit Unions	8.7	10.0	10.3	10.8	10.7	11.0	10.9
Insurance Companies	14.1	14.3	14.4	14.6	13.9	13.5	15.1
Life	9.9	10.1	10.3	10.6	10.1	9.9	11.1
Non-Life	4.2	4.2	4.1	4.0	3.8	3.7	4.0
Pension Plans	9.1	10.2	10.5	10.3	11.2	10.1	9.8
Mutual Funds	8.8	8.9	9.6	9.6	10.2	9.7	9.9
Assets to GDP (%)							
Total DTIs	171.7	157.0	153.0	177.7	179.3	158.4	147.5
Commercial Banks	134.7	123.5	119.5	138.1	139.1	122.9	114.7
Finance Companies	14.9	9.9	9.3	10.4	10.4	9.3	8.1
Credit Unions	22.1	23.6	24.3	29.3	29.8	26.2	24.7
Insurance Companies	35.9	34.0	34.2	40.4	39.4	32.9	34.3[p]
Life	25.3	24.1	24.4	29.4	28.6	24.0	25.2[p]
Non-Life	10.6	9.9	9.8	11.0	10.8	8.9	9.1[p]
Pension Plans	23.3	24.2	24.9	28.8	31.8	26.5	22.1[e]
Mutual Funds	22.6	21.1	22.9	26.7	29.0	23.4	22.5
Memo:							
Credit Union Membership (000's)	195	206	216	222	228	235	240
Pension Plans Membership (000's)	28	29	26	24	28	27	27

Sources: Central Bank of Barbados and Financial Services Commission

p – Provisional

e – Estimate

Table C2: Key Indicators of the Payments System

$ Millions	2017	2018	2019	2020	2021	2022	2023
RTGS Transactions	36,781	27,001	11,668	14,771	15,488	16,163	18,092
ACH Transactions	19,584	19,559	19,293	17,268	19,710	24,566	26,274
Cheques	17,343	17,151	15,573	11,412	10,198	12,079	11,910
Direct Payments	2,241	2,408	3,719	5,855	9,512	12,487	11,715
Debit Card Transactions	1,197	1,248	1,324	1,223	658	N/A	N/A
ATM Transactions	660	675	698	611	329	N/A	N/A
Debit Card POS Transactions	537	573	626	612	328	N/A	N/A
Credit Card Transactions	725	717	739	646	726	967	1,116
Personal Sector	615	607	604	520	574	737	847
Business Sector	110	110	135	126	152	230	270
Currency in Circulation Outside of Commercial Banks and Finance Companies	599	626	656	736	799	808	843

Source: Central Bank of Barbados

N/A – Not Available

Appendix D: Financial Soundness Indicators

Table D1: Financial Soundness Indicators – Commercial Banks

	2017	2018	2019	2020	2021	2022	2023 Q1	2023 Q2	2023 Q3	2023 Q4
Solvency Indicators (%)										
Capital adequacy ratio (CAR)	17.0	13.8	13.5	16.0	16.8	17.6	18.4	18.6	18.7	20.9
Leverage ratio	8.6	7.5	7.0	9.5	9.9	10.5	11.0	11.0	11.1	12.6
Non-performing loans net of provisions to capital[1]	5.8	10.6	11.5	11.2	11.3	11.2	10.8	10.6	9.1	9.2
Liquidity Indicators (%)										
Loan-to-deposit ratio	74.7	63.0	61.7	57.1	53.0	53.1	52.2	52.2	53.7	54.3
Transferable deposits to total deposits	90.0	92.3	94.8	95.9	96.3	96.9	97.0	97.0	97.3	97.2
Transferable deposits to total deposits (Domestic currency)	91.5	92.7	94.9	95.9	96.4	96.9	97.0	97.1	97.3	97.3
Liquid assets to total assets	29.7	25.9	26.0	27.5	31.1	32.0	32.6	32.5	31.8	30.9
Liquid assets to total assets (Domestic currency)	32.6	26.1	21.8	25.4	28.8	28.9	30.0	30.3	28.8	28.1
Liquid assets to transferable deposits	46.1	36.5	35.5	36.1	40.2	40.4	41.1	41.2	40.4	39.5
Credit Risk Indicators (%)										
Total loans (y-o-y change)	1.2	-0.7	-0.6	-2.1	-2.1	6.2	6.7	6.8	5.7	2.7
NPL ratio	7.7	7.4	6.6	7.3	7.3	5.9	5.7	5.5	4.9	5.0
Substandard loans to total loans	6.1	5.7	5.2	5.5	5.7	4.9	4.8	4.5	4.2	4.2
Doubtful loans to total Loans	0.8	0.9	0.5	1.3	1.0	0.6	0.5	0.5	0.4	0.4
Loss loans to total loans	0.8	0.8	0.9	0.5	0.6	0.4	0.4	0.5	0.3	0.3
Provisions to NPLs	80.4	67.3	59.4	62.0	60.3	50.8	51.2	49.3	50.6	50.3
Foreign Exchange Risk Indicators (%)										
Foreign-currency loans to total loans	18.3	4.0	2.9	1.8	1.7	1.6	1.5	1.4	1.4	1.3
Foreign-currency deposits to total deposits	8.1	6.8	6.7	8.0	7.8	8.9	9.8	9.1	9.2	8.8
Liquid assets to transferable deposits (Foreign currency)	90.7	73.1	140.8	96.2	92.8	82.3	78.9	77.2	83.2	83.5
Profitability Indicators (%)										
Return on equity	11.5	-1.8	5.4	7.1	10.3	11.9	11.8	12.4	17.6	15.7
Return on average assets	1.3	-0.2	0.6	0.8	1.1	1.3	1.3	1.4	2.0	1.8
Net interest margin	5.1	5.3	5.7	4.9	4.5	4.8	4.8	4.8	4.8	4.8
Interest rate spread	5.8	6.0	6.1	5.7	5.6	5.5	5.2	5.2	5.2	5.1

Source: Central Bank of Barbados

[1]Revised estimates

Table D2: Financial Stability Indicators (FSIs) – Finance Companies

	2017	2018	2019	2020	2021	2022	2023 Q1	2023 Q2	2023 Q3	2023 Q4
Solvency Indicators (%)										
Capital adequacy ratio (CAR)	38.3	21.4	18.4	19.3	19.0	19.9	21.0	20.3	20.5	20.6
Leverage ratio	22.0	11.5	11.2	12.1	12.4	12.8	14.4	13.9	13.7	14.1
Non-performing loans net of provisions to capital	11.8	24.5	43.0	42.5	63.1	51.2	45.0	42.5	44.7	42.1
Liquidity Indicators (%)										
Loan-to-deposit ratio	103.2	97.3	97.2	103.0	100.6	107.8	112.1	112.6	112.9	119.2
Transferable deposits to total deposits	18.2	1.4	2.6	3.6	5.6	5.1	5.4	6.2	6.9	3.4
Transferable deposits to total deposits (Domestic currency)	18.4	1.3	1.6	2.3	2.1	2.6	2.7	2.7	2.7	2.5
Liquid assets to total assets	19.3	13.7	12.9	11.9	13.3	18.0	14.8	13.9	15.3	13.8
Liquid assets to total assets (Domestic currency)	17.7	12.2	9.7	8.8	6.9	12.7	8.9	8.6	10.8	8.8
Liquid assets to transferable deposits	170.0	1382.0	678.2	459.3	332.0	544.7	420.0	347.2	350.5	652.5
Credit Risk Indicators (%)										
Total loans (y-o-y change)	(0.6)	(25.9)	(0.4)	2.8	1.8	3.1	2.1	1.2	1.5	-0.1
Non-performing loans ratio	9.4	8.4	11.3	11.7	16.1	14.1	12.5	12.2	12.8	12.2
Substandard loans to total loans	6.4	6.8	8.9	9.2	13.3	11.8	10.7	10.3	6.8	10.3
Doubtful loans to total loans	0.8	0.6	0.6	0.9	0.7	0.3	0.3	0.6	4.4	0.6
Loss loans to total loans	2.3	1.0	1.7	1.5	2.0	2.0	1.5	1.3	1.6	1.4
Provisions to NPLs	44.9	31.0	26.0	30.1	24.0	26.1	26.1	28.1	27.1	26.5
Foreign Exchange Risk Indicators (%)										
Foreign-currency deposits to total deposits	1.4	0.2	1.3	1.7	5.1	3.0	3.1	3.9	4.6	1.4
Liquid assets to transferable deposits (Foreign currency)	2189.3	2528.1	486.7	360.0	266.1	369.2	363.9	258.0	198.0	893.0
Profitability Indicators (%)										
Return on equity	4.4	1.9	7.8	5.3	7.0	8.7	8.4	7.7	7.2	7.4
Return on average assets	1.2	0.4	1.2	0.7	1.0	1.2	1.2	1.1	1.1	1.1
Net interest margin	4.7	4.7	4.4	4.5	4.4	4.6	4.5	4.4	4.4	4.8
Interest rate spread	4.7	4.4	4.5	4.3	4.2	4.2	4.0	3.9	3.9	4.0

Source: Central Bank of Barbados

Table D3: Performance Indicators – Credit Unions

	2017	2018	2019	2020	2021	2022	2023
Solvency Indicators (%)							
Total capital to total deposits	14.3	13.7	13.0	12.6	12.8	12.9	12.9
Total capital to total assets	12.2	11.8	11.3	11.0	11.1	11.2	11.2
Total NPLs on total capital	47.0	53.3	58.1	76.7	73.0	73.6	73.7
Total NPLs net of provisions to total capital	32.7	37.7	41.2	58.7	50.1	50.3	54.5
Liquidity (%)							
Liquid assets to total assets	5.7	10.0	14.0	17.7	17.6	15.3	14.5
Liquid assets to total deposits	6.6	11.6	16.1	20.3	20.3	17.7	16.7
Total loans to total deposits	86.7	81.9	78.3	73.4	73.2	74.6	74.6
Credit Risk Indicators (%)							
Total loans to total assets	74.4	70.8	68.2	64.0	63.5	64.7	64.7
Total NPLs to total loans	7.7	8.9	9.6	13.2	12.8	12.7	12.8
Total NPLs net of provisions to total loans	5.4	6.3	6.8	10.1	8.8	8.7	9.4
Provisions to total NPLs	30.4	29.3	29.2	23.4	31.4	31.7	26.0
Provisions to total loans	2.4	2.6	2.8	3.1	4.0	4.0	3.3
Profitability Indicators (%)							
Return on average assets	1.2	0.9	0.9	0.7	0.7	0.8	0.5
Interest margin to gross income	63.9	62.0	68.4	67.4	65.2	67.5	65.6
Growth Indicators (%)							
Total assets	8.7	9.6	7.5	7.3	5.3	4.6	2.9
Total deposits	9.4	10.4	8.3	7.6	4.8	4.4	2.8
Total loans	6.3	4.2	3.5	0.8	4.4	6.0	2.8

Source: Financial Services Commission

Table D4: Performance Indicators – General Insurance

	2017	2018	2019	2020	2021	2022	2023
Capital Adequacy (%)							
Net prem. to capital	80.9	114.1	143.6	135.5	83.6	112.3	91.7
Capital-to-assets ratio	26.2	20.4	17.2	17.8	27.9	21.7	26.3
Capital-to-liabilities ratio	35.6	25.7	20.8	21.7	38.8	27.8	35.7
Asset Quality (%)							
Equities to total assets	4.4	5.0	3.9	4.8	7.9	7.9	7.3
Receivables to (GPW and Rein. Recoveries)	17.7	17.4	15.1	16.1	18.3	15.1	15.0
Reinsurance and Actuarial Issues (%)							
Rein. ceded to GPW	51.5	52.1	50.5	53	53.4	55.9	56.2
Earnings & Profitability (%)							
Loss Ratio	64.3	64.7	60.7	57.2	63.2	69.3	64.7
Return on assets	0.1	-2.4	2.1	4	5.1	-2.9	3.9
Return on equity	0.4	-11.8	12.2	22.3	18.1	-13.3	14.8
Net income to GPW	0.3	-5.2	4.4	8.2	10.7	-5.5	7.5
Liquidity (%)							
Liquid assets to total liabilities	23.5	26.2	28.6	25.2	30.5	26.5	26.0

Source: Financial Services Commission

Table D5: Performance Indicators – Life Insurance

	2017	2018	2019	2020	2021	2022	2023
Capital Adequacy (%)							
Net prem. to capital	18.6	21.2	19.9	17.7	17.6	18.1	15.3
Capital-to-technical reserves	93.6	91.8	93.7	100.6	98.8	102.1	124.2
Asset Quality (%)							
Equities to total assets	1.1	0.5	0.5	0.4	0.4	0.3	0.4
Real estate to total assets	3.5	3.5	3.3	3.0	2.9	2.8	2.3
Related-party investments to total assets	41.6	42.6	43.9	44.9	41.4	40.6	47.3
Earnings & Profitability (%)							
Investment income to invested assets	2.8	-1.8	2.8	2.3	2.4	2.6	2.6
Return on assets	5.3	6.3	4.8	4.4	3.5	4.0	1.1
Return on equity	11.6	14.0	10.4	9.0	7.3	8.1	2.0
Net income to GPW	53.9	58.5	46.3	45.5	38.3	41.6	12.7
Liquidity (%)							
Liquid assets to total liabilities	7.4	8.1	7.8	9.1	8.4	6.8	6.4

Source: Financial Services Commission

Table D6: Performance Indicators – Mutual Funds

	2017	2018	2019	2020	2021	2022	2023
Asset Concentration (%)							
Related-party investments to total assets	27.2	28.4	30.0	30.7	30.7	30.1	27.9
Liquidity (%)							
Cash & cash equivalents to total assets	7.7	6.1	6.3	4.9	5.2	4.1	3.6
Liquid investments to total assets	32.0	28.1	27.5	25.8	25.1	24.8	27.5
Asset Growth (%)							
Return on net assets (net income/net assets)	13.3	-1.8	8.6	-3.6	24.0	-1.2	15.6
Net assets under management	26.4	-3.8	13.5	1.9	11.5	-3.1	5.3

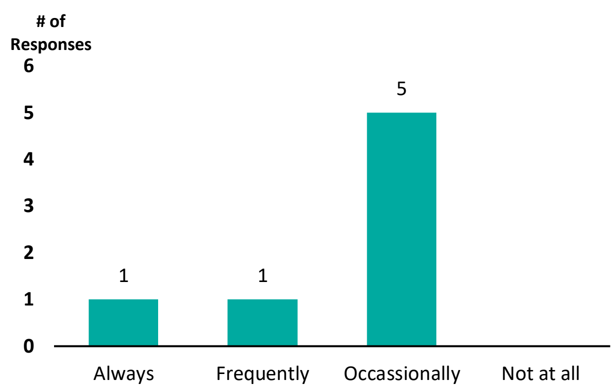
Source: Financial Services Commission

Appendix E: Climate and Environmental Risk Management Survey Report

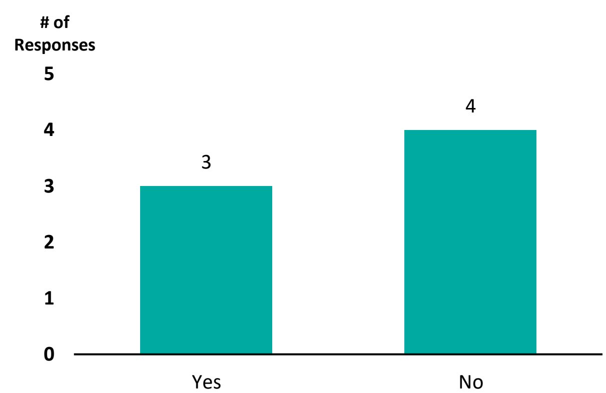
Banks and finance companies within Barbados have started to incorporate climate-related risks into their assessments as it relates to the granting of credit. Seven respondents to the survey indicated that they incorporate climate-related and environmental risks throughout the credit granting process (Figure E1A). In assessing the effects of climate-related factors on a borrower's default risk, three institutions indicated "Yes" (Figure E1B). Regarding the valuation of assets, four institutions incorporated climate-related and environmental risks in relation to the valuation of collateral, specifically in relation to physical locations (Figure E2A). However, this was not the case pertaining to climate-related risk premiums on assets. Seven respondents indicated that they do not apply that type of premium on any of the items on the asset side of their balance sheet (Figure E2B).

Figure E1: Climate-Related Risks Assessment

A: Does your institution incorporate climate-related and environmental risks in all relevant stages of the credit-granting process?



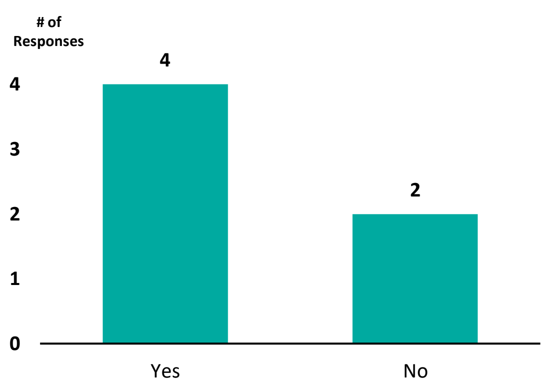
B: Does your institution assess the impact of climate-related and environmental factors on a borrower's default risk?



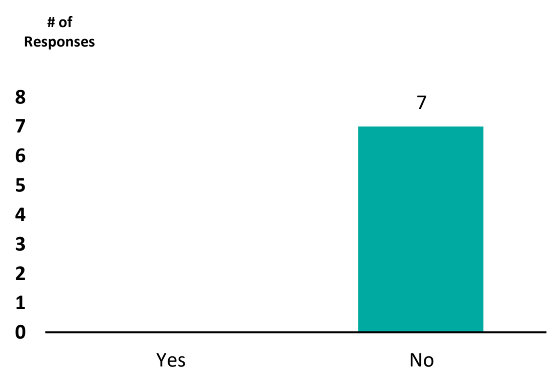
Source: Central Bank of Barbados

Figure E2: Valuation of Assets

A: Does your institution consider climate-related and environmental risks in collateral valuations, particularly in relation to the physical locations?



B: Does your institution apply a climate-related risk premium on its assets?



Source: Central Bank of Barbados

Banks and finance companies have placed an emphasis on Environmental, Social and Governance (ESG) within their corporate strategy.[54] Institutions have not only committed to going paperless or using minimal paper within their operations, but also using recyclable materials and more energy efficient equipment. In terms of supporting greening initiatives, they have provided products such as loans for commercial and household solar generation and the purchasing of hybrid and electric vehicles. Some institutions have decided to allow some employees to work remotely in order to decrease the carbon footprint.

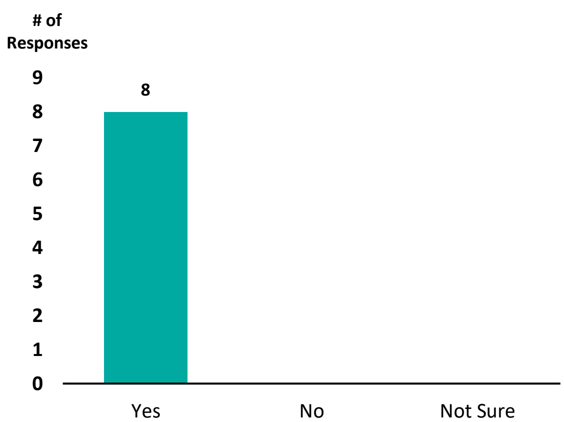
[54] Derived from a survey issued to both banks and finance companies in which part was focused on climate and risk management assessment for financial institutions.

Appendix F: Cyber Risk Survey Report

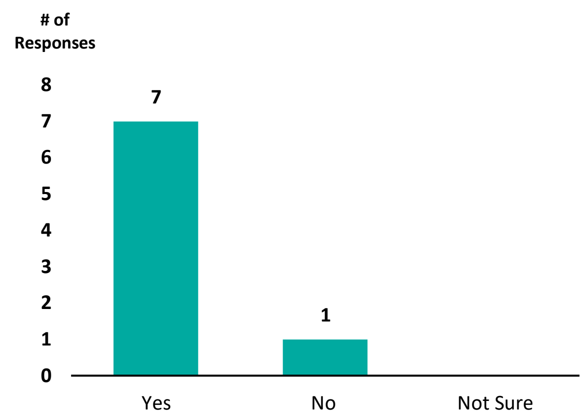
All respondents (six commercial banks and two finance companies) indicated that cyber risk is deemed as a priority (Figure F1A). Further, all institutions, save one, indicated that they have a board-approved cyber security strategy in place (Figure F1B). As a result, these DTIs have implemented cyber security policies (Figure F1C) which encompass both a documented and regularly tested cyber incident response plan internally (Figure F1D). In terms of their management framework, seven of the eight respondents incorporated recovery activities which include procedures on returning to normal business operations or to a pre-defined acceptable level of operations (Figure F1E). In order to strengthen their preparedness against attacks, all respondents have put in place internal cyber security training for their employees (Figure F1F).

Figure F1: Cyber Risks as A Priority and Company Strategy

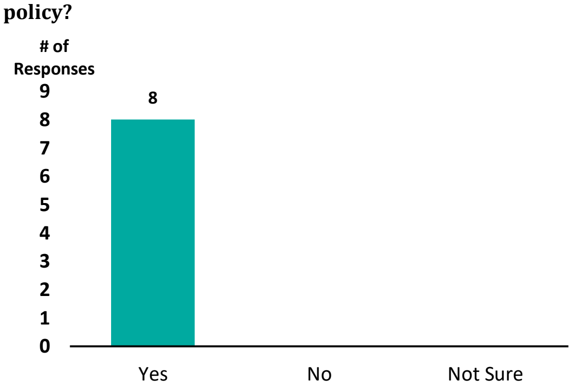
A: 1. Considering the increasing risks posed by cyber threats to the entire financial system, has your institution made cyber risk a priority?



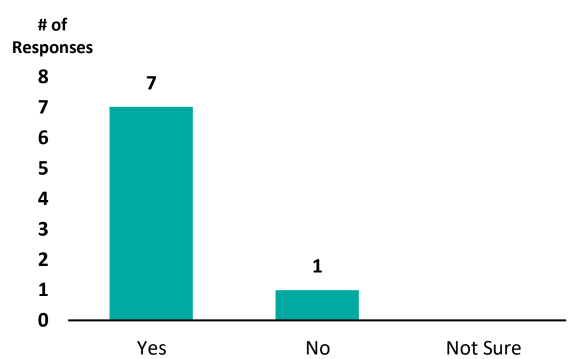
B: 2. Do you have a cyber security strategy that has been approved by the board?



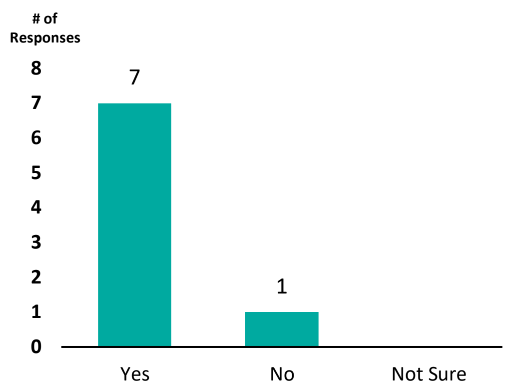
C: 3. To your knowledge, does your institution have a cyber risk policy?



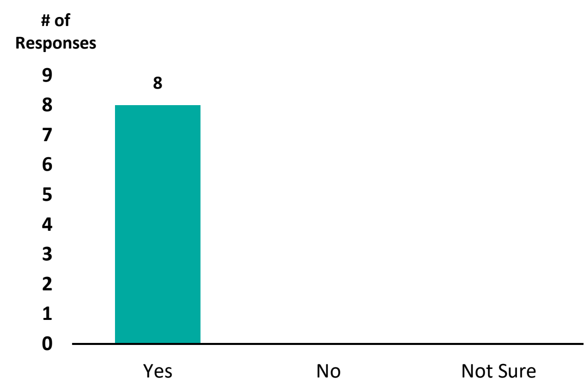
D: 4. Do you have a documented and regularly tested cyber incident response plan?



E: 5. Does your cyber incident management framework explicitly include recovery activities, covering returning to normal operations, or to a pre-defined, acceptable level?



F: 6. Considering the increasing risk related to cyber threats, has all staff been provided with cyber security training?



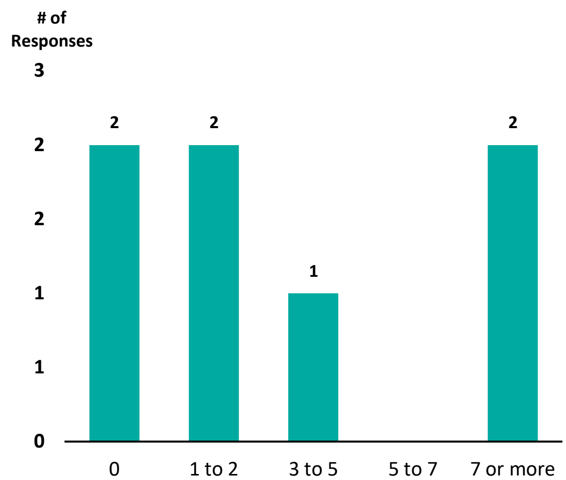
Source: Central Bank of Barbados

Five institutions reported that their banking systems were attacked during 2023 with varying frequencies (Figure F2A). Banks and finance companies experienced different types of cyber-attacks in 2023, where the majority was "Spam & Phishing" attacks.

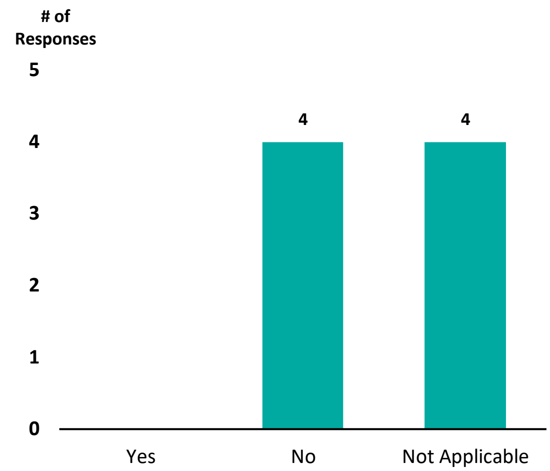
As it relates to data leaks, four instititutions responded that no information was leaked, and four others indicated "Not Applicable" (Figure F2B). In terms of financial losses or damages, three specified that there were no losses incurred, and the other five respondents answered "Not Applicable" (Figure F2C).

Figure F2: Cyber Threats

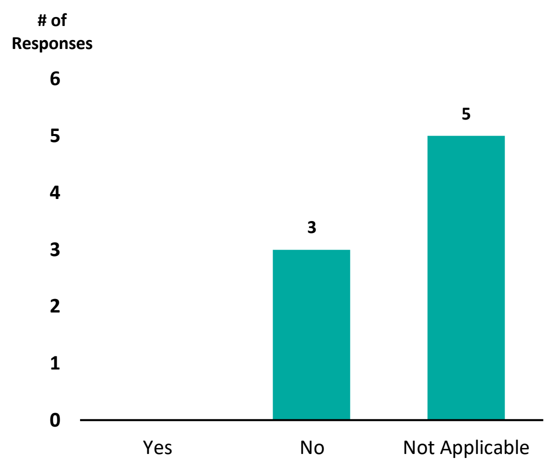
A: 7. What was the number of cyber threats encountered by your institution during 2023?



B: 8. To the best of your knowledge, was any data leaked or lost during any of the cyber-attacks?



C: 9. Kindly, can you indicate if there were any losses financially?



As it relates to each institution's preparedness (Figure E3), respondents answered a question, "Kindly, can you state where the institution can improve in terms of better preparedness as it relates to cyber security?". Based on their responses, four of them indicated that implementing great technology tools was an area where they could enhance their level of preparedness against cyber-attacks, along with training and educating employees. Three of the responding institutions specified that attracting and retaining highly skilled talent was also a priority, while to a lower extent, they indicated that improving communication was important.

Figure F3: Improving Preparedness

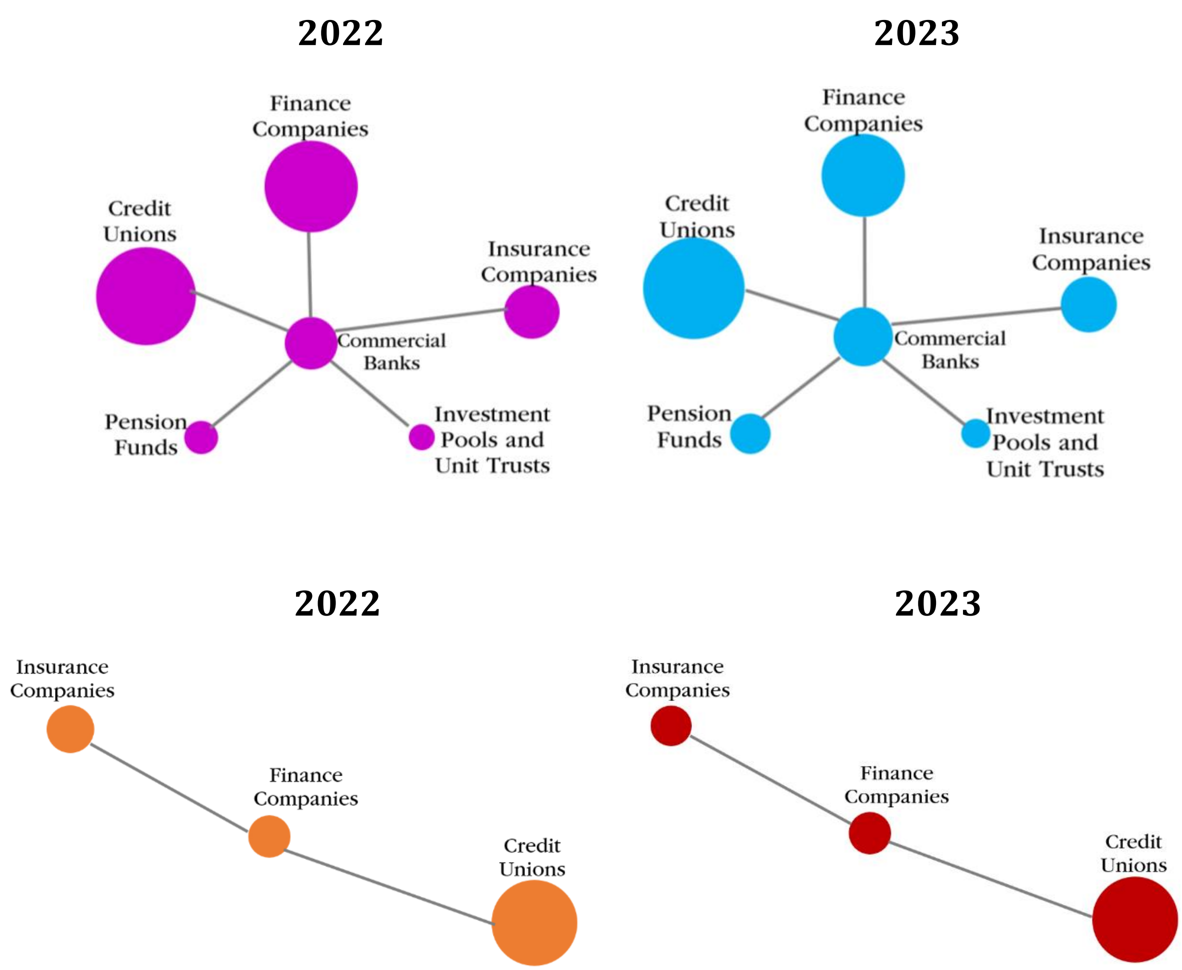
Source: Central Bank of Barbados

Appendix G: Domestic and Cross-Border Network Analysis

Cross-Sectoral Analysis

Tighter liquidity conditions in finance companies and credit unions resulted in a decline in their deposits held at commercial banks. The proportion of their deposits in commercial banks relative to their total assets reduced from 12.7 percent to 11.6 percent for finance companies and from 14.5 percent to 11.8 percent for credit unions. The ratio of all other financial subsectors remained stable.

Credit unions' deposits in finance companies increased, while those of insurance companies declined. The ratio for credit unions remained virtually the same as last year, while that of insurance companies fell from 0.7 percent to 0.5 percent.



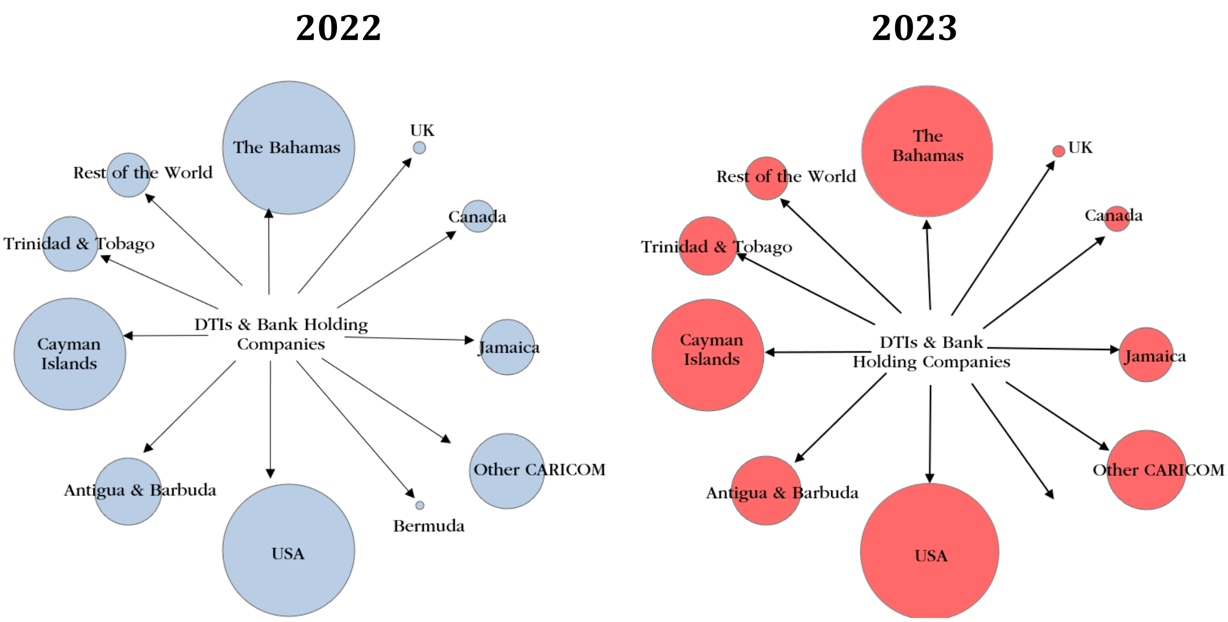
Source: Central Bank of Barbados

Note: Outer nodes represent subsectors' deposits in the centre node relative to the assets of that financial subsector.

Cross-Border Assets of DTIs and Bank Holding Companies by Geographical Location

At the end of 2023, cross-border assets of DTIs and bank holding companies were 4.5 percent lower than 2022 levels and accounted for 16.7 percent of their assets. The share of investments in equity and debt instruments remained comparable to last year, measuring 52 percent and 48 percent, respectively. A substantial reduction of debt instrument claims on the USA drove the contraction in cross-border assets and resulted in the Bahamas being the largest exposure. During the year, there were increased claims on Antigua & Barbuda, Trinidad & Tobago, and other CARICOM countries.

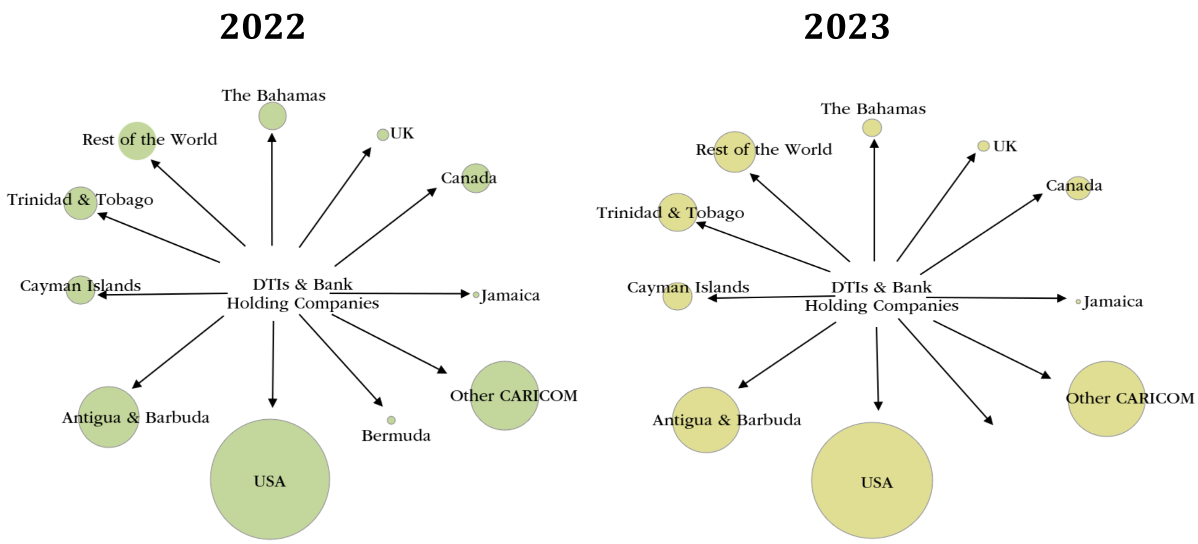
Total Claims on Non-Residents by Country and Region of Residence



Source: Central Bank of Barbados

Declines in long-term debt securities and deposits held in unaffiliated institutions in the USA reduced debt instrument claims. However, deposits held in subsidiaries in Antigua & Barbuda, Trinidad & Tobago, and other CARICOM countries registered increases. At the end of the review period, no institution held financial derivatives.

Debt Instrument Claims on Non-Residents by Country and Region of Residence

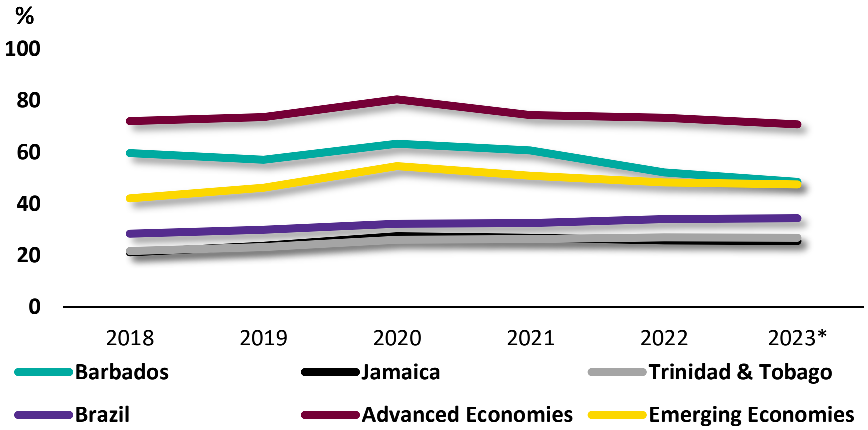


Source: Central Bank of Barbados

Note: Debt instrument claims are assets in the form of debt instruments. They comprise deposits, debt securities, loans, accounts receivable, and cash.

Chart Annex

Figure J1: Household Debt to GDP



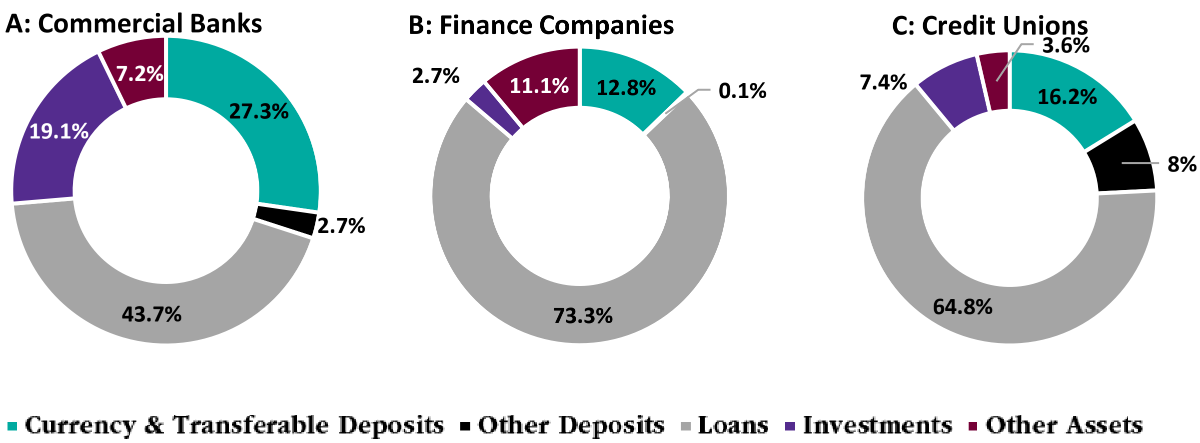
* Trinidad & Tobago is as at March 2023, Brazil, Emerging Economies and Advanced Economies are as at September 2023, and Barbados as at December 2023

Sources: Statistical Institute of Jamaica, Bank of Jamaica, Bank for International Settlements Statistics Explorer

Table J1: Total Assets of the Financial System (BDS $M)

	2019	2020	2021	2022	2023
Commercial Banks	12,825	13,202	13,760	14,357	14,655
Insurance Companies	3,647	3,780	3,817	3,795	4,379
Finance Companies	995	991	1,031	1,087	1,036
Credit Unions	2,606	2,797	2,946	3,063	3,152
Mutual Funds	2,437	2,494	2,811	2,702	2,871
Pension Funds	2,654	2,690	3,085	2,814	2,825
Total	**25,166**	**25,954**	**27,449**	**27,817**	**28,918**

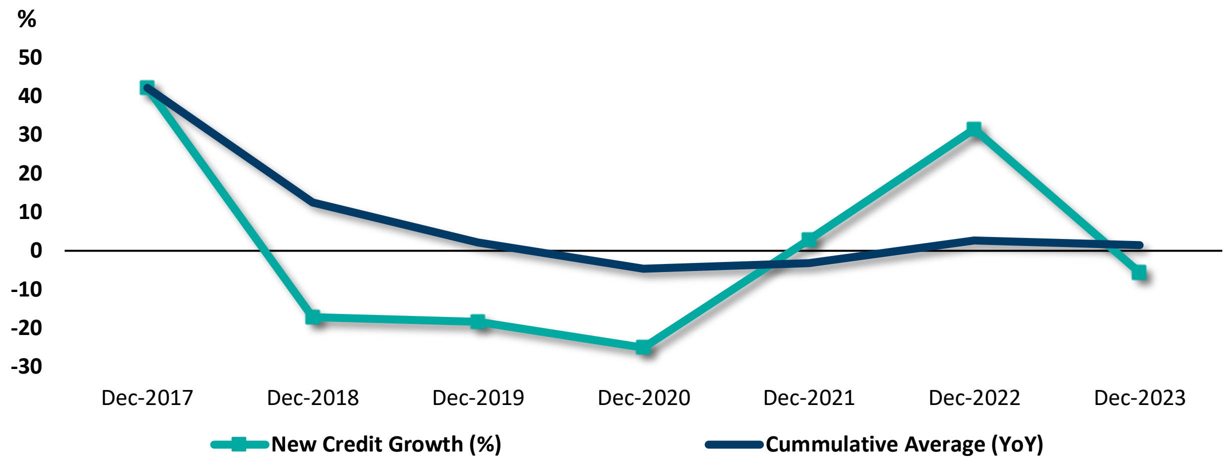
Figure J2:Asset Composition



Sources: Central Bank of Barbados and Financial Services Commission

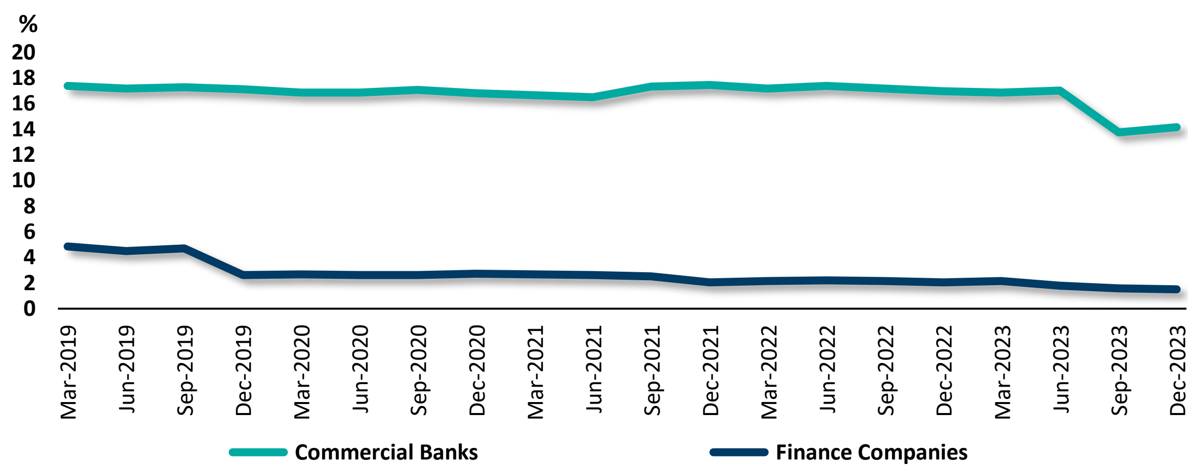
Sources: Central Bank of Barbados and Financial Services Commission

Figure J3: New Credit Growth



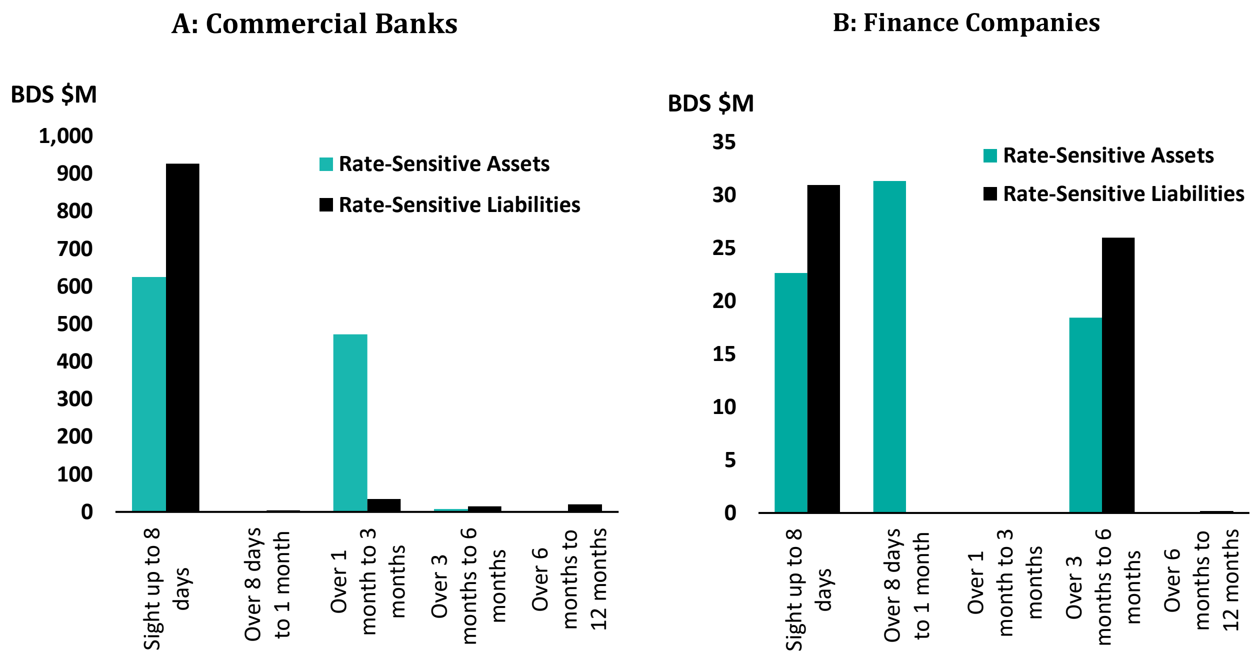
Sources: Central Bank of Barbados and Staff Calculations

Figure J4: Sovereign Exposure - Government Debt Securities to Total Assets



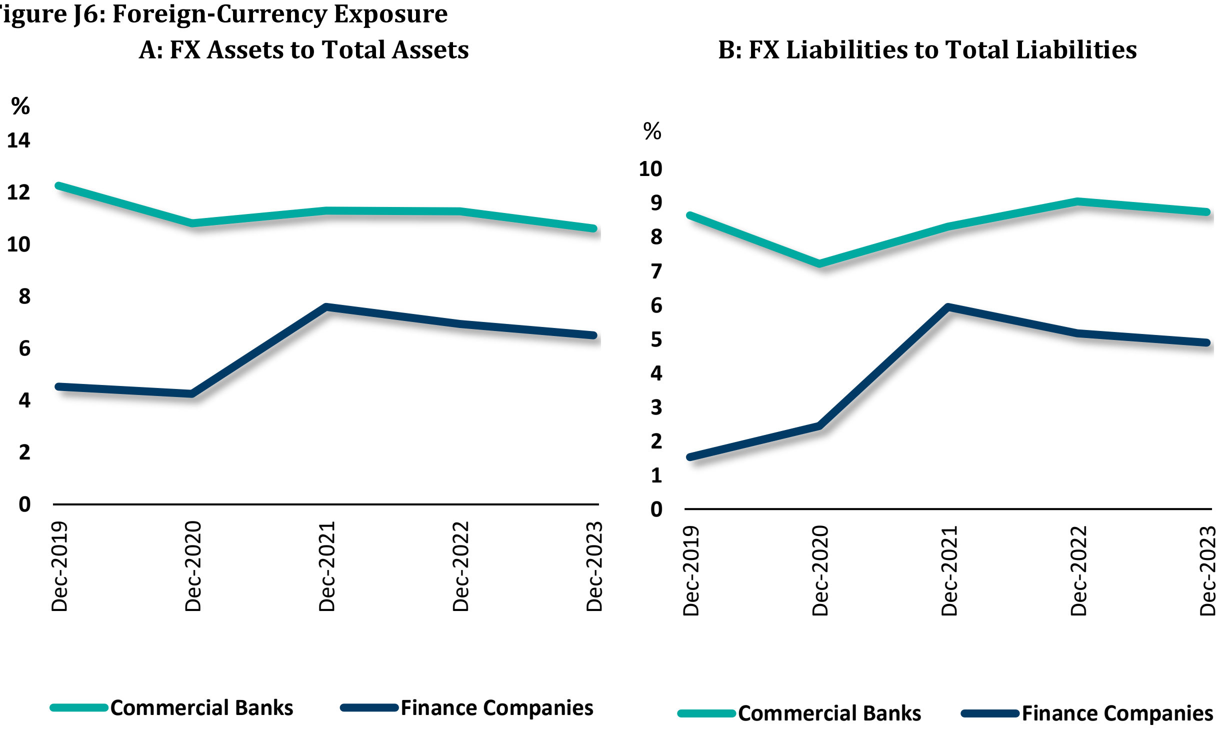
Source: Central Bank of Barbados

Figure J5: Maturity Gap Analysis (USD$)



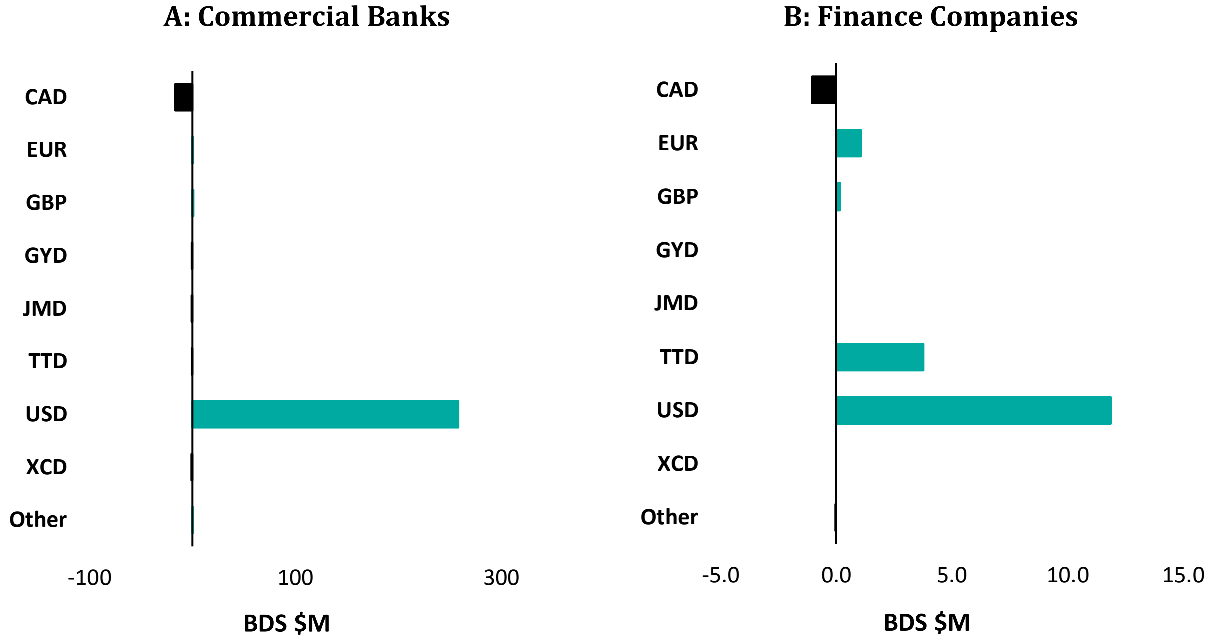
Source: Central Bank of Barbados

Figure J6: Foreign-Currency Exposure



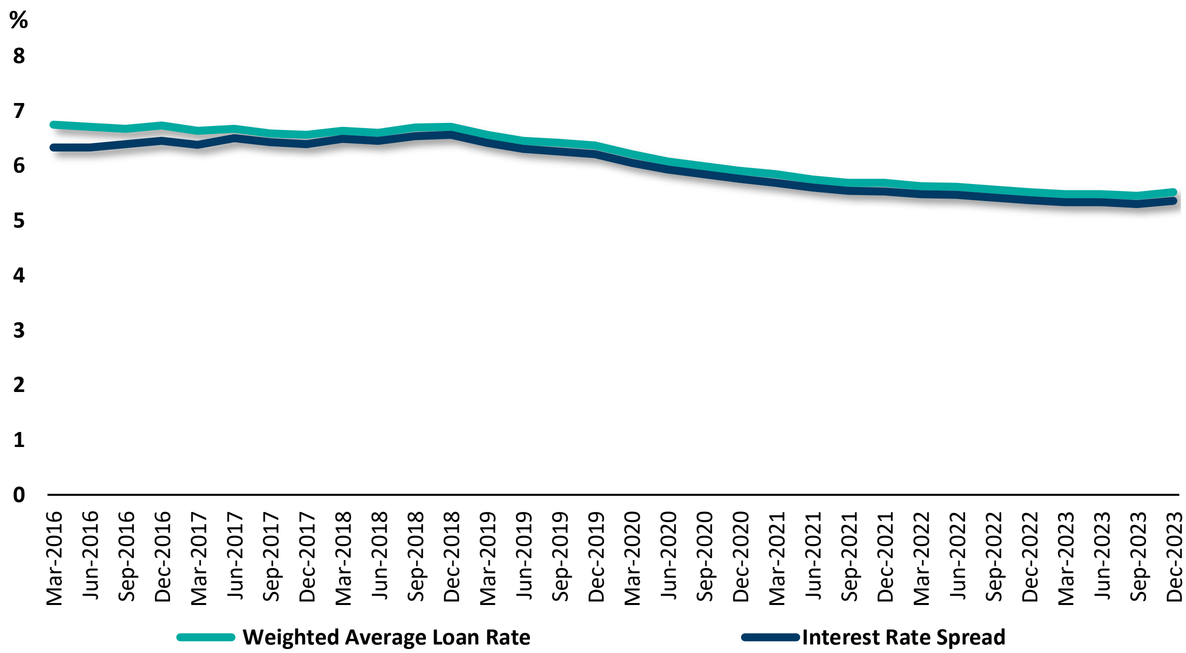
Source: Central Bank of Barbados

Figure J7: Net Open Position in Foreign Currency



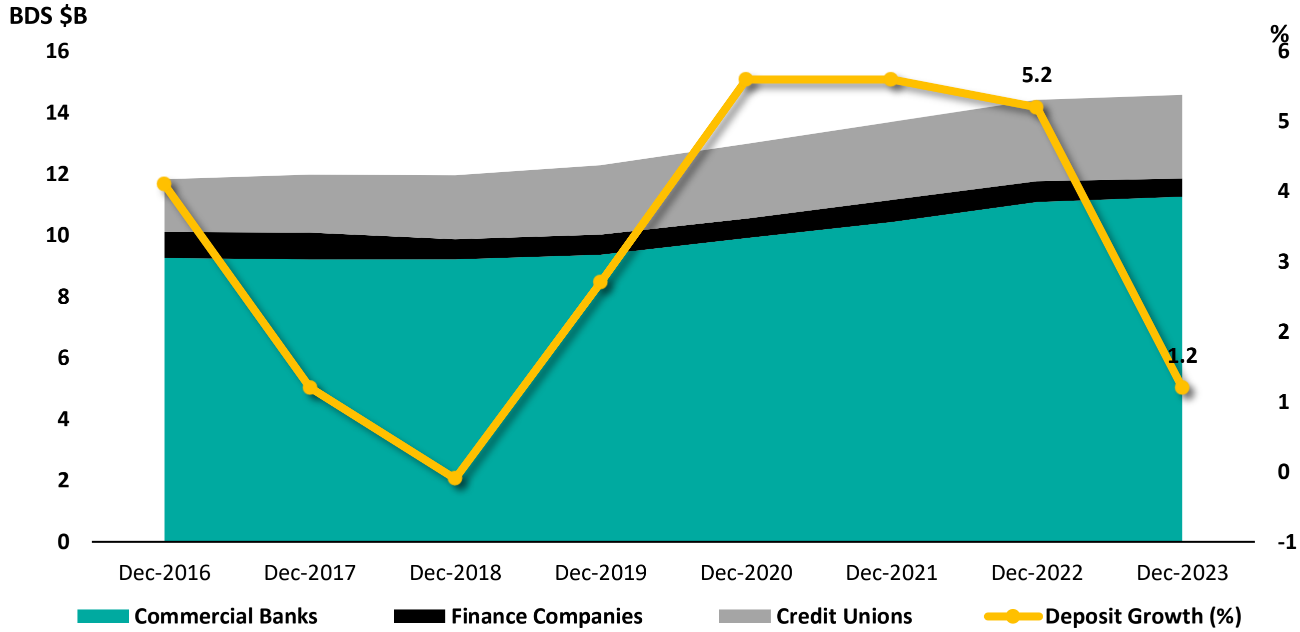
Source: Central Bank of Barbados

Figure J8: Interest Rate Spread



Source: Central Bank of Barbados

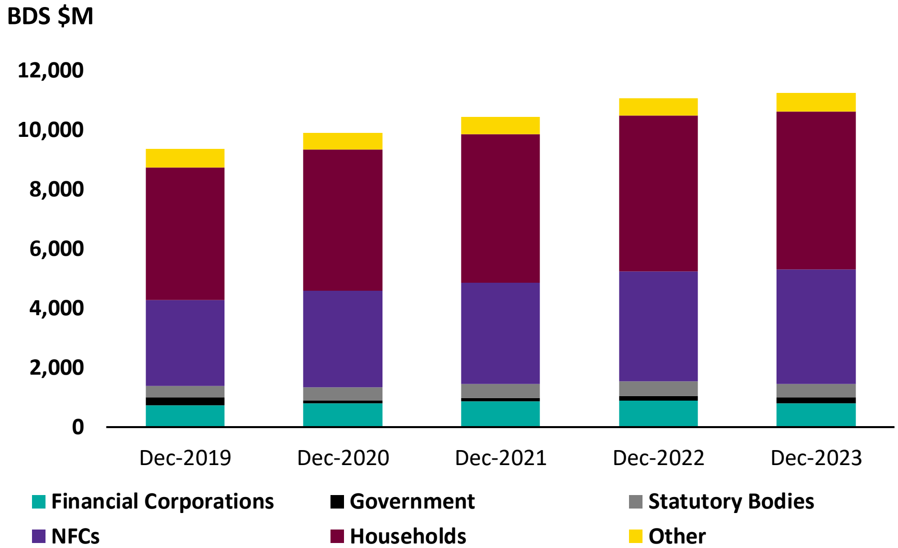
Figure J9: Consolidated Deposits



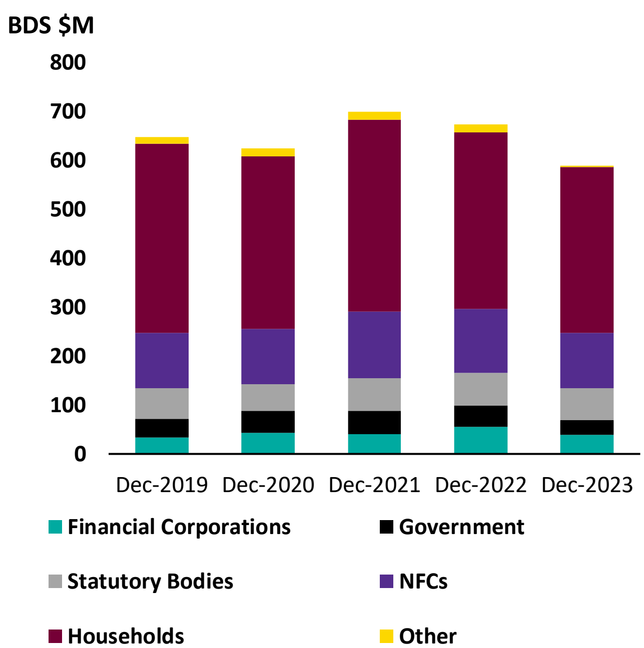
Sources: Central Bank of Barbados and Financial Services Commission

Figure J10: Total Deposits

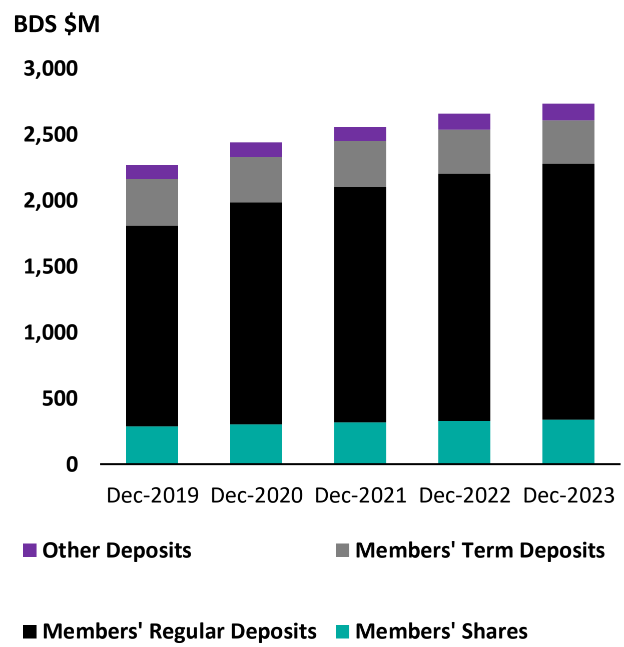
A: Commercial Banks' Deposits by Sector



B: Finance Companies' Deposits by Sector



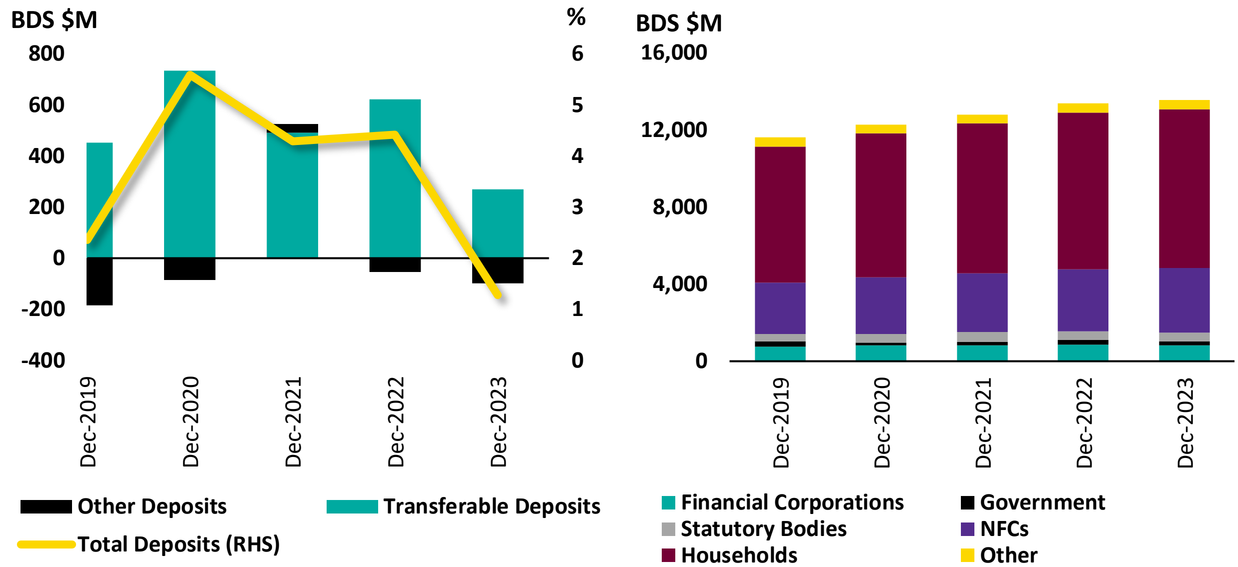
C: Credit Unions' Deposits by Type



Sources: Central Bank of Barbados and Financial Services Commission

Figure J11: Domestic-Currency Deposits

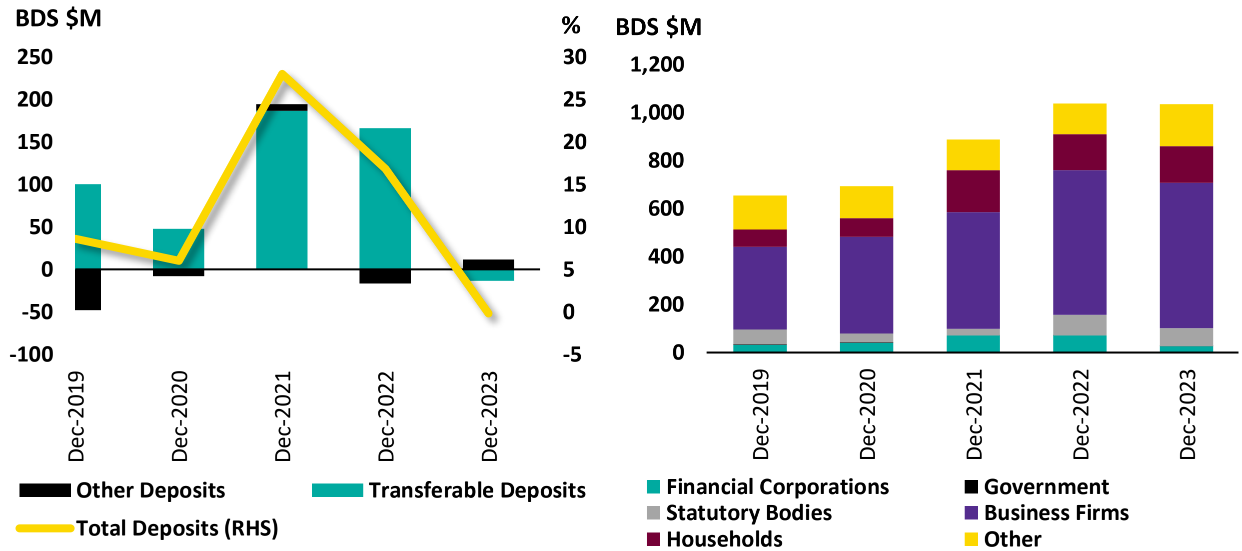
A: Changes in Deposits | **B: Deposits by Sector**



Sources: Central Bank of Barbados and Financial Services Commission

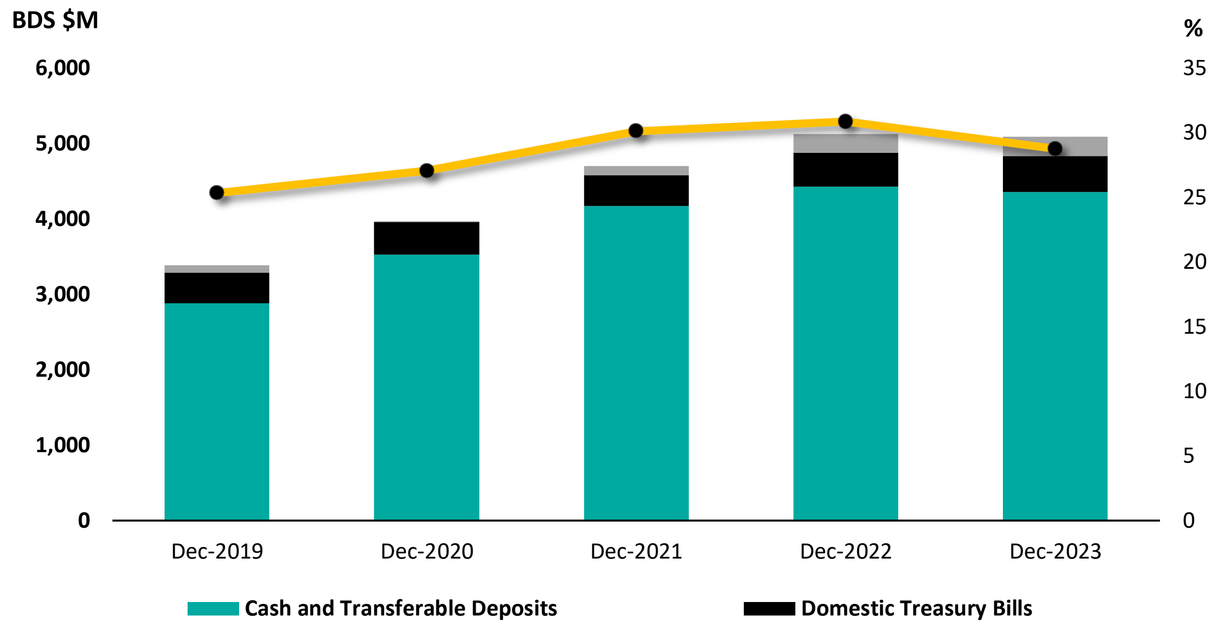
Figure J12: Foreign-Currency Deposits

A: Changes in Deposits | **B: Deposits by Sector**



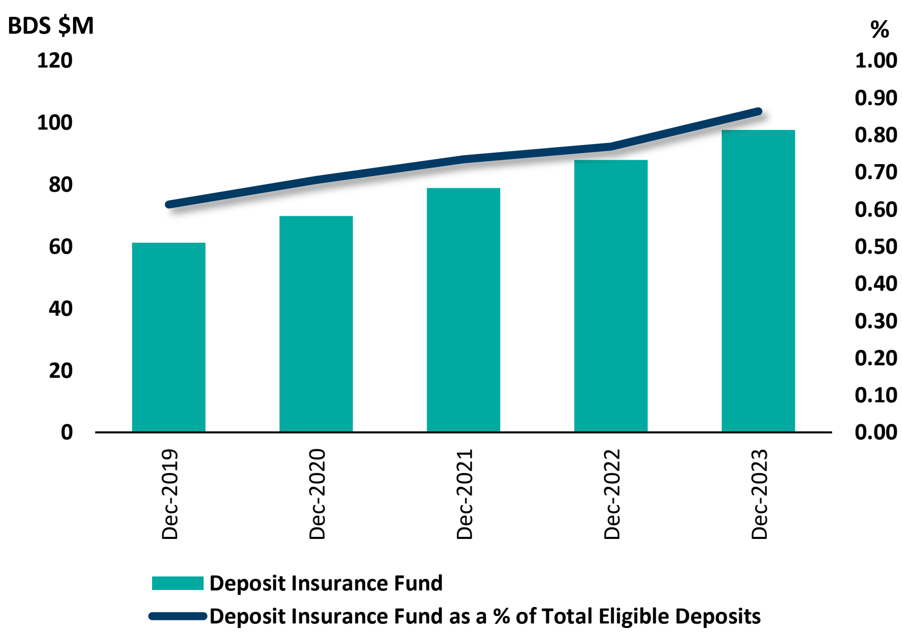
Sources: Central Bank of Barbados and Financial Services Commission

Figure J13: Liquidity Components



Sources: Central Bank of Barbados and Financial Services Commission

Figure J14: Deposit Insurance Fund



Source: Barbados Deposit Insurance Corporation

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