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Green Bonds and the Pathway to Sustainability

A Guide to Green Bonds: A look at the role of green bonds in the climate challenge and within a fixed income portfolio.

INTRODUCTION

A Green Recovery

After a very strong year for global green bond issuance in 2019, another record year in 2020 looked inevitable, driven by robust and growing demand for sustainable fixed income investments, a favorable credit environment and regulatory tailwinds. However, green bonds were not immune to the unexpected shock the coronavirus has had on global markets and because issuers need to establish a comprehensive framework and identify a project pipeline prior to issuance, the frenzy to raise cash was not conducive to green issuance. Issuance dropped sharply in March versus the prior year, following a strong January and February.

However, green bond issuance rebounded sharply as markets became more orderly and demand has clearly not abated, judging by inflows to sustainable fixed income funds this year. In the depths of the market selloff, performance of green bonds was in line with the broader fixed income market, after adjusting for sector and duration exposure. That has provided validation to one of the most appealing aspects of green bonds, which is that they allow investors to build sustainable fixed income portfolios without significantly impacting their risk and return profile.

We believe the green bond market weathered the storm well and the resilience of the market has made them even more attractive to fixed income investors globally. Further, with economic recovery at the top of policymakers' agendas, there is a once in a generation opportunity for them to now advance a sustainability agenda while simultaneously rebuilding the economy. Green bonds can be an integral piece of financing that recovery.

Monetary and Fiscal Green Bazoorkas

Central banks, including the U.S. Federal Reserve, have recently revived and expanded financial crisis-era lending and asset purchase programs to provide support to many parts of the fixed income markets. With certain ETFs, high yield bonds and even some collateralized loan obligations (CLOs), now eligible for investment or financing under various programs, it is perhaps not hard to contemplate central bankers incorporating sustainability criteria into other initiatives. This could include favorable capital treatment for banks on loans financing green

projects, penalizing "brown" assets held on bank balance sheets or open market operations that target green bonds. These options were already receiving attention from central bankers prior to the current turmoil and may remain in the playbook as potential ways to provide additional targeted stimulus, even if this is not the immediate priority. In July, both the European Central Bank and the Bank of England announced that they will examine ways to pursue green policy objectives through the banks' operations, including asset purchases.

While central banks have been credited with bringing order back to financial markets, focus has turned to the fiscal response of governments worldwide, primarily on replacing lost household income and providing relief to businesses until the economy fully reopens. Given the severity of the economic downturn, additional rounds of fiscal stimulus are likely. Green investment was already on the agenda globally, prior to the recent shock, with extremely ambitious programs proposed in Europe and even the United States. Faced with rebuilding a badly damaged economy, these proposals could find further support to the extent they emphasize infrastructure investments that could provide a boost to economic growth and jobs to the millions of people who are no longer employed. So far, this has perhaps best been exemplified by the European Green Deal, a set of policy initiatives which is built on the idea that climate change is an existential threat and that building a green economy can allow the E.U. to become a net zero greenhouse gas emitter by 2050 while also achieving sustainable economic growth.

The Green Deal should also be viewed in the context of other green initiatives taken recently by European policymakers. One is the adoption of a nearly EUR 2 trillion rescue package that will include EUR 750 billion of "common" bonds backed by the E.U. as a whole, with up to a third of that in the form of green bonds—an amount that has the potential to transform the green bond market. Second, the European Parliament has recently adopted an E.U. wide green taxonomy which provides a classification system to determine what types of activities can be considered green. Included in the proposal is

a green bond standard and the taxonomy could also serve as a basis for a global standard of green finance.

Tax policy, spending plans and subsidies all have the ability to encourage private capital to flow to sustainable projects such as clean energy, sustainable transport, climate-resilient infrastructure and others. Large scale investment can, therefore, help to achieve two goals: economic stimulus and accelerating the decarbonization of the global economy.

Will Cheap Oil Derail Green Investment?

We continue to believe that energy companies, including companies involved in electricity generation and transmission, as well as oil and gas producers, must play a crucial role in the transition to a low carbon economy. Many have been active in the green bond market to finance investments in renewable energy. Will oil prices remaining depressed, impacted both by supply and demand shocks, fundamentally shift the economics of clean energy back in oil's favor? We do not believe it will, and it may even strengthen the resolve to become less reliant on fossil fuels. The CEO of Enel, an Italian multinational energy company, has said that the coronavirus pandemic may create the "perfect opportunity for renewables to pick up speed" and that cheap oil may accelerate the shift to green energy, citing already weak demand prior to the Saudi/Russia price war and weakened lobbying influence from those opposed to renewables. Moreover, large corporates have already committed to the transition due to economic considerations.¹ Enel has a target of generating 60% of its capacity from renewables by 2022 and has issued nearly \$4 billion in green bonds to finance that investment.² It is not just corporates who have been shaken by uncertainty in the global energy markets, with anecdotal evidence of increases in sales of residential solar panels and battery storage as households look to future-proof their savings and homes.³

The International Energy Agency (IEA) notes that, unlike previous periods when government stimulus was needed, the cost of renewable energy is much lower while the technologies are far more advanced. Governments drive 70% of energy investment directly or indirectly, according to the IEA, partly

through the \$400 billion in subsidies provided to lower the price of oil to end consumers.⁴ With current low oil prices, these subsidies may no longer be needed and these funds can be redirected towards cleaner sources of energy. Current low interest rates will make debt financing of projects more affordable, which, along with government incentives or initiatives to lower risk, can go a long way to encourage private investment. Governments went into the current crisis with heavy debt burdens. In the United States alone, the anticipated budget deficit may reach \$2 trillion this year with the measures announced so far.⁵ Mobilizing private capital is becoming even more important not only in the transition to a low carbon economy, but to revive the economy and bring back jobs. Measures to encourage green investment through innovative financing solutions such as green bonds may be a key piece of additional stimulus measures.

What Role Will Green Bonds Play?

Why is there so much hope for further growth of the green bond market among investors, policymakers and issuers? They have already proven themselves to be an effective way to mobilize private capital by tapping into the \$100 trillion global debt markets. They have the same fundamental risk and return characteristics as conventional bonds, and investors do not need to sacrifice yield or assume additional risk to build sustainable and diversified fixed income portfolios. Importantly, they provide transparency into the projects being financed and allow investors to measure the impact that their investment is making.

The benefits of green bonds are both tangible and measurable to investors and the public at large, whether experienced on a daily commute on a newly built mass transit system, lower energy bills through renewable energy, or the significant number of jobs generated from building new green and resilient infrastructure—all of which can be financed through green bonds. For these reasons, we believe green finance and green bonds in particular, may play a key role in the oncoming economic recovery. Investors will be able to measure the impact they are having, both towards their investment objectives as well as their sustainability objectives.

¹ <https://www.bloombergquint.com/markets/enel-ceo-says-cheap-oil-may-accelerate-green-energy-transition>

² Climate Bonds Initiative, as of 4/10/2020

³ <https://www.pv-magazine.com/2020/03/19/forget-toilet-paper-australians-are-panic-buying-pv/>

⁴ <https://www.iea.org/commentaries/put-clean-energy-at-the-heart-of-stimulus-plans-to-counter-the-coronavirus-crisis>

⁵ <https://www.nytimes.com/aponline/2020/04/10/business/bc-us-budget-deficit.html>

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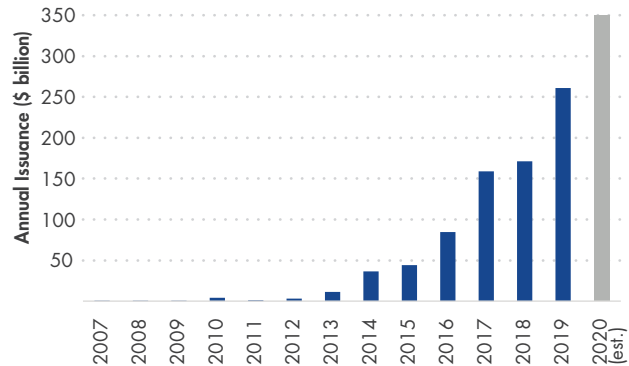
A Guide to Green Bonds

A Growing Green Market

The size of the green bond market has increased significantly in recent years. With issuance at less than \$50 billion per year just five years ago, annual issuance has increased at a remarkable pace and has reached parabolic growth levels. Despite a lull in issuance in the early days of the pandemic in 2020, issuance has resumed and may match or exceed the record \$260 billion of issuance in 2019.⁷ The increased demand for green bonds has come from a range of investors including institutional pension and endowment funds with environmental, social and governance (ESG) mandates to individual investors looking to add a green focus into their fixed income allocations.

Green bonds are simply conventional bonds with an environmentally friendly use of proceeds. Today the overall market resembles a core global fixed income benchmark, with similar yield, duration and credit quality. Investors can allocate a portion of their core bond portfolio to green bonds without significantly altering the risk and return profile of their portfolio. In other words, bond investors can structure a more environmentally aware portfolio without having to compromise on their investment goals.









Green Bond Issuance



Source: Climate Bonds Initiative.

Although green bonds still represent only about 1% of global debt outstanding, there is tremendous potential for continued growth.⁸ We believe that the issuance of green bonds will likely scale up massively in a short amount of time to finance the projects needed to help transition to a low carbon economy. This represents a significant opportunity for fixed income investors.

Common Green Project Categories

<p>Energy </p> <hr/> <p>Solar</p> <p>Wind</p> <p>Transmission</p>	<p>Buildings </p> <hr/> <p>Efficient Buildings</p> <p>Low Carbon Materials</p> <p>Urban Development</p>	<p>Industry </p> <hr/> <p>Resource Production</p> <p>Fuel Production</p> <p>Carbon Capture</p>	<p>Transport </p> <hr/> <p>Rail</p> <p>Charging Infrastructure</p> <p>Sustainable Shipping</p>
<p>Information Technology </p> <hr/> <p>Power Management</p> <p>Connectivity</p> <p>Broadband</p>	<p>Waste and Pollution </p> <hr/> <p>Waste to Energy</p> <p>Material Recovery</p> <p>Recycling</p>	<p>Land Use/Marine Resources </p> <hr/> <p>Agriculture Production</p> <p>Sustainable Fisheries</p> <p>Commercial Forestry</p>	<p>Water </p> <hr/> <p>Monitoring</p> <p>Flood Defense</p> <p>Storage and Treatment</p>

Source: Climate Bonds Initiative.

⁷ Climate Bonds Initiative

⁸ VanEck, based on Climate Bonds Initiative and SIFMA data

What Makes a Bond “Green”?

A bond is generally considered to be “green” if the issuance proceeds are used solely to finance projects or activities that have a positive environmental impact. When issuers clearly indicate to investors how a green bond’s proceeds will be used, the bond receives a “green label”. Carbon emissions mitigation to combat global warming often comes to mind when discussing green bonds (and some use the term “climate bonds” interchangeably), but green bonds can also be used to finance other objectives.

Labelled vs. Unlabelled Green Bonds

It should be noted that there is currently no market-wide, definitive list of green bond-eligible projects. Issuers may assess whether a project is in line with climate mitigation or other environmental goals and can “self-label” a bond as green, provided they disclose to investors the types of projects being financed. In many cases, such as building a solar or wind farm, this assessment is generally straightforward and a green label would not be ambiguous. However, as market size and investor interest have grown, there has been growing demand for independent evaluations to verify that a green bond is, indeed, green. The vast majority of issuance now features an independent verification. Further, an increasing number of countries are enacting regulation that defines a standard for green bond issuance, removing any uncertainty around what constitutes “green.” As long as these bonds, whether self-labelled, independently verified or issued under a national green bond standard, finance eligible projects and provide the required disclosure, they are all part of the labeled green bond universe.

Although the green label has attracted investor attention as a way to identify bonds that have a clearly disclosed use of proceeds that aims to benefit the environment, there is also a large (approximately \$1.1 trillion) universe of unlabeled green bonds.⁹ Many infrastructure projects that might be considered green—for example, municipal water projects—were financed through bond issuance long before the relatively recent development of the green bond market. Many issuers of unlabeled green bonds may not feel the additional disclosure or cost of verification is worth the expense. Or they may simply be unaware of the tremendous interest in labeled green bonds.

Another example of unlabeled green bonds relates to bonds issued for general corporate purposes by “pure-play”¹⁰ companies, such as manufacturers of solar panels or electric cars. Although the businesses of these firms are inherently environmentally friendly, most market participants do not consider these bonds to comply with best practices since the use of proceeds is not specified at the time of issuance, and therefore the bonds do not carry a green label. To be sure, proceeds may go towards activities or projects considered environmentally friendly; however, they could also finance non-green activities such as a dividend payment or share repurchase.

Given that the market is still in its early years, we believe that both the transparency and disclosure provided by a green label and independent verification are essential in providing confidence to investors that their investment is promoting environmentally sustainable projects, and are needed to promote future market growth.

The Climate Challenge

The transparency provided by labelled green bonds has been so successful that it has provided a foundation for the growing social and sustainable bond markets, which use similar disclosure practices for bonds that finance a broader set of sustainability related projects and outcomes. Discussions about climate change and carbon emissions can elicit debate and rhetoric around both the causes of, and solutions to, global warming. However, there are some facts that can generally be agreed upon. First, the concentrations in Earth’s atmosphere of greenhouse gases such as carbon dioxide, methane and nitrous oxide increased in the industrial revolution, and began to increase exponentially after the middle of the 20th century.¹¹ Second, average temperatures have been increasing, particularly in the last 30 years, and the last five years have also been the hottest five years since modern recordkeeping began.¹² Lastly, as the effects of climate change have begun to have a more noticeable impact all over the world with more frequency, people are demanding action from their leaders. Governments around the world have begun to respond.

⁹ Bonds and Climate Change: The State of the Market 2018.

¹⁰ Pure-play is defined as a company that is focused on only one industry or product.

¹¹ Intergovernmental Panel on Climate Change AR5 Working Group 1: Climate Change 2013: The Physical Science Basis

¹² NASA

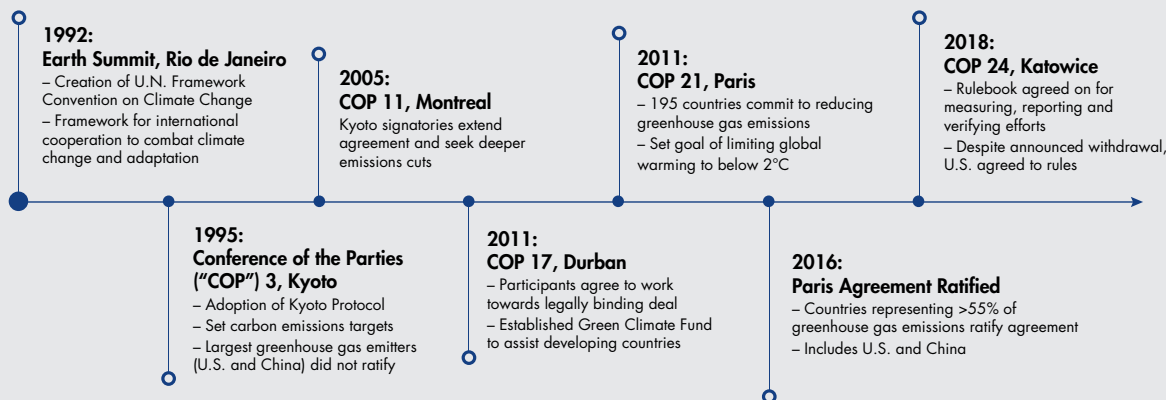
Paris Agreement Signals Real Progress, Despite U.S. Withdrawal

Perhaps the most significant progress to date occurred at the December 2015 meeting of the parties to the United Nations Framework Convention on Climate Change, referred to as the Conference of the Parties. At “COP 21” in Paris, an agreement to limit global warming to 2°C from pre-industrial levels was reached. The agreement was ratified the following year when countries representing 55% of global greenhouse gas emissions signed on. Under the agreement, signatories must submit and report on carbon emission targets, and developed nations agreed to supply \$100 billion to fund projects in developing countries. However, each country sets its own target and there is no guarantee that the carbon emissions targets set will be sufficient to meet the 2°C target. Further, some believe that even if the target can be reached, it is insufficient to reverse the impact and consequences from the damage that has already been done.

However, additional progress was made at COP 24 in Katowice, Poland by establishing a detailed “rulebook” that addressed implementation of the Paris Agreement, including uniform guidelines on reporting and measuring emissions by countries.

The June 2017 decision by the U.S. to withdraw from the Paris Agreement has brought uncertainty around the country’s commitment to reach the 2°C target, at least at the federal level. However these goals are necessarily long term in nature, and even if the U.S. wavers in its obligation over the next few years, progress is expected to continue globally. In addition, 24 states and Puerto Rico, as well as several U.S. cities have committed to implementing policies to advance the goals of the Paris Agreement. These programs, as well as the necessary investment needed to upgrade the country’s aging infrastructure, will further highlight the need for additional green financing initiatives, including green bonds.

Progress has been made to establish climate-related goals.



New York: Passed legislation to achieve 100% carbon-free electricity by 2040 and net-zero carbon emissions by 2050

California: Passed legislation to reduce emissions to 80% below 1990 levels by 2050, with plans to increase renewable energy usage, cut emissions and increase energy efficiency

New York City: New regulations cap greenhouse gas emissions of large buildings, with goal of reducing emissions by 40% by 2030

United States: Despite lack of support at the federal level, 24 states and Puerto Rico have aligned themselves with the Paris Climate Agreement

Source: S&P.

United Kingdom: First nation to pass a country-wide law targeting net-zero greenhouse gas emissions by 2050

China: Government introduced official green bond guidelines and proposed tax incentives

France: Adopted mandatory climate reporting for companies and institutional investors

Mexico: Adopted law to decrease greenhouse gas emissions by 50% by 2050

Climate Goals Come at a Staggering Cost

Despite these potential issues, what is clear is that there is a concerted effort by governments globally to slow down the effect of climate change, which has begun to result in policies and regulations to achieve their goals. Governments, municipalities and companies in developed and developing countries must make significant investments to achieve the goals that have been established.

The amount of investment needed is staggering, estimated at \$53 to \$93 trillion over the next 15 to 20 years.¹³ With debt-to-GDP ratios in developed economies already at or exceeding 100%, governments simply do not have the resources to make the needed investments to transition to a low carbon economy.¹⁴

Private capital is, therefore, needed to fill this financing gap. The global debt capital markets, with more than \$100 trillion currently outstanding, is expected to play a vital role.¹⁵

For these reasons, green bonds have begun to receive the attention of both issuers and investors worldwide. Issuance of green bonds will need to scale up massively in short order to finance the projects needed to transition to a low carbon economy.

Market Standards to Promote Growth

In addition to government actions to address climate change and sustainable finance, another reason behind the rapid growth of the green bond market has been progress towards establishing a commonly accepted definition of what a green bond is, and towards developing standards against which green bonds can be evaluated. In the first few years of the green bond market's existence, the self-labeled nature of the market led to concerns that issuers could apply proceeds of "green" bonds towards non-green purposes, sometimes referred to as "greenwashing". This perceived "wild west" market environment led to the establishment of the Green Bond Principles in 2014 by the International Capital Market Association. Although voluntary, the Green Bond Principles

set out four core principles that have gained broad market acceptance by bond underwriters, issuers and investors. In particular, providing clear disclosure and reporting around the use of proceeds has become a defining feature of green bonds and provides a level of transparency needed to provide confidence to investors that they are financing green projects. Further they have become the foundation for policymakers and market participants seeking to establish detailed standards.

Various frameworks have been developed to identify the types of projects considered "green". The taxonomy developed by the Climate Bonds Initiative, an investor-focused nonprofit working to mobilize debt markets for climate change solutions, is recognized globally as a de facto standard in assessing whether the projects being financed by a green bond are truly green. Issuers have increasingly sought opinions from independent external reviewers to verify that their green projects are aligned with this taxonomy.

In addition, there has been progress in establishing common, detailed standards aligned with the Green Bond Principles. The Climate Bonds Initiative has developed a standard based on its taxonomy that includes sector-specific technical criteria and post-issuance requirements, known as the Climate Bonds Standard. Issuers can arrange to have their bonds independently reviewed and certified against this standard, providing additional assurance and transparency to investors. Further, regulations have emerged in several markets that formalize green bond market practices and definitions to establish a legal definition of green bonds. Issuance in China surged after that country enacted guidelines, and the European Union is soon expected to establish its own standard that covers reporting requirements and the verification process. Japan, India and ASEAN nations have all also adopted their own standards.

The green bond market is still young, and we believe it is important that policymakers are not overly prescriptive, as this could increase the cost of issuance and stifle the market's growth potential. However investors are going to need assurance that a bond issued in compliance with the Green Bond Principles is in fact going towards a green project, and accepted taxonomies, verifications and national standards all help to provide this confidence. In addition, standards that

¹³ Climate Bond Initiative, based on International Energy Agency and New Climate Economy estimates

¹⁴ International Monetary Fund (IMF)

¹⁵ SIFMA

remove potential ambiguity help to attract more issuers to the market. We believe a properly developed global standard will help to rapidly scale up the global green bond market, and that the work of organizations such as the Climate Bonds Initiative is vital in helping to achieve this growth.

The Green Bond Market Today

The first green bond was issued in 2007 by the European Investment Bank in response to an institutional investor's request to finance environmentally friendly projects. This was followed shortly after by a green bond issued by the World Bank. In fact, in the first five years of the market's existence, the green bond market consisted almost entirely of

The Green Bond Principles have four core components:

- **Use of proceeds:** Proceeds should fund projects with clear environmental benefits, with clear disclosure in legal documentation
- **Project evaluation and selection:** Issuers should outline a process to determine project eligibility and sustainability objectives
- **Management of proceeds:** Proceeds should be ring-fenced or tracked through a formal internal process
- **Reporting:** Annual disclosure of the use of proceeds and qualitative and quantitative performance measures

The Climate Bonds Initiative works to mobilize the global bond market for climate solutions:

- **Market research and tracking:** Provides updates on industry and governmental developments, and tracks global issuance of labeled green bonds
- **Develop trusted standards:** The Climate Bonds Standard was developed to provide clear sector-specific eligibility criteria for assets and projects. Issuers can engage third-party verifiers to certify pre- and post-issuance requirements are met
- **Policy models and advice:** Work closely with governments, issuer, underwriters and investors to develop policy proposals

Source: International Capital Market Association Green Bond Principles and Climate Bonds Initiative.

supranationals. The high credit quality of these issuers, as well as the ability to issue bonds large enough in size to attract institutional interest, has resulted in supranational issuers having a dominant role in the green bond market.

Following the adoption of the Green Bond Principles in 2014, which provided process and reporting guidelines on the use of proceeds of green bonds, issuance from other types of issuers has surged. Supranationals have maintained a strong presence in the green bond market and continue to aid in market development through their innovation and establishment of best practices, but now account for a smaller portion of the overall market. For example, in 2019, supranational green bonds accounted for around 11% of global issuance. Corporate issuers such as Bank of America and the Electricite de France (EDF) began entering the market in 2013 with benchmark-sized deals. These brought the green bond market into its current phase of growth. Since then, other household name corporate issuers such as Apple have increasingly become a larger part of the green bond market, and high yield corporate issuers have also had successful issuances, bringing increased diversity into the market. Fannie Mae has emerged as the world's biggest green bond issuer, issuing nearly \$75 billion of green mortgage backed securities through an industry-leading green bond framework that provides investors with CUSIP-level environmental impact reporting.¹⁶

In late 2016, Poland became the first sovereign issuer to bring a green bond to market, which was issued to finance various green projects within the country. The bond was three times oversubscribed.¹⁷ Shortly after, in January 2017, France came to the market with a €7 billion green bond issue, which was notable not only for its size, but also its 22-year maturity, the longest maturity green bond issued to date. France has since successfully tapped the market to bring nearly €14 billion of additional issuance. Countries such as Indonesia, Nigeria, Ireland, the Netherlands and Chile have also issued bonds, bringing total sovereign green bond issuance to approximately \$68 billion.¹⁸ More recently, in August 2020 the German government issued EUR 7 billion of green bonds with heavy investor demand, establishing a benchmark for pricing other green transactions in Europe.¹⁹

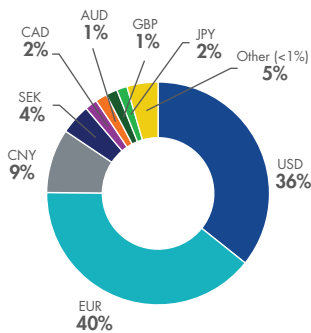
¹⁶ <https://multifamily.fanniemae.com/media/8376/display#:~:text=The%20company%20is%20the%20largest,in%20the%20years%202012%2D2019.>

¹⁷ Climate Bonds Initiative: Poland wins race to issue first green sovereign bond. A new era for Polish climate policy? December 15, 2016.

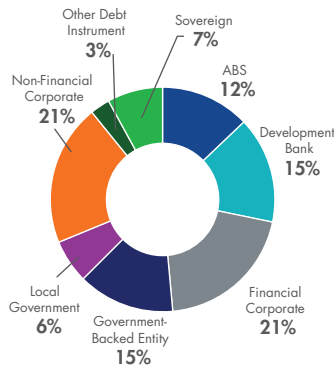
¹⁸ Climate Bonds Initiative. 6/30/2020

¹⁹ <https://www.ft.com/content/39bd3613-2843-459c-bd6b-c625b6843fef>

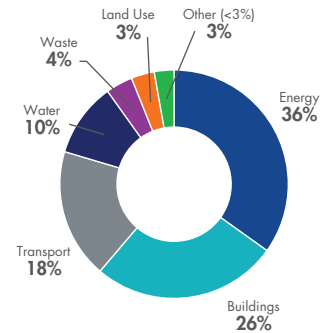
Total Green Bonds Issued by Currency



Total Green Bonds Issued by Issuer Type



Total Green Bonds Issued by Use of Proceeds



Source: Climate Bonds Initiative as of 9/30/2020

Increased issuance by sovereign and municipal issuers, as well as a potential increase in securitized green bond issuance are helping to bring added diversity to the green bond market, as well as increased liquidity. Further, issuers are exploring innovative financing structures such as guarantees and other credit enhancement mechanisms that may open up debt capital markets for issuers who otherwise may not have access or may not be able to afford green bond issuance. This is particularly important for issuers in emerging markets, where significant green investment is needed but, to date, little financing has been made available.

Government Incentives to Boost Issuance?

Despite the rapid growth seen across the green bond market, it may not be enough to meet the climate goals set out by governments globally. In addition to creating clear definitions and standards to promote market confidence and transparency, government incentives may also be needed to spur further growth. Tax advantages for investors, similar to the benefits individual investors in U.S. municipal bonds receive, may be one option governments can explore. Alternatively, direct subsidies to issuers, preferential treatment for green bonds that are held on bank balance sheets, or preferential withholding tax rates are other avenues worth exploring. A massive increase in issuance, as well as a robust secondary market and additional ways for investors to access green bonds, are essential for continued market growth.

Green Bonds: The Issuer Perspective

Before we can discuss why investors may want to hold green bonds in their portfolio, it's important to consider an issuer's standpoint. An entity may issue a green bond to achieve

environmental goals that it has adopted. Green bond issuance may also create goodwill by promoting a "green" public image. However, when the additional costs associated with obtaining independent verification, ongoing reporting and the auditing of the use of proceeds are considered, some issuers may choose to refrain from placing a green label on their bonds. This may explain why a much larger unlabeled green bond universe currently exists. Further, with market standards still in development, some issuers may have liability concerns if the issuer's definition of green does not coincide with that of an investor.

Regulators have begun to take note, however, given government efforts to promote green finance as an integral piece of addressing climate change. In addition to the green bond standards adopted by countries such as China and Japan, and those under development in Europe, other regulatory initiatives aim to increase disclosures by companies and investors in order to identify climate related risks. For example, the Task Force on Climate-related Financial Disclosures now recommends that firms provide disclosure about the potential impact of climate change on their operations. The Financial Stability Board has focused on the impact on asset values, and the potential risk to global markets, as climate risks get priced in. And in September 2020, the United States Commodities Futures Trading Commission issued a report that highlights the risks that climate change poses to the U.S. financial system and urged bold and decisive action from policymakers, including adoption of definitions and data disclosures around the climate risks of financial products. With the devastating 2018 wildfires in California and the resulting bankruptcy of PG&E in recent memory, along with increased shareholder resolutions related to climate issues, the

pricing of climate risk into asset prices may begin to receive heightened investor attention going forward. We believe increased disclosure on climate risk may make green bonds an attractive option for many issuers seeking to mitigate these risks and demonstrate to the marketplace that they are taking sustainability issues seriously.

Green Bond Pricing

Given the costs and concerns around potential liabilities, one might expect a lower cost of financing for issuers of green bonds as an incentive to participate in the market. However, this is not necessarily the case. Green bonds are generally priced the same as conventional bonds at issuance. There are a few reasons for this. First, green bonds are the same as conventional bonds, other than having a disclosed use of proceeds versus the more typical bond issuance in which proceeds are often used for general corporate purposes. From a credit standpoint, there is no justification for a different interest rate, all else equal. Second, the majority of investors, even those seeking green bonds, are typically not willing to sacrifice return to achieve their environmental investing objective. Third, many green bonds are purchased by traditional bond investors who may not even be aware of the green label.

There has been anecdotal evidence of a slight “green premium”, particularly in secondary markets. When this occurs, it is likely due to the high demand for green bonds from ESG-focused investors relative to the supply available. Further, this premium may exist in certain markets, such as Europe, where there is higher demand for green bonds rather than being a global phenomenon. To the extent that such a premium may exist, additional issuance to satisfy demand may remove any yield differential. On the other hand, if governments introduce subsidies or tax advantages, permanent pricing differentials may emerge.

Two examples are shown below comparing a green bond versus a conventional bond from the same issuer. Currency of issuance is the same, and maturities are within a few months of each other. Of course, a more analytical comparison must account for all differences between issuances, including liquidity, optionality, investor base, benchmark inclusion and other significant differences that may exist in the bond indenture.

Such analysis is beyond the scope of this simple comparison. However, what is clear is that the pricing levels of green and conventional bonds have been very close and highly correlated. Further study is needed to determine the potential effect on bond pricing of being green, both in primary and secondary markets.

Republic of Chile: Yield to Maturity Comparison



Source: Bloomberg. As of 9/30/2020. Past performance is no guarantee of future results.

Duke Energy: Yield to Maturity Comparison



Source: Bloomberg. As of 9/30/2020. Past performance is no guarantee of future results.

The Investment Case for Green Bonds

Beyond the desire to “do good”, is there an investment rationale for holding green bonds in an investor’s portfolio? Given that there is no clear systematic pricing difference between green bonds and conventional bonds, the case for holding green bonds begins with the rationale for holding any fixed income investment: primarily, income and relative safety versus other portfolio holdings.

The investable global green bond market includes all issuer types across countries and currencies. The rapid growth of the green bond market has provided investors the ability to segment the market and identify opportunities that match their risk and return objectives, while maintaining diversification and liquidity. For example, the global nature of the green bond market, with nearly 65% of outstanding issuance in euro-denominated securities, has made it difficult for U.S. dollar-based investors to assume the associated currency risk within their portfolios given the low and even negative interest rates in that market over the past few years. Fortunately, the

investable U.S. dollar-denominated green bond market, as measured by the S&P Green Bond U.S. Dollar Select Index, has grown significantly in both size and diversity over the past few years. The market includes government, corporate, financial and agency bonds and is characterized by high average credit quality and a yield and duration profile similar to the Bloomberg Barclays U.S. Aggregate Bond Index.

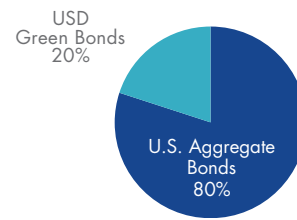
As a result, replacing a portion of a core U.S. bond allocation with green bonds may have minimal impact to an investor’s portfolio from a risk and return perspective. Investors can mitigate currency risk without the need to implement costly or complicated hedging programs, which may have unanticipated tax consequences, and do not need to sacrifice yield. Because of the differences in sector exposures, adding green bonds may increase the diversification of a core bond portfolio. For example, U.S. Treasury bonds represent approximately 40% of the U.S. Aggregate Index but have no presence currently in the U.S. dollar green bond market, which is more heavily weighted towards corporate issuers.



Yield	1.18%
Modified Duration (Yrs.)	6.12
Financial	9%
Government	43%
Utilities	2%
Mortgage Securities	29%
Energy	2%
Basic Materials	2%
Other	13%
Investment Grade	100%
Non-investment Grade	0%



Yield	1.73%
Modified Duration (Yrs.)	5.28
Financial	36%
Government	23%
Utilities	19%
Mortgage Securities	8%
Energy	4%
Basic Materials	4%
Other	7%
Investment Grade	90%
Non-investment Grade	10%



Yield	1.29%
Modified Duration (Yrs.)	5.95
Financial	14%
Government	39%
Utilities	6%
Mortgage Securities	25%
Energy	3%
Basic Materials	3%
Other	12%
Investment Grade	98%
Non-investment Grade	2%

Source: S&P Dow Jones Indices, Bloomberg Barclays, as of 9/30/2020. Green Bonds are represented by the S&P Green Bond U.S. Dollar Select Index. U.S. Aggregate Bonds are represented by the Bloomberg Barclays U.S. Aggregate Bond Index. See index definitions in Important Definitions and Disclosures.

A Potential Hedge Against Climate Risk

For those who recognize the potentially significant effects that climate change may have on companies and governments in the future, the idea that adding exposure to green bonds may have minimal impact to a portfolio's risk and return profile may represent a "low-cost option" to hedge climate-related risks. Green bond issuers are addressing these risk factors, and in the case of project or revenue bonds, bond payments are directly tied to a green project. In a world where investors start to place a significant price on environmental risks, green bonds may provide protection versus a bond portfolio that does not take these factors into account.

Lastly, there is anecdotal evidence that green bonds have been able to better withstand periods of market stress compared to their non-green counterparties from the same issuer, exhibiting a small degree of outperformance in these periods. The ability to provide better risk-adjusted returns, particularly in a stressed environment, may be driven by the "green factor."²⁰ The high demand for these bonds and the assumption that they are primarily held by long-term dedicated ESG investors may explain a lower level of volatility in periods of market stress. This attractive feature of green bonds further supports their use as a potential risk reducer within a bond portfolio.

Conclusion

As debt-burdened governments grapple with the massive challenges of addressing climate change, private capital must play an integral role in financing the infrastructure needed to transition to a low carbon economy. Government actions to promote green finance and continued development of green bond market standards will likely drive the growth that's needed. As a result, we expect green bonds to make up an increasingly larger share of the overall global debt market, and consequently, within investors' core fixed income portfolios. The significant growth already experienced in the green bond market has started to attract interest not only from ESG-focused investors, but also traditional fixed income investors who previously did not have an efficient way to "green" their portfolios. With green bonds, fixed income investors are finding that they can fulfill their investment objectives while still making a positive impact.

²⁰ Climate Bonds Initiative: Green Bond Pricing in the Primary Market: July – December 2018.

SDG FOCUS

Using Green Bonds to Build an SDG Portfolio

For investors seeking to achieve both sustainability and financial objectives, green bonds have emerged as an important bridge to the UN Sustainable Development Goals (SDGs). The SDGs represent a globally agreed upon framework that can help investors understand and measure how their portfolios are contributing to addressing critical global sustainability issues.

An overarching principle of the SDGs is to provide a viable model for economic growth that does not come at the expense of certain societies or the environment. The SDGs comprise 17 broad, complex, and interconnected environmental and social goals, with detailed targets representing a global consensus on sustainable development priorities through 2030.

Sustainable Development Goals



Source: UN.

A Framework to Guide Investment Decisions

The SDGs have gained widespread support across a broad constituency, including corporations, international development organizations and governments. Asset managers and asset owners are increasingly looking to align investment processes with these goals, as interest in and demand for responsible investing continues to grow. The SDGs can provide a framework to mobilize the trillions of dollars needed to achieve these goals, and also to identify opportunities for social, environmental and financial returns. The cost of achieving the SDGs is enormous, but so are the potential economic benefits. In addition, the costs of failure have the potential for, in our opinion, large economic consequences.

Investors can use the SDGs in several ways, depending on their objectives. From a purely financial perspective, the SDGs can help investors understand the sustainability issues that can create material risks within a portfolio. Similarly, they can help identify investments that can benefit from offering solutions to sustainability challenges. At a more macro level, the SDGs can help identify systemic risks as well as emerging long-term megatrends that may drive financial returns in the future. For investors looking to measure both societal and financial returns, the SDGs offer a framework to measure impact. Providing a common language among investors and companies, the SDGs also serve as a platform for engagement on sustainability issues.

Green Bonds: A Bridge to the SDGs

Green bonds offer a link to the SDGs for investors seeking to achieve both sustainability and financial objectives. Their innovation is in their simplicity, given that they are structurally no different from traditional bonds. The additional disclosure and transparency of green bonds on the use of proceeds help connect investors with assets that are expected to deliver a positive sustainability impact.

Below, we highlight how green bonds align with specific SDG targets, and the potential economic impact that achieving these goals may have. All bonds mentioned have been designated as “green” by the Climate Bonds Initiative (CBI). This means that the projects financed align with CBI’s taxonomy, which is based on achieving a dramatic and rapid reduction in greenhouse gas emissions to mitigate climate change. The SDGs cannot be achieved in isolation, and achieving one can have multiple knock-on impacts. Identifying where green bonds may provide a direct pathway towards the achievement of specific SDG targets provides a starting point towards mobilizing the capital needed to finance these goals, unlocking economic potential and growth.

13 CLIMATE ACTION



Climate change is considered by many to be the fundamental challenge of the 21st century. The consequences of failing to achieve SDG 13 are potentially catastrophic, and jeopardize all other goals. Sustainable agriculture, access to clean water, and zero poverty are difficult to envision in a world that fails to

adequately address this challenge. Specific targets related to SDG 13 include integration of climate into national policies and adapting to climate-related hazards.

The vast majority of green bonds finance projects such as renewable energy, green buildings and sustainable infrastructure, and a small percentage go towards adaptation projects. France’s green bond program provides an example of a green bond aligned with SDG 13. In addition to projects related to climate change adaptation, the bonds finance mitigation-related expenditures such as tax credits and interest free loans for green buildings, tax credits for sustainable agriculture, and funding for sustainable transport and clean energy technology research and development.

1 NO POVERTY



With 10% of the global population in extreme poverty²¹, building more resilient infrastructure, sustainable land use, and ecological protection can help increase the resilience of vulnerable communities to extreme climate-related events, which is a target of SDG 1. Green bonds can therefore play a role in achieving this goal, which would significantly contribute towards other SDGs and unlock the economic potential of these populations.

One of **African Development Bank’s** strategic goals is to achieve sustainable growth that leads to a deep reduction in poverty, and the bank uses green bonds as a way to fund its work. The bank notes that compared to other regions, Africa has the highest proportion of its population at “extreme” risk to climate change. Projects funded include a solar project in Mali, irrigation infrastructure in Morocco, and traffic reduction and poverty alleviation projects in Tanzania.

2 ZERO HUNGER



Over the past 10 years, the agriculture sector has absorbed 25% of the total damage and losses caused by droughts, flood, and other extreme climate events²², emphasizing the need for sustainable agriculture solutions. Green bonds can support efforts to achieve agricultural productivity and sustainable food production targets. With private sector commercial potential in food and agriculture estimated to be worth \$2.3 trillion annually and to generate 80 million jobs²³, the investment opportunity is substantial.

²¹ Roser & Ortiz-Ospina (2018): Global Extreme Poverty

²² FAO, IFAD and WFP. 2015: Achieving Zero Hunger: the critical role of investments in social protection and agriculture. Rome, FAO.

²³ AlphaBeta, 2016. Valuing the SDG prize in food and agriculture

The **International Bank for Reconstruction and Development**, part of the World Bank Group, uses green bonds to fund a variety of initiatives in emerging markets including projects related to agriculture and land use. Project examples include pasture-based livestock management in Armenia, a reduction in water usage for rice, wheat and maize farms in China, and an agricultural innovation program in Peru.

3 GOOD HEALTH AND WELL-BEING



This SDG includes a target to substantially reduce the number of deaths and illnesses from hazardous chemicals as well as pollution and contamination in the air, water and soil. Good health and well-being contribute to the social and economic development of communities, and 24% of income growth can be attributed directly to health improvements.²⁴

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Beijing Capital's \$500 million green bond provides an example of a bond aligned with this goal, as a portion of its proceeds will be used to control air pollution in China.

6 CLEAN WATER AND SANITATION



This goal includes five separate targets related to improved water quality, pollution reduction, water usage efficiency, water management and protection of water-related ecosystems. Water is vital for producing food and energy, and therefore for the livelihoods of people and economic growth.

Several water-related green bonds have been issued. For example, **NWB Bank's** green bonds finance projects related to flood defense, water treatment and transport and cleaning of wastewater. Eligible projects for **Anglian Water's** green bond are related to water management and water recycling.

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7 AFFORDABLE AND CLEAN ENERGY



Renewable energy represents 40% of green bond total issuance, making it the largest category in terms of use of proceeds²⁵. Specific targets of SDG 7 relate to increasing the share of renewables

in the energy mix, increasing efficiency and expanding infrastructure to provide access to clean energy. 14% of the global population lacks access to electricity, demonstrating the need and opportunity to not just build more capacity, but build green capacity.

Examples include **Southern Power**, whose green bonds have financed several large-scale solar and wind projects in multiple states, and **EDF**, whose green bonds have financed hydro and wind projects in France, the U.S. and Canada.

8 DECENT WORK AND ECONOMIC GROWTH



The SDGs emphasize not only economic growth, but also quality of growth. That includes the creation of quality jobs. SDG 8 includes a target on decoupling economic growth from environmental degradation,

including job creation in fields such as clean energy and building new green infrastructure.

KfW, a German development bank that is one of the world's largest financiers of renewable energy, estimates that 22 jobs are created or secured for every EUR 1 million invested (approximately \$1.2 million) in their green bonds.

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



Adequate infrastructure has numerous positive effects on economic growth and in achieving other SDGs. Targets for SDG 9 relate to developing resilient infrastructure that supports development, upgrading and retrofitting existing infrastructure to improve sustainability, as well as enhancing research and encouraging innovation.

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Transport for London and **MTR** have issued green bonds to help finance new low-carbon transit projects in Greater London and Hong Kong, respectively.

11 SUSTAINABLE CITIES AND COMMUNITIES



This goal includes targets related to air quality, waste reduction, green space development, effective planning for climate change and sustainable building development. With 54% of the world's

population in urban areas, the human opportunity associated with SDG 11 is massive. Further, cities are the world's engines of growth, representing 80% of global GDP, while also consuming 75% of natural resources, accounting for 64% of global energy demand, and producing 50% of all waste, illustrating the need to make these environments more sustainable.²⁶

²⁴ Jamison et al (2013). Global Health 2035: A world converging with a generation

²⁵ Climate Bonds Initiative, 2018. Briefing: Green bonds as a bridge to the SDGs.

²⁶ Citigroup, 2018: United Nations Sustainable Development Goals: Pathways to Success, A Systematic Framework for Aligning Investment

At a country level, the **French sovereign** green bond included funding for the “City of Tomorrow,” with nearly 500 active projects in development. At a more local level, **Massachusetts Institute of Technology’s** green bond financed five LEED²⁷ certified buildings.



Green bonds can contribute towards targets related to marine pollution reduction, protecting marine ecosystems, and sustainable fisheries. Healthy oceans balance the effects of climate change, and have an economic impact as well.

DC Water’s green bonds focus on projects to improve the water quality of rivers and waterways, enhance flood relief and mitigation protection, and remove harmful contaminants and pollutants from waterways, which flow into the Atlantic Ocean.



Targets for SDG 15 relate to conservation, restoration and sustainable use of ecosystems, an end to deforestation, and protection and promotion of biodiversity.

Similar to oceans, forests play a critical role in absorbing greenhouse gas emissions, and 15% of all greenhouse gas emissions are the result of deforestation.²⁸

Sovereign green bonds issued by **France** and **Poland** have financed conservation and restoration projects in those countries. The **Commonwealth of Massachusetts’** green

bond has funded open space protection and environmental remediation projects in the state, as well as restoration and management of natural habitats and wetlands.

Investment Opportunity and Impact

The overall cost to achieve the SDGs is difficult to fathom, estimated at nearly \$6 trillion per year.²⁹ Financing needs remain massive even when isolating specific goals. For example, SDG 13 (Climate Action) is estimated to require \$300 billion per year of additional investment to meet sustainability goals, in addition to the nearly \$3 trillion base case that reflects current energy policies.³⁰ Governments alone cannot finance these goals, and private capital is needed. While not all of the SDGs are naturally attractive to private capital seeking an investment return, many are. Long-dated, income-generating projects are well suited for financing through loans or green bonds. The growth of the green bond market reflects this opportunity, allowing investors to potentially achieve both sustainability and investment objectives, without having to compromise on either.

The global framework provided by the SDGs allows investors to not only understand sustainability issues, but to also build more sustainable portfolios and identify the risks and opportunities that will emerge as the world grapples with the most challenging issues facing humanity. Green bonds will play a key part in addressing these challenges.

²⁷ Leadership in Energy and Environmental Design (LEED) certification provides independent verification of a building’s green features

²⁸ WWF, 2018: Overview of deforestation

²⁹ Citigroup, 2018: United Nations Sustainable Development Goals: Pathways to Success, A Systematic Framework for Aligning Investment

³⁰ International Energy Agency, World Energy Outlook 2017

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