



TRANSFORMING GREEN BOND MARKETS

Using financial innovation and technology to expand green bond issuance in latin-america and the caribbean.



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TRANSFORMING GREEN BOND MARKETS USING FINANCIAL INNOVATION AND TECHNOLOGY TO EXPAND GREEN BOND ISSUANCE IN LATIN-AMERICA AND THE CARIBBEAN

INTER-AMERICAN DEVELOPMENT BANK – DISCUSSION PAPER

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The opinions expressed in this publication are those of the authors and do not necessarily reflect the views of the Inter-American Development Bank, its Board of Directors, or the countries they represent.

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INTRODUCTION

Climate change and global warming represent an increasing threat to economies around the world. In Latin America and the Caribbean (LAC), ever more frequent and intense climate events – hurricanes, heavy rains, flooding, droughts – and extreme weather are imposing higher risks to the region’s development.

Consequently, there is an important need for climate-friendly investments in emerging markets. The overall figure could reach US\$23 trillion until 2030¹. However, the public sector will only be able to fund about one quarter of these investments and, therefore, other finance alternatives need to be found.

The last decade saw some advances in new mechanisms to direct private financial resources to climate change mitigation and adaptation activities. These advances were supported by the widespread adoption of technological innovation, in both industry and finance, and the public commitment to mobilize incremental private funds. In this context, green bonds emerged as one of the most promising tools.

The idea behind the green bond was that a growing class of investors would be willing to pay a premium to invest in climate-friendly activities. Using a fixed income instrument, a bond, and labelling it “green” would somehow assure its investors that the proceeds of its placement would be used to fund only green projects, and nothing else. So, in 2007 a green bond market was created, and it has been growing since at remarkable rates (see Section I for an overview of the green bond markets).

Fixed income markets are a natural fit for

low-carbon infrastructure assets, which are commonly characterized by high up-front capital costs and long-term income flows. The promotion of a deep, global, green bond market can greatly facilitate access to relatively less-expensive² sources of funding for issuers to finance green projects. At the same time, it can expand opportunities for climate-aware investors actively seeking to increase the share of green ventures in their portfolios.

However, albeit exhibiting notable growth, the size of the green bond market is still marginal in relation to the overall bond market (less than 1%). Moreover, the global development of the green bond market has been somehow uneven, fairly concentrated in a few issuing regions or countries, as well as in terms of the assets that are being financed with the proceeds. Europe, the US and, most recently, China, are clear dominant players in the market, which is still largely focused on renewable energy projects. Despite vast green investment potential in these and other sectors, emerging and developing regions, including LAC, are lagging behind³.

The most important promise of green bonds – that investors would be willing to pay a “green premium” – has not materialized in any relevant way. While the green bond pricing spreads are still a matter of debate – no consistent premium in green bonds is identifiable using existing data –, advantages of green bonds vs. standard bonds have been found to be relatively insignificant, in the range of 0 to 3 basis points (bps)⁴.

To weaken green bonds appeal further,

1 Climate Investment Opportunities in Emerging Markets: An IFC Analysis, International Finance Corporation, (2016). The study analyzed national climate commitments made in Paris by 21 emerging market economies where major investment in infrastructure and climate-smart solutions are expected. Specific sectors considered in the analysis include: renewable energy generation, transmission and distribution, buildings, industrial energy efficiency, transport and waste.

2 The cost of project finance debt is higher than the yield for investment-grade project bonds in most markets.

3 The IDB estimates infrastructure investment needs in LAC are in the order of US\$250 billion, with some additional US\$30 billion to meet climate action needs. The resulting financing gap to cover these investment needs is roughly US\$130 billion, which represents 2.6% of the region’s GDP. See Serebrisky, Tomás, *Infraestructura sostenible para la competitividad y el crecimiento inclusivo. Estrategia de infraestructura del BID* (2014).

4 Figures from analyses of green bonds performance in primary and secondary markets. See Zerbib, O., *Is There a Green Bond Premium? The Yield Differential Between Green and Conventional Bonds* (May, 2018); and *Green Bond Pricing in the Primary Market: January - June 2018*, Climate Bond Initiative (October, 2018).

there is the presumption of the increased transaction costs. Because of the need to reassure investors that the bond proceeds are indeed directed towards green investments, structuring, monitoring and reporting are generally feared as more cumbersome and costly for green bonds than they are for standard issuances. The costs associated to labelling a bond green will depend on many factors related to the characteristics of the issuance (with regards to both the issuer and the assets) and, consequently, to what type of certification and verification processes are used. Providing sounder guarantees to back up the green label – for instance, by adding external reviews by an authorized second or

third-party – comes at additional cost, which can be of relevance particularly in the case of small or first-time issuers⁵. The relative impact of monitoring costs also can vary widely depending on the specific group of assets being financed, with more heterogeneous pipelines involving a much more complex – and costly – framework.

In the following sections this paper presents a brief review of the green bond market, analyzing some of the issues inhibiting its development, and keeping on to explore how the market can be enhanced. In particular, the paper explores two key dimensions: i) the risk profile of the green bond instrument; and ii) the transaction costs associated to green bond issuance and reporting.

⁵ Second opinion or third-party assurance costs are estimated between US\$10,000 and US\$100,000. See Green Bonds: Country Experiences, Barriers and Options, In support of the G20 Green Finance Study Group, OECD (2016). According to BIS (2107), the upper bound cost of a green assessment by a major rating agency should not be higher than the cost of a normal credit rating (up to 3 to 5 bps of the issue value).

I. GREEN BOND MARKET OVERVIEW

I.1. Definition of Green Bonds

A green bond is just like a conventional bond – a fixed-income debt instrument with long-term maturity – save for one particularity: that the issuer commits to use the proceeds solely for the financing or re-financing of investment projects, assets or business activities considered green (i.e., those that deliver environmental benefits)⁶.

In terms of regulation, legal framework, documentation and financial disclosure requirements, the issuance and placement process of a green bond is fairly similar to that of a regular bond. The main difference is that a “green” label adds additional disclosure and procedure obligations, intended to provide assurance to investors on the green use of proceeds.⁷

I.2. Evolution of the Green Bond Market

The first green bond was issued in 2007 by the European Investment Bank, under the name Climate Awareness Bond. It was a structured bond with proceeds dedicated to renewable energy and energy efficiency projects. Until 2012, the issuers were mostly Multilateral Development Banks (MDB) and other Sovereign Supranational Agencies (SSA). Between 2013 and 2015, supported

by the launch of the Green Bond Principles (GBPs), the market saw further diversification of issuer profiles, to include the private sector – corporates and banks – and governments. From then on, annual green bond issuance has grown rapidly.

Global green bond supply exceeded US\$155 billion in 2017 (a 78% rise from 2016)⁸ and is projected to have totaled US\$167.3 in 2018⁹. Further issuer diversification and more clarity around standards and definitions are expected to continue to expand the market, with issuances projected to reach US\$200 billion in 2019 (Figure 1).

On the demand side, interest in green bonds has been growing among the investor community. Pension funds, insurance companies, sovereign wealth funds and other institutional investors are increasingly looking for sustainable responsible investments¹⁰. According to the Climate Bond Initiative (CBI), investors with at least US\$45 trillion of assets under management have publicly committed to climate and responsible investments. The UN-supported Principles for Responsible Investment (PRI)¹¹ has now over 1,700 signatories from more than 50 countries; the aggregated volume of assets under management represented by this group amounts to US\$73.5 trillion¹².

7 Green bond standards are continuously evolving in line with the development of the market. Although it started with bonds being issued without certification, that market practice has become less accepted by investors with time and, nowadays, the norm is to have the green label certified under at least one of the different standards available. In an attempt to standardize the market and provide clarity on the approach for green bond issuance, the International Capital Markets Association (ICMA) published a set of voluntary guidelines, the Green Bond Principles (GBPs) in January 2014. The GBPs, updated annually, comprise four core components: i) use of proceeds; ii) process for project evaluation and selection; iii) management of proceeds; and iv) reporting. It also adds recommendations on external reviews to be carried out in connection with the issuance. The GBPs are currently the most widely used standards; yet, there are others, including those with an asset focus (such as CBI's for climate-related activities) or a jurisdiction focus (national standards, such as the Chinese). Green bond good practices, standards and other performance requirements are currently being reviewed by ISO and rating agencies.

8 Green Bond Highlights 2017, Climate Bond Initiative (January, 2018)

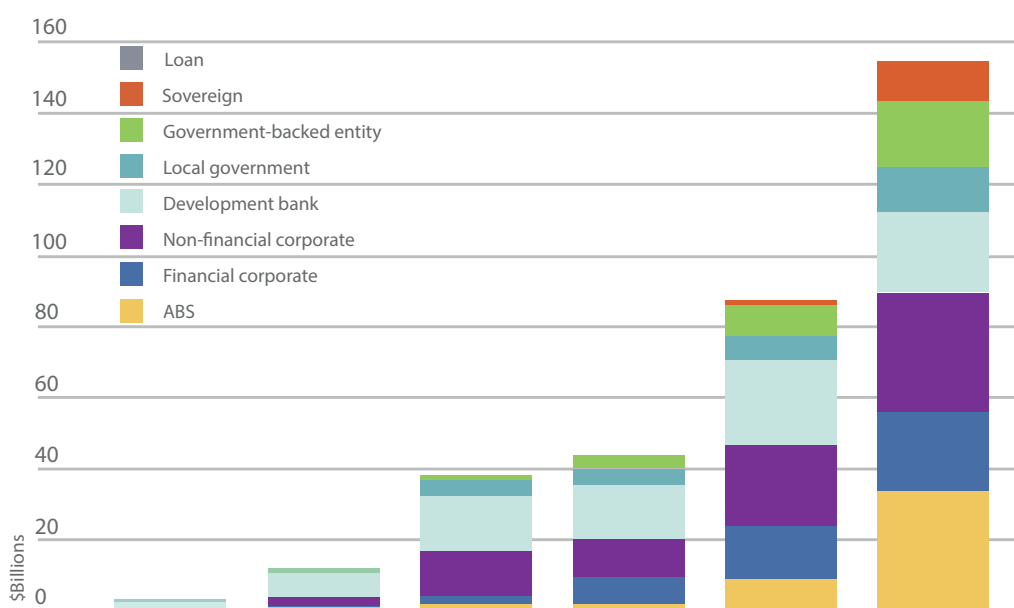
9 2018 Green Bond Market Summary, Climate Bond Initiative (January, 2019). Other estimations, including by HSBC, Commerzbank Global, Moody's Investors Service and UNEP are in the range of US\$170 and US\$200 billion. Growth in 2018 seems to have slowed down from previous years, possibly due to bond label diversification (sustainable, social and SDG bonds).

10 Also, regulatory pressures on investors to disclose how they are addressing environmental risks in their portfolios, are emerging. Article 173 in France is an example.

11 The PRI were launched in 2006 to guide investors in integrating environmental, social and governance (ESG) factors into investment decisions and ownership practices

12 Green Bonds – Ecosystem, Issuance Process and Regional Perspectives, GIZ and SEB, Brazil Edition (November, 2017) and Mexico Edition (January, 2018). Other similar initiatives include: the Paris Green Bond Statement, signed in 2015 in the context of the Paris Climate Agreement by investors with USD 10 trillion of assets under management, the Statement of Investor Expectations for the Green Bond Market, subscribed by 26 large global investors, and the Green Infrastructure Investment Coalition.

Figure 1. - Global Green Bond Market Growth



Source: CBI (2018)

Amidst this momentum, the global green bond market potential is estimated to be in the range of US\$4.7 and US\$5.6 trillion of outstanding bonds by 2035, with annual issuances in the order of US\$620-US\$720 billion (roughly a 4% share of the current debt securities market)¹³. However, despite investor enthusiasm and favorable policy developments that have led to the exponential growth experienced since 2015, the green bond market still remains a small fraction (less than 1%) of the global bond market. Furthermore, the market is highly concentrated. In 2018, the top 5 issuers (US, China, France, Germany and the Netherlands) accounted for 55% of the global market, and these regions are bound to continue to show high growth rates. They also have the greatest share of repeat issuers, which although much

smaller in number than single issuers, are driving overall green bond volumes (63% of 2018 volume corresponds to repeat issuers, as per CBI data).

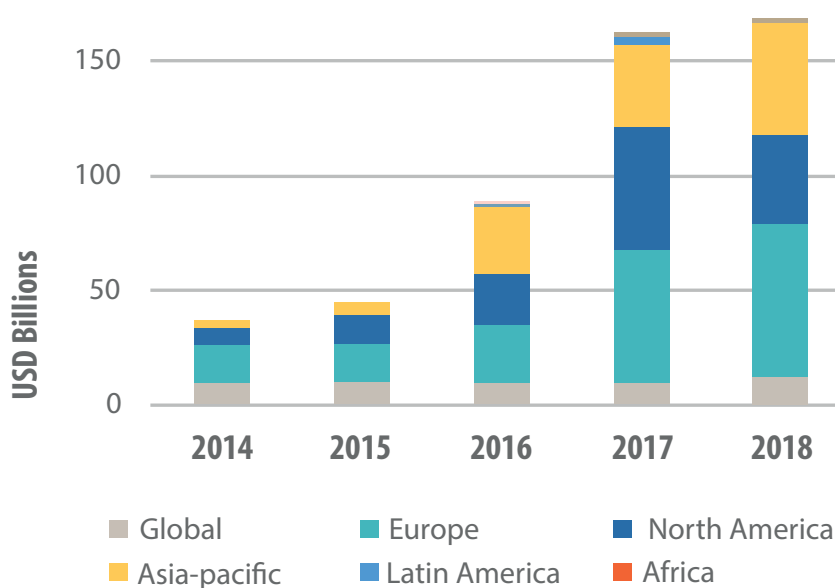
In emerging economies, except for China, issuances have grown at a much slower pace than in their developed counterparts. This is mostly due to their relatively shallow and underdeveloped local capital markets, limited investor demand for local green offerings, and lack of awareness and knowledge¹⁴. In addition, more than half (52%) of green bond proceeds in emerging markets are financing renewable energy¹⁵, leaving other sectors far behind. Although some, such as land use and buildings, are already gaining importance, much work is still needed to support diversification and stimulate these markets further.

13 Mobilising Bond Markets for a Low-Carbon Transition, Green Finance and Investment, OECD Publishing (2017). Their analysis is focused in 4 markets (China, the European Union the United States and Japan), across 3 sectors (renewables, energy efficiency and low-emission vehicles) which account for 80-90% of the low-carbon assets included in the two-degree scenario.

14 Creating Green Bond Markets – Insights, Innovations, and Tools from Emerging Markets, IFC and CBI for Sustainable Banking Network (SBN) (October, 2018).

15 Globally, this share is about 45%.

Figure 2. - Issuance by Region



In LAC, overall market value of green bonds reached US\$8.1 billion in 2017, more than twice the US\$3.7 billion in 2016 (US\$1 billion in 2015)¹⁶. Yet, 2017's exponential increase was mostly driven by a single green bond issuance of US\$2 billion to finance the new Mexico City Airport, making it Latin America's largest such issuance to date but also an outlier that poses statistical interference for green bond data series in the region. In 2018, issuance totaled US\$540 million. Bearing in mind that the \$3.96 billion raised in the previous year includes the Mexico City Airport bond, 2018 still marks a decline with respect to the normalized trend, potentially due to uncertainties in the region's major economies, which may have slowed down capital flows¹⁷. On average, green bond issuances correspond to only 1.6% of the total LAC bond issuance in international markets, although this share continues to display an upward trend¹⁸. Ultimately, the region's volume remains too small compared to North America, Europe and, especially, Asia (see Figure 2), representing less than 1% of total global issuances.

1.3. Financial Performance of Green Bonds

As the market evolves, issuers have seen strong demand for their green bond issuances, usually realizing increased access to new investors and higher oversubscription. However, views with regards to a concrete pricing advantage are still mixed. Several studies on the financial performance of green bonds relative to conventional bonds are already available, but without definitive results.

The CBI's comparative analysis¹⁹ on the performance of USD and EUR-denominated green bonds in the primary markets, vis-à-vis non-green bonds, suggests that green bonds perform only slightly better than their non-green counterparts. While the former are observed to achieve larger average oversubscription, cost differences with their plain-vanilla equivalents are not found to be significant. In fact, the resulting spread compressions are quite small, at -0.4bp and

¹⁶ The average value of the green bonds issued in LAC between 2014 and 2017 is some US\$310 million. Due to its exceptional size, this average excludes the 2017 Mexico City Airport bond. See *Los Bonos Verdes y la Transformación Estructural de la Región*, IDB for ALIDE (2108).

¹⁷ Garrido, F., Feliba, D., Castells, D., *LatAm set for a green bond boon following 2018 lull*, S&P Global Market Intelligence (January, 2019).

¹⁸ *The rise of green bonds: financing for development in Latin America and the Caribbean*, Economic Commission for Latin America and the Caribbean (ECLAC) (October, 2017).

¹⁹ *Green Bond Pricing in the Primary Market: January - June 2018*, Climate Bond Initiative (October, 2018)

-2.4bp for bonds denominated in EUR and USD, respectively, suggesting that attaching a green label to an issue does not have a significant impact on its price or yield at issuance. HSBC²⁰ also analyses green vs. conventional bond yields at issuance without finding any significant differences. On the other side of the spectrum, a comparison of credit spreads at issuance by the Bank of International Settlements (BIS)²¹ finds a mean difference of -18 bps in spreads of green bonds vs. conventional bonds in their sample. Research on yield differentials on secondary markets also show contrasting results, going from no premium at all identified, to premiums in the order of -1 or -2 bps, and up to -17 bps (-25bps observed in some specific types of green bonds)²².

The evolving landscape of the market includes ongoing efforts to better reflect green factors in credit-risk analysis and bond pricing, with increasing involvement of fixed-income investors and credit ratings agencies (see Section II.1). In the meantime, the evidence seems to reinforce the perception that green bonds still offer little financial incentives to issuers²³, i.e. that the reduction in yields, due to investors appreciation of the green label, is not perceived as quite enough to offset the presumed incremental issuance costs that attaching such a label implies.

I.4. Additional Transaction Costs associated to the Green Label

Whereas issuing bonds with a green label does not seem to offer significant pricing benefits to issuers, it does imply several additional processes and costs (upfront and throughout

the life of the bond). These costs originate with the need of reassuring investors on the use of proceeds and the environmental impact of the underlying projects. Investors do not necessarily have the capacity to assess the green element of a bond and have to weigh in a potential reputational risk of the green integrity of the bond being challenged, i.e. claiming an investment as green when in reality it is not. Much work has been devoted to determining what counts as green and to preventing so-called greenwashing²⁴. Certification and reporting are key in this respect, as they help mitigate this risk and provide sufficient confidence to investors willing to invest in these markets. Typically, this entails the following steps (following the GBPs):

- (i) Transparent process for project evaluation and selection: Issuers should clearly and transparently communicate to investors: a) the environmental objectives of the projects; b) how the projects fit into one of the categories established by the GBPs; and c) the eligibility criteria or any process that applies to the projects with environmental effects.
- (ii) Management of proceeds: issuers need to hire independent auditors in order to verify the authenticity of the allocation of funds' process, or complement the scope of their annual audits with this type of verification.
- (iii) Reporting: in order to provide necessary clear and up-to-date reporting,

20 Green Bonds 2.0. Fixed Income Credit report, HSBC (2016).

21 Ehlers, T. and Packer, F., Green Bond Finance and Certification, BIS Quarterly Review (September, 2017).

22 Preclaw, R. and Bakshi, A., The Cost of Being Green, Barclays Credit Research (September, 2015); Investors are willing to pay a "green" premium. Bloomberg New Energy Finance Report (2017); Zerbib, Olivier, Is There a Green Bond Premium? The Yield Differential Between Green and Conventional Bonds (May, 2018).

23 Such has been so far the global market understanding of this issue. See Beyond transparency: unlocking the full potential of green bonds, Institute for Climate Economics (IACE) (June, 2016) and Mobilising Bond Markets for a Low-Carbon Transition, Green Finance and Investment, OECD Publishing (2017)

24 According to the OECD, the term greenwashing is used when an issuer does not use proceeds for their intended purposes or when it is unable to prove that resources were used to fund projects with positive environmental impact.

issuers must maintain a full list of all projects that have received proceeds from the green bond, with each project's description and intended results. Performance metrics and their application methodology in the reporting process are necessary for investors to gauge the impact of their investments²⁵.

(iv) The GBPs also recommend that issuers use external parties to confirm alignment with the principles²⁶. There are three main audit methods: a) second-party opinions on the methodology used by the issuer to select the projects for investment, b) unrelated third-party certification and verification of the green bond, and c) use of an auditor to verify the internal tracking method and the allocation of funds²⁷.

Estimates for upfront and ongoing transaction costs – from labelling and associated administrative, certification, reporting, verification and monitoring requirements – vary widely, depending on the market, the type of bond (corporate versus project) and other specifics of the transaction. A green certification under the GBPs – the standard followed by most issuers in the market – ranges between some US\$15,000 and US\$20,000 for a single issuance. The OECD estimates that second-opinion verification of procedures and reports by an authorized third-party, can cost anywhere from US\$10,000 to US\$100,000²⁸, although it is unclear how much of it is entirely attributable to the green nature of the bond. Even if major rating agencies (e.g., S&P, Moody's) continue to move towards integrating the issue of ESG in their rating

processes, it is argued that any cost associated to the development of a green assessment should remain of no concern to those already using normal credit ratings (estimated on as much as 3 to 5 bps of the issue value)²⁹. Nonetheless, as the bulk of the costs seem to be more or less the same regardless of the size, these costs can be of much higher impact in the case of smaller issuances.

II. A ROADMAP TO IMPROVE THE GREEN BOND MARKETS

The analysis above can be summarized as follows. Green bond issuance has grown substantially in global terms, but it still (i) is a small fraction of the overall bond market, and (ii) is concentrated in a reduced number of jurisdictions and sectors. Issuing a green bond involves extra costs due to the additional reporting requirements, which in some cases may be significant or perceived as such. Nevertheless, issuers have not yet been able to realize a sufficiently meaningful price advantage. At the same time, investors have no incentive to accept lower yields as, in general, the credit risk of a green bond is the same as any other bond from the same issuer. This clearly becomes a deterrent to issuance and partly explains the protracted state of this market.

Consistent with the analysis above, and mindful that there are various fields of action that can be explored in order to improve the state of the green bond markets³⁰, this section focuses on presenting ways to address the two shortcomings identified – risk profile and transaction costs.

25 The fourth core component of the GBPs emphasizes reporting by issuers. Originally focused around a requirement to account for the allocation of proceeds either on a project-by-project or on an aggregated portfolio basis, it has since been updated to emphasize the importance of disclosing key underlying methodology and/or assumptions used in the determination of quantitative indicators that helps inform investors.

26 In Europe, the region currently dominating global green bond markets and with highest reporting standards, more than 98% of issuance benefits from external reviews.

27 Audits are provided by specialized verifiers (e.g. Vigeo, Sustainalytics) and/or large consultant firms (e.g. KPMG, Deloitte, PwC).

28 Green Bonds: Country Experiences, Barriers and Options, In support of the G20 Green Finance Study Group, OECD (2016).

29 Ehlers, T. and Packer, F., Green Bond Finance and Certification, BIS Quarterly Review (September, 2017).

30 For example, targeted interventions for under-represented sectors (development of methodologies for facilitating certification and monitoring), small projects (bundling and packaging of pipelines of diverse assets, such as schemes to aggregate SMEs agribusiness or EE projects), or first-time issuers, and financial instruments other than those presented in the following sections (such as the Fundo de Investimento em Direitos Creditórios, FIDC, or debentures schemes in Brasil).

II.1. Addressing the Risk Profile of the Instrument

The difference between a green bond and a plain vanilla bond, issued by the same name, resides only on one factor: the issuer's pledge that the proceeds will be used solely to finance green investments. But this pledge does not considerably affect the risk-return profile of the bond. Credit rating agencies are beginning to explore the business of assessing greenness beyond credit worthiness, by developing more systematic tools to help integrate the issue of environmental, social and governance (ESG) criteria as part of their risk assessment³¹. But, until credit risk analysis evolves to factor in sustainability issues, the risk characteristics of a green bond are for now considered almost identical to those of a plain vanilla bond and, hence, both generally yield about the same.

To be able to issue a green bond with a yield advantage over a plain vanilla bond, the risk profile needs to be somehow altered. There are two main avenues to accomplish this: a) to enhance the risk of the green bond with additional meaningful collateral; and b) to enhance the green bond risk with a partial credit guarantee issued by a third party with a credit rating that is higher than that of the issuer of the bond.

II.1.2 Covered bonds

To provide investors with surety in addition to the claim on the issuer, the concept of covered bonds can be entertained. A covered bond is a bond collateralized against a pool of assets that covers claims in the event of default, providing the investors with recourse against both the issuer and the collateral asset pool

(additional cover or dual recourse). Unlike asset-backed securities (ABS)³², in a covered bond, both the debt and the underlying asset pool remain on the issuer's balance (i.e. the risk is not transferred from the issuer to the investor). This dual recourse structure affords covered bonds with lower risk profile and superior credit ratings (based on the quality of the specific collateral in the registered cover pool). Lower risk entails smaller risk premiums, lowering in turn the funding costs of issuers relative to similar unsecured bonds. In addition to the risk reduction element, a covered bond can also be a useful tool for bundling smaller underlying assets, helping develop pipelines of small-scale projects normally found in sectors such as sustainable agriculture, SME energy efficiency, and housing, and particularly relevant in emerging economies.

Covered bonds are usually subject to specific regulation – and, at times, to laws – to protect bondholders. Regulation must cover aspects such as authorized issuing institutions, eligibility of assets that will conform the cover pools, regulatory authorities, minimum reporting and disclosure standards. This is done by defining conditions that the issuer must comply with to ensure that the quality of the collateral (pool of assets) is maintained, and that it consistently backs the covered bond (see Annex 1 for reference on international covered bond frameworks). This entails, for instance, an obligation by the issuer to replace any non-performing loans or pre-paid debt in the pool.

However, the most important function of the legal framework is directed to protecting investors under potential credit events. Regulation must provide assurance to

³¹ Since the launch of the ESG in Credit Ratings Initiative in 2016, the PRI has been working with investors and credit rating agencies to promote the consideration of ESG factors in credit risk analysis. See ESG, Credit Risk and Ratings - Part 3: Exploring the Disconnects, PRI for UNEP-FI (January, 2019). Beginning 2019, Fitch Ratings launched a new integrated scoring system that shows how ESG factors impact individual credit rating decisions, across all asset classes.

³² ABS are being used for green bonds since 2014, specifically in the US by Fannie Mae's regular issuance of Green Mortgage Backed Securities bonds.

investors that enforceability of the contract during a credit event will not be challenged by any court, and that the segregation of the collateral pool of assets will not be questioned either.

Ultimately, the reduction in the risk premia of covered bonds is a direct function of the perceived quality of the collateral pool and of the confidence on contract enforceability. Furthermore, the transaction costs involved in the structuring of a covered bond are also

inversely proportional to those two factors.

In some jurisdictions, regulators are reluctant to grant permission – or have introduced restrictions – to bank-issued covered bonds. This is because the pledging of assets works against depositors' security in the event of resolution³³. This understandable reluctance explains why covered bonds have been so far only authorized to back investments deemed of social interest, such as mortgages.

Box 1.- Covered Bond Market Facts

Dating back to 18th century Prussia, the first covered bonds were issued in 1769, as a way to allow banks to raise funding for loans on housing and land in the aftermath of war. By 1900, the instrument was included in the German Mortgage Bank Law and was then used widely to finance post-war reconstruction and reunification infrastructure³⁴.

Traditionally, covered bonds have been used much more extensively in European markets, although the instrument has been adopted in many other countries, including Australia, Canada, New Zealand, United States, Chile, Singapore and South Korea, all of which have already implemented covered bond legislation (except for the US, where no covered bond legislation has been passed to date, despite several attempts after the crisis)³⁵. Other jurisdictions – including some LAC countries such as Brazil, Mexico, Panama, and Peru – are exploring the introduction of covered bonds or already in the process of adopting legislation. In 2016, the outstanding covered bond market stood at €2.5 trillion, practically unchanged in relation to 2015. Issuances fell by 10% from the previous year, reaching some €485 billion. The collateral used for covered bonds still consists mostly of mortgages, which account for €2.1 trillion (nearly 85% of the outstanding market). Europe is still the largest market player, with Denmark, France, Germany and Spain accounting for 53% of the outstanding market volume. Non-EU countries accounted for more than 17% of total outstanding covered bonds in 2016³⁶. In 2015, the German real estate and mortgage bank BerlinHyp issued the first green covered bond (Pfandbrief), raising €500m with a 7-year tenor and coupon of 0.125%. The cover pool consisted of green building certified mortgages, with assets located in Germany, France, UK, Netherlands and Poland. The issue achieved oversubscription of 4x and produced 15 new investors for BerlinHyp³⁷.

See Annex 1 for additional information on specific covered bond markets.

33 Canada limits issuance to 4% of bank's assets. Australia and New Zealand each have an 8% limit. Other countries, such as Italy, Netherlands and Germany, impose thresholds on total issuance in relation to bank's equity.

34 Damerow, F., Kidney, S., Clenaghan, S., How Covered Bond markets can be adapted for Renewable Energy Finance and how this could Catalyse Innovation in Low Carbon Capital Markets, Climate Bonds Initiative (May, 2012)

35 The market operates under the Federal Deposit Insurance Corporation (FDIC) Covered Bond Policy Statement, from 2008, and the US Treasury's Best Practices for Residential Covered Bonds. These are non-binding international guidelines.

36 Covered Bonds: A global perspective, European Covered Bond Council (ECBC), Global Issues Working Group (April, 2018).

37 Green Covered Bonds: building green cover pools, Climate Bond Initiative (February, 2017).

Today, policy makers generally regard green investments as being socially desirable. Then, the potential of the green bond market could be unlocked by putting in place specific legislation, as part of an enabling financial infrastructure, to facilitate funding via covered bonds for lending in areas targeted by green policy. Regulation could be developed or updated to accommodate new asset classes considered green (renewable energy, sustainable transport, green buildings, water conservation). While there is no common definition of what constitutes a green asset, the use-of-proceeds criteria of a regular green bond could be applied to identify green assets within segments of the existing covered bonds market, and to develop standards for further covered issuances.

More importantly, an appropriate legal framework needs to be solid enough to guarantee investor claim privileges, provide clear definitions on the characteristics of the assets in the cover pool and compel issuing banks to maintain high levels of discipline in originating the loans that will conform that pool. As the market of green covered bonds develops, new investors attracted by the enhanced risk profile of the issuances will generate more demand, which in turn will influence bond pricing and liquidity of the market.

A boost in covered bond market activity has already been linked to a growing interest in green financing of banks and investors alike, driven by evolving policy and the widespread notion of environmental and reputational benefits. According to S&P, “the emergence of green covered bonds highlights the growing prominence of green finance in the

traditional area of covered bonds and offers an alternative mechanism for banks to contribute to financing global climate commitments.”³⁸

The relatively steady, long term cash flows of a good number of green projects, in fact makes them well-suited assets to be used as collateral. Investors, on the other hand, would need minimal adaptation of portfolio guidelines because of the high level of security offered by the instrument.

MDBs can assist countries in supporting identification of green assets in potential cover pools (including the development of standards and definitions) and designing or upgrading regulation that will make green covered bonds viable and attractive to issuers and investors. In particular, they can technically assist governments in developing local guidelines and procedures that allow a straightforward identification of projects with environmental impact and mitigate the risk of greenwashing, as well as in assessing current regulation and coordinating the incorporation of frameworks for specific asset classes based on that assessment.

MDBs can also have a role in facilitating the availability of good-quality assets eligible for the cover pool of the bond, by providing resources or enhancement mechanisms for green lending by national development banks or other potential issuers³⁹, and potentially developing alternative dual recourse bond schemes where proper covered bond regulation has not yet progressed.

II.1.3 Partial Credit Guarantees

A second way to improve the risk profile of green bonds, particularly for larger issuers,

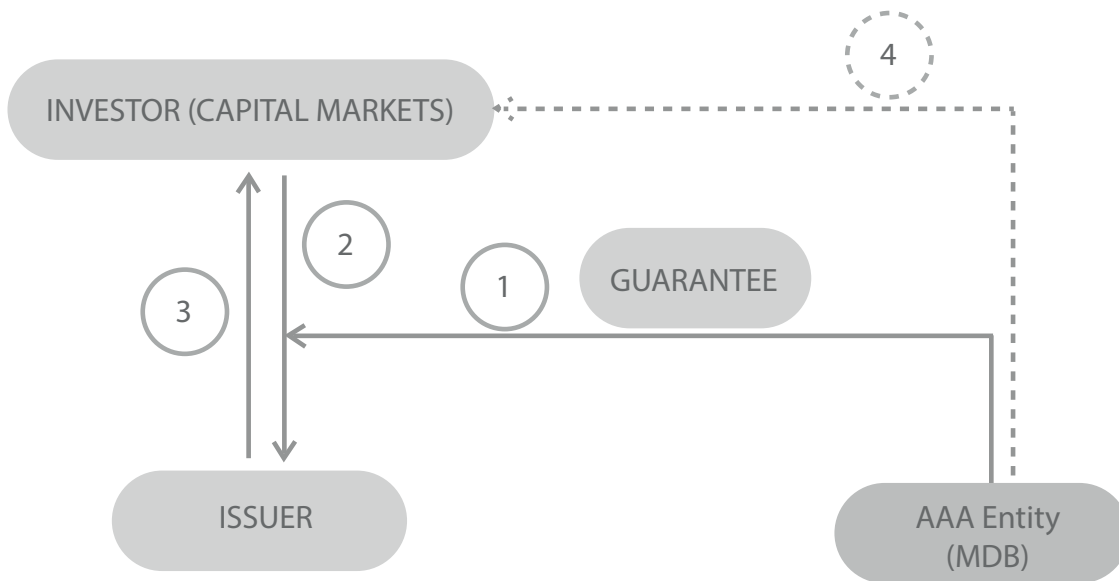
³⁸ What’s Behind the Rise in Green Covered Bond Issuance, Standard & Poor’s Financial Services, Ratings Direct (June, 2018)

³⁹ Following their mandate, National Development Banks can often provide a pipeline of green projects, suitable for cover pools, that can be financed or guaranteed with MDB resources. This in turn implies that strict supervision of the quality of these projects is in place, as per international standards, which provides an extra layer of confidence to investors on the assets backing the bond.

consists of using third-party issued partial credit guarantees. Generally, when a financial obligation is enhanced by a credit guarantee issued by a AAA entity, the rating of the bond increases more or less proportionately to the percentage of the payments covered by the guarantee, thus reducing investors' perception of the risk profile of the issuance. In general, guarantee schemes help manage the risks of a financial instrument by isolating those risks that are critical and transferring them to other actors that are more capable of assuming them. The instrument can be very effective in facilitating the flow of private investment to high-risk sectors, but also

contributes to developing financial markets and using public funds efficiently, particularly in the infrastructure sector. While there are costs associated to the issuance of a guarantee, it is fairly easy to identify its benefits in terms of enhanced risk structure of the bond. Leveraging MDB's triple-A credit rating, via the use of partial credit guarantees, can make green bonds a better fit with the risk profile of institutional investors otherwise unwilling to opt for a high-risk green bond. The guarantee support would allow for new investors to become familiar with the opportunities in LAC, efficiently boosting local green bond markets⁴⁰.

Figure 3. - Partial Credit Guarantee Scheme



1. Guarantee covers default risk. AAA rating of MDB enhances the rating of green bond issued by a private or public issuer. MDB charges the standard fee for the guarantee.
2. Issuer issues green bond in the local or international market with MDBs guarantee.
3. Issuer repays principal and interests
4. Partial or total default triggers a call on the guarantee.

Source: Author

⁴⁰ In fact, green bonds issued in LAC between 2014 and 2017 have largely benefitted from guarantees or partial guarantees from the government and/or regional and multilateral banks. See *The rise of green bonds: financing for development in Latin America and the Caribbean*, Economic Commission for Latin America and the Caribbean (ECLAC) (October, 2017).

II.2. An Improved Framework to Reduce Transaction Costs

The second factor that reduces the attractiveness of green bonds from the point of view of the issuer is the incremental transaction costs of these instruments, versus those of plain vanilla bonds. This is particularly so in the case of small or first-time issuers, as well as for issuances financing large, diverse pipelines of projects, projects that are geographically dispersed or projects in sectors for which monitoring is usually more costly – e.g. land use, agriculture. The transactional cost increase originates from three main sources: a) costs of compliance with the regulatory environment; b) costs associated to structuring of green bonds; and c) costs of tracking and reporting on the underlying investments to bondholders.

II.2.1 Regulatory Environment

Policy and regulatory frameworks play an important role in incentivizing the growth and integrity of the green bond markets. Regulatory needs differ from country to country, depending on the level of development of a bond market, the local long-term investment framework, the local and international investor base, etc.

For example, while self-regulation and voluntary principles still govern much of the international green bond market, green bond issuance in China is overseen by government authorities. Having established close policy exchange and dialogue with the ICMA and the CBI, and using their standards as reference, Chinese regulators worked together to enact regulation and provide

better incentives. In 2015, the People's Bank of China (PBOC, China's Central Bank) released the first country-specific green bond issuance guidelines and taxonomy to guide local issuance on green bonds, which has seen exceptional growth since 2016. The National Development and Reform Commission (NDRC) regulates China's corporate green bond market, in line with the PBOC's guidelines, and listed companies are regulated by China's Securities Regulatory Commission (CSRC). India also issued regulation governing the issuance of green bonds locally, in 2017. The Securities Exchange Board of India (SEBI) now establishes disclosure requirements for issuance and listing of green debt securities, and categorizes projects and assets for eligible use-of-proceeds, in line with international practice.

Relative slower expansion in other large economies has been credited to a lack of regulation that establishes a proper green bond system – with clear definitions of what qualifies as green – and imposes stricter penalties for issuers who do not manage bond proceeds properly⁴¹.

In Brazil, the government's stance has been to allow the market to develop its practices and principles and to establish a broad public-private dialogue on how regulation can facilitate the market. In this sense, a number of initiatives by the private sector have been leading in the development of good practices and standards. The Brazilian Federation of Banks (FEBRABAN) and the Brazilian Business Council for Sustainable Development (CEBDS) have published a guide to issuing green bonds locally. The "Guidelines for Issuing Green Bonds in Brazil 2016" presents recommendations to participants in the Brazilian fixed-income

41 Wang, E., Financing Green: Reforming Green Bond Regulation in The United States, Brooklyn Journal of Corporate, Financial & Commercial Law, Volume 12, Issue 2, Article 9 (June, 2018).

securities market on the process of issuing green bonds, and also intends to contribute to the development of this market in the country. The guide is still a non-binding document but provides guidance on eligible activities for green bonds in line with the GBPs and the Climate Bonds Taxonomy. The country is also formally a participant in the ongoing discussions around the elaboration of international ISO methodologies and the stock markets are developing a classification for green bonds. The private sector in Brazil is openly supporting this type of developments through the Brazil Green Finance Initiative (BGFI). Originally known as the Brazil Market Development Council, the BGFI is organized by the secretariats of the CEBDS and the CBI, and is comprised of 27 representatives from domestic pension funds, insurance companies, banks, major industry sectors and investors, working together to strengthen the development of a local green finance market and attract international capital flows to catalyze opportunities for green investment in Brazil (see also Box 2).

The other largest green bond market in LAC, Mexico, as of today has no separate regulatory framework governing the issuance of green bonds. Just like any regular bond, Mexican green issuances abide by Securities' Market Law and are regulated by the National Banking and Securities Commission (CNBV). Only international guidelines (the GBPs) are used to meet additional requirements related to the green use-of-proceeds⁴².

In the rest of LAC, the limited development

of capital markets at large inhibits the expansion of the green bond market. On the positive side, it could be said that a nascent state of these markets might facilitate the introduction of a comprehensive green bond framework into a broader financial market development strategy. For instance, recent OECD efforts with MDBs on a G20 Action Plan to support the development of local currency bond markets, could be further applied to green bonds⁴³.

In order to provide international investors with increased access and confidence to local markets, policy-makers and regulators will need to address most aspects of the issuance process, including definitions and disclosure requirements, marketplaces (listings and trading), and clearing, settlement and custody. It is also convenient to work with stock exchanges, as they facilitate market liquidity, geographic diversification, and investor access. Exchanges can aid in the development of green bond listing criteria and indices that make it easier for investors to discover and track the performance of green bonds⁴⁴.

MDBs can help establish a dialog with national governments and regulators, as well as collaboration with investors, issuers, and other relevant actors (rating agencies, certifiers, auditors), for the development of regulatory environments that facilitate green bond issuance and are more conducive to the emergence of new mechanisms, such as covered bonds.

42 Green Bonds – Ecosystem, Issuance Process and Regional Perspectives, GIZ and SEB, Brazil Edition (November, 2017) and Mexico Edition (January, 2018)

43 Mobilising Bond Markets for a Low-Carbon Transition, Green Finance and Investment, OECD Publishing (2017).

44 The Role of Exchanges in Accelerating the Growth of the Green Bond Market, Climate Bonds Initiative (May, 2017)

Box 2.- Promotion of favorable green bond regulation: The case of Brazil

Through the Financial Innovation Lab (LAB)⁴⁵ initiative, the Inter-American Development Bank (IDB) is assisting the government of Brazil to simplify procedures and develop regulation for facilitating issuance of green bonds. The LAB works in two main fronts:

- Creating a space for dialogue between regulators (Central Bank, Exchanges Commission, insurance and pension fund regulator), line Ministries, banks and investors' associations (including insurance and pension funds)⁴⁶, stock markets, and international players, such as CBI. The discussions are focused on determining the role of regulators, making recommendations of regulatory changes and improvements, and proposing good practices to be promoted in the market, based on thorough research and analysis provided as part of the program.
- Formally offering inputs to the government decision-level group, which discusses policy and regulation related to the capital markets.

The LAB has already submitted recommendation to alter Decree 8.874/2016 (Law 12.431/2011), which regulates the criteria for approval of investment projects considered national priority by the Federal Government. The adjustment proposal would entail that infrastructure investment projects that qualify as attending to environment responsibility criteria or positive social impact in certain vulnerable communities, be treated as a national priority⁴⁷. Similarly, the group has produced specific recommendation to the Exchanges Commission (CVM) in order to adjust regulation for debentures that would be certified as green, increase flexibility in the way infrastructure investment funds are authorized to operate and stimulate green bond issuances.

The LAB has also helped assess those areas in which there is no need for government intervention, i.e. provide evidence-based assurance to the Government of the possibility to use existing international green bond metrics, rather than developing national ones.

The IDB is replicating the LAB model in Mexico, expected to be launched by April, 2019.

⁴⁵ The LAB was structured to stimulate the participation of the private sector in the creation of financial solutions for those markets that involve the supply of a number of services, including water, transport, energy, agriculture, infrastructure and financial services. It is constituted by four independent working groups: Green Finance, FinTech, Impact Investments and Green Bonds. The ultimate purpose of the LAB is for Brazil to become a reference in the promotion of solutions for adapting to climate change, addressing social impact and stimulating digital finance.

⁴⁶ These include: the Brazilian Federation of Banks (FEBRABAN), the Brazilian Business Council for Sustainable Development (CEBDS), The Brazilian Development Association (ABDE), the Brazilian Association of Financial and Capital Markets Entities (AMBIMA), the Brazilian National Association of Pension Funds (ABRAPP).

⁴⁷ The treatment of this projects would follow the same line of the Investment Partnerships Program (PPI), created by Law in 2016 to "expand investment and employment opportunities and stimulate technological and industrial development, in harmony with the country's social and economic development goals". Ventures qualified for the PPI are treated as a national priority, which means the organs and entities involved must act so that the processes and acts necessary for the structuring, liberation and execution of the project occur in an efficient and economical way.

II.2.2 Structuring of Green Bonds

Even when proper regulation is in place, knowledge gaps and lack of bond structuring capacity can add additional costs to the task of putting together a green bond transaction. In LAC, most local issuers need to become acquainted with the specificities of green bond market transactions, and develop capacity to be able to bring their green issuances to the market.

MDBs can assist at different levels. First, in broader activities around the fundamental building blocks of the green bond market: education and training of potential and existing domestic issuers, marketing and knowledge sharing with local and international investors, awareness of opportunities and requirements in international markets, and guidelines and methodologies for certification and standardization of cross-border definitions and processes. Second, at the operational level, assistance can be provided to issuers in all phases of the process – pre, launch and post issuance. This includes: i) identifying a pipeline of eligible green projects, ii) providing information and case studies on available options regarding bond structure, credit enhancement and required documentation, iii) organizing road shows, iv) implementing monitoring and evaluation criteria, v) overseeing the procurement of services related to financial advisory, underwriting, rating agencies, second opinion providers and audit firms. Support in these areas is of particular importance in the case of specific sectors with high potential for investments that can qualify as green but do

not yet have a defined framework in existing international guidelines, i.e. agribusiness, forestry, aggregation of small business energy efficiency loans.

II.2.3 Reporting on Underlying Green Investments

As it has been mentioned before (see section I.4), transparency and reporting on bond's underlying investments is an important distinguishing feature of green bonds. The reason of its importance is that transparent, accurate and timely information on the use of proceeds is of essential value to investors, since they need to be confident that positive climate impact is being achieved through the green bond they bought. Sometimes, where internationally qualified third-party institutions are not involved, investors may choose to undertake their own due diligence and analysis, adding costs to the transaction. In any case, it is quite clear that information management represents a potential source of costs for the issuer.

Fortunately, certain new technologies can be the key to finding cost-effective ways to perform the required information management functions. For instance, the rapidly evolving Distributed Ledger Technologies (DLT), analogous to the Blockchain, could improve the way in which green bond tracking and reporting commitments are fulfilled, making the process more efficient and reliable. Under DLT, information stored, and transactions registered become fundamentally unchangeable, incorruptible and irreversible, which would ensure tracking integrity to

investors. Besides, all relevant information would be available to all concerned, on a timely basis. Finally, distributed data technology affords improved overall security to the system, relative to a centralized alternative.

The development of a transparent reporting and validation system requires periodical interaction among several key stakeholders participating in a green bond transaction, each of them holding different faculties and rights. A DLT-based model provides an efficient platform to reliably connect this network of actors – issuer, validators, investors and regulators – in real time. It also enables a process flow that is defined based in sequential milestones that can confirm compliance of the use of proceeds, from construction/commissioning to implementation and operation of green projects backing the bond, including the associated environmental impacts. A milestone validation approach would also enable all involved actors to better understand where problems arise and potentially implement corrective measures for future issuances. See Annex 1 for a basic outline of how DLT-enhanced green bond reporting could work.

A secure and public platform where these project-level tracking, definitions and verification processes are registered, provides accessible evidence that commitments were fulfilled, building a track record for issuers and providing extra confidence on green bond markets at relatively low cost. With better access to reporting, investors will be in a better position to make informed decisions on their investments, and supervisors will be able to monitor these transactions with

reduced due-diligence costs. Overall, green bond reporting can be simplified, and costs reduced. This is particularly relevant in the case of small issuers, who usually lack the resources to develop specific systems to fulfill post-issuance information commitments, as well as those issuances financing pipelines with a large number of projects, projects that are geographically dispersed or projects in sectors that are difficult to monitor or for which indicators are usually more complex – e.g. agriculture, small energy efficiency.

III. END-NOTES

New approaches to risk design and technology-based approaches to monitoring and reporting are essential to untapping the potential of green bond markets, particularly in LAC and other developing areas.

Seizing international investors' appetite for green assets requires careful consideration of regulation, to align local green definitions and standards with internationally-accepted guidelines in order to avoid confusion and reputational risks.

Plenty of additional information needs to be provided to improve international investors' understanding of LAC's general bond market performance, and in particular for green bonds (databases and indices).

The incorporation of financial mechanisms such as covered bonds and guarantees can adequately address the risk of the issues, making the market more attractive for investors. An increased investor base may help lower funding costs for issuers and strengthen their financial position in future issuances.

Issuers' concerns around transaction

costs from green labelling and associated certification and verification requirements can also be addressed via enhanced regulation and education.

Leveraging efficiencies of new and evolving technologies such as the DLT can substantially reduce monitoring and reporting costs, while improving transparency in the use of proceeds and market integrity.

The ideas presented in this paper are intended to instigate further dialogue with policymakers, regulators and public financial institutions – the main drivers of green bond market development – looking for efficient ways to meet their goals with regards to green investment needs and capital market development. As green bond markets in LAC remain in a relatively nascent stage, the guidance and support of a supranational institution with proven reputation in the field, such as the IDB, is essential to provide the standards and assurance needed to attract investors internationally.

Box 3.- The IDB and green bonds in LAC

The IDB is well-recognized as a transformational champion in the promotion of green finance and technical assistance for implementing Paris goals⁴⁸. It is committed to aligning its operations to support countries in LAC to deliver their Nationally Determined Contributions (NDCs), offering financial and technical support and encouraging cross-ministerial dialogue and policy consistency in order to translate NDCs into specific investments.

The IDB has already extensive experience in the field as well as strong partnerships with political and financial actors in multiple countries in the region, as well as experts in the field with thorough knowledge of and strong presence in the international green bond market. The IDB has been working closely with countries in LAC to support them in assessing and structuring green and sustainable bond issuance at local and international markets (see Green and Sustainable Bonds). With technical assistance programs funded by the Swiss (SECO), the German (IKI) and the Chinese governments, at least ten institutions have benefited so far, with US\$480 million issued in Mexico, Colombia and Argentina, including the first Mexican locally-issued green bond associated to agribusiness. It is also helping to enable green bond markets via webinars, events and a focused working group in Brazil – the Financial Innovation Lab – that has produced important achievements, such as an assessment of the local green bond market, a proposal for new regulation for green debentures and good practice guidelines. The IDB is also looking into collaborating with other MDBs to complement their efforts aimed at providing financing for climate-friendly investments and NDC implementation with focus on green bonds.

48 Wright, H et al., Banking on Reform Aligning Development Banks with The Paris Climate Agreement, E3G. The IDB ranks 1st in the overall assessment of the six largest multilateral development banks in the world.

ANNEX 1.- FEATURES OF COVERED BOND JURISDICTIONS⁴⁹

The internationalization of the covered bond markets, more than 15 years ago, and the growth of mortgage lending activities in the EU, brought about the introduction of new and adapted covered bond legislation in many European jurisdictions.

Since the inclusion of the instrument by law in the 1980s, Spanish covered bonds have become the main funding instrument used by financial institutions to finance mortgages (cedulas hipotecarias). More recent figures show how this instrument has maintained its relevance in the market in the post-crisis period and over the past decade, representing 99% of the total issued volume for the sector in 2018 (equivalent to €20,000 million). Spanish covered bonds are subject to limits on the volume of issuance and over-collateralization of assets.

Other examples, such as the German case (Pfandbrief), demonstrate how covered bond legislation can be adapted in response to financial institutions' long-term funding requirements to support specific industry sectors. Between 2008 and 2009, German Pfandbrief legislation was adapted for shipping assets and aircraft. Although these represent a small portion of covered bond issuance, the principles that apply to the incorporation of new asset classes into legislation, associated reporting and performance criteria, demonstrate that structures such as the Pfandbrief offer enough flexibility to further adapt to green assets.

Sweden implemented a law for covered bonds in 2004, although a liquid market for mortgage bonds existed since the 1980s. The Swedish outstanding volume of covered bonds (€165,9

billion by end of 2017) is nearly twice as much as outstanding volume of government bonds. The European Commission's Capital Markets Union (CMU) is now exploring new ways in which the industry can support the growth agenda and provide long-term financing to the real economy, among which is the role of European lenders in the framework of housing and small and medium sized enterprise (SME) financing and developing energy efficient mortgages and green covered bonds for the benefit of EU citizens and the environment.

In LAC, accomplishments with covered bonds have been very limited. In 2012, Panama was the first country to issue a covered bond, even though the country does not have a specific legal framework and these issuances are based on contractual agreements only. Covered bonds in Chile (Bonos Hipotecarios), supported by law finalized in 2012, are specifically aimed to raise funds for the origination of mortgage loans (Mutuos Hipotecarios). Only residential mortgages are accepted as collateral, excluding commercial, public or other types of assets and the market still has a reduced, locally-distributed issuance. In 2015, Brazil enacted Law No. 13,097 which outlined the main framework for Brazilian covered bonds (Letra Imobiliária Garantida), which then was complemented by secondary legislation approved by the Brazilian National Monetary Council in 2017. The Brazilian legal framework provides assurance to covered bond holders on asset pool quality and claims in case of issuer's default. Further regulation is in the process of being issued by the Brazilian Central Bank.

49 European Covered Bond Fact Book, 13th Edition, European Covered Bond Council (ECBC) (August, 2018); Covered Bonds: A global perspective, European Covered Bond Council (ECBC), Global Issues Working Group (April, 2018); Estadística de Títulos Hipotecarios, Asociación Hipotecaria Española (January, 2019).

Figure A1.- Covered Bond Framework, Country Comparison

MARKET	CHILE	SPAIN	GERMANY	SOUTH KOREA	UNITED STATES
	Bonos Hipotecarios (BH)	Cédulas Hipotecarias (CH)	Pfandbriefe	SK Covered Bonds (CB)	US Covered Bonds (CB)
I. ISSUER					
Issuer	Specialized credit institution	Universal credit institution Specialized credit institution	Universal credit institution with a special license	Universal credit institution	Special Purpose Entities (SPE or SPV)
Bondholder recourse to the credit institution	Yes, direct	Yes, direct	Yes, direct	Yes, direct	No
Is the issuer the originator of the assets?	Yes	Yes	Yes	Yes	No
II. FRAMEWORK					
Special covered bond legislation	The General Banking Law (Ley General de Bancos, LGB): Article 69, n°2, BH issuances; and Articles 125, 126 and 134, special treatment of banking entities under bankruptcy	Law 2/1981 on Mortgage Markets regulation (1981), modified by Law 1/2013 and developed by Royal Decree 716/2009	PfandbriefAct (Pfandbriefgesetz, PfandBG) from 22 May 2005, which came into force on 17 July 2005; this Act was amended in 2009, 2010, 2013, 2014 and 2015	The Korean Covered Bond Act was passed by the National Assembly of Korea in December 19, 2013 and came into effect in April, 2014	No
III. COVER ASSETS					
Types of assets that may be included in cover pools	Exposures to public sector entities, Mortgage loans, Exposures to credit institutions	Mortgage loans	Exposures to public sector entities, Mortgage loans, Ship loans, Aircraft loans, Exposures to credit institutions	Exposures to public sector entities, Mortgage loans, Group originated Senior MBS, Senior MBS issued by third parties, Ship loans, Aircraft loans, Exposures to credit institutions	Exposures to public sector entities, Mortgage loans, Group originated Senior MBS, Senior MBS issued by third parties
Geographical scope for assets	Domestic	EEA	Public sector: Domestic, Multilateral development banks, EEA, CH, USA, Canada, Japan Mortgage: Domestic, EEA, CH, USA, Canada, Japan, NZ, AUS, Other	Domestic	Domestic Other
Are regular covered bond specific disclosure requirements to the public mandatory?	Yes	Yes	Yes	Yes	No
IV. VALUATION OF THE COVER POOL & LTV CRITERIA					
Valuation for LTV	Market value	Mortgage lending value	Mortgage lending value	Mortgage lending value	Other
LTV limits	Residential 80%	60% in the general case and 80% for residential. LTV limits do not apply to the cover pool but to the issuance	60% in all cases	No	Residential 75%
Source: ECBC and Author					

ANNEX 2.- DLT-ENHANCED GREEN BONDS

Introduction

The model considered here has been developed to show how DLT can be used to improve credibility and verification of use of proceeds and impact commitments associated to green bond (GB) issuance. It is not aimed towards the issuance process itself or the handling of secondary market transactions, clearing and settlement. The model only focuses on green bonds issued against future pipelines⁵⁰.

The proposed model is aimed to offer a means to reduce costs of data validation and simplify the handling of annual progress reports owed to investors, hence, promoting transparency and efficiency of these markets.

Given this objective, the set of actors that participate in GB transactions (see section B), and the lack of need for a public system with an in-protocol cryptocurrency, the proposed model supposes a permissioned DLT wherein participants are clearly identified, are pre-approved and have specific permissioned roles.

A. Basic Structure

- 1) Protocol layer: Configured under a permissioned DLT with the respective distributed consensus algorithm. As such, there is no need for a proof of work algorithm and therefore it would not be energy-intensive⁵¹.
- 2) Network layer: peer to peer network set up to incorporate the main actors and respective roles and permissions.
- 3) Application layer: user interface structured for several sequential validation's checkpoints or milestones for each GB commitment.

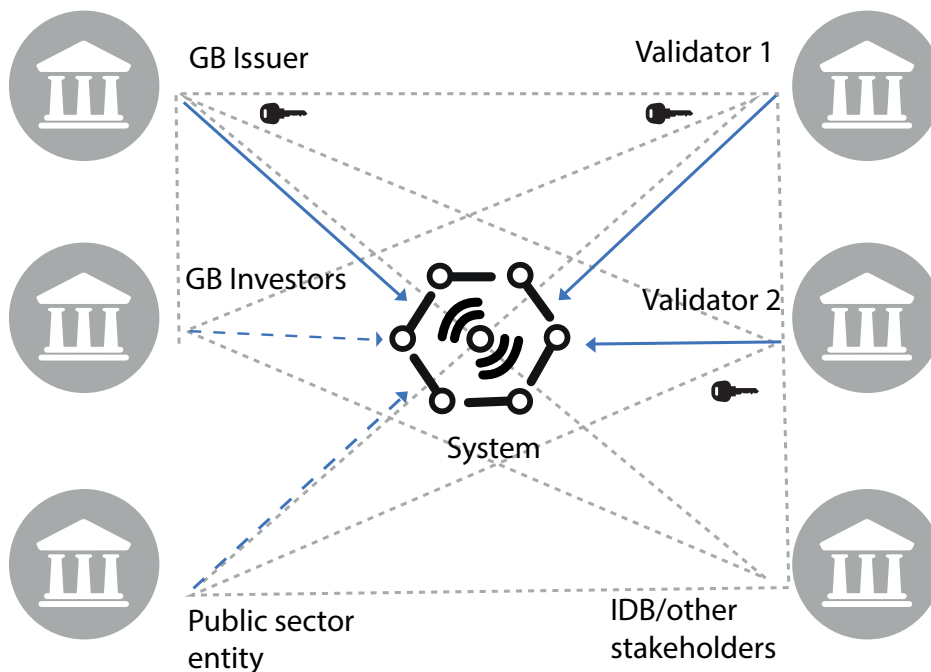
B. Main actors and roles

The basic set of (permissioned) actors participating in the system and their respective roles are described in the Table (next page).

⁵⁰ Alternatively, bond proceeds can be allocated to refinancing existing assets, the premise being that the freed-up balance from the refinancing would be allocated to new green lending. Reporting needs will vary if proceeds are fully allocated to the refinancing of existing projects rather than new projects, i.e. post-issuance reporting in the former will not require annual recounting on allocation and use-of-proceeds. Impact reporting, though increasingly being considered a best practice, is not yet mandatory in any green bond guidelines.

⁵¹ There are several algorithms that can be used in permissioned systems such as Proof of Authority (PoA) or Practical Byzantine Fault Tolerance (PBFT).

Actor	Main Role
GB Issuer	Responsible for uploading evidence/documentation to demonstrate compliance with commitments.
Certified Validators	Responsible for validating evidence/documentation provided by the GB Issuer. Validators need to be certified in order to have the permission to participate in the system.
Issuer(s) of validators' certificates	Certify validators, providing them with credentials needed to write/participate in the DLT system. An entity with this authority would need to be identified and established.
GB investors	Can access the system to examine documentation reported and respective validations in order to monitor performance of a specific GB GB investors would be able to read and track documentations and the respective validation for each milestones of the respective GB they invested in.
Key public sector entities (e.g. Central Bank, Ministry of Finance)	Can access the system to examine evidence/documentation reported and respective validations. Monitor the overall system
Other key stakeholders (e.g. IDB, MDBs, ALIDE)	Can access the system to examine evidence/documentation reported and respective validations. Monitor the overall system



C. Validation objectives and process

The application would entail several validation layers, depending on each GB's structure, commitments and participants, with the overall objective of providing trust and transparency of green investment claims to investors.

1. Basic validation. A process flow would be established for each GB considering (i) the GB's profile or basic characteristics, (ii) several specific and sequential milestones tailored to the underlying green project/commitments, (iii) validation responsibilities, for certified validators; and (iv) a series of smart contracts which will determine if the validation process can continue if certified validators confirm achievement of each sequential GB milestones, as established in the rules of engagement. Once a milestone has been validated by a certified radiator (through his signature) or several validators (through a multi-signature or multisig scheme), the process for the second milestone is triggered. This process is applied to each subsequent milestone until the entire process flow is completed, thereby showing compliance with commitments. For example, a milestone of a project can be the approval of specific designs or construction standards by one or several validators. To do so, validators would perform a review and if accepted, they would input their signature in the (multisig) smart contract to indicate approval and enable the second milestone. Following the example, the actual construction outcome would be the following milestone, and so on. The smart contracts can be designed to decide how many validators

(i.e. signatures) are needed to move forward to the next milestone.

A fully complete process (i.e. all milestones were completed allowing the process to finalize) will not only provide investors with the certainty that the green investments happened as expected but it would allow issuers to develop a track record that would be relatively easy to confirm. Moreover, the milestone approach would also allow investors (and issuers) to better understand where problems arise and how to potentially find corrective measures.

2. Conditioning Disbursements to the achievement of milestones. If issuers/ investors wish to provide/obtain even more certainty, the disbursement of a bond's tranche can be structured to be subject to the compliance of previously defined milestones. If such milestones are completed, the smart contract can automatically execute the disbursement.

D. Certified Validators

Depending on the project, potential validators can be international or standard setting organizations, IOT devices⁵², approved engineering or legal firms etc.

Validators can participate in multisig smart contracts and more than one validator can be included for a particular milestone. Several validators could be included depending on the level of confidence required.

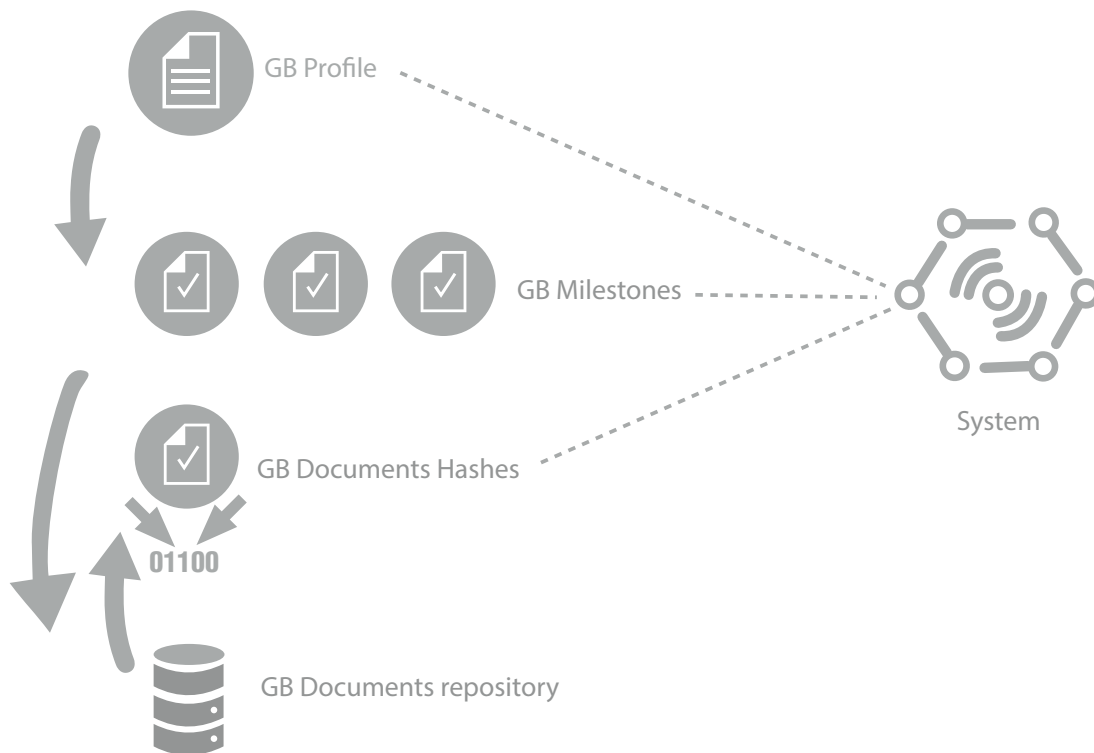
All validators will need to be certified and

⁵² IoT (Internet of Things) devices are nonstandard computing devices that connect wirelessly to a network and have the ability to transmit data. IoT devices include wireless sensors, software, actuators, and computer devices.

have the applicable credentials to operate/ participate in the system.

E. Data

All relevant documentation will be in a separate repository. A hash⁵³ of all related project would be included in the system for verification purposes and to ensure transparency throughout the process. Investors would use all these tools to track progress



⁵³ A hash is a function that converts an input of data (letters and numbers) into an encrypted output of a fixed length. It is created using an algorithm, and is widely used in cryptography, as makes input data easy to verify but difficult to reconstruct (if unknown), providing a means to assure integrity of transmitted data.

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