



# Assessing a Sovereign Green Bond Issued by a Lower-Middle-Income Country: A Proposed Framework for Pricing, Demand, and Use of Proceeds

Carlos Szymanski<sup>1\*</sup>, Jakub Chukwu<sup>2</sup>, Saltanat Gupta<sup>3</sup>

<sup>1</sup>Department of Business, Lapland Institute of Business, Tanzania

<sup>2</sup>Department of Business, Ebro Center for Business, Armenia

<sup>3</sup>Department of Business, Rhine Center for Business, Guyana

## Article Info

Volume 1, Issue 1, 2026

[doi: 10.62715/ijafe.2026.v1.i1.pp14-19](https://doi.org/10.62715/ijafe.2026.v1.i1.pp14-19)

Received: 08 October 2025

Accepted: 18 December 2025

Published: 26 February 2026

## Abstract

Governments of lower-middle-income countries have begun to issue green bonds, and each issuance is followed by claims about what it achieved: a lower yield than a conventional bond would have carried, a broader investor base, and finance for projects with environmental benefits. These claims are seldom tested in a consistent way, partly because the methods used to study corporate and advanced-economy green bonds assume liquid markets and many comparable securities, which such issuers do not have. This article proposes a framework for assessing a single sovereign green bond in that setting. It has five stages: establishing the context and the counterfactual, estimating the pricing difference at issue against the sovereign's own curve, examining the order book and the final allocation, tracing the proceeds through the budget to eligible expenditure and reported impact, and forming an overall judgement that sets any benefit against the additional costs of issuance. For each stage the article states the question, the data required, the method suggested and the main ways in which the conclusion can go wrong. The framework is assembled from market standards and the published literature on green bond pricing. It is a proposal and has not been applied to an issuance or validated here.

**Keywords:** Sovereign green bonds, Greenium, Bookbuilding, Use of proceeds, Debt management, Lower-middle-income countries

© 2026 Carlos Szymanski et al. This is an open access article under the CC BY license (<https://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made.

## 1. Introduction

The sovereign green bond market is young. Poland issued the first such bond at the end of 2016 and France followed with a much larger one in 2017. Fiji and Nigeria came to market later in 2017, Indonesia issued a green sukuk in 2018, and Egypt issued the first sovereign green bond in the Middle East and North Africa in 2020. Lower-middle-income issuers are therefore part of the market's history from early on, although they account for a small share of the amounts raised. For them a green bond is a more consequential decision than for a large advanced economy, because the fixed costs of a framework, an

\* Corresponding author: Carlos Szymanski, Department of Business, Lapland Institute of Business, Tanzania. E-mail: [carlos.szymanski@lapland.edu](mailto:carlos.szymanski@lapland.edu)

© 2026 Carlos Szymanski et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

external review and reporting are spread over a smaller programme, and because market access itself may be intermittent.

Three benefits are usually claimed. The first is a pricing advantage, often called a greenium. The second is diversification of the investor base towards funds with environmental mandates. The third is that the proceeds support expenditure with environmental benefits and that the discipline of tracking them improves public financial management. Overviews by international institutions describe these motives and the instruments in detail ([World Bank, 2015](#); [Ando et al., 2022](#); [Doronzo et al., 2021](#)), but an analyst who wishes to check the claims for a particular bond finds no agreed procedure.

This article proposes one. It is addressed to debt management offices, supreme audit institutions, researchers and civil society analysts who need to assess an individual issuance with the information a lower-middle-income sovereign can realistically supply. The framework is a proposal built from existing standards and published methods. It has not been applied to a bond here, and no results are reported.

## 2. Background

A green bond is defined by its use of proceeds, not by its credit. The Green Bond Principles rest on four components: use of proceeds, the process for project evaluation and selection, management of proceeds, and reporting ([ICMA, 2021](#)). The Climate Bonds Standard adds sector criteria and certification ([Climate Bonds Initiative, 2019](#)), and the European Union has legislated a voluntary standard tied to its taxonomy ([European Union, 2023](#)). A sovereign green bond ranks equally with the issuer's other debt and is serviced from general revenue. Any pricing difference must therefore come from investor preferences or from liquidity, since the credit risk is the same.

Evidence on the size of that difference comes mostly from corporate and municipal markets and is mixed. Matching green bonds to conventional bonds of the same issuers, [Zerbib \(2019\)](#) found a small negative yield premium. [Larcker and Watts \(2020\)](#), comparing United States municipal green bonds with almost identical conventional bonds issued on the same day, found essentially none. [Baker et al. \(2022\)](#) reported a modest premium at issue and more concentrated ownership, while [Flammer \(2021\)](#) found no pricing advantage for corporate issuers but a favourable market reaction and subsequent environmental improvement. Third-party verification appears to matter for whatever premium exists ([Bachelet et al., 2019](#)). Theory attributes a premium to investors who derive utility from holding green assets ([Pástor et al., 2021](#)).

For sovereigns the cleanest evidence comes from twin bonds, as issued by Germany, where a green security is paired with a conventional one of identical coupon and maturity. A lower-middle-income issuer has no such twin. It may have only a handful of bonds outstanding in the relevant currency, traded thinly. Many such issuers borrow abroad in foreign currency because they cannot do so in their own ([Eichengreen and Hausmann, 2005](#)), which means that a green bond may be the only security of its kind on the curve. A framework for this setting has to work with sparse comparators and to be frank about the resulting uncertainty.

## 3. The Proposed Framework

The framework has five stages, taken in order because each supplies assumptions for the next. Table 1 lists the question, data and method for each stage, and Figure 1 shows the sequence with the principal evidence on which each stage draws.

### 3.1. Stage 1: Context and counterfactual

Every later comparison depends on what the bond is compared with, so the first task is to state the counterfactual. The analyst reads the medium-term debt strategy and the annual borrowing plan to establish whether the green bond replaced a planned conventional issue of similar size, currency and maturity, or was additional to the plan. The green bond framework and the second-party opinion are reviewed against the four components of the Green Bond Principles ([ICMA, 2021](#)). The analyst also records the market conditions on the pricing date, the credit rating and outlook, and any credit

enhancement, since a guarantee from a development institution changes the credit and makes a comparison with the sovereign's own curve invalid.

**Table 1: Stages of the proposed assessment framework, with the question, data and method for each**

| Stage        | Question                                          | Data required                                                        | Suggested method                                          |
|--------------|---------------------------------------------------|----------------------------------------------------------------------|-----------------------------------------------------------|
| 1. Context   | What would the sovereign have issued otherwise?   | Debt strategy, borrowing plan, green bond framework, external review | Document review; define the counterfactual bond           |
| 2. Pricing   | Did the bond price inside the conventional curve? | Yields of outstanding bonds on pricing day; issue terms              | Fitted curve or interpolated comparator; uncertainty band |
| 3. Demand    | Was demand larger, broader or of better quality?  | Order book, investor type and region, allocations                    | Compare with the issuer's previous conventional deals     |
| 4. Proceeds  | Did the money reach eligible expenditure?         | Budget execution data, allocation and impact reports                 | Trace allocations; test eligibility and additionality     |
| 5. Judgement | Did benefits exceed the extra costs?              | Results of stages 2 to 4; issuance and reporting costs               | Structured summary with stated confidence                 |

### 3.2. Stage 2: Pricing at issue

The pricing question is whether the yield at issue was lower than the yield at which the same sovereign could have sold a conventional bond of the same maturity and currency on the same day. Where the issuer has enough bonds outstanding, a yield curve of the form proposed by [Nelson and Siegel \(1987\)](#) can be fitted to their secondary market yields at the close before pricing, and the green bond's yield compared with the fitted value at its maturity. Where there are too few bonds to fit a curve, the analyst interpolates linearly between the two conventional bonds that bracket the maturity, which is the approach used to construct synthetic comparators in the matching literature ([Zerbib, 2019](#)).

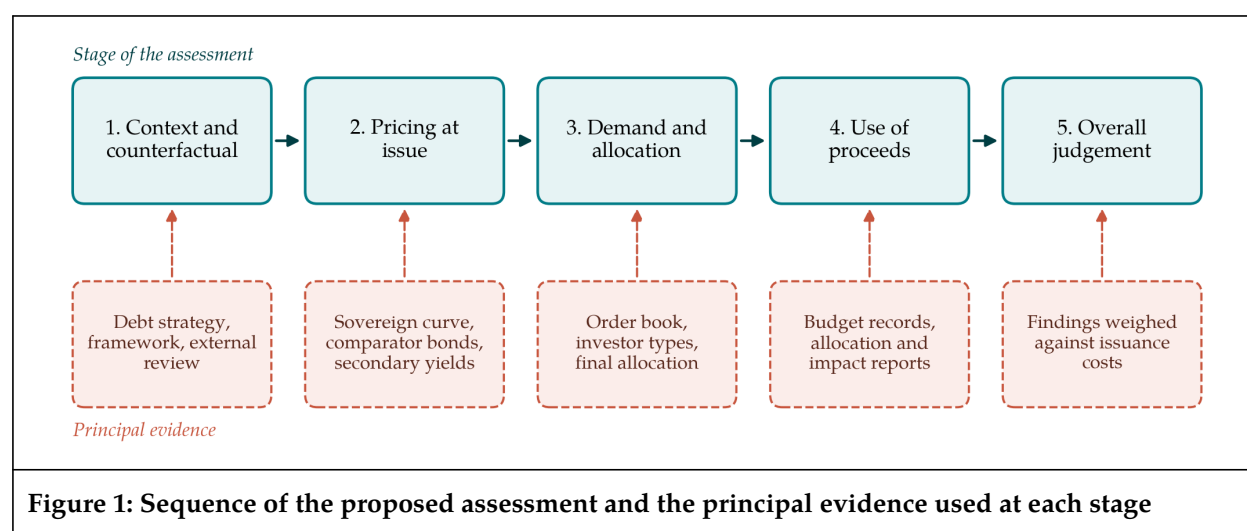


**Figure 1: Sequence of the proposed assessment and the principal evidence used at each stage**

Two adjustments are needed before the difference is read as a greenium. New bonds are normally priced with a concession to the secondary curve, so the difference should be set against the concession the same issuer paid on its recent conventional deals, where these can be established. Liquidity also differs, since a new benchmark-sized issue may trade more actively than older comparators. The analyst should report the estimate with a band that reflects the bid-ask spreads of the comparator bonds and the fit of the curve. With thinly traded comparators the band will often be wider than the premiums reported in the literature, and in that case the honest conclusion is that no pricing difference can be detected, not that none exists. Secondary market yields in the weeks after issue provide a check on the estimate made at

pricing.

### **3.3. Stage 3: Demand and allocation**

Issuers commonly cite the ratio of orders to the amount sold as evidence of success. The figure needs care. In a bookbuilt offering investors submit indications of interest that the lead managers use to set the price and the allocation ([Cornelli and Goldreich, 2001](#)), and investors who expect to be scaled back have reason to ask for more than they want. A large book is thus weak evidence by itself. More informative comparisons are with the same issuer's earlier conventional transactions: how far guidance tightened between the initial talk and the final price, how much of the book remained after tightening, and how the final allocation divided among investor types and regions.

The claim of diversification can be examined directly if the issuer discloses allocations. The analyst identifies the share placed with investors that have a stated environmental mandate, and the share placed with accounts that had not bought the sovereign's bonds before. Ownership of green bonds has been found to be more concentrated among such investors ([Baker et al., 2022](#)), which may support the price in secondary trading but can also reduce liquidity. For a local-currency bond the analyst should note how much was taken by domestic banks and pension funds that hold government paper for regulatory reasons, since their demand says little about the green label.

### **3.4. Stage 4: Use of proceeds**

Proceeds of a sovereign bond enter the treasury account and are not physically separated. Tracking is therefore notional: the issuer undertakes that an amount equal to the proceeds will be matched to eligible expenditure. The analyst obtains the allocation report and reconciles it with budget execution records, checking that the expenditures listed were made, that they fall within the eligible categories of the framework, and that the same expenditure is not also financed by an earmarked loan or grant. The proportion of refinancing of past expenditure to new expenditure should be established, together with the look-back period the framework allows.

Additionality is the hardest point. Money is fungible, and a government can label spending it would have undertaken anyway. The framework does not ask the analyst to prove that projects would not have happened without the bond, which is seldom possible. It asks for three narrower things: whether the eligible budget lines grew after the issuance relative to the medium-term expenditure plan, whether the unallocated balance was reported and how long it remained, and whether impact indicators were reported with stated methods and, ideally, external assurance. Evidence that labelled bonds are followed by measurable environmental improvement exists for corporate issuers ([Flammer, 2021](#)), and no comparable body of evidence exists yet for sovereigns.

### **3.5. Stage 5: Overall judgement**

The last stage brings the findings together and sets them against the costs that a conventional bond would not have incurred: preparation of the framework, the external review, arrangements for tracking and reporting, and the staff time of the ministries involved. A greenium of a few basis points on a modest issue may not cover these costs in the first transaction, although the framework can be reused for later ones. The analyst should present each finding with an explicit statement of confidence and should resist a single score, since the three dimensions do not share a unit.

## **4. Fitting the Framework to Limited Data**

In practice the binding constraint is disclosure. Order book and allocation data are held by the issuer and the lead managers, and public statements usually give only headline figures. Debt management offices that wish their claims to be credible can publish the allocation by investor type and region for green and conventional deals alike. Secondary market quotations for frontier sovereigns are often indicative, and the analyst should prefer traded prices where a reporting system makes them available and state clearly when only quotes were used. Where the green bond is the issuer's only bond in a currency, stage 2 cannot be carried out against the issuer's own curve. Comparison with similarly rated peers is possible but

introduces differences in credit that are larger than any plausible greenium, and the framework recommends recording the pricing question as unanswered in that case.

## 5. Limitations and What Remains to Be Shown

The framework is proposed and untested. It has not been applied to an issuance in this article, and its usefulness depends on matters that only application can establish: whether the uncertainty band in stage 2 is narrow enough to be informative for typical lower-middle-income issuers, whether issuers will disclose the allocation data that stage 3 requires, and whether budget classifications are detailed enough for the reconciliation in stage 4. The pricing stage estimates a difference on one day and cannot separate preference for the label from the publicity and investor outreach that accompany a first green transaction. The framework also takes the eligibility criteria of the issuer's own document as given. Whether those criteria are ambitious enough is a separate question on which standards differ ([Climate Bonds Initiative, 2019](#); [European Union, 2023](#)). Applying the procedure to several issuances by different sovereigns would show which stages are feasible and where it needs revision.

## 6. Conclusion

Claims made for sovereign green bonds by lower-middle-income issuers can be examined in an orderly way even where markets are thin. The framework proposed here separates the pricing, demand and use-of-proceeds questions, ties each to data that an issuer could disclose, and requires the analyst to report uncertainty and to say so when a question cannot be answered. It remains a proposal until it has been applied, and its first applications should be treated as tests of the method as much as assessments of the bonds.

## Conflict of interest

To be declared by the author(s) before publication.

## Funding

To be declared by the author(s) before publication.

## References

- Ando, S., Fu, C., Roch, F. and Wiriadinata, U. (2022). [Sovereign climate debt instruments: An overview of the green and catastrophe bond markets](#). IMF Staff Climate Note 2022/004. International Monetary Fund, Washington, DC.
- Bachelet, M.J., Becchetti, L. and Manfredonia, S. (2019). [The green bonds premium puzzle: The role of issuer characteristics and third-party verification](#). *Sustainability*, 11(4): 1098.  
<https://doi.org/10.3390/su11041098>
- Baker, M., Bergstresser, D., Serafeim, G. and Wurgler, J. (2022). [The pricing and ownership of US green bonds](#). *Annual Review of Financial Economics*, 14: 415-437.
- Climate Bonds Initiative (2019). [Climate Bonds Standard Version 3.0](#). Climate Bonds Initiative, London.
- Cornelli, F. and Goldreich, D. (2001). [Bookbuilding and strategic allocation](#). *Journal of Finance*, 56(6): 2337-2369.
- Doronzo, R., Siracusa, V. and Antonelli, S. (2021). [Green bonds: The sovereign issuers' perspective](#). Markets, Infrastructures, Payment Systems series. Bank of Italy, Rome.
- Eichengreen, B. and Hausmann, R. (eds.) (2005). [Other People's Money: Debt Denomination and Financial Instability in Emerging Market Economies](#). University of Chicago Press, Chicago.
- European Union (2023). [Regulation \(EU\) 2023/2631 of the European Parliament and of the Council of 22 November 2023 on European Green Bonds and optional disclosures for bonds marketed as environmentally sustainable and for sustainability-linked bonds](#). Official Journal of the European Union.

- Flammer, C. (2021). [Corporate green bonds](#). *Journal of Financial Economics*, 142(2): 499-516. <https://doi.org/10.1016/j.jfineco.2021.01.010>
- ICMA (2021). [Green Bond Principles: Voluntary Process Guidelines for Issuing Green Bonds](#). International Capital Market Association, Zurich.
- Larcker, D.F. and Watts, E.M. (2020). [Where's the greenium?](#) *Journal of Accounting and Economics*, 69(2-3): 101312. <https://doi.org/10.1016/j.jacceco.2020.101312>
- Nelson, C.R. and Siegel, A.F. (1987). [Parsimonious modeling of yield curves](#). *Journal of Business*, 60(4): 473-489.
- Pástor, L., Stambaugh, R.F. and Taylor, L.A. (2021). [Sustainable investing in equilibrium](#). *Journal of Financial Economics*, 142(2): 550-571. <https://doi.org/10.1016/j.jfineco.2020.12.011>
- World Bank (2015). [What Are Green Bonds?](#) World Bank, Washington, DC.
- Zerbib, O.D. (2019). [The effect of pro-environmental preferences on bond prices: Evidence from green bonds](#). *Journal of Banking & Finance*, 98: 39-60. <https://doi.org/10.1016/j.jbankfin.2018.10.012>