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Green Bonds

Current Development and Their Future

Olaf Weber and Vasundhara Saravade

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Governance Innovation

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Olaf Weber joined CIGI as a senior fellow in March 2015. His research with CIGI focuses on sustainability and the banking sector, including sustainability guidelines and regulations for central banks and regulatory bodies. He is currently associate professor and program director of the Master's Program in Sustainability Management as well as professor in the School of Environment, Enterprise and Development (SEED) at the University of Waterloo. Since 2010, Olaf has held the Export Development Canada Chair in Environmental Finance.

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About the Global Economy Program

Addressing limitations in the ways nations tackle shared economic challenges, the Global Economy Program at CIGI strives to inform and guide policy debates through world-leading research and sustained stakeholder engagement.

With experts from academia, national agencies, international institutions and the private sector, the Global Economy Program supports research in the following areas: management of severe sovereign debt crises; central banking and international financial regulation; China's role in the global economy; governance and policies of the Bretton Woods institutions; the Group of Twenty; global, plurilateral and regional trade agreements; and financing sustainable development. Each year, the Global Economy Program hosts, co-hosts and participates in many events worldwide, working with trusted international partners, which allows the program to disseminate policy recommendations to an international audience of policy makers.

Through its research, collaboration and publications, the Global Economy Program informs decision makers, fosters dialogue and debate on policy-relevant ideas and strengthens multilateral responses to the most pressing international governance issues.

Acronyms and Abbreviations

ABS	asset-backed security
ASEAN	Association of Southeast Asian Nations
CICERO	Center for International Climate Research
CPPIB	Canada Pension Plan Investment Board
EDC	Export Development Canada
ESG	environmental, social and governance
FDI	foreign direct investment
INDC	intended nationally determined contribution
ICMA	International Capital Markets Association
IISD	International Institute for Sustainable Development
ISO	International Standards Organization
LCR	low-carbon and climate change-resilient
MDBs	multilateral development banks
OECD	Organisation for Economic Co-operation and Development
PRI	Principles for Responsible Investment
S&P	Standard & Poor's
SRI	socially responsible investments
SPV	special purpose vehicle

Executive Summary

Given the urgency of climate change and the short time frames, it is necessary that our society make a transition toward a green and low-carbon economy. One way to do so is through finance markets that are tailored to fund low-carbon and climate-friendly projects. Such climate finance markets can prove to be an important factor in how fast and how incentivized our society is to make the transition.

An important tool in measuring the recent impact of climate change on financial markets has been the green bond. As its name suggest, a green bond allows various issuer types — whether countries or organizations — to mobilise traditional debt investments into projects or assets that can help society adapt or mitigate climate change impacts. Furthermore, it allows investors to fulfill their environmental, social and governance (ESG) concerns and mandates by allowing for climate-aligned investments. This "bonus" moral or green factor is what currently sets the market apart from its traditional counterparts. The popularity of the green bond market and its impact are explored in this paper, which also addresses the growth of the market in the national as well as international context.

The paper introduces the green bond market by highlighting its ability to tackle risk and serve as an opportunity for the financial sector. It then addresses the growth in various international and national contexts, with a brief overview of the Canadian market. The paper highlights the ongoing challenges in the market, especially given its exponential growth in recent years. Finally, it speaks to the environmental performance of the green bond and showcases the need for standardization and regulation around the market. The paper ends with policy recommendations for various key stakeholders including regulators, governments and issuers and concludes by addressing ongoing standardization efforts by other market players.

Introduction

As Mark Carney (2015) has said, "climate change is a tragedy of the horizons," meaning the lack of ability to think long-term impedes addressing this societal problem. Studies in behavioural economics have shown that people struggle to consider the long-term consequences of problems, such as climate change, whose impacts can span across decades and various countries (Brekke and Johansson-Stenman 2008). To prevent future damage, it requires us to set aside the temporal mindset by making present-day changes in our society (ibid.) The same is true for our financial systems. With some exceptions, the financial industry is mainly driven by short-term goals. With more in-depth knowledge about the consequences of climate change and a growing number of extreme weather events, as well as a greater awareness about the impact on the planet, the tragedy-of-the-horizons problem may be possible to overcome by offering financial products, such as green bonds, that can finance activities addressing climate change and other environmental issues. Green bonds are a climate finance instrument, which can be used to raise long-term debt capital from various investors, to either finance or refinance green assets and projects.

To tackle environmental risks, governments and private sector actors around the world have slowly started to address the problem of temporal mindsets by providing economic and social nudges. We can see examples of this in the way we are framing the narrative toward how we invest in the future. For example, investments into fossil fuel companies have now started to be frowned upon — not only because of their impacts on the environment but also due to the rising pressures of public awareness about long-term consequences of burning fossil fuels (Watts 2018). Socially responsible investments (SRI), a form of investment that takes environmental and societal indicators into account, has not only emerged as a popular trend for socially responsible investors but has also found entrance into mainstream investment because it addresses financial risks caused by environmental and societal issues. Furthermore, in the age of climate change, notions of risk and stability are constantly changing (King et al. 2015). That is why investors have started to assess risk not only in terms of financial risk, but also through ESG indicators that may be critical to financial returns.

With awareness about climate impacts increasing, investors are demanding that ESG components be factored into the investing criteria (ibid.).

About US$200 billion to US$1,000 billion per year are needed to address climate change, and additional funds are needed to address other environmental challenges (Reichelt 2010). These funds cannot exclusively come from government resources. Additional investments have to come from financial markets and investors (ibid.). Regarding investment needed to build and upgrade infrastructure, there is a high demand in both developed and developing countries, even without taking climate change mitigation and adaptation into account (Sonerud, Kidney and Tripathy 2015). To ensure that new infrastructure is low-carbon and climate change-resilient (LCR), the global annual investment required for infrastructure has been suggested to be upward of US$6.2 trillion (Corfee-Morlot et al. 2016).

Despite the urgent need to build LCR infrastructure, these massive investment needs are not being met, as an estimated annual US$1 trillion gap in the funding of just regular infrastructure projects suggests (Sonerud, Kidney and Tripathy 2015). As well, only seven to 13 percent of current infrastructure projects are estimated to be low-carbon and designed to deal with the impacts of a changing climate (Canfin-Grandjean Commission 2015).

Green and climate bonds could be a way to address this financing issue, given their mandate of channelling debt capital specifically toward green or low-carbon projects and assets. Today, bonds are the single largest pool of capital (an estimated US$80 trillion versus US$53 trillion in equities as of 2014), and they can be directly linked to low-carbon infrastructure projects (van Renssen 2014), among others. Attracting investments in low-carbon projects is crucial in emerging economies, where expensive capital increases project costs and can make high-capital expenditure projects economically unviable (Sonerud, Kidney and Tripathy 2015). The cumulative nature of climate change, however, means that investing now is crucial; the longer the delay, the more likely the socio-political systems of various countries will be unable to avoid the downside of climate impacts. Infrastructure, which does not address climate change risks, will lock-in greenhouse gas emissions for several decades to come (ibid.).

Because of their long-term nature, infrastructure investments require "patient capital" (Corfee-Morlot et al. 2016) — one that sees returns over a long period, rather than just the short term. Long-term investors in the private sector — such as institutional investors — can play an important role in providing the necessary capital for long-term investments. Institutional investors include pension funds, insurance companies, hedge funds, mutual funds, sovereign wealth funds and endowments (Williams, Jones and Pickin 2017). They usually pool their capital to invest in tangible assets such as securities, real estate and, more recently, infrastructure (ibid.). Institutional investors are an important source of additional capital to help fill the LCR finance gap. However, their climate-related investment is currently low due to a number of constraining factors such as low liquidity, uncertainty in the policy environment for infrastructure, risk-return profiles, shortage of quality data on transactions and objective information from the issuers of investment products (Corfee-Morlot et al. 2016, 55). With constrained public balance sheets, the need to fulfill the current LCR infrastructure gap using private sector capital becomes important.

As noted in Table 1, the Organisation for Economic Co-operation and Development (OECD) institutional investors have sizeable and growing assets (an estimated US$80 trillion as of 2015) that will need to show consistent returns in the future (Corfee-Morlot et al. 2016). Furthermore, institutional investors prefer to invest in infrastructure projects that are already operational and have a stable cash flow (ibid.). This is where having low-risk financial instruments, such as bonds, can be beneficial when financing or refinancing large capital projects.

Given the complexity of infrastructure projects and their dependence on stable local conditions, most institutional investors prefer familiar markets. However, infrastructure demands are more common across emerging and developing markets. Consequently, there is a real opportunity for investors to diversify investment based on geographical areas as well. Currently, an estimated 10 percent of OECD investors invest a small percentage in infrastructure in emerging and developing markets (Corfee-Morlot et al. 2016). Institutional investors, however, might start looking toward emerging markets as potential investment destinations if these markets meet certain investment conditions. Such conditions

Table 1: Overview of Institutional Investors' Assets under Management as of 2015

Institutional Investors	Assets under Management (US$ trillion)	Current Investment in Infrastructure (US$ billion)	Current Investment in Emerging Markets and Developing Countries
OECD institutional investors	80	800	10 percent
Emerging market institutional investors	5	25	High percentage
Sovereign wealth funds	4	80	Relatively high
Other global institutional capital	20	200	Low

Source: Corfee-Morlot et al. (2016, 56).

can include having stable regulatory environments and enabling policies for investment sectors, low social turmoil and bureaucratic red tape, as well as having stabilized currency exchange risk on investment (World Bank Group 2018; Henisz and Zelner 2010; Ward et al. 2009).

Furthermore, LCR investment becomes especially crucial with extreme weather events increasing around the globe. Future investments must address their climate change impact and avoid a high-carbon lock-in. One way of looking at the climate change investment challenge is by investing in relatively new asset classes (such as LCR infrastructure) and spreading it over different geographical areas and projects. Such a change in strategy is possible through the flexibility and diversification that new and innovative financial tools can bring to the table.

One such innovative financial instrument making waves in the global financial sector since 2007 has been the green bond. Similar to traditional bonds, green bonds allow their issuers to raise money from investors, with the caveat that it is specifically aimed at financing or refinancing green projects and assets. The popularity of green bonds is visible in their ability to fund various climate mitigation and adaptation projects around the world, and the fact that green bonds have shown exponential growth in the market every year since inception. Green bonds have not only been issued to finance climate-related infrastructure but also to finance other sectors such as renewable energy, low-carbon transport, water and green buildings, among many others. Not only has there been increasing interest in green and climate finance shown from various sectors but there is also a sense that the global economy needs to be involved in driving environmental issues forward.

A green bond can act as the financial instrument for investors to provide the necessary up-front capital for green projects and activities. It is important to note that green bonds are particularly suited to addressing the investment needs of institutional investors by giving them appropriate investment vehicles to tap into their large capital holdings at scale. With increasing institutional and stakeholder pressure on institutional investors to disclose their climate-related investment risks and strategies, and the evident impacts of climate change across the world, green bonds can serve as an important tool for the financial sector to mainstream green or climate-friendly investment.

Green Bonds and the Financial Sector

Ever since the Industrial Revolution, bonds have played a critical role in financing infrastructure and other big projects. Bonds are fixed-income investments issued by a government or corporate entity — such as companies, municipalities, states (provinces) and national governments. Investors or debt holders invest in such a bond and loan money to this entity, also called the issuer, for a defined period at a fixed interest rate. Bonds can be used to finance or refinance a variety of projects and activities, such as infrastructure, power plants or maintaining ongoing operations (Weber and Feltmate 2016). They can be publicly

traded or traded over-the-counter (International Capital Markets Association [ICMA] 2018a), depending on the type of market (primary vs secondary) and the liquidity of the bond. The interest rate, or price, of a bond depends on the credit risk of the issuer, the duration and on the general financial market and is usually not dependent on the type of project that is financed by the bond (Scott-Quinn and Cano 2015). Therefore, green bonds have the same interest rate as conventional bonds issued by the same issuer for the same duration. Investors in such markets are called fixed-income investors and usually range from institutional investors and retail to multilateral development banks (MDBs) such as the World Bank. Bonds have been used for financing or refinancing infrastructure because they offer long-term maturities to investors. Consequently, they are a good fit for institutional investors' long-term liabilities, such as pension holders, who will draw from their pension in several decades' time and allow for matching of liabilities with such investments (Sonerud, Kidney and Tripathy 2015). At the same time, bonds are relatively stable and predictable when compared to equity (Kaminker and Stewart 2012).

Similar to their regular counterparts, green bonds are a debt finance instrument used to raise long-term capital with low risk. Their "use of proceeds," however, go specifically toward green projects or assets (ICMA 2018b). Use-of-proceeds refers to the detailed information for investors on how money invested in an undertaking will be put to use. Bonds that disclose the use of proceeds for environmental projects are called labelled green bonds. They are comparably priced to traditional bonds, have lower risk-return profiles, given their environmental due diligence (Allen 2017), and can increase overall capital flow as well as access to finance at various stages of the project lifecycle (Kala and Vivek 2015). Consequently, green bonds allow risk-averse investors who are, for instance, looking to invest their clients' retirement savings with a low-risk yet innovative investment opportunity. In today's scenario, many green bonds can finance infrastructure-related upgrades or investments into LCR alternatives (Sonerud, Kidney and Tripathy 2015). This market also allows institutional investors to diversify their portfolio by investing in green bonds issued by issuers in emerging economies such as India or China.

The increasing appetite of institutional investors for green bonds can be explained through three types of impact. First, there is increasing stakeholder pressure, for instance by beneficiaries, to channel investments into green investments (Jansson and Biel 2011). Second, there is institutional pressure on institutional investors from their shareholders and stakeholders to disclose their strategy with regard to climate change risks and the integration of environmental and social criteria into their investment decisions (Hebb 2006; 2008; Cotter and Najah 2011). Third, there is an increased risk for non-green long-term investments becoming stranded because of climate change and other environmental impacts (Carney 2015) that could be avoided by investing in green bonds.

Types of Green Bonds

Based on an Institute for Climate Economics 2016 report, green bonds can fall into seven types of categories, which are quite similar to their "vanilla" or traditional counterparts (Shishlov, Morel and Cochran 2016, 8). The first type of green bond is a corporate bond, or a use-of-proceeds bond, that is backed by the corporation's balance sheet. In contrast, project bonds are backed by earnings of a single project or multiple projects. The proceeds of these projects are disbursed through a special purpose vehicle (SPV). An SPV is a subsidiary of the bond issuer (public or private) that has a legal status that allows it to fulfill its obligations even if the parent issuer goes bankrupt (Bloomberg New Energy Finance 2014). If multiple projects are grouped and collateralized, this type of green bond is called an asset-backed security (ABS). ABS are often used to fund projects such as wind farms, or energy efficiency assets such as solar panels (Nanji, Calder and Kolodzie 2014).

An issuer might issue covered bonds and secure them with a pool of underlying assets that will cover the bond in case the issuer becomes insolvent (Shishlov, Morel and Cochran 2016). Smaller institutions usually use financial sector bonds to finance "on-balance sheet" lending. Multilateral issuers, such as development banks or supranational agencies, issue bonds called supranational, sub-sovereign and agency bonds

Table 2: Various Types of Issuers of Labelled Green Bonds

Private Sector Issuers of Green Bonds	Public Sector Issuers of Green Bonds
Institutional issuers (private pension funds, insurance companies, etc.)	State-owned or public sector banks
Corporations or multinational companies	Municipalities and state-owned utilities
Commercial and private sector banks	Bilateral trade agencies and development banks
Private universities	State universities and education boards
Private utility companies	Other state-owned enterprises
Private sector financial services	MDBs
Private power and renewable energy producers	State-owned financial services and certain institutional issuers (public pension funds, etc.)

Source: Authors' analysis of the Climate Bonds Initiative's (2018d) green bond database.

to fund projects across a variety of countries and currencies. The last type of bond is issued by regional governments, municipalities or cities and is called a municipal bond. Municipal bonds fund a wide range of regional projects, including infrastructure (Bloomberg New Energy Finance 2014). Green Canadian municipal bonds have been issued, for instance, by the City of Ottawa (2017), to finance various low-carbon projects. More recently, the City of Toronto (2018) also issued its first green bond to finance a range of unique projects such as flood resilience infrastructure, smart grids and circular economy integration, among others.

To demonstrate the different types of green bonds, Table 2 summarizes the various types of issuers and categorizes them based on whether they represent private or public interests. For example, institutional issuers can fall into either category of public or private, as this is dependent on whose pensions they are representing. A recent case is the Canada Pension Plan Investment Board (CPPIB), which issued its inaugural green bond priced at US$1.15 billion in June 2018 (Onoszko 2018; EY and Corporate Knights Inc. 2018). The CPPIB green bonds were the first of their kind in terms of issuance from a public pension fund in Canada (CPPIB 2018) and aimed to invest the proceeds into three eligible categories of renewable energy, sustainable water and wastewater management, as well as green buildings (Center for International Climate Research [CICERO] and the International Institute for Sustainable Development [IISD] 2018). Similarly, other issuers, such as universities, utilities, financial services firms and energy producers, can fall into either category.

Labelled Green Bonds

Green bonds are a standard debt instrument whose proceeds fund green projects. The majority of green bonds issued are green use-of-proceeds or asset-linked bonds (Climate Bonds Initiative 2018a). Beyond the concept, however, the reality of green bonds becomes rather fuzzy as investors consider restrictions on the use of green bond proceeds (also known as the use of proceeds) and the definition of what constitutes a "green project" (Nanji, Calder and Kolodzie 2014).

Before the issuance of the green bond, the issuer discloses the use of proceeds for the chosen type of green bond. A framework is then developed to showcase how the use of proceeds will be monitored. Often, an independent second opinion on this framework comes from an environmental think tank (such as CICERO),[1] investor-focused groups (such as the Climate Bonds Initiative), other private ESG rating companies (for instance, Vigeo Eiris), as well as domestic rating companies in certain countries (for instance, Sustainalytics).[2] After the second opinions are made public, and

1 One of the world's biggest provider of third-party reviews and verifications of a green bonds use of proceeds, CICERO is a Norwegian research institute that focuses on interdisciplinary climate research www.cicero.oslo.no/en/posts/platform/climate-finance.

2 Both are research and rating agencies that evaluate an organization's integration of ESG factors into their strategies, operations and management (Vigeo Eiris 2018; Sustainalytics 2018). They have distinct methodologies and criteria for evaluating these factors.

upon further discussions with the issuers, investors assess whether the bond meets their ESG criteria and their responsible investment mandate (Nanji, Calder and Kolodzie 2014). Once the green bond is issued, the issuer reviews the progress of projects (on an ongoing basis) financed by the green bond and provides periodic reports on the use of proceeds for the benefit of investors (ibid.). However, due to a lack of standardization in the market, this process can vary in its time frame, and the amount of disclosure is dependent on the issuer.

Since inception, the green bond use-of-proceeds market has developed around the idea of flat pricing, where the bond price is the same as a regular bond by the same issuer and with the same duration (Climate Bonds Initiative 2018a). Consequently, there is no difference in pricing because investors are not willing to take lower than expected returns on the green bond issuance, thereby making green bonds as attractive to investors as regular bonds (OECD and Bloomberg Philanthropies 2015), but with a "bonus" moral return of investing in green projects. It can even be argued that green bonds are less risky because they assess additional risks, such as environmental or climate-related risks. However, from the issuer perspective, this *pari passu*, or equal pricing of green bonds and regular bonds, can be a challenge, as green bonds incur additional costs of certification and third-party reviews.

Financial Risks and the Green Bond Market

Other characteristics of bonds are their investment grade or ratings, indicating the level of risk for defaulting, which is determined by bond rating firms such as Standard & Poor's (S&P) among others. High-quality bonds are usually given a "AAA" or "AA" rating. Medium credit quality is "A" and "BBB" and still considered investment grade. The lowest credit qualities are "BB," "B" or "CCC" etc. and these are referred to as "junk bonds" (S&P 2016). Although this paper does not explicitly refer to the bond ratings of any particular green bond, it is obvious that higher investment grade bonds are much more valuable to investors who want low-risk exposure than lower investment grade bonds. Therefore, established market players, such as developed countries and MDBs, tend to have higher ratings and a well-known reputation in the bond market. Lower risks usually lead to a greater demand for most of their bonds and even to oversubscription (Osterland 2018).

Oversubscription in the regular bond market is common as fixed income investors always have the capital to invest. So far, oversubscription has been a consistent trend in the green bond market as well, and most green bonds are in high demand as investors are looking to diversify their portfolio. For example, when Xinjiang Goldwind Science and Technology (a Chinese wind energy firm based in Hong Kong) issued its first labelled green bond in 2015, it was oversubscribed almost five times. Their US$300 million green bond received orders of US$1.4 billion from investors (Kidney 2015).

Investor appetite or demand in the bond market is dependent on factors such as size of bond, timing of issuance, tenor or time-to-maturity, credit quality, price and supply in the market (Harrison and Boulle 2017). In the green bond market, these factors can vary, given that the market is still in its formative stages and oversubscription might be driven by tight supply. However, what differentiates the oversubscription in the green bond market as compared to the regular bond market is that there is an added investor base of green investors or SRI-focused investors (ibid.). Given this diverse investor base, the appeal of a green bond is broader than that of a regular or vanilla bond. Having a diverse investor base also offers more stability during volatile times (ibid.) and therefore can contribute toward its popularity.

Another development in the market has been the evolution of various green bond rating frameworks by various rating agencies. For example, S&P's green rating framework addresses two types of assessments of green projects financed by green bonds. Its green evaluation framework applies either to carbon or water and is based on three components: governance, transparency and environmental impact (Wilkins et al. 2017). The standing of the green project (and, by extension, the green bond that is funding it) is determined by factors such as the significance of its environmental contribution, level of climate change mitigation and the location of the project, in conjunction with local environmental stresses (ibid.). For example, a water reuse project in New York would receive a higher net benefit score than in Chicago because the level of water stress in New York is much higher than in Chicago (ibid.). However, a renewable

energy project in New York is more likely to receive a lower net benefit than in Chicago due to the different carbon intensities of each cities' respective electricity grid (ibid.). Based on these frameworks, it is evident that a green bond's impact varies depending on the location of its green projects and how the projects will improve the local environment or mitigate climate change impacts. Therefore, standardization of bonds and assessments is not easy to establish.

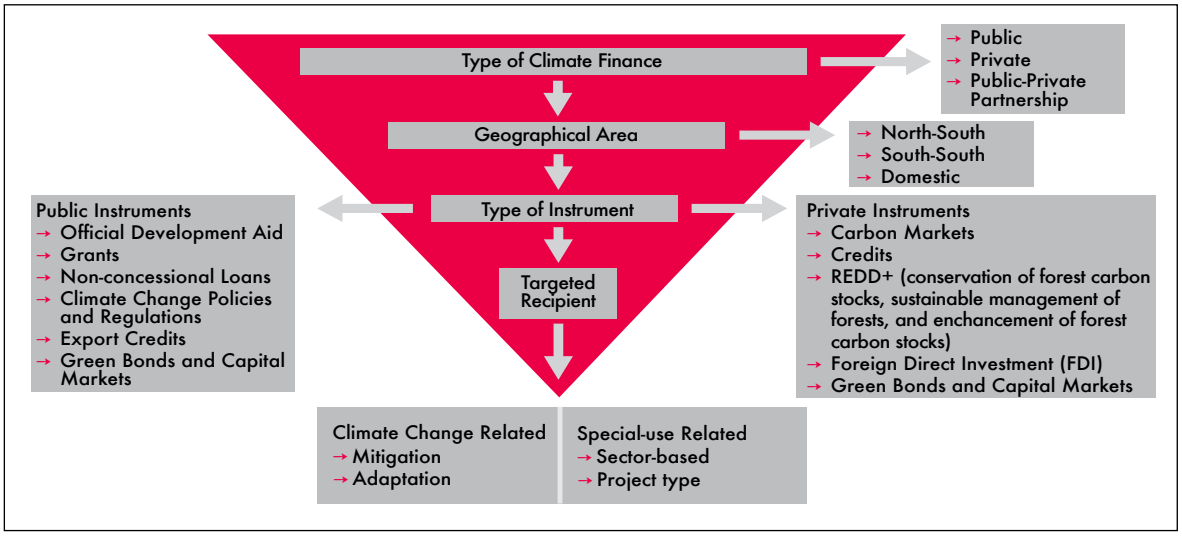
The Growth of Green Bonds

Green infrastructure is not the only way green bonds are currently changing the way societies are financed and built. Investment in evolving sectors such as energy, climate change adaptation, water, waste, buildings and transport are now booming due to green bonds. Having a variety of sectors allows various types of investors, ranging from mainstream institutional investors to SRI, to access this market. This can be especially useful for financing new endeavours, such as innovative climate adaptation projects. One example is the Île-de-France regional government's bond to purchase and create "ecological corridors" to allow movements of wildlife between two natural areas that are disconnected by structures such as roads and national highways (Kidney 2014). The example suggests that calculating the use of proceeds for such a project is not trivial.

Currently, bonds aligned with the global climate agenda are estimated to total US$895 billion, which is a US$201 billion increase from the previous year (Boulle, Meng et al. 2017, 2). Out of this US$895 billion, approximately US$221 billion are labelled green bonds (ibid.). Furthermore, the green bond market has already surpassed the US$100 billion mark, with US$155.5 billion being issued in 2017 alone (ibid.). This amount is substantially more than the money that flows across global borders as official development aid or public sector international aid for tackling climate change (Kato, Ellis and Clapp 2014, 32). As Figure 1 shows, the flows of climate finance across geographical areas are dependent on whether they are classified as North-South, South-South or domestic (Buchner, Brown and Corfee-Morlot 2011). Out of these climate finance flows, capital market instruments such as green bonds play a big role in driving both public and private money toward targeted recipients (in this case it can be either or both climate change-related and specific-use related). Public, private and public-private partnerships are able to flourish between various countries as well as domestically.

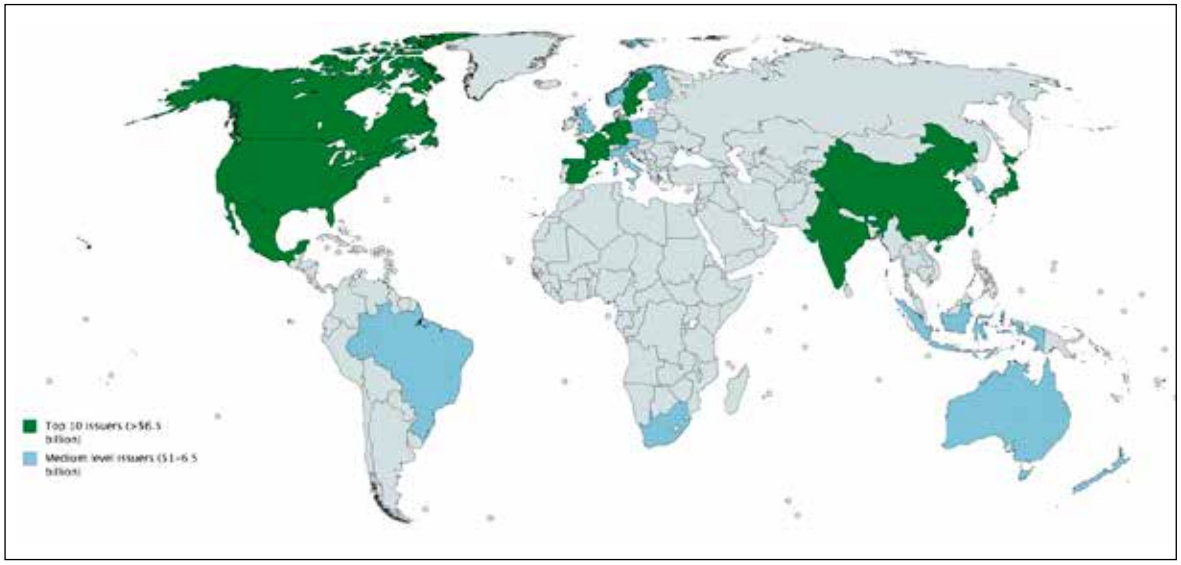
Because green bonds allow greater financial flows across borders, several countries are trying to raise funds for their Intended Nationally Determined Contribution (INDC) climate targets through this market. INDCs are country-specific targets that

Figure 1: Various Dimensions of Climate Finance Flows



Source: Authors' adaptation of a figure from Buchner, Brown and Corfee-Morlot (2011, 10).

Figure 2: Top 10 Climate-aligned Bond Countries in US Dollar Issuances



Source: Authors, based on Meng et al. (2018, 3).

almost 190 countries released in the lead-up to the twenty-first Conference of the Parties to the United Nations Framework Convention on Climate Change in Paris in 2015 to outline their intended action to mitigate greenhouse gas emissions after 2020 and to adapt to climate change impacts (Goodman 2017). Green bonds are not only applicable to finance such climate targets but can also help increase FDI dedicated to addressing environmental issues in developing and emerging economies. As Figure 2 and 3 show, up-to-date issuance of the top 10 countries (greater than US$6.5 billion) in the market include countries in North America, Europe and Asia. Mid-level country issuers (ranging from US$1–6.5 billion) include Australia, Belgium, Brazil, Finland, Indonesia, Italy, Norway, Poland, South Africa, South Korea and the United Kingdom.

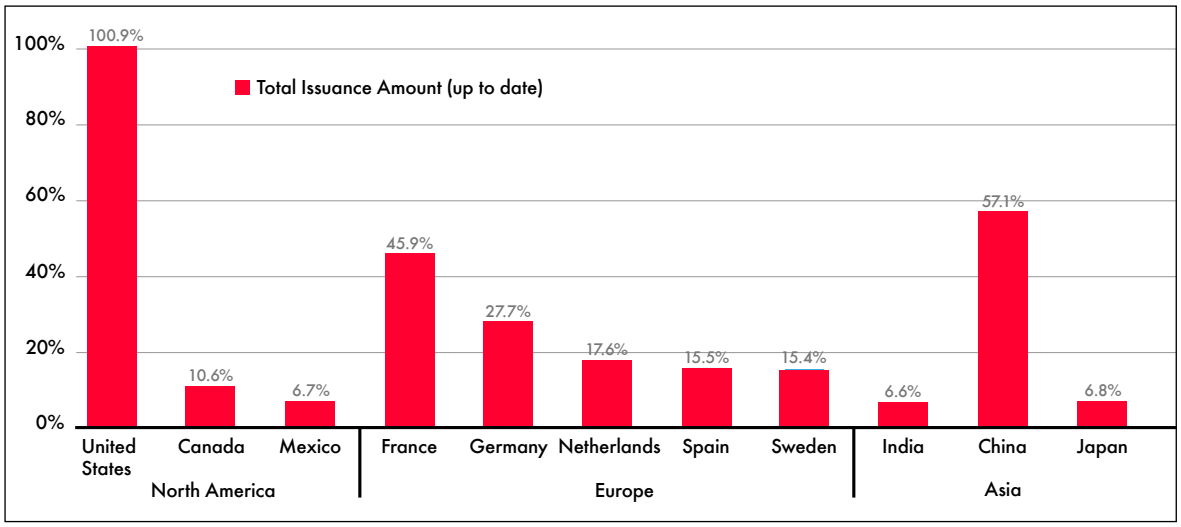
Figure 3 shows the share of dominant climate-aligned bond issuers in 2018. The figure suggests that China, Europe and the United States dominate the market. Although the United States has dominated due to the strong growth in its municipal market, with regard to general green bonds, China has become the global leader.

There is a clear demand for green and climate bond markets across developed, emerging and developing countries, as seen in Figure 4. In 2017, green bond issuances occurred across all six continents, with an increasing number of emerging market issuances (China, India and Mexico, among others). Although the United States dominated issuances over the past few years, there has been a significant increase in geographical diversity of issuers. More recently, in 2018, two additional countries — Iceland and Indonesia — joined the market in the first quarter, thereby bringing the total number of green bond countries to 47 (Filkova 2018).

Furthermore, regarding growth in different sectors, Figure 5 suggests that investments are growing every year. Over the years, investment in renewable energy has continued to be the most popular. However, new sectors, such as low-carbon buildings and energy efficiency, rose 2.4 times in 2017 (Climate Bonds Initiative 2018c). Investments in the transportation sector have also doubled in volume, mainly due to a large number of projects in rail and municipal transit. According to Climate Bonds Initiative (2018c), the trend to finance a wide range of sectors such as waste management, land use and adaptation is also on the rise. However, due to a lack of clear definitions on the eligible projects for these sectors, their share in investment has been lower than the energy, low-carbon buildings, and transportation sectors (ibid.).

Emerging market and sovereign issuances in particular are driving the business case for green bonds. Emerging countries such as China, India and Mexico, among others, seem to have strengthened growth in this market in 2017. For example, in

Figure 3: Top Green Bond Issuances per Country, 2018



Source: Authors, based on data from Climate Bonds Initiative's Green Bond Highlights 2017 report (Climate Bonds Initiative, 2018c, 2).

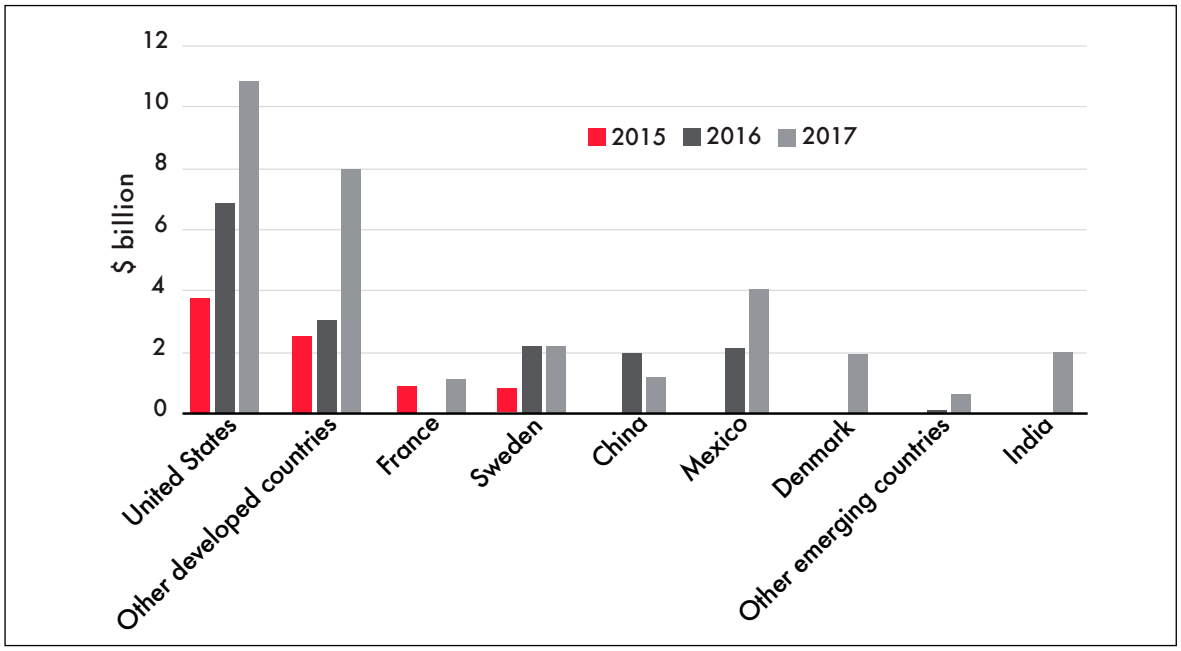
the first quarter of 2017, the global contribution of emerging markets was 15 percent, whereas in the first quarter of 2018, this contribution doubled and was 32 percent of global first-quarter issuances (Filkova 2018). Although development banks were the prominent issuers in emerging markets in both years, other issuer types, such as sovereign wealth funds and corporate bonds, started to achieve a bigger market share in 2018 (ibid.). Sovereign issuances in 2017 were from Fiji (US$50 million), France (US$10.7 billion) and Nigeria (US$30 million) (Climate Bonds Initiative 2018c). More recently, in 2018, countries such as Belgium, Indonesia, Lithuania and Poland issued green bonds, while Hong Kong and Ireland have signalled the intent to come to market by issuing frameworks and green bond programs (Filkova 2018).

The Climate Bonds Initiative(2018c) study indicated that sovereign wealth fund issuances increased to 30 percent of the emerging markets and 32 percent of the developed markets (ibid.). Furthermore, public sector issuances, excluding supranational, accounted for almost 26 percent of the global market in 2018. This public sector drive to grow the market, either through sovereign issuances or policy signals, is visible across all countries. However, governments and regulators from predominantly emerging and Asian countries, such as China, Hong Kong, India, Indonesia, Japan, Malaysia and Singapore (ibid.), have been proactively contributing to the development of clear guidelines and policies for defining and determining what is green and therefore building the foundations for their green bond market.

Although the growth of green bonds is encouraging, it is unclear whether they really attract additional investments or whether they only re-label conventional bond issuances that would have been issued anyway. However, there is an urgent need to "green" the regular bond market as well to address climate change and other environmental issues. As the extreme impacts of climate change grow, they will affect certain industries and sectors more than others. For example, the insurance sector is less likely to take on clients or insure assets that do not meet climate change resiliency standards (Scism and Friedman 2017). This is one major sector where green bond investments into LCR infrastructure will make a substantial difference. However, with public funding already stretched on existing projects, it is imperative to explore additional options, such as private sector financing, to meet the targets of the Paris Agreement (Xu, Dong and Wang 2016) and prevent disastrous climate change effects.

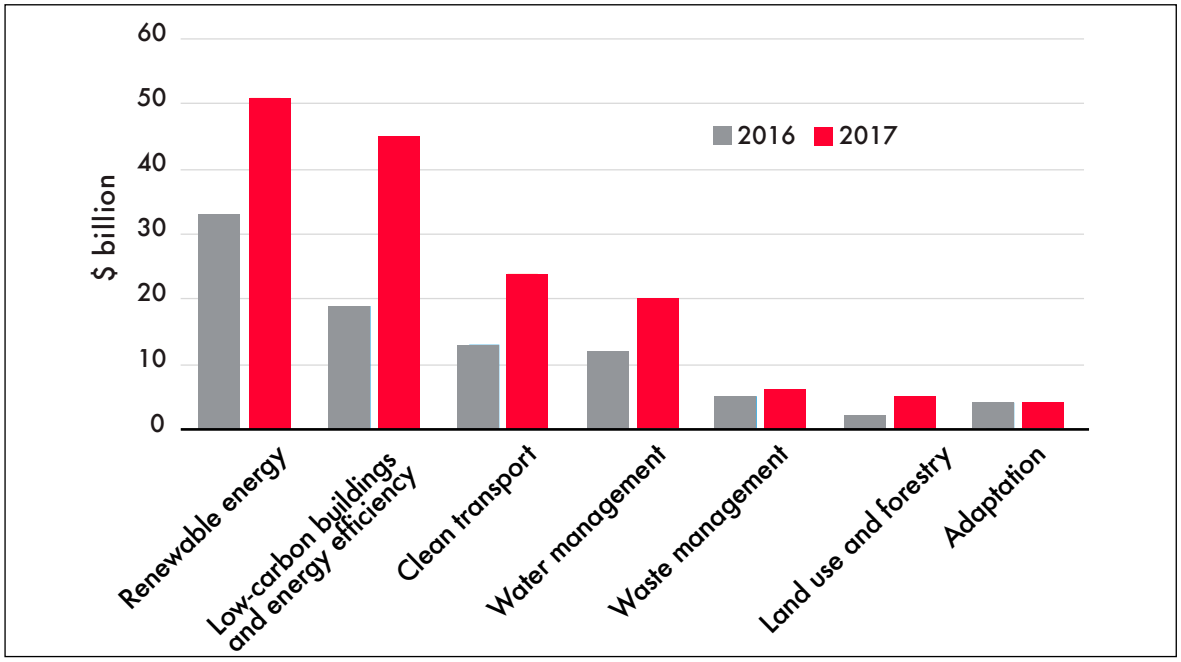
Over the past few years, the private sector has become more active about climate-related opportunities and transitioning toward a low-carbon economy. This trend is evident in the green bond market as well, with private sector issuers entering the market from 2013 onward

Figure 4: Green Bond Issuances Based on Green Bond Countries in 2015, 2016 and 2017



Source: Authors, using data from Climate Bonds Initiative (2018d).

Figure 5: Green Bond Issuances Based on Sectors in 2016 and 2017



Source: Authors, using data from Climate Bonds Initiative (2018d).

and the number of issuers growing every year. As mentioned above, the absolute value of green bond issuances is increasing, but the same is true for the type of investors and issuers involved. In the initial few years, development banks, such as the World Bank, the European Investment Bank and other MDBs, drove the market. However, 2013 was a turning point, with the entry into the market of corporate issuers and government-backed entities. Since then, issuances from new types of issuers, such as non-financial corporations and local governments have also increased (Filkova 2018). In 2015, the market became more balanced regarding the spread of issuance across issuer types. Furthermore, issuances from sovereigns first began in 2016, and new sovereigns have entered the market since then. Given the slowdown of development bank issuances, but a rise in public as well as private issuances in recent years, the green bond market seems to be moving toward the mainstream.

The Canadian Green Bond Market

With CDN$3.8 billion, Canada ranked tenth in 2017 with regard to issuing labelled green bonds (Climate Bonds Initiative and Smart Prosperity 2017). The year 2017 exceeded all other years combined in the domestic Canadian green bond market. The largest issuers were TD Bank (CDN$1.25 billion), the crown corporation Export Development Canada (EDC) (CDN$1.1 billion), the provinces of Ontario (C$800 million) and Quebec (CDN$500 million), and the City of Ottawa (CDN$102 million) (Climate Bonds Initiative and Smart Prosperity 2017). CoPower issued the only Canadian retail bond with the aim of refinancing CDN$20 million of its renewable energy projects (ibid.). Although the TD Bank issued the largest bond in 2017, issuances by public issuers, such as municipalities and provinces, have been more constant over time.

Furthermore, EDC has issued green bonds every year since 2015. However, in general, the amount of green bonds issued in Canada is relatively small compared with the ambitious climate goals set in Canada's Mid-century Long-term Low Greenhouse Gas Development Strategy (Environment and Climate Change Canada 2016). Although issuances increase annually, the Canadian green bond market has a long way to go to reach its potential in the global market.

Analyzing the Environmental Performance of Green Bonds

As more issuers and investors enter the green bond market each year, greater accountability and transparency is needed to mitigate fears of "greenwashing." Greenwashing in the green bond market means bond proceeds get allocated to assets that have little or no environmental value, which shakes market confidence (Bartels et al. 2015; Whiley 2017). To tackle these transparency and accountability issues, market indices from S&P Dow Jones, Bank of America Merrill Lynch, Barclays MSCI and Solactive have emerged as important features for issuers to benchmark their performance on the green bond market (Ehlers and Packer 2017). By providing granularity and global coverage of green bonds, these indices and tools help investors to analyze which type of green bond they would like to invest (ibid.). The tools provided by the indicies allow investors to simulate and build portfolios that can accommodate financial and geographical preferences in investment and enable users to analyze their exposure to climate and other environmental risks.

Analyzing green bonds is especially useful for both niche or SRI investors who are specifically looking for such green fixed-income investments (Green Bond Principles Databases and Indices Working Group 2017) and conventional investors. Investing in green bonds helps conventional investors to reduce their exposure to climate-related or other environmentally related financial risks (Weber and Feltmate 2016). Certified and transparent green bonds can be a useful addition to the portfolios of both types of investors.

Green bond indices also serve as a type of check and balance on the market and are reflective of how the broader market reacts to the reputation of the green bond issuer (Green Bond Principles Databases and Indices Working Group 2017). One example is the Spanish oil and gas company Repsol, which issued an EU500-million self-labelled green bond in May 2017 to finance and refinance energy efficiency in its chemical and refinery facilities in Spain and Portugal (Whiley 2017). However, this bond's self-labelled green tag sparked controversy because major green bond

indices excluded the bond (ibid.). This exclusion reflects the market opinion that improving the efficiency of fossil fuel plants is not the primary motive of a green bond — rather, it should go further and help similar issuers transition toward a low-carbon business strategy by investing more into renewables (Brown 2017).

This "brown-to-green" model is witnessed in the case of India's biggest power utility, NTPC Ltd, when it issued the INR20 billion (US$369 million) green "masala" bond in August 2016, yet got its certification from the Climate Bonds Initiative (Kidney 2016). This certification was warranted due to the fossil fuel company harnessing the existing strength of its "brown" balance sheet to fund the expansion of clean energy generation. Similar instances of other brown-to-green issuers achieved greater market support than purely brown issuers looking to improve energy efficiency through baseline changes (Brown 2017). This approach has some level of consensus among various investors around the world. By encouraging investments in green energy instead of fossil fuels, the green bond market provides an opportunity to diversify investment portfolios and hedge risks associated with climate change (Weber and Dordi 2017; Hunt and Weber 2018). By providing long-term competitiveness on green assets, high bond market liquidity and lower risks, green bonds are becoming an attractive investment option, especially for institutional investors who wish to fulfill their long-term fiduciary duty (Ordonez, Uzsoki and Thinley Dorji 2015). Consequently, green bonds complement green equity investment and green lending.

Market Challenges

As we have seen, the green bond market recently increased in size and issuer types across various countries. However, when different countries are involved, the harmonization of the definition of green and what it means for the international market becomes especially complex. For example, China's definition of green may include "clean coal," whereas this would be unacceptable for some investors or issuers in other countries (Lee 2017). The lack of a universal definition of green has further raised investor concerns around the risk of greenwashing, where bond proceeds are allocated to assets that have little or dubious environmental value (Whiley 2017). This dubious allocation was visible to an extent in the Repsol case. However, the market corrected itself, and over the past few years it has encouraged the establishment of green bond standards to tackle this issue (Flood 2017).

In emerging markets and developing countries, guarantees and regulations that are able to mitigate investors' risks do not always exist (World Bank Group 2018). According to several bilateral trade agencies and other investment-focused organizations based in developed markets, similar risks exist for private sector investments that are not constrained within developed markets. For example, a Canadian institutional investor might find it risky to invest in a wastewater treatment project, even in an emerging economy such as India. The risk might be due to reasons such as lack of enabling policy conditions, regional social turmoil (*BBC News* 2016), political instability (Henisz and Zelner 2010) or currency volatility. These are issues that are not only relevant to the green bond market but also to other investments in emerging and developing countries. For example, India's banking sector faced almost US$2.5 billion in losses in 2018 due to bank fraud and scams, leading to widespread public outrage (Anand 2018). Although bad loans occur everywhere, the perceived levels of lack of accountability and fluctuating levels of stability have an impact on FDI (Henisz and Zelner 2010), including investments in green bonds.

Since its inception, the green bond market has emphasized a high level of transparency and disclosures to avoid any issues related to accountability. More recently, impact reporting of their use of proceeds is also increasing due to investor demand (Harrison and Boulle 2017). These efforts have pushed some issuers to advocate for a pricing benefit, also known as a "greenium,"[3] when it comes to the pricing of a green bond as compared to a regular bond (Allen 2017). Issuers prefer that compliance costs, such as third-party verification or subsequent reporting costs, should either be paid for by the investors (perhaps

3 Sometimes a bond might be issued at a higher price, but offers its buyers a lower yield. This is known as a new issue discount, or when present in a green bond, it is called a greenium. There is no credit enhancement currently to explain this pricing difference, and issuers of green bonds still have to incur additional compliance costs such as certifications and third-party reviews (Harrison and Boulle 2017).

through this greenium) or given preferential treatment from governments via tax incentives or subsidies. However, many investors (especially mainstream ones) are not willing to pay a premium for green, and some governments have only recently started creating incentives for the market (McLellan 2016). Such regulatory changes may push more issuers to enter the market in the future.

In the meantime, it seems the early issuers in this market will have an advantage because they are cutting long-term transaction costs by establishing an efficient internal green bond process for issuance (ibid.). Generally, it cannot be expected that green bonds will achieve a premium, but that conventional bonds will become greener because they try to avoid climate-related and other environmental risks.

Furthermore, there is also a level of currency risk in emerging markets, and this can impact financial investments in emerging and developing markets. Currency exchange rate fluctuations make returns volatile and can potentially undermine the profitability of an investment (Ward et al. 2009). On the other hand, such risks might be hedged and are not different from those of conventional bonds or FDI.

To address such types of risks, Raphaël Jachnik, Randy Caruso and Aman Srivastava (2015) examine the criteria required for private investments to flow into climate finance markets. Their criteria outline that in order to be sustainable over the long run, any private financial instrument, including green bonds, should: accurately reflect the available practical incentives; leverage the use of public interventions to scale up; have the potential for standardization; and be practicable in its use of data and expertise available, especially in terms of time and cost-effectiveness. The green bond market fits these criteria by providing financial stability through fixed interest rates. Consequently, green bonds are often oversubscribed, suggesting that there is a higher demand for this type of investment than supply. This demand offers an opportunity for private and public green bond issuers, as well as for public-private partnerships.

Regarding standardization, the first type of standardization in the market was through the Climate Bonds Standard and Certification Scheme (the latest version is 2.1), which also includes a taxonomy of the various eligible investment areas in green sectors (Climate Bonds Initiative 2018b). There are other regional standards in place as well, the first being the Association of Southeast Asian Nations (ASEAN) Green Bonds Standard, which was put out by the ASEAN Capital Markets Forum in November 2017 (Arshad 2018). Regarding harmonizing various existing green definitions, the European Union is working on green taxonomies through its High-Level Expert Group on Sustainable Finance (European Commission 2018). Furthermore, the International Standards Organization (known as ISO) is currently working on green bond standards, called ISO 14030 (Gould 2018). The question remains, however, whether different issuers from different regions will be able to agree on the same standards.

There is a tangible need for improvement in policy support from various national regulators and governments to further enable the green bond market to grow. International platforms, such as the United Nations or the ISO, could initiate an international dialogue and bring stakeholders from various developing and developed countries to the table.

Finally, the issuer disclosures on the use of proceeds and the growing trend of impact reporting are what differentiates the green market from others. However, there is a need to make disclosure more efficient and built-in among various issuers, which is possible either through voluntary measures or intervention from regulators. By doing so, the practicality of this financial instrument and its market would be sustainable over the long term, and defined standards would make it easier to address retail investors in addition to institutional investors and, consequently, increase the market for green bonds.

The Role of Standards in the Green Bond Market

Given the exponential growth of the green bond market, there has been an increasing amount of interest from various sectors of global society about the standardization of green bonds. Stakeholders such as academia, institutional investors, issuers, industry associations, governments and various non-governmental organizations are currently involved in determining the future direction of this market. With interest in SRI growing and, at the same time, green bond issuances limited, the

trust and confidence of stakeholders is resting on a more standardized and transparent version of the market. Standardization can indeed result in robust frameworks for monitoring, reporting and assurance of the green bond proceeds. Doing so can allow investors across the world to invest in green bonds without doubting the viability of their investments. For example, if a globally recognized standard were in place, an institutional investor, such as the Ontario Teachers' Pension Plan, could confidently invest in a renewable energy project in a developing country without fearing economic, legal or political risk factors.

With regard to green bond standardization, it must be stated that earlier attempts to standardize SRI products have failed. There is the argument that the market should regulate such products. If, for instance, green bonds are not transparent and fail to deliver the expected "green return," then fewer investors will invest in them. What is needed in this case, however, is transparency through standardized and verified disclosure. Based on the assumption of market transparency, the market should be able to price green bonds adequately.

A global standard is meant to create a certain level of trust, transparency and accountability in the functioning of any market. Doing so in the green bond market would further enable new types of issuers and investors to venture into the market. For example, an energy efficiency company that was previously unsure of how to go about issuing a green bond can now refinance, or even initiate new projects, based on a global standard. One such company that has been able to do so without a standard, however, is the Canadian-based renewable energy company CoPower. By issuing a retail green bond, they are the first Canadian issuer to allow new types of investors, including retail investors, to enter the green bond market (CoPower 2017). Enabling issuers to follow a recognized green bond standard, however, would encourage more such medium to large-scale enterprises to enter as issuers and create a valuable shift in how retail or individual investors invest in green and climate-related projects.

For any collaborative process to be successful, there is a need to develop a shared language and align mental models. By doing so, stakeholders of a market can begin to see how their domains are influenced by others and how their actions could have similar effects. This is important because of the variety of players in the green bond market, including those focusing on financial returns and environmental impacts or those preferring local over global investments. This is why having a multi-stakeholder engagement in the creation of an international green bond standard is one way to effectively implement the standard. It is important to note here that primary stakeholders in the market are institutional investors, regulators, issuers and verifiers. When it comes to creating a standard, having the support and participation of these high-priority stakeholders can be an important component of how implementable the standard is in practice. Furthermore, given this heterogeneity of players in the green bond field, there needs to be a uniform focus on clarifying the definition of green as well as improving conditions for risk reduction across projects and geographies. Creating such stable market conditions will allow for stronger investor participation as well as mainstreaming of the market, irrespective of the country or project type.

Issuers are also in a position to affect the level of transparency in the market, beyond standards. They can do so by having external verification mechanisms and transparent, standardized reporting about the use of proceeds. Transparent disclosure might lead to more positive accountability in the market. Third-party verifiers and auditors are playing an important role in verifying mandatory and non-mandatory reporting, for instance, in corporate social responsibility reporting (Hammond and Miles 2004). Having such additional external verification in place, however, creates costs and can be a hindrance for current issuers, as well as those who wish to enter the market.

Nevertheless, it is important to note that without an emphasis on transparent and verified disclosure, the green bond market will resemble any other bond market and lose some of its unique appeal. To satisfy investors, as well as issuers, it is important that any green bond standard be non-prescriptive, simple and transparency-focused. Furthermore, it should also reduce the costs of verification and minimize the challenges of greenwashing over time.

Regulating Green Bonds

Still, the question remains whether financial regulators will start regulating the environment and social performance of financial products and services, such as green bonds. So far, global, national and regional financial regulators address only financial risks of green products and services. Fiduciary duty is also mainly demanded with regard to achieving financial outcomes. Although recently fiduciary duty has expanded to address ESG aspects that might be material for the financial performance of an investment (Richardson 2011; 2013; Waitzer and Sarro 2012), there is still a lack of clarity regarding who should regulate and supervise the environmental and social performance of financial products and whether this is a task financial regulators should fulfill. It is clear from countries such as China and the United Kingdom that financial regulators or central banks have already started to integrate climate and other environmental risks into their supervisory activities (Bank of England 2018; Cui, Geobey, Weber and Lin 2018), but other country regulators have yet to follow this approach.

To understand the level of institutional or regulatory impact that a market regulator can have, the authors of this report are currently conducting a study on the green bond markets of India and China. Preliminary findings suggest that the role of the regulator is different based on the country's economy and political system. However, any market growth needs some form of government support and policy signals if it is to grow any further (Weber and Saravade 2018).

Therefore, even if the amount of regulation may vary, the type of intervention needed to grow the market can be based on national priorities outlined in terms of socio-economic growth and development, overall robustness of the country's financial sector, support from across the political spectrum, financial incentives available for issuers to safely invest in new and innovative sectors or projects, advocacy for the market being conducted by stakeholders such as the Climate Bonds Initiative, the potential to create new types of businesses (such as verifiers or impact reporting) and strong policy signals with sustained involvement from the regulators' side. Hence, there might be a role for regulators with regard to green bonds, but that this role might be different depending on the market.

Policy Recommendations

Based on the state of the market and its future potential, the following recommendations are proposed to the different stakeholders in order to address key aspects of this market.

Regulators

So far, most financial regulators are not actively involved in supervising environmental aspects of green financial products. Regulations focus exclusively on financial risks and disclosure. If financial products such as green bonds offer additional green returns, there should be mechanisms that prevent greenwashing. Therefore, we recommend that international and domestic regulators engage in supervising the environmental performance of green financial products.

They can do so by developing an inter-regulatory strategy for their involvement in the green bond market. The main purpose of doing so would be to coordinate regulatory policies and ensure there is harmonization in the different regulatory environments (including, but not limited to, stock exchanges, listed companies and investment management, as well as banks and financial services providers).

The Group of Twenty Task Force on Climate-Related Disclosures is an example of high-level coordination of financial regulatory engagement in the field of green finance. In particular, in developing and emerging countries the involvement of financial regulators in supervising green bonds might mitigate investment risks as well. Consequently, risk mitigation would attract more green bond investors into projects in emerging and developing countries that are in need of this finance.

Standardization

Standardized reporting guidelines might help investors to analyze risks and opportunities of green bonds. Therefore, we recommend voluntary industry approaches to standardize green bonds. These approaches could be in the form of voluntary

codes of conduct, such as the Equator Principles or Principles for Responsible Investment (PRI).[4]

Standardization will enable entities to issue green bonds more easily and will help investors analyze bonds using a standard framework. This helps in not only cutting transaction costs by creating a market standard but also in enabling investors to measure impact across various geographies, project types and countries.

However, given the different needs and levels of climate impacts around the world, standardization should take into account the different norms and approaches of various countries as well. In order to do so, an intensive collaboration between country-specific market players, such as issuers, underwriters, investors, verifiers and governments, is needed to guarantee buy-in to the standards by the primary stakeholders.

Governments

The role of governments might involve creating the financial and policy incentives for the various stakeholders involved. Incentives should include risk-mitigating guarantees for green bonds, especially if they address governments' environmental and climate change-related targets for a country (such as their INDC under the Paris Agreement). Doing this enables governments to not only access private capital for investments into climate change adaptation and mitigation projects but also increases FDI into the country.

In terms of creating a project pipeline for green bonds, government infrastructure and the assistance of development banks can help facilitate greater interest in this market as well as engage private sector participation in blended finance. Development banks can also act as a country-specific mediator between the government, issuers and investors, as well as serve as a forum for further development of the market. Furthermore, they could also issue green bonds themselves, as has been already conducted by EDC, for instance.

In addition to issuing public or sovereign bonds, governments could support industries and sectors that are affected by climate change. By designing incentive-based policies and climate-related regulations, governments can help brown issuers turn green by catalyzing the transition to a low-carbon economy. Here, as well, the country-specific financial sector buy-in would be crucial in facilitating higher corporate green bond issuances and providing conventional companies and sectors the incentive to move toward a low-carbon economy.

Issuers

Recommendations for issuers include higher-voluntary disclosure levels of the impact of their bonds in order to improve their reputational benefits. Investors are particularly interested in greater disclosure about their investments with regard to the environment and climate change.

If an issuer can voluntarily increase transparency in addition to financial disclosures, the green bond market will become even more attractive to mainstream investors. However, it is important to report both positive and negative impacts to enable investors to analyze the green performance of the bond.

In terms of increasing the credibility and validity of reporting, external entities should be involved in the disclosure verification process. The practice of using a third party gained popularity through corporate social responsibility and corporate sustainability reporting, and it has helped increase the credibility of voluntary reporting. Although green bond issuers are already using such third-party verifiers, it is important that this practice be maintained in the market to reduce fears of greenwashing.

Finally, it is acknowledged that the work going into reporting and other transaction costs, such as verification, are tangible for issuers. These costs can serve as a deterrent for potential issuers who wish to enter the market. This challenge should be addressed by various issuers, either through advocating or working with governments to subsidize the transaction costs, improving their internal issuance processes through repeat issuances of green bonds or just waiting until the market becomes more standardized.

4 The Equator Principles are a risk management framework that have been adopted by 94 financial institutions around the world in order to determine, assess and manage ESG risks in decision making (Weber and Feltmate 2016). The PRI is an investor-focused organization that supports an international network of mainstream and institutional investors to understand the implications of ESG decision making and investment (PRI 2018).

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