Greening the US Sovereign Bond Guarantee Program: A Proposal to Boost Climate-Directed Sovereign Finance in Developing Countries

Scott Morris, Rowan Rockafellow, and Alan Cameron

Abstract

Sovereign bond guarantees (SBGs) are an effective but underutilized instrument available to the US government in support of developing country partners. By protecting bond purchasers in the event of a foreign issuer country's default, SBGs substantially reduce borrowing costs for developing country governments. In this CGD policy paper, we estimate the costs and benefits of historical US sovereign bond guarantees in order to model the use of SBGs for climate finance purposes. We demonstrate that the US government-provided SBG has the effect of conferring the US government's cost of borrowing on the partner government. On that basis, it represents substantial savings for these countries. Based on this analysis, we propose a $20 billion "Green" SBG program aimed at financing climate change mitigation efforts in 28 emerging market economies. We estimate that the US government could support $20 billion in bond issuances through a subsidy outlay of $2 billion, resulting in a 22 percent reduction in borrowing cost of the target countries, which represents $4 billion in budgetary saving for their governments. We propose that the subsidy appropriations in support of the guarantees be retained and recycled within the Green SBG program, which would substantially improve the financial leverage of the program over time. We also suggest that the program could be used for climate adaptation purposes by targeting a different group of developing countries.

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CGD Policy Paper 250
February 2022

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The Center for Global Development is grateful for contributions from the Bill & Melinda Gates Foundation in support of this work.

Scott Morris, Rowan Rockafellow, and Alan Cameron. 2022. "Greening the US Sovereign Bond Guarantee Program: A Proposal to Boost Climate-Directed Sovereign Finance in Developing Countries." CGD Policy Paper 250. Washington, DC: Center for Global Development. https://www.cgdev.org/publication/greening-us-sovereign-bond-guarantee-program-proposal-boost-climate-directed-sovereign

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Introduction

As the US government seeks to carry forward its commitment to support climate financing efforts in developing countries, there is a strong case for adapting the existing sovereign bond guarantee (SBG) program for climate purposes. US bond guarantees are an underutilized financing tool, which effectively reduce the cost of borrowing to developing countries by protecting bond purchasers in the event of default by a sovereign (government) bond issuer. To date, the guarantee program has been used sparingly to support US foreign policy and has never been targeted for climate purposes. Climate finance is uniquely compelling as a global public good, but importantly, the bond guarantee instrument is adaptable and could be well suited to other global goods like pandemic preparedness. Nonetheless, we focus here on its use for climate investment as a leading US objective.

This paper:

- reviews the history of the SBG program;
- identifies the budgetary cost to the US government of guarantees issued to date;
- estimates the reduction in borrowing cost for foreign governments as a result of the guarantee;
- examines the suitability of sovereign bond guarantees for climate finance purposes;
- proposes a new green sovereign bond guarantee program (the "Green SBG"), targeting 28 countries for an initial $20 billion in bond issuances.

We find that US government-provided SBGs can be effective in reducing the cost of borrowing for developing country governments. Under federal budget scoring rules, SBGs can be provided at a modest cost to US taxpayers, representing good value for money. In our proposal, we identify 28 countries where $20 billion in bond issuances could be guaranteed at a cost of $1.9 billion. For these countries, we find that the cost of borrowing is reduced by over $4.4 billion or 22 percent. In effect, the guarantees confer US government borrowing costs on governments whose cost of borrowing would otherwise be much higher. Over time, the 11-to-1 leverage ratio implied by a one-off program (a $1.9 billion subsidy supporting a $20 billion round of bond issuances) could improve further if program subsidies were recycled in a revolving program.

Unlike traditional forms of US aid, the Green SBG offers scale, speed, and efficiency in the provision of climate finance. The proceeds of bond issuances guaranteed by the United States could be deployed as public finance for mitigation and adaptation investments in the issuing countries. This financing mechanism could be particularly attractive to developing country governments, who may otherwise be disinterested in more onerous forms of traditional aid or the more cumbersome financing modalities of the multilateral development banks. Moreover, the Green SBG provides the United States with enough oversight authority to ensure money is well-spent, while keeping financial and administrative burdens on the US government to a minimum. Finally, due to its historical focus on middle-income emerging economies, the SBG program is already tailored to support the infrastructure needs of some of the fastest-growing contributors to anthropogenic climate change.

History of US-provided sovereign bond guarantees

In its current form, the US SBG program dates back to 1993, when a sovereign bond guarantee was provided to Israel to help finance immigrant resettlement programs. Since then, the United States has issued bond guarantees on an irregular and limited basis, largely in support of US strategic and foreign policy goals. This program has enabled countries with developing credit markets to access $23.78 billion in commercial capital to date (see Table 1).[1]

Unlike other government aid programs, SBGs require no transfer of funds from the United States to foreign countries unless the borrower country defaults on its debt. The implementing agency (historically USAID) will guarantee a foreign government's bond issuance, enabling that government to access commercial capital at significantly lower interest rates than it otherwise would have been able to. If the bond issuer were to default on its debt, the US government would be liable to repay both the principal amount and interest. However, no country has defaulted on a US SBG to date.[2]

Table 1. Portfolio of SBGs issued since 1993

Country	Year of Issuance	Amount (US$), mn
Israel	1993	9,199
Israel	2003	4,100
Egypt	2005	1,250
Tunisia	2012	485
Tunisia	2014	500
Jordan	2014	1,250
Jordan	2014	1,000
Ukraine	2014	1,000
Ukraine	2015	1,000
Jordan	2015	1,500
Tunisia	2016	500
Ukraine	2012	1,000
Iraq	2017	1,000

Source: USAID FY2020 Agency Financial Report.

As a result, the only financial outlay incurred by the US government when issuing a guarantee is the "subsidy cost" of that guarantee. This subsidy cost is equal to some portion of the guaranteed bond principal, and is "determined on the basis of a country rating of the estimated risk involved provided by OMB, contract terms, and other loan characteristics."[3] Subsidy costs are paid with funds appropriated to the State Department's Economic Support Fund and are held in a special Treasury account until the issuing country fully repays its bond.[4] If the bond issuer were to default on its debt, the US government would be liable to repay both the principal amount and interest. However, no country has defaulted on a US SBG to date. Although the subsidy cost of the guarantee is scored as an expenditure, the appropriated funds are returned to the Treasury as budgetary savings when the bond has been repaid.[5] This means that the only budgetary cost of every SBG to date is the time value of the subsidy cost.

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[1] USAID, "FY 2020 Agency Financial Report: A Foundation Built on Decades of Global Health Investment" (Washington, D.C: USAID, November 16, 2020).
[2] Ibid.
[3] Curt Tarnoff, "U.S. Foreign Assistance: USAID Loan Guarantees," CRS Report (Washington, D.C: US Library of Congress, Congressional Research Service, 2017).
[4] USAID, "FY 2020 Agency Financial Report: A Foundation Built on Decades of Global Health Investment" (Washington, D.C: USAID, November 16, 2020).
[5] United States Congress, "Foreign Assistance Act of 1961," Pub. L. No. 87–195, § 226 - 234, 22 U.S.C. 2151 U.S. Code (1961).

The approval and oversight process for US SBGs is complex. According to the Congressional Research Service, "section 122 of the Foreign Assistance Act of 1961 (P.L. 87–195) grants basic authority to the President to provide loans […] including sovereign loan guarantees. In practice, sovereign guarantees have been specifically authorized by congress."[6] Congressional authorizations are often included in appropriations bills, but these authorizations have delegated far more decision-making authority to the implementing agency as more guarantees have been issued. For example, a 2003 appropriation for guarantees of Turkish bond issuances—which Turkey ultimately declined—mandated Turkey's cooperation with Operation Iraqi Freedom, compelled Turkish compliance with certain budgetary and economic reforms, and prohibited Turkey from unilaterally deploying forces in Iraq.[7] By contrast, a 2015 appropriations bill merely "permitted" that funds be used to provide loan guarantees to Jordan, Ukraine, and Tunisia, with no further explicit conditions.[8]

Once Congress has authorized a loan guarantee, the implementing agency (historically USAID) will design a loan guarantee program. This entails convening an interagency panel that includes Treasury, State, USAID, and OMB personnel to evaluate the borrower's risk of default and set a subsidy cost.[9] It also involves crafting a loan agreement, which further defines the acceptable uses for guaranteed borrowings and imposes conditions on the borrower. Once the inter-agency panel finishes crafting the loan agreement, the borrower country can either approve or reject the program. Approval will result in the borrower country signing a formal agreement, committing to the provisions of the bond guarantee.

Conditionality has played a key role in SBG program and has particular salience for a Green SBG. Conditions historically have included provisions related to transparency and financial management practices, as well as directed uses of the funds for specific sectors, activities, or projects. In one case, a borrower government also promised to take unguaranteed bonds to market alongside the US-guaranteed bond issuance.[10]

There are two avenues for ensuring borrower-country compliance with the conditions of SBGs. First, USAID may impose "prior" conditions on the borrower country which must be satisfied before the closing date and issuance of the SBG. Tunisia's 2014 guarantee agreement required the country to submit proof of its compliance with several conditions prior to issuance of the SBG. These conditions included Tunisia's maintenance of IMF transparency standards, adoption/approval of tax reform, customs reform, FDI regulation reform, and banking reform measures in cooperation with various US/international organizations and expanded welfare support for vulnerable households.[11]

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[6] Curt Tarnoff, "U.S. Foreign Assistance: USAID Loan Guarantees," CRS Report (Washington, D.C: US Library of Congress, Congressional Research Service, 2017).
[7] United States Congress, "An Act Making Emergency Wartime Supplemental Appropriations For The Fiscal Year 2003, and for Other Purposes.," Pub. L. No. 108–11, 117 Stat. 559 U.S. Statutes at Large (2003).
[8] Charles Dent, "Consolidated Appropriations Act, 2016," Pub. L. No. S. 1725, § 7034, U.S. Code 114-113 (2015).
[9] Curt Tarnoff, "U.S. Foreign Assistance: USAID Loan Guarantees," CRS Report (Washington, D.C: US Library of Congress, Congressional Research Service, 2017).
[10] US Department of State, "Foreign Assistance Economic Cooperation Loan Guarantee Agreement Between the United States of America and Iraq" (U.S. Department of State, January 5, 2017).
[11] US Department of State, "Loan Guarantee Agreement Between the United States of America and Tunisia," Treaties and Other International Act Series, no. 14-718.1 (June 3, 2014).

In addition to prior conditionality, the US government may further ensure borrower-country compliance with the bond provisions with revolving or staggered guarantee programs. This approach offers the borrower country access to a series of periodic US bond guarantees, with future guarantees contingent on borrower-country compliance with the conditions of previous guarantees. One example of this is the Israel Bond Guarantee Program, which authorized the US government to guarantee up to $2 billion in Israeli debt each year between 1993 and 1997, provided that Israel did not expand settlements in disputed territories or otherwise pursue activities inconsistent with US-Israel agreements. In September 1993, President Clinton announced his intention "to reduce the amount available to Israel in FY1994 by $435 million, equal to the amount Israel spent in the occupied territories in FY1993."[12] While the provision did not, in this case, dissuade Israel from pursuing further development in occupied territories, one can see how staggered implementation might better incentivize borrower country compliance with the outlined provisions of guarantee agreements.[13]

Other existing programs

There are a number of other sovereign loan and guarantee programs offered by the US government, though none offer the potential scale or cost effectiveness that would make them as attractive for climate finance relative to the bond guarantee program. The 2018 BUILD act, which established the DFC, authorized the transfer of four other USAID lending programs to the DFC. They include the SBG program, the Development Credit Authority Program (DCA), the Direct Loan Program (DL), the Urban Environmental Program (UE), and the Micro and Small Enterprise Development Program (MSED). It also transferred authority for the SBG program to the DFC, but it's unclear whether the existing SBG portfolio was included in that transfer. Oversight of the DL, UE, MSED, and DCA was transferred to the DFC in FY2020.

The Development Credit Authority

From 1999–2020, the DCA enabled USAID missions and other offices to issue loan guarantees, loan portfolio guarantees, portable guarantees, and bond guarantees in support of USAID development goals. DCA funding could be applied to projects in any sector under any USAID operating unit, but targeted small and medium-sized businesses rather than entire countries. There were three conditions for any DCA project. First, the project must generate enough revenue to cover any debt service associated with it, including USAID fees. Second, a private sector entity must assume at-least 50% of the risk associated with any DCA project. Third, the project must not crowd out private sector lending within the recipient country.

[12] Larry Q. Nowels and Clyde, Mark, "Israel's Request for U.S. Loan Guarantees," CRS Issue Brief (Washington, D.C: US Library of Congress, Congressional Research Service, July 26, 1994).

[13] It is worth noting here that the costs to borrower countries of ignoring the prior conditions of US guarantees likely depend a lot on the share of the recipient country's external financing need that is supported by the SBG. In richer countries with higher nominal GDP (Israel), SBGs cover a small share of the external financing gap, making it less costly for Israel to ignore prior conditions and forgo future guarantees. In smaller countries like Tunisia, US guarantees would cover a larger share of the borrower's external financing gap, the guarantees themselves more valuable, and the penalties for noncompliance them more severe.

Relative to the SBG program, the scale of DCA funding is small. Between 1999 and 2016, $4.8 billion in credit was made available through the DCA for projects in 76 countries. There is no doubt that the DCA operated in an important niche, subsidizing international development-focused projects on a small and medium scale. That work should absolutely continue under the DFC, prioritizing green infrastructure development. But even if the DCA was substantially expanded, it would leave considerable room for a Green SBG program to operate at the national level.

The Direct Loan Program

The DL Program was authorized under the Foreign Assistance Act of 1961 and incorporated several predecessor programs. It enabled USAID to lend directly to foreign governments, with loans denominated in both US dollars and borrower country currency. Loans denominated in foreign currencies could be issued with or without maintenance of value (MOV) mechanisms, which place currency devaluation risk on the borrower. In accordance with the 2018 BUILD Act, USAID's DL portfolio was incorporated into the DFC's Direct Loan program in FY2020.

Between 2010 and 2019, USAID disbursed an average of $2.81 billion per year under the direct loan program. While significant, this is nowhere near the $40+ trillion needed for infrastructure financing in the developing world between 2021 and 2035. Moreover, funds channeled through this program are not subject to the same multiplier effect as funds channeled into SBGs, as they have little bearing on recipient countries' ability to secure private capital on international markets.

Urban and Environmental Program

The UE program enabled USAID to guarantee to US private-sector lenders who funded public- and private-sector water, sanitation, and housing development projects in international, low-income urban settings. The program also sought to connect US-based NGO and private sector companies with borrower-country city governments, financial institutions, and community organizations to share US expertise. Before it was incorporated into the DFC's portfolio, the UE program increasingly targeted environmental problems that impaired human health. Still, in relation to climate-related financing, the UE program focused on adaptation rather than mitigation.

Micro and Small Enterprise Development Program

Although largely replaced by the DCA, USAID's MSED program was established to support private sector development by supplying loans and loan guarantees to small enterprises in developing countries. The scale of this financing was small, with just over $1 million disbursed between 2010 and 2019. While this is in line with the needs of target companies, the MSED does not offer a viable pathway for funding climate change mitigation efforts.

The economics of sovereign bond guarantees

The historical uses of SBGs by the US government appear to have been motivated by foreign policy objectives, whether to support key allies like Israel over a long period or to offer targeted and timely support at key political moments as with Tunisia following the fall of its authoritarian government. Given these leading objectives and the limited number of countries where SBGs have been used, it is not obvious that SBGs make economic sense. And in fact, documentation of SBGs to date offer very limited justification or analysis in economic terms beyond publication of the subsidy cost.

Yet, in considering a potential Green SBG across a wider array of countries, it is important to consider the economic costs and benefits of the guarantees. Specifically, how does the subsidy cost to the US government compare to the scale of the bond issuance supported, and what if any reduction in borrowing costs is realized by the issuing government? If the subsidy cost were equivalent to proceeds of the bond issuance, it wouldn't make economic sense to provide a guarantee. It would be more efficient to simply provide direct US financing. In turn, even if the subsidy cost is less than the value of the bond, representing good value for the United States, it is important to know the extent to which the guarantee reduces borrowing costs for the issuer. In the event there is little or no reduction in costs, there will be little incentive for the issuing government to seek the guarantee.

We start with the subsidy cost of US bond guarantees under federal budget scoring rules. For every foreign bond offering that the United States guarantees, money is set aside by the Department of State to cover the cost of repaying creditors should the borrower country default on its debt. This "subsidy cost" is not equal to the full amount of the borrower country's bond issuance. Instead, it is some portion of the guarantee principal. The subsidy costs of previous US SBGs vary widely depending on the borrower country's risk of default, contract terms, and other loan characteristics.[14] While the OMB's formula for calculating these costs is not a matter of public record, the subsidy rates associated with individual guarantees are. Historically, they have ranged from 4.6 percent of the total bond offering to 44.7 percent.[15]

This subsidy cost is typically paid out of the State Department's Economic Support Fund, which also supports USAID programs to address political, economic, and security needs in countries of strategic importance to the United States.[16] These costs eventually recouped—returning to the Treasury after the borrower repays the bond—so the only real cost of every historical SBG is the time value of the subsidy cost. Still, in the near term, the initial outlay of subsidy cost funds is scored as a liability against the State, Foreign Operations, and Related Programs (SFOPS) budget.[17] Every dollar held as a SBG subsidy cost is a dollar that cannot be spent on other aid programs until the guaranteed loan is repaid. This means there is an opportunity cost for each foreign sovereign bond guaranteed by the United States.

[14] Curt Tarnoff, "U.S. Foreign Assistance: USAID Loan Guarantees," CRS Report (Washington, D.C: US Library of Congress, Congressional Research Service, 2017).
[15] Subsidy costs were calculated using the total bond amount and the original subsidy rates provided in White House FY2022 subsidy rates spreadsheet: https://www.whitehouse.gov/wp-content/uploads/2021/05/cr_8_fy22.xlsx
[16] US Development Policy Team, "Foreign Assistance Agency Brief: US Department of State," Agency Brief (Washington, D.C: Center for Global Development, March 22, 2017).
[17] United States Congress, "Foreign Assistance Act of 1961," Pub. L. No. 87–195, § 226 - 234, 22 U.S.C. 2151 U.S. Code (1961).

Table 2. The costs and benefits of previous US SBGs

Country	Year of Issue	SBG Interest Rate	Comparable Interest Rate	Moody's Risk Rating at Time of Issue	Guaranteed Bond Principal (US$, mn)	Estimated Market Value (US$, mn)	Value of US Bond Guarantee (US$, mn)	Subsidy Cost (US$, mn)
Tunisia 7/16/2019	2012	1.69	4.23	Baa3	485.00	411.31	73.69	30.00
Jordan 10/20/2020	2013	2.50	3.75	B1	1,250.00	1,155.18	94.82	104.50
Jordan 6/23/2019	2014	1.95	3.13	B1	1,000.00	945.72	54.28	83.60
Tunisia 7/24/2021	2014	2.45	3.78	Ba3	500.00	459.61	40.39	48.70
Ukraine 5/16/2019	2014	1.84	11.27	Caa3	1,000.00	658.47	341.53	193.80
Jordan 6/30/2022	2015	2.59	5.99	B1	1,000.00	807.58	192.42	123.70
Jordan 6/30/2025	2015	3.00	5.99	B1	500.00	388.64	111.36	61.85
Ukraine 5/29/2020	2015	1.85	23.27	Ca	1,000.00	399.60	600.40	446.50
Tunisia 5/8/2021	2016	1.42	6.54	Ba3	500.00	533.70	33.70	28.35
Ukraine 9/29/2021	2016	1.47	8.38	Ca	1,000.00	1,069.20	69.20	290.00
Iraq 1/18/22	2017	2.15	6.48	(P)Caa1*	1,000.00	1,103.93	103.93	255.30
Total					**9,235.00**	**7,132.68**	**2,102.32**	**1,666.30**

* Iraq's (P)Caa1 rating was revoked prior to the issuance of it's 2017 US-Guaranteed Bond.
Source: SBG and comparable bond data from Bloomberg, subsidy cost data from the White House FY2022 Subsidy Rates Spreadsheet.

Given the evidence of historical subsidy rates, US SBGs appear to represent good value in the sense that they cost the US taxpayer significantly less than they generate in bond issuances, even in the most expensive cases. But what about the effects of the guarantees for the issuing countries? Do the guarantees reduce borrowing costs, and specifically, is the reduction in cost greater than subsidy cost to the United States government? To evaluate this question, we estimate the historical cash flows of the guaranteed bonds and their coupon rate.[18] We then identify the yield to maturity (YTM) rates of contemporaneous unguaranteed bonds issued by the borrower government.[19] Using the unguaranteed bond YTM as a proxy for the

[18] All previously issued US guaranteed bonds have been structured with corporate bullet-style repayment models and have been sold at par value.

[19] Under ideal circumstances, we would discount the value of U.S. guaranteed bond cashflows using YTM data from USD yield curves of borrower countries to ensure comparability. Unfortunately, most of these countries do not have well-developed yield curves to draw from. As a result, we use the YTM of bonds issued by borrower countries that most closely match the tenor and principal value of US-guaranteed bonds. We collect the YTM of "comparable" bonds on the date that their respective guaranteed bond was issued. For a list of bonds used as proxies for market rates in this analysis, see Appendix 2.

interest rate of debt issued by SBG Recipient countries, we discount the guaranteed stream of cashflows at the interest rate to arrive at the estimated market value of an unguaranteed bond with similar characteristics to that guaranteed by the United States. The difference between this estimated market value and the guaranteed bond par value is the *estimated value of the US bond guarantee*.

As shown in the table above, six of the eleven US bond guarantees over the past 10 years provided greater value to the borrower country than they cost the US government. The five outstanding cases include US guarantees to Jordan in 2013, Jordan in 2014, Tunisia in 2014, Ukraine in 2016, and Iraq in 2017. For each of those cases, the US government subsidy cost was greater than the estimated discount that the borrower country realized by issuing US-guaranteed debt.

Still, this cost-benefit analysis of historical SBGs shows significant potential, particularly on a portfolio basis. For a later-recouped outlay of $1.7 billion, US guarantees helped to mobilize $9.2 billion in bond subscriptions for issuing countries. That means that every US dollar set aside leveraged $5.6 for developing countries. These US guarantees also saved borrower countries an estimated $2.1 billion through interest rate reductions. So far, none have been called, so the only real cost to US taxpayers is the time value of the subsidy costs.

This cost-benefit analysis may understate the appeal of SBGs to some borrowing countries, including cases where the US subsidy cost ultimately exceeds the estimated benefit. The guarantee helps to create certainty on an *ex-ante* basis as countries consider a bond issuance. For developing country governments, there can be a great deal of uncertainty about market responses to their bond offers. In this environment, a US guarantee could be appealing even if its impact *ex post* is modest.

Crafting a green SBG program

Building on the evidence provided by the existing SBG program, we now consider how SBGs may be leveraged to promote green development in the form of a Green SBG. We consider two questions. First, how will the program be administered and funded? And which countries should be targeted?

Administering and funding a green SBG

Historically, oversight of the US SBG program has rested with the Department of State, and USAID has been the implementing agency. However, the BUILD Act of 2018 (passed as the FAA Reauthorization Act of 2018) complicated this picture, as it "authorized" the transfer of the Sovereign Loan Guarantee Program, including "loan accounts and the legal rights and responsibilities of the sovereign loan guarantee portfolio," from USAID to the "[DFC] or any other appropriate department or agency of the United States Government."[20] Despite this legislation, it remains unclear how much of USAID's SBG portfolio has been transferred to

[20] Brett Guthrie, "FAA Reauthorization Act of 2018," Pub. L. No. 115–254. H.R.302, (2018).

the DFC, and what plans are in place to facilitate that handoff. Further, with no new SBGs since the creation of DFC, it is unclear if or how DFC will be the implementing agency.

One possible rationale for this rests with USAID accounting procedures. Even though most SBGs only ever cost the US government the time value of their subsidy cost, USAID "recognizes the present value of the estimated net cash outflows of the loan guarantees as a liability."[21] A bulk transfer of existing guarantee accounts to the DFC might therefore consume a considerable portion of the DFC's budget. For context, USAID's total exposure from SBGs in 2020 was $15.2 billion.[22] This compares to DFC commitments of $6.7 billion FY2021 and an overall exposure limit of $60 billion.[23]

With climate finance as a leading element of the new agency's agenda, it makes sense to view the DFC as the implementing agency for a Green SBG, working in coordination with an interagency process to identify target countries, calculate subsidy costs, and specific conditions on the guarantee. The DFC already has considerable expertise with debt financing and country risk profiling—two major components of SBGs.[24] Subsidy costs associated with the program could continue to be funded through the Economic Support Facility at the State department, and the level of exposures contemplated in this proposal could be accommodated within the DFC's overall exposure limit.

Selecting partner countries

Next, we turn to the question of which developing country governments should be targeted for a US-backed Green SBG. Our country selection methodology is premised on the bond finance being allocated to climate change mitigation efforts. In part, countries that have a significant program of bond issuance already also tend to be a growing source of greenhouse gas emissions, so there is a reasonable alignment of countries with program objectives. It is important to note, however, that one objective of this analysis is to demonstrate the cost efficacy of SBGs as a financing tool for global public goods more generally. From this perspective, financing climate change adaptation or even global health investment would likewise be compelling objectives for a new tranche of SBGs. Of course, country selection would need to be tailored for each purpose and could easily be included in the country selection criteria without undermining the program's financial viability.

From a climate change mitigation perspective, Green SBGs should prioritize countries with the highest projected emissions. Because this program will take several years to implement, this analysis uses countries' total forecasted emissions to prioritize countries for Green SBGs. Figure 1 provides a heat map of total forecasted CO_2 emissions by country from 2030–2050.

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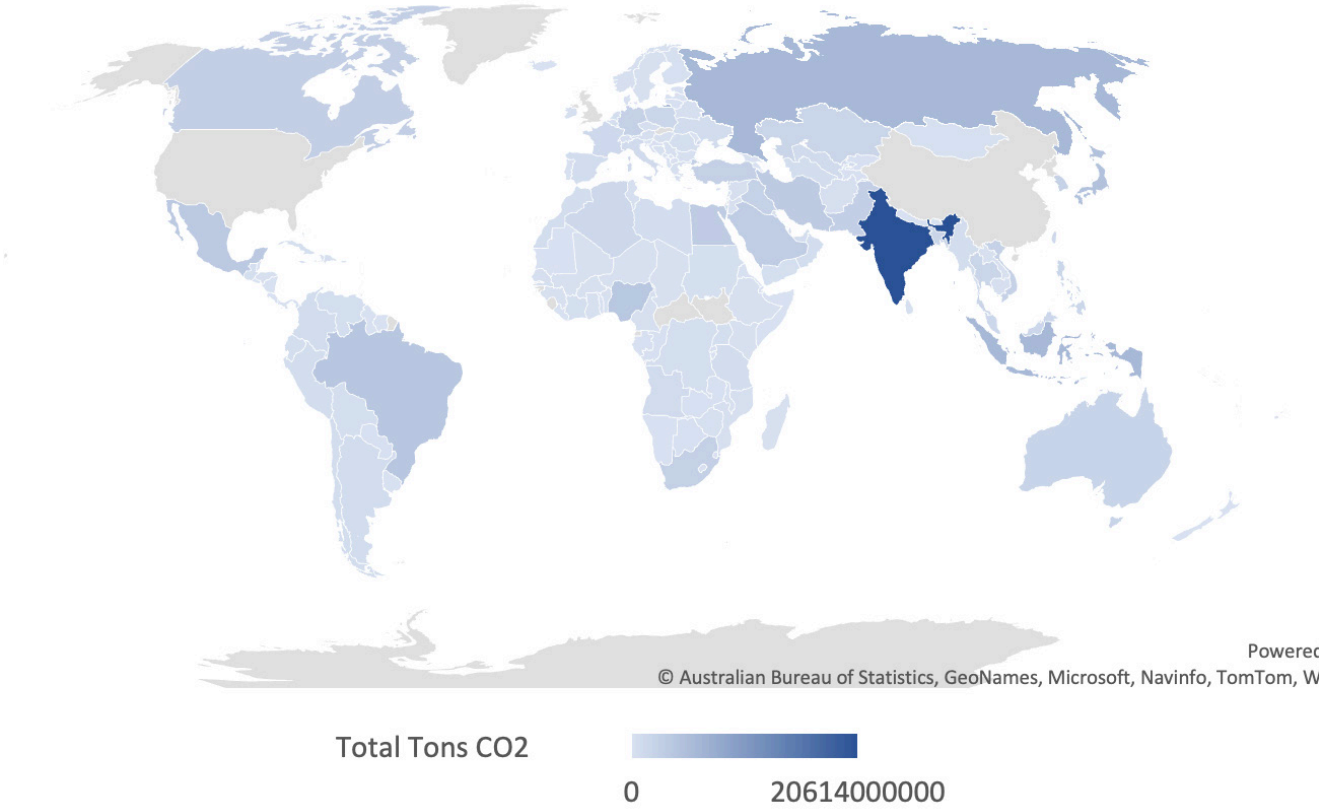
[21] USAID, "ADS Chapter 623: Financial Management of Credit Programs" (USAID, September 19, 2012).
[22] USAID, "FY 2020 Agency Financial Report: A Foundation Built on Decades of Global Health Investment" (Washington, D.C: USAID, November 16, 2020).
[23] U.S. International Development Finance Corporation, "Congressional Budget Justification: U.S. International Development Finance Corporation Fiscal Year 2020" (U.S. International Development Finance Corporation, October 1, 2019).
[24] U.S. International Development Finance Corporation, "DFC's Roadmap for Impact: DFC's Inaugural Development Strategy January 2020-December 2025" (U.S. International Development Finance Corporation, January 1, 2020).

Countries on the higher end of the emissions distribution are shown in dark blue, while those on the lower end are shown in light blue. The United States and China are excluded because their emissions are so high, they dwarf the emissions of other countries.

Figure 1. Forecasted CO_2 emissions by country (2030–2050)



Source: Denver University Pardee Center's International Futures (IFs) Version 7.58 Global Carbon Emissions Forecasts Dataset.

While it is tempting to allocate funds solely on the basis of emissions, doing so is impractical in the case of bond guarantees. SBGs work by mitigating the risk faced by commercial creditors in lending to a country. If the country in question has enough financial stability to source low-cost commercial credit on international markets, it derives no monetary benefit from bond guarantees.[25] Conversely, if the risk involved in lending to a given country is high, guarantees will offer that country considerable monetary benefits, but the subsidy costs of those guarantees will also be high. As a result, target countries for Green SBGs must fall into a "Goldilocks" range in the global distribution of sovereign credit risk.

[25] The point at which guarantees become effective tools for lowering borrower-country interest rates depends on the spread between unguaranteed and guaranteed interest rates. One reason that the Jordan 2019, Jordan 2020, and Tunisia 2021 SBGs had subsidy costs that outweighed their value was because they were issued in 2013–14, when US borrowing costs were high, but emerging market borrowing costs were unusually low thanks to strong commodity markets. This means that global credit conditions will influence the point at which SBGs become unproductive for countries with higher credit ratings.

The US government uses the Interagency Country Risk Assessment System (ICRAS) to score countries according to their willingness and ability to repay sovereign debt.[26] ICRAS country risk scores are also a primary metric used in the OMB's calculation of subsidy rates for bond guarantees. While official ICRAS score data are not publicly available, several publicly available proxies do exist, including Moody's country risk ratings.[27] The Moody's system ranks countries on a scale of Aaa to C, with Aaa representing countries with prime-grade credit ratings, and C representing countries that are in default (see Appendix 3 for a ranked table of Moody's credit ratings).

Looking at previous US bond guarantees, we see that no country with a Moody's country rating over Baa3 has ever received a US bond guarantee, likely because these countries can access low-cost capital on international markets and would derive little to no benefit from a guarantee.[28] The lowest-rated country to ever receive a US bond guarantee was Ukraine in 2015, which had a Moody's rating of Ca. But as Table 2 shows, the subsidy costs of bond guarantees get significantly more expensive for the US government as borrower country credit ratings go down. This is, in large part, the reason Ukraine and Iraq's 2016 and 2017 bond guarantees had subsidy costs that outweighed their economic value.[29] As a result, we limit the list of countries eligible for a Green SBGs to those with Moody's credit ratings between Baa3 and Caa2.

Figure 2 applies this country risk filter to the heat map of forecasted CO_2 emissions depicted in Figure 1. We also exclude high-income countries. This leaves 71 potential Green SBG target countries. Those on the higher end of the forecasted emissions distribution appear in dark blue, while those on the lower end appear in light blue. Note that the emissions data used in Figure 2 has also been transformed using the natural log to reduce the variance and exaggerate the relative differences between eligible countries. Russia and China have also been excluded from this figure as geopolitical tensions make US loan guarantees to these countries highly unlikely.

Figure 2 shows that, of the countries with risk classifications consistent with bond guarantee requirements, the largest CO_2 emitters (in order) are India, Brazil, Nigeria, Egypt, Pakistan, Turkey, South Africa, Iraq, Vietnam, and Bangladesh. Between 2030 and 2050, these countries are forecasted to emit 44.6 billion tons of CO_2 and serve as a starting point for our proposal.[30]

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[26] Export-Import Bank of the United States, "EXIM Board Unanimously Approves New Policy to Support U.S. Exporter Sales to Additional Foreign Markets and More Effectively Counter Competitors Such as the People's Republic of China," News, December 23, 2020.

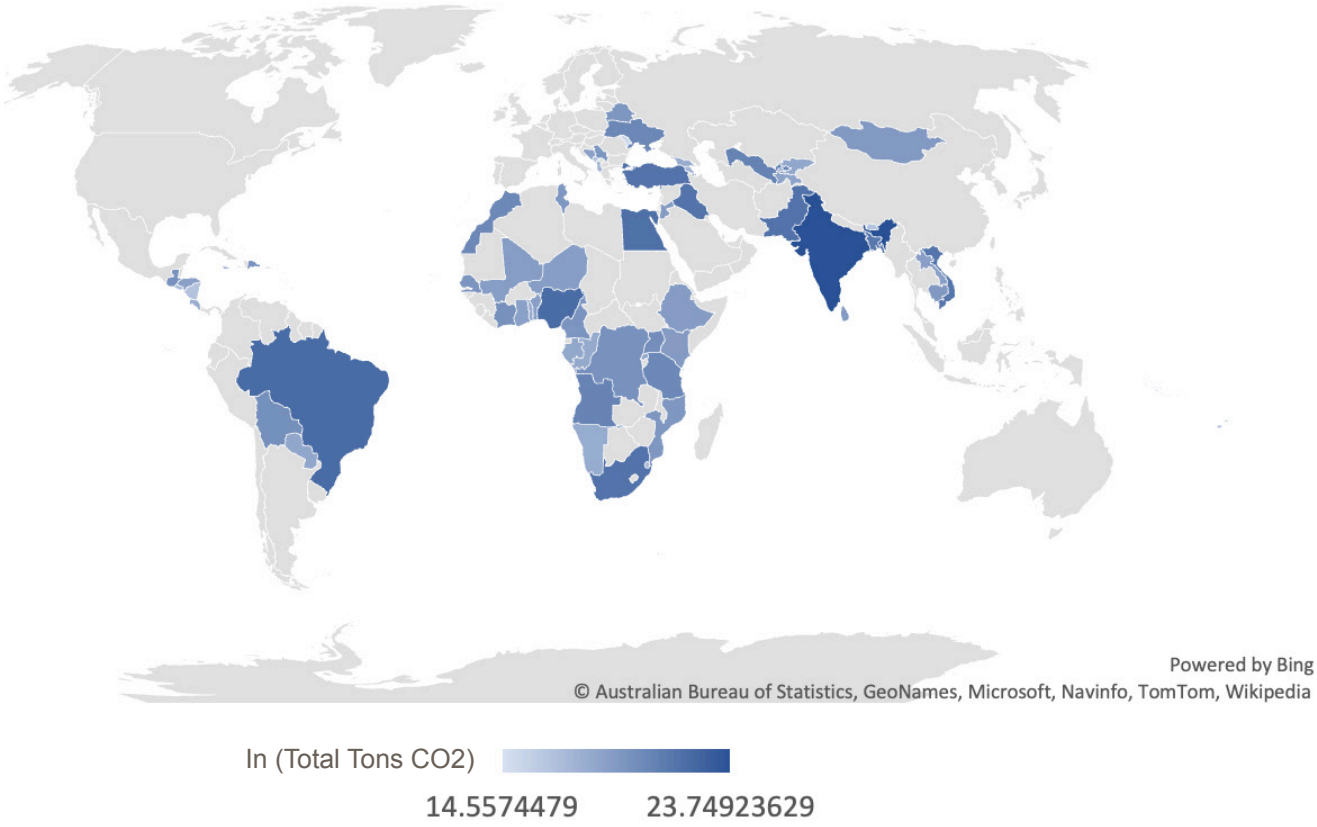
[27] In this analysis, we use Moody's long term foreign currency sovereign ratings data in lieu of ICRAS ratings data. Academic literature suggests that the credit ratings of independent credit ratings agencies are highly correlated to one another: John A. Ruddy, "An Analysis of Bank Financial Strength Ratings and Credit Rating Data," Risks 9, no. 9 (August 26, 2021).

[28] Moody's country risk ratings for each US bond guarantee recipient are listed in Appendix 1. The authors used the most recent classifications released prior to the issuance of the guaranteed bond offering.

[29] Although there is one more case where the subsidy cost of a US bond guarantee outweighed its economic value (Iraq 2017), Moody's revoked its (P)Caa1 rating of Iraq prior to the issuance of this guarantee.

[30] Barry B. Hughes, "International Futures (IFs) and Integrated, Long-Term Forecasting of Global Transformations," Modelling and Simulation in Futures Studies 81 (August 1, 2016): 98–118.

Figure 2. Forecasted CO_2 emissions by country (2030–2050) for low- and middle-income countries with Moody's ratings Baa3-Caa2



Source: Emissions forecast data from the Denver University Pardee Center's International Futures (IFs) Version 7.58 Global Carbon Emissions Forecasts Dataset. Country risk data from Moody's.

A target country list for green SBGs: Identifying $20 billion in climate financing

In this section, we model the costs and benefits of a hypothetical Green SBG program targeting 28 countries that have the highest 2030–2050 CO_2 emissions forecasts and also meet the credit rating criteria discussed above (See Appendix 4 for a list of these countries).

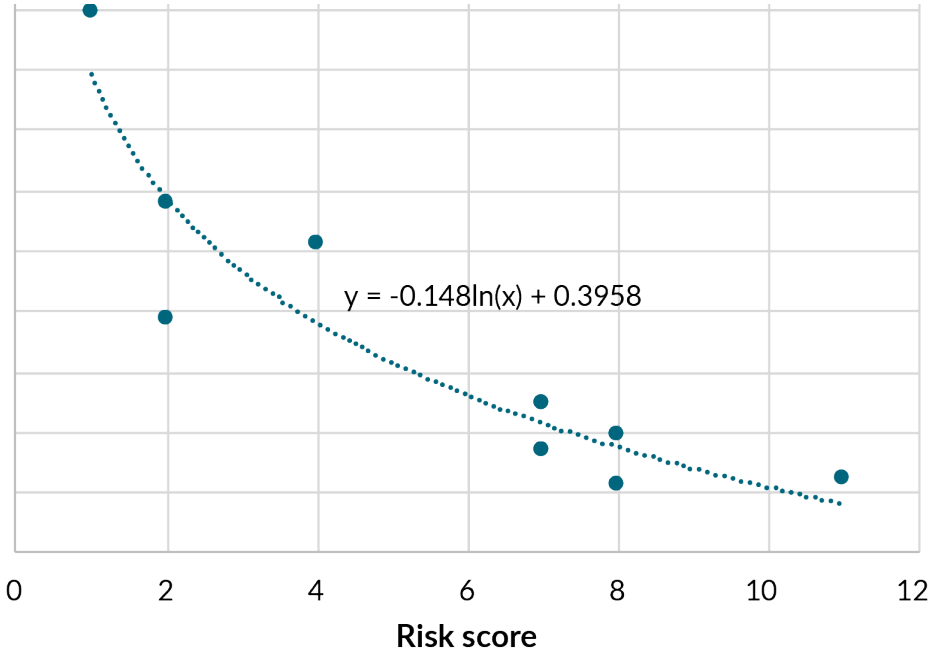
Estimating the subsidy cost of a $20 billion green SBG program

Because the US Government does not publish the methodology used to calculate the subsidy cost of US bond guarantees, we can only approximate the cost of a Green SBG program from available data. Such an approximation requires two prerequisites. First, we need data on the structure and total amount of money raised by hypothetical guaranteed bond issuances. Second, we need to model how the US government will assign subsidy costs to the hypothetical bond guarantees.

In a policy context, the structure and principal value of the bonds being guaranteed should be tied to tangible objectives, like the cost of implementing green public transit systems or renewable energy powerplants. For the purposes of this analysis, we assume that all guaranteed bonds will feature seven-year repayment schedules with semiannual interest payments with a bullet repayment of principal in the final period. The principal value of the hypothetical climate bonds being guaranteed is also somewhat arbitrary. Taking the 28 highest emitting countries identified in the previous section, we set the principal value at 27 percent of the country's IMF quota—a calculation that determines the maximum amount of financing member states can obtain from the IMF.

Looking at previous USAID bond guarantees, we see that subsidy rates go up (subsidy costs as a share of the guaranteed bond principal) as credit ratings go down (see Figure 3). This makes intuitive sense, since the subsidy cost of a guarantee is the money held in reserve by the US government against the liability of potential default. We can therefore regress subsidy costs (as a share of principal) against to credit rating and to model how subsidy rates change depending on the credit rating of the borrower country.[31] In the figure below, we use an exponential decay function because the subsidy rate should approach 100 percent as credit ratings approach C (default) and should approach zero as credit ratings improve.[32]

Figure 3. Historical guarantee subsidy cost relative to country risk ratings*



*In this figure, a risk score of 0 corresponds to a Moody's rating of C. A risk score of 12 corresponds to a Moody's rating of Baa2.
Source: Country risk data from Moody's.

[31] As above, we use Moody's Country Credit Ratings in lieu of ICRAS scores.
[32] Clearly there are not enough observations to create a robust model. We therefore use the available data to create the best model we can, noting that the relationship we observe is not statistically significant.

Using the formula from the model above, we calculate the subsidy rate of each hypothetical Green SBG from its current credit rating. We then use this subsidy rate to estimate the subsidy cost of each guarantee (see Table 3).

Table 3: Subsidy rate and subsidy cost calculations

Country	Moody's Credit Rating	Moody's Credit Rating (Numerical)	Subsidy Rate (%)	Principal Amount ($, mn)	Subsidy Cost ($, mn)
India	Baa3	11	4	4,938.69	202.05
Bangladesh	Ba2	11	4	401.67	16.43
Morocco	B2	10	6	336.82	18.53
Guatemala	B2	10	6	161.40	8.88
Brazil	B3	9	7	4,158.25	293.62
South Africa	B2	9	7	1,149.04	81.13
Azerbaijan	Ba2	9	7	147.51	10.42
Serbia	Caa1	9	7	246.59	17.41
Vietnam	Ba3	8	9	434.24	38.23
Dominican Republic	Ba3	8	9	179.78	15.83
Senegal	B1	8	9	121.86	10.73
Uzbekistan	Caa1	7	11	207.57	22.38
Nigeria	Ca	6	13	924.33	120.74
Egypt	B3	6	13	767.14	100.20
Turkey	B2	6	13	1,754.36	229.15
Tanzania	Ba1	6	13	149.81	19.57
Uganda	Caa3	6	13	135.95	17.76
Bolivia	B2	6	13	90.42	11.81
Cameroon	B2	6	13	103.94	13.58
Pakistan	Ba2	5	16	764.84	120.54
Ukraine	Ba3	5	16	757.61	119.40
Cote d'Ivoire	Caa1	5	16	244.93	38.60
Belarus	Ba1	5	16	256.64	40.45
Tunisia	Ba3	5	16	205.31	32.36
Iraq	B2	4	19	626.56	119.44
Angola	B2	4	19	278.71	53.13
Congo, Dem. Rep.	Ba3	4	19	401.44	76.53
Mozambique	Ba2	3	23	85.56	19.95
Total				**20,030.98**	**1,868.85**

Source: Country risk data from Moody's.

As seen in the table above, our analysis shows that for a later-recouped subsidy cost of $1.9 billion, the US government could mobilize $20 billion in bond sales for the high-emissions countries above. This means that every dollar set aside by the US government would leverage $10.7 for target countries.[33]

Estimating the benefits of green SBGs for the 28 target countries

The analysis above shows how bond guarantees offer the US government a considerable multiplier effect for mobilizing climate finance for low- and middle-income countries. We next seek to estimate the incentive effects of a US guarantee for the 28 target countries. How much would a Green SBG reduce borrowing costs for these countries? In a climate context, it is important to identify meaningful reductions in the cost of borrowing due to the guarantees. The leading goal of a Green SBG program is to incentivize green investments where they may not otherwise happen. A guarantee that has little impact on a country's cost of borrowing in turn provides little incentive to borrow for climate-related investments.

Ultimately, just how much a guarantee will lower the effective interest rate on a bond depends on how investors regard the difference in risk associated with the guarantee. One might assume that, because US SBGs represent legal obligations on the part of the US government, a US-guarantee would confer US borrowing costs on covered bonds. Figure 4 shows that the yields of historical US guaranteed bonds do indeed track the yields of US Treasury bonds with corresponding tenors. Still, there is some variation in the yields of historical US guaranteed bonds relative to US treasury yields (Figure 5).[34]

Across these historical cases, guaranteed bonds sell a premium of 34 basis points over the yield of Treasury bonds with equivalent maturity timelines. We estimate that the YTM for the prospective Green SBGs below as follows:[35]

(1) *Green SBG YTM = (Treasury 7-year YTM) + 0.34%*
(2) *2.05% = 1.71% + 0.34%*

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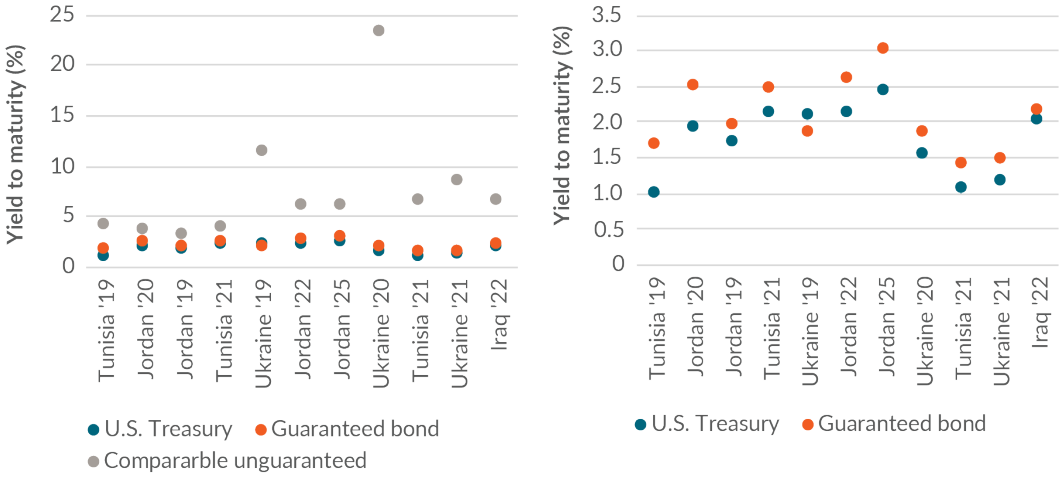
[33] For context, the Benban Solar PV power station in Egypt cost $4 billion to build. Once completed, it will produce 4 TWh of electricity per year, preventing 2 million tons of CO_2 emissions: Matthew Goosen, "Top 10 Solar Power Plants in Africa," *Energy Capital & Power*, July 18, 2021.

[34] The authors' conversation with a fixed income investor suggested that the difference in price between US SBGs and Treasury rates reflect an "illiquidity premium," as historical SBGs have not been included in major bond indices. If the United States were to pursue the Green SBG program, it would be worth exploring options to incentivize SBG inclusion in these indices to offset this illiquidity premium and further reduce SBG borrowing costs. Moreover, the United States may help countries further reduce their borrowing costs by requiring the certification of Green SBGs through international green bond certification organizations like the Climate Bonds Initiative or European Union. These certifications can be costly and cumbersome to attain, but evidence suggests that green bond certification results in an interest rate discount on certified bonds, further reducing costs to developing country issuers: Malcolm Baker et al., "Financing the Response to Climate Change: The Pricing and Ownership of U.S. Green Bonds" (Cambridge, MA: National Bureau of Economic Research, October 2018).

[35] Note that this method of estimation assumes that guaranteed bonds will have equal yields regardless of the credit rating of the borrower country. While there is some evidence that this represents an oversimplification of historical trends, we do not have enough historical cases to create a robust model

Figures 4 and 5. US Treasury, historical guarantee, and comparable unguaranteed bond yields*



* US Treasury yields captured on the pricing date of guaranteed bonds. Yields displayed correspond to the tenor of guaranteed bonds.
Source: Bloomberg.

Having estimated the yield of the hypothetical Green SBG bonds, can estimate the value of the prospective Green SBG guarantees using the same methodology employed in Table 2. First, we calculate the cash flow of each bond at the Green SBG interest rate calculated above, assuming seven years of semiannual interest payments and a bullet principal repayment in the final period. We then discount the guaranteed stream of cashflows at the market yield[36] to arrive at an estimated market value of an unguaranteed bond with similar characteristics to the Green SBG. The difference between this estimated market value and the guaranteed bond par value is the *estimated value of the Green SBG*.

This analysis shows that, on average, US Green SBGs would save borrower countries 23 percent of the principal amount of their bonds. In total this comes to $4.4 billion across the entire hypothetical guarantee program. This provides ample financial incentives for borrower governments to agree to the US SBG program, though the guarantees certainly offer more upside to countries with lower credit ratings. Importantly, on a portfolio basis, the Green SBG also represents a very favorable net benefit, with savings realized by developing country governments ($4.4 billion) greatly exceeding the estimated subsidy cost to the US government ($1.9 billion).

[36] Under ideal circumstances, we would discount the value of Green SBG cashflows using YTM data from USD yield curves of borrower countries to ensure comparability. Unfortunately, most of these countries do not have well-developed yield curves to draw from. As a result, we use the YTM of bonds issued by borrower countries that most closely match the tenor and principal value of US-guaranteed bonds. We collect the YTM of "comparable" bonds on December 13, 2021. For a list of bonds used as proxies for market rates in this analysis, see Appendix 5.

Table 4. Green SBG cost-benefit analysis

Country	Comparable Unguaranteed Interest Rate* (%)	Green SBG Interest Rate (%)	Principal ($, mn)	Estimated Market Value ($, mn)	Estimated Value of Green SBG ($, mn)	Subsidy Cost ($, mn)
India	3.85	2.05	4,938.69	4,398.64	540.05	202.05
Brazil	4.74	2.05	401.67	338.02	63.65	16.43
Nigeria	8.02	2.05	336.82	230.70	106.12	18.53
Egypt	8.13	2.05	161.40	109.80	51.60	8.88
Pakistan	8.24	2.05	4,158.25	2,810.86	1,347.40	293.62
Turkey	7.76	2.05	1,149.04	799.97	349.07	81.13
South Africa	4.57	2.05	147.51	125.47	22.04	10.42
Iraq	5.27	2.05	246.59	200.67	45.92	17.41
Vietnam	2.20	2.05	434.24	430.06	4.18	38.23
Bangladesh	2.15	2.05	179.78	178.67	1.11	15.83
Uzbekistan	4.69	2.05	121.86	102.87	18.99	10.73
Angola	7.88	2.05	207.57	143.47	64.10	22.38
Ukraine	9.36	2.05	924.33	583.11	341.22	120.74
Tanzania	8.30	2.05	767.14	516.52	250.62	100.20
Morocco	3.75	2.05	1,754.36	1,572.66	181.70	229.15
Uganda	8.30	2.05	149.81	100.86	48.94	19.57
Bolivia	6.86	2.05	135.95	100.07	35.88	17.76
Azerbaijan	3.56	2.05	90.42	82.03	8.39	11.81
Cote d'Ivoire	5.70	2.05	103.94	82.30	21.64	13.58
Congo, Dem. Rep.	8.30	2.05	764.84	514.97	249.87	120.54
Guatemala	4.33	2.05	757.61	654.30	103.32	119.40
Dominican Republic	5.04	2.05	244.93	202.18	42.75	38.60
Cameroon	8.13	2.05	256.64	174.59	82.05	40.45
Senegal	6.08	2.05	205.31	158.74	46.58	32.36
Serbia	3.63	2.05	626.56	565.89	60.67	119.44
Belarus	10.69	2.05	278.71	162.15	116.56	53.13
Tunisia	10.83	2.05	401.44	231.55	169.89	76.53
Mozambique	10.28	2.05	85.56	51.03	34.53	19.95
Total			**20,031**	**15,622.15**	**4,408.83**	**1,868.85**

* India, Bangladesh, Tanzania, Uganda, and the DRC do not currently have any USD denominated debt outstanding. In these cases, we take average yield across the JP Morgan Index constituents in the matching rating bucket (See Appendix 6). Cameroon and Serbia have outstanding Euro denominated debt, but no outstanding USD denominated debt. In these cases, we use the Bloomberg YAS (Yield & Spread Analysis) tool to convert the Euro-Denominated bonds into a USD-comparable yield.

Source: Bloomberg (interest rates captured on 2/2/2022).

A Green SBG program may also have positive externalities beyond its monetary benefits. As discussed in above, guarantees may help to create certainty for countries considering a bond issuance on an ex-ante basis. US-backed Green SBG program may also incentivize countries to seek certification for green bond issuances, which can be a cumbersome and expensive process. Finally, the expansion of Green SBGs may incentivize major bond indices to begin investing in Green SBGs, which would increase price competition among bidders for Green SBGs, further lowering the borrowing cost for low- and middle-income countries.

Conclusion and next steps

This paper seeks to identify the economic effects of a US Green SBG program. Our estimates show that such a program merits priority consideration as the US government seeks to move forward in a timely way with ambitious climate finance commitments. A Green SBG can mobilize climate financing at significant scale at reasonable cost to the US government and for a considerable benefit to developing country borrowers. We have offered some views on administration of the program, but key questions remain in carrying the proposal forward. Policymakers should consider:

How best to structure climate conditionality. The Green SBG could operate effectively as a form of project finance, with specific projects committed where public finance is needed, whether in the energy or transport sector or other areas that can demonstrate mitigation benefits. Alternatively, the Green SBG could employ policy conditionality akin to budget support provided by institutions like the World Bank. Under this scenario, the US government might, for example, obtain a commitment through a memorandum of understanding for fossil fuel subsidy reforms in the issuing country in exchange for the SBG.

How to appropriately gauge conditionality. It will be important that conditionality is appropriately scaled to the level of benefit offered by the guarantee. In short, conditionality can't be too onerous. This suggests that conditions should be tailored to the country's circumstances and hew closely to climate goals as much as possible. General conditions, such as tying the guarantee to IMF programs, would not be appropriate for countries that are not particularly vulnerable form a balance of payments perspective.

How best to structure the program on a sustainable basis. A key consideration for a Green SBG program would be its viability and sustainability over time. We have put forward an economic justification for a one-off portfolio of SBGs where the subsidy cost is budgeted on a one-time basis. Yet, the net benefit of the program would improve further if it were structured to operate on a revolving basis. Namely, as guarantees expire upon maturity of the bonds (whether 5-year, 7-year, or 10-year), the subsidy appropriations could be recycled within the program to support new guarantees. In this way, the appropriated funds could operate as a form of capital over time.

Appendices

Appendix 1. Bond offering details for US-guaranteed bonds

Bond	ISIN	Amount Issued ($)	Maturity (Years)	Coupon Rate (%)	Moody's Risk Rating at Issuance
Tunisia 7/16/2019	US066716AG65	450,000,000	7	1.686	Baa3
Jordan 10/20/2020	US418097AC53	1,250,000,000	7	2.503	B1
Jordan 6/23/2019	US418097AD37	1,000,000,000	5	1.945	B1
Tunisia 7/24/2021	US066717AA78	500,000,000	7	2.452	Ba3
Ukraine 5/16/2019	US903724AK89	1,000,000,000	5	1.844	Caa3
Jordan 6/30/2015	US418097AE10	1,000,000,000	7	2.587	B1
Jordan 6/30/2015	US418097AF84	500,000,000	10	3	B1
Ukraine 5/29/2020	US903724AL62	1,000,000,000	5	1.847	Ca
Tunisia 5/8/2021	US066716AJ05	500,000,000	5	1.416	Ba3
Ukraine 9/29/2021	US903724BL53	1,000,000,000	5	1.471	Caa3
Iraq 1/18/22	US462652AD08	1,000,000,000	5	2.149	(P)Caa1*

Source: Bond offering data from Bloomberg, credit rating data from Moody's.

Appendix 2. Bond offering details for unguaranteed comparable bonds

Guaranteed Bond ISIN	Comparable Bond ISIN	Comparable Bond Amount Issued ($)	Comparable Bond Maturity (Years)	Comparable Bond Coupon Rate (%)
US066716AG65	XS0773212179	500,000,000	5	4.22
US418097AC53	XS0557127353	750,000,000	5	3.75
US418097AD37	XS0557127353	750,000,000	5	3.13
US066717AA78	XS0773212179	500,000,000	5	3.78
US903724AK89	XS0858358236	1,250,000,000	10	10.88
US418097AE10	XS1117279882	1,000,000,000	10	5.99
US418097AF84	XS1117279882	1,000,000,000	10	5.99
US903724AL62	XS0858358236	1,250,000,000	10	22.41
US066716AJ05	XS1175223699	1,000,000,000	10	6.54
US903724BL53	XS1303921214	1,013,354,000	7	8.38
US462652AD08	XS1662407862	1,000,000,000	6	6.66

Source: Bloomberg.

Appendix 3. Moody's credit ratings

Grade	Moody's Credit Rating
Prime	Aaa
High Grade	Aa1
	Aa2
	Aa3
Upper Medium Grade	A1
	A2
	A3
Lower Medium Grade	Baa1
	Baa2
	Baa3
Non-Investment Grade Speculative	Ba1
	Ba2
	Ba3
Highly Speculative	B1
	B2
	B3
Substantial Risks	Caa1
	Caa2
	Caa3
Extremely Speculative	Ca
In Default	C
Not Rated	WR

Appendix 4. Target countries for green SBGs guarantees

Country	GDP/capita ($)	IFs Total Forecasted Emissions 2030–2050 (Tons CO_2)	Moody's Credit Rating	IMF Quota ($, mn)
India	1,900.7	20,614,000,000	Baa3	18,291
Bangladesh	1,968.8	1,723,000,000	Ba3	1,488
Morocco	3,009.2	612,000,000	Ba1	1,247
Guatemala	4,603	340,000,000	Ba1	598
Brazil	6,796.8	3,815,000,000	Ba2	15,401
South Africa	5,090.7	2,403,000,000	Ba2	4,256
Azerbaijan	4,213.3	394,000,000	Ba2	546
Serbia	7,666.0	260,000,000	Ba2	913
Vietnam	2,785.7	2,129,000,000	Ba3	1,608
Dominican Republic	7,268.2	303,000,000	Ba3	666
Senegal	1,487.0	266,000,000	Ba3	451
Uzbekistan	1,685.8	897,000,000	B1	769
Nigeria	2,097.1	3,686,000,000	B2	3,423
Egypt	3,547.9	3,024,000,000	B2	2,841
Turkey	8,538.2	2,446,000,000	B2	6,498
Tanzania	1,076.5	638,000,000	B2	555
Uganda	817.0	439,000,000	B2	504
Bolivia	3,143.0	409,000,000	B2	335
Cameroon	499.4	288,000,000	B2	385
Pakistan	1,193.7	2,546,000,000	B3	2,833
Ukraine	3,726.9	672,000,000	B3	2,806
Cote d'Ivoire	2,325.7	361,000,000	Ba3	907
Belarus	6,411.0	257,000,000	B3	951
Tunisia	3,319.0	241,000,000	B3	760
Iraq	4,157.5	2,233,000,000	Caa1	2,321
Angola	1,895.8	836,000,000	Caa1	1,032
Congo, Dem. Rep.	556.8	355,000,000	Caa1	1,487
Mozambique	448.0	240,000,000	Caa2	317

Source: GDP and IMF Quota data from the IMF. Emissions forecast data from the Denver University Pardee Center's International Futures (IFs) Version 7.58 Global Carbon Emissions Forecasts Dataset. Country risk data from Moody's.

Appendix 5. Comparable unguaranteed interest rates for green SBG target countries

Country	Credit Rating	ISIN	YTM (%)
India	Baa3	*	3.85
Brazil	Ba3	US105756CE88	4.74
Nigeria	Ba1	XS1910827887	8.02
Egypt	Ba1	XS2297226545	8.13
Pakistan	Ba2	XS2322319638	8.24
Turkey	Ba2	US900123DA57	7.76
South Africa	Ba2	US836205AY00	4.57
Iraq	Ba2	XS1662407862	5.27
Vietnam	Ba3	USY9384RAA87	2.20
Bangladesh	Ba3	**	2.15
Uzbekistan	Ba3	XS2365195978	4.69
Angola	B1	XS2083302419	7.88
Ukraine	B2	XS1577952952	9.36
Tanzania	B2	***	8.30
Morocco	B2	XS2270576965	3.75
Uganda	B2	***	8.30
Bolivia	B2	USP37878AC26	6.86
Azerbaijan	B2	XS1678623734	3.56
Cote d'Ivoire	B2	XS1631415400	5.70
Congo, Dem. Rep.	B3	***	8.30
Guatemala	B3	USP5015VAK28	4.33
Dominican Republic	Ba3	USP3579ECH82	5.04
Cameroon	B3	XS2360598630	8.13
Senegal	B3	XS1619155564	6.08
Serbia	Caa1	XS2308620793	3.63
Belarus	Caa1	XS2120882183	10.69
Tunisia	Caa1	US066716AB78	10.83
Mozambique	Caa2	XS2051203862	10.28

* Used the average yield across BBB rated sovereign issuers as represented by the J.P. Morgan - EMBIG Diversified Credit BBB Yield to Worst index (Bloomberg ticker JPBYBXYW)
** Used the average yield across BB rated sovereign issuers as represented by the J.P. Morgan EMBI Global Diversified IG BB Custom Spread to Worst index (Bloomberg ticker JPGCSUVS)
*** Used the average yield across B rated sovereign issuers as represented by the J.P. Morgan - EMBIG Diversified Credit B Yield to Worst index (Bloomberg ticker JPBYCBYW)
+ Used the Bloomberg Yield & Spread Analysis Tool (YAS XCCY) tool to convert the yield on the Euro-denominated bonds into a USD-comparable yield.
Source: Bond data from Bloomberg (interest rates captured on 2/2/2022). Country risk data from Moody's.

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