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Green bonds are a recent market innovation designed to facilitate capital formation in projects and companies whose activities have a positive environmental impact.

# Climate Change, Green Bonds, and Index Investing: The New Frontier

As index investing has gained steam, the resulting commoditization of investment products has given rise to economic efficiency and brought transparency to the financial markets, while extending the benefits to a broad range of investors. This holds immense promise not only for efficiently meeting the vast capital needs required to address climate change, but also for addressing longer-term macro-risk themes affecting today's fixed income investors.

Green bonds are a recent market innovation designed to facilitate capital formation in projects and companies whose activities have a positive environmental impact. The hope is that, in aggregate, these activities will help to mitigate the long-term negative impact of climate change.

According to the Climate Bond Initiative (CBI), a non-profit organization, "the green bonds era has begun—mobilizing bond markets as a low-cost financing tool will be essential for the realization of a low-carbon and climate-resilient economy." The need to address climate change will likely drive innovation to create financial products meeting the demands of investors in the USD 100 trillion global fixed income market.<sup>1</sup>

Developed as a collaborative research project between S&P Dow Jones Indices (S&P DJI) and Infrastructure Credit Alpha Group LLC (InfraCredit), this paper has been organized with the following objectives in mind:

1. Provide a current overview of the green bond market, including the key trends and drivers underlying its recent growth (Section 1);
2. Highlight the key macro drivers influencing the future of the green bond market, and discuss why this market may evolve into an asset class (Section 2);
3. Discuss why the emergence and evolution of green bond indices may be evidence of market maturation (Section 3); and
4. Introduce S&P Dow Jones Indices' debut green bond index (Section 4).

<sup>1</sup> [Bonds & Climate Change – The State of the Market in 2014](#), HSBC and Climate Bond Initiative, July 2014. p2.

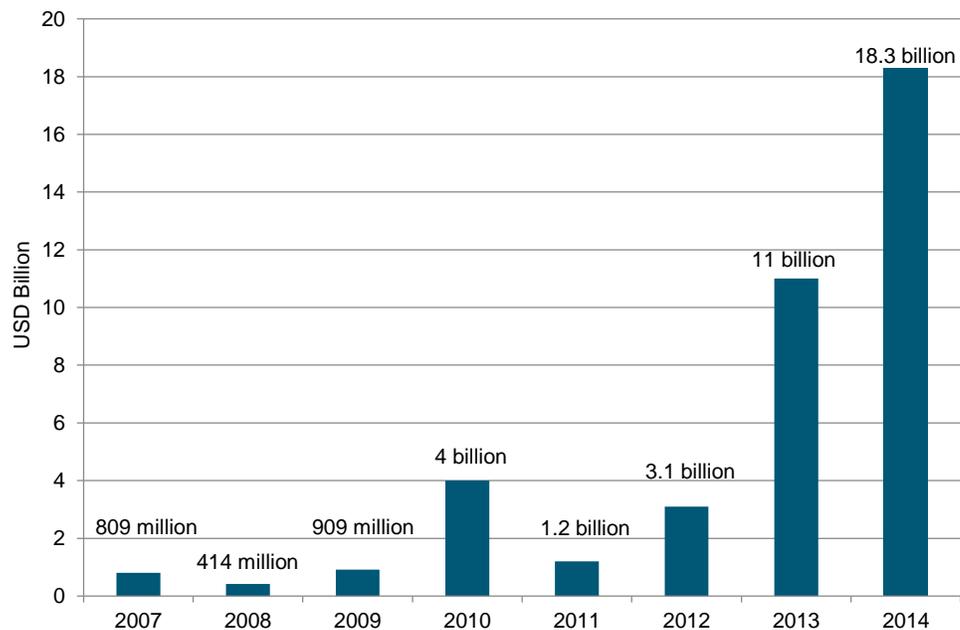
## 1. GREEN BONDS: THE STATE OF THE MARKET

Since its inception in 2007, the green bond market has grown rapidly at a 50%+ compound annual growth rate (CAGR), and it continues to evolve into a mainstream subset of the broader fixed income market. With an estimated issuance exceeding USD 40 billion in 2014 vs. only USD 11 billion in 2013 (and USD 5 billion in 2012, see Exhibit 1), the market has expanded significantly in terms of scope, average issue size and issuer diversity.

While still relatively small, at about USD 36 billion current outstandings vs. the USD 100 trillion global fixed income market, the green bond market has the potential to grow and achieve scale. If the current trends continue, it could grow from USD 150 billion to USD 200 billion over the next three to five years, thus providing an array of investment opportunities to long-term fixed income investors.

The need to address climate change will likely drive innovation to create financial products meeting the demands of investors in the USD 100 trillion global fixed income market.

**Exhibit 1: The Evolution of the Green Bond Market**



Source: Climate Bond Initiative (CBI). Data as of June 10, 2014. Charts and tables are provided for illustrative purposes.

The green bond market, as it stands today, is a “self-labeled” market with voluntary issuer disclosure standards that vary in scope and quality. Unlike plain vanilla corporate bonds, which generally provide a company’s management the flexibility to decide how to use bond proceeds, green bonds are required to direct their proceeds only into projects that generate environmental benefits. While there is no established, mandatory criteria as to what constitutes “green” or which shades of green meet the threshold,

a voluntary set of guidelines (The Green Bond Principles, or GBP<sup>2</sup>) developed by industry participants have catalyzed issuances and investor interest.

According to current GBP guidelines, a bond issue is green if the issuer uses the proceeds solely for capital expenditures associated with green or climate-related environmental benefits in accordance with certain disclosures and transparent “policing” standards. This “use of proceeds” requirement neither specifies the type or the nature of the project, nor does it mandate a certain threshold level of climate or environmental benefits. Moreover, under current GBP principles, a third-party provider is expected to ensure compliance with either the green “use of proceeds” criterion, or the “project selection process” that is intended to identify projects with the greatest environmental benefits.<sup>3</sup> Our research indicates that there is inadequate information on the actual “greenness” of projects, making it difficult to determine whether the environmental impact will be actually realized. Despite the inherent limitations of the labeling standards, which are largely voluntary today but evolving to instill more confidence in the marketplace, “green labeling” does help to discover bond issues with green attributes. This enhances the issuer’s ability to signal a non-price attribute for a given rating or credit quality, and a bond pricing level, meeting investor demand for a bundled product of fixed income and green attributes.

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At its core, the green bond concept is a market innovation allowing efficient capital intermediation between investors and green or climate-related projects. What is innovative about this concept is the ability to identify and label a specific bond issue as “green” based on relatively transparent and independently verifiable (though not too specific) qualifying criteria.

The labeled green bond market is a small but rapidly growing segment of the broad, largely unlabeled, climate-themed bond universe. Climate-themed bonds are not new instruments. The CBI estimates that approximately USD 503 billion in climate bonds is currently outstanding, and such bonds are intended to finance the transition to a low-carbon economy. This universe is principally dominated by unlabeled issuers (93%) in transport and energy sectors. With USD 36 billion in current outstanding issuance, the labeled green bond market is still a small subset (7%) of the overall climate bond universe.

The labeled green bond market has attracted many different types of issuers whose activities promote a low-carbon economy, contributing to a range of risk/return investment opportunities. From what was originally a

<sup>2</sup> See [Green Bond Principles](#).

<sup>3</sup> Our analysis indicates that such providers often help set up the project selection process, and, in some cases, choose the projects. It is not always clear what exactly is independently verified. However, the market agrees that the existence of some sort of independent verification is better than its absence.

supranational- and sovereign-dominated issuer market that included issuers such as the World Bank, the European Investment Bank (EIB) and the International Finance Corporation (IFC), the labeled green bond market has matured into a broad market that is global and now includes corporate bonds, asset-backed securities (ABS), project and infrastructure assets, as well as subnational and municipal issuers (regional and city governments). The emergence of new issuer types with varying credit profiles, along with diverse capital and funding needs, will likely extend the credit and the maturity curves—a welcome change as the market evolves to meet a variety of risk/return requirements.

The labeled green bond market still predominantly consists of investment-grade bonds, given the relative weight of sovereigns and supranationals, and therefore, a large portion of the green bond market can provide investment opportunities for mainstream investment-grade portfolios. The U.S. dollar, euro and Swedish krona are the predominant currencies in which these bonds have been issued.

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Based on industry analysis of the labeled green bond market, the EIB has been the largest issuer of green bonds, followed by the World Bank and the IFC. Over 75% of the issuance has been 'AAA' rated since 2007, which could change with more corporate issuers, and over 75% of all issues have had maturities between 2 and 10 years.<sup>4</sup>

However, while the labeled green bond market is principally made up of investment-grade bonds, and can be considered for institutional investment-grade portfolios, only 47% of CBI's current, broad USD 503 billion, climate-themed bond market (7% labeled and 93% unlabeled) is investment grade. This is due to CBI's exclusions resulting from minimum issue size and currency restrictions from institutional investors.<sup>5</sup>

The labeled green bond market encompasses a range of sectors that can potentially provide climate solutions. Climate change affects a multitude of sectors, which can play a major role in meeting climate and sustainability goals. Green investment opportunities are likely to be most prevalent in the following sectors: energy, transportation, finance, waste and pollution control, buildings and industry, agriculture and forestry, and water. In the future, labeled green bond issuances will likely span these sectors, and thus provide a range of investment opportunities as well as climate benefits. However, such opportunities may vary in terms of the extent of their individual climate benefits, depending on the types of green assets, projects and their locations. Predominantly unlabeled, CBI's climate bond universe of USD 503 billion is dominated by transport (rail) projects, with definite perceived climate benefits. Rail transport is regarded as less polluting than

<sup>4</sup> [Green Bonds, Fifty Shades of Green](#), RBC Capital Markets, March 2014.

<sup>5</sup> [Bonds and Climate Change, The State of the Market in 2014](#), HSBC and Climate Bond Initiative, July 2014. p5.

auto transport. However, compared to renewable energy projects, whose climate benefits are relatively more easily quantifiable, the climate benefits of transport projects, along with those of many other issuers in other sectors, need to be established based on consistent and transparent methodologies.

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The green bond segment is generally synonymous with the “labeled” issuer universe, though it is in fact part of the bigger universe of climate or environmental bonds. Labeling provides an effective way to define and distinguish green bonds as a specific subuniverse of environmental or climate bonds. S&P DJI and InfraCredit see the potential for further expansion of the labeled issuer universe. Certain types of unlabeled bonds—especially renewable energy and energy efficiency project bonds—that satisfy the Green Bond Principles can be retroactively or prospectively labeled green, as benefits from labeling are well established. While there is currently no established definition of what should be counted in the green bond universe, the market can be segmented depending on the type of issuers, whether a bond is labeled, and if there is a clear rationale for the labeling, or, in the case of unlabeled bonds, whether the green label could be objectively (and in some cases, retroactively), applied by the issuer. The latter would be applicable to those bond issues, such as those involving renewable energy production or energy efficiency, where the substantial climate benefit is relatively more easily quantifiable, and the ring-fencing of proceeds, and the creation of green assets, are an integral part of the structure. Over time, if issuers see economic benefits from labeling, such as reduced financing costs, and if such economic benefits outweigh the transaction costs due to extra compliance with labeling standards, green labeling will likely become more mainstream.

S&P DJI and InfraCredit believe that renewable energy and energy efficiency related issues, which to-date have not been labeled, will likely become green-labeled issues in the future. Exhibit 2 describes the current segmentation of the market by issuer type, green attribute (labeled or unlabeled) and credit quality.

**Exhibit 2: Green Bond Market Segmentation by Issuer, Green Label and Credit Quality**

Type	Green Attributes	Credit Quality	Definition
Sovereigns, quasi-sovereigns	Labeled	High investment-grade	Bonds issued by country governments or entities that are fully owned by governments, e.g., KEXIM, EDC, KfW
Supranationals	Labeled	High investment-grade	Bonds issued by multilateral development banks and other international organizations, e.g., IFC, EIB, IBRD, Africa Development Bank
Subnationals including regional, state, municipalities and city governments	Labeled	Investment-grade	Bonds issued by regional, local or cities, e.g., Johannesburg, Massachusetts, Gothenburg
Corporates	Labeled	Investment-grade/ Subinvestment-grade	Bonds issued by corporates, including banks, e.g., Bank of America, GdF Suez, Arise, Unibail Radamco, EDF
Asset-backed securities (ABS)	Labeled	Low investment-grade	Asset-backed securities whose cashflows come from a portfolio of loans, receivables leases or PPAs, which are indirectly associated with renewable energy and energy efficiency projects e.g., Toyota ABS
Asset-backed securities (ABS)	Unlabeled	Low investment-grade	Asset-backed securities whose cashflows come from a portfolio of loans, receivables leases or PPAs, which are associated with renewable energy and energy efficiency projects, e.g., Hannon Armstrong, SolarCity
Project bonds/loans	Unlabeled	Low investment-grade/ Subinvestment-grade	Cashflows to repay come from specific assets created by the green bond proceeds, e.g., Topaz Solar Farms, Breeze, CSolar
Corporate – pure play green or renewable	Unlabeled	Low investment-grade/ Subinvestment-grade	Corporates with portfolio of renewable energy and energy efficiency, assets issuing debt at the corporate level, e.g., Terraform

Source: InfraCredit and S&P Dow Jones Indices LLC. Data as of July 31, 2014. Charts and tables are provided for illustrative purposes.

## 2. THE FUTURE OF THE GREEN BOND MARKET: CAN THE MARKET GROW TO PROVIDE CAPITAL AT SCALE AND EMERGE AS AN ASSET CLASS?

### Market Growth is Due to Converging Trends

The recent growth in the green bond market reflects a number of converging trends: the growing awareness of climate change by investors and the public; the recognition that capital markets can provide solutions to meet the vast capital needs for climate-sensitive infrastructure; and investor demand for fixed income instruments that meet environmental and sustainability mandates without compromising returns.

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## Green Bond Projected Issuances by Segment

Green bond segments are poised to grow, though supply and demand characteristics vary by segment.

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- **Sovereigns and subnationals:** This segment could remain very strong as national, regional and local governments attempt to find cost-effective sources of capital to meet their infrastructure budgets as they are generally strapped for capital.
- **Supranationals:** Given their global development and climate mandates in the emerging markets, and the strong need for capital deployment in emerging markets, the supranationals, such as the World Bank and the IFC, will likely continue to use their credit ratings to issue green debt for climate change projects. As has been the case historically, this segment could be a prominent issuer over the next two to three years.
- **Corporate Bonds:** This segment could be one of the most active issuers of green bonds, as corporates move to diversify their funding sources and existing investor bases. Corporate issuances will likely be driven by the implementation of Green Bond Principles and best practices in green reporting, especially the “use of proceeds” disclosure and assurance requirements. Though not legally binding, implementation of the principles would force issuers to maintain investor confidence.
- **ABS:** The green ABS market, especially involving those issuers that have a large number of underlying green assets (consumer solar or energy efficiency loans), will likely evolve slowly over the next three to five years. It remains challenged due to the smaller issue sizes of green ABS (e.g., SolarCity, Hannon Armstrong), the lack of an operational history of assets and investor inability to benchmark green ABS against more mature ABS asset classes. On the other hand, ABS issues in asset classes that are more established, such as auto receivables (Toyota green-label ABS), could have broad support.
- **Project Bonds:** This segment could continue to grow rapidly as stand-alone projects (single assets) or as portfolios involving renewable energy and energy efficiency related assets. As renewable energy technologies have become more competitive, their deployment has been more widespread in recent years. Project bond issuers, after projects are built, could tap bond markets for long-term capital. Whether the project issues will be labeled green, and consequently designed to meet the GBP, remains to be seen.

## Climate Change: A Capital Problem

Recent research points to the unequivocal evidence that climate change is real. Driven in large part by the growth of global greenhouse gas emissions due to the economic activity of the last three centuries, climate change-

induced global warming has contributed to an increase in global temperatures. The U.N. consensus is that the world can avoid negative impacts of climate change and rising temperatures, if such temperatures remain within two degrees Celsius of preindustrial temperatures. While estimates vary depending on the source, investments in infrastructure of over USD 2.5 trillion per year would be required to keep the temperatures from rising.<sup>6</sup>

### **The Role of Fixed Income Markets in Meeting the Climate Change Challenge**

The need for large amounts of capital to address climate change coincides with the growing investor awareness of, and sensitivity to, climate change issues and their potential impact on institutional portfolios.

The need for large amounts of capital to address climate change coincides with the growing investor awareness of, and sensitivity to, climate change issues and their potential impact on institutional portfolios. According to the CBI, over USD 13 trillion of assets under management (AUM) incorporate environmental, social and corporate governance (ESG) guidelines into decision-making, while over USD 45 trillion of AUM is represented by investors who support Principles for Responsible Investment (which includes fixed income). Recent green bond issuances have attracted not only mainstream fixed income investors but also ESG mandate-driven investors who have historically looked at the stocks of companies meeting sustainability criteria.

S&P DJI and InfraCredit believe that strong investor demand will continue to drive green bond issuances from investment-grade-rated corporations, ABS issuers, project bonds issuers and supranationals.

Fixed income markets (worth USD 100 trillion vs. USD 63 trillion in equity markets<sup>7</sup>) are vital to addressing climate-change-related capital needs, as they represent the deepest pool of long-dated capital. Given the vast potential for issuer and ratings diversity as the green bond and climate bond market grows, it is possible that green bonds will not only provide an outlet to meet the growing investor environmental and sustainable mandates, but will also, potentially, satisfy additional investment considerations. These might include liability and duration matching, stable and inflation-linked returns, and diversification from other asset classes such as public equities. The trend toward incorporating climate change as a long-term risk consideration into strategic asset allocation decision-making by institutional investors may also prompt a shift (or a greater allocation) to green fixed income and other climate-sensitive asset classes such as infrastructure, farmland and real assets, which require a longer-term perspective. Over time, green bond financing structures may begin to price in climate change-related risks, thus providing an avenue for diversification among investors.

<sup>6</sup> [World Energy Investment Outlook Special Report](#), International Energy Agency, 2014.

<sup>7</sup> [Bonds and Climate Change. The State of the Market in 2014](#), HSBC and CBI. July 2014. p.2.

### **Capital Solutions at Scale Will be Needed**

One of the challenges in climate investments is the small and varying size of projects, which may be too small to access capital markets. Over time, green projects will be aggregated in portfolios, pooled, or moved to larger corporate balance sheets and taken out or securitized in capital markets to achieve risk profiles that enable capital to be raised most efficiently. New intermediaries are entering the ecosystem. We are already seeing the emergence of green monolines that are mission-driven and use non-profit capital and public funding to provide credit enhancement.

Over time, similar to credit ratings, some form of green ratings aimed at quantifying the environmental benefits could come into existence to allow investors and issuers to differentiate between the shades of green and the climate change impact.

Government regulations and political support for the development of low-carbon infrastructure, as well as fiscal and tax incentives, will drive institutional and retail investor interest in the sector. The conventional wisdom is that infrastructure investment creates jobs and stimulates economic growth and will likely create a conducive environment for long-term capital formation.

### **Tighter Green Standards Will Emerge to Gain Investor Confidence**

The current labeling requirement is at the option of the issuer, who runs reputational risk if proper disclosure requirements are not followed. Over time, we expect the “green labeling ecosystem” will emerge with standardized reporting and verification practices, which would make the labeling practices mandatory. Green ratings, which can capture and quantify the environmental benefits and complement credit ratings, is an idea in infancy, but it could go a long way in assessing both green and credit attributes of green bonds. Currently, the green label does not capture the varying “shades of green” of green bonds (i.e., some projects may produce more climate benefits than others). Rather, the green label merely signals that proceeds will create some environmental benefits, and the quality and quantity of such benefits remains uncertain at best. Whether the intended climate benefits justify the capital spent, or whether the realized benefits meet climate change objectives is not addressed in the GBP. As investors become more discerning with respect to the capital efficiency of their green investments (more climate benefits for unit capital), pricing and investor demand will be more variable among green-labeled bonds.

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### 3. GREEN INDICES: A NATURAL OUTGROWTH OF MARKET MATURATION

Based on our research, we have concluded that the green bond market has attained a threshold level of size and maturity, which can provide the foundation for more issuance; this market development can be enhanced by the development of green fixed income indices. We summarize our key findings on whether the green bond is poised to emerge as an asset class.

#### **Increasing Fixed Income Allocations to Meet Investor Mandate Could Mean More Capital in the Green Bond Market**

With current outstandings of approximately USD 36 billion, the green-labeled bond market has reached sufficient maturity and size, but it is still not an asset class on its own because it is only a small portion of climate bonds (under 10%). Market standards are still evolving and there is a need for more investor education and awareness. Over time, as issuers perceive the benefits of labeled bonds and as climate assets, supported by favorable regulation, provide adequate financial returns, S&P DJI and InfraCredit believe that more labeled bonds will be issued to take advantage of rising investor demand and positive sentiment.

As investors begin to allocate a share of their corporate fixed income capital to green investing, it is reasonable to expect that green bonds could mainstream into the fixed income universe, creating a greater need for green indices. Based on investor feedback, our research suggests that investor interest in and concern over climate change will likely increase, moving beyond the market's current early formative stage. Green indices would then be needed to achieve transparency and simplicity, and aid in the commoditization of the asset class. Over time, increasing commoditization may result in debt capital being committed to the diversified green assets, potentially lowering the cost of capital. Such increased capital efficiency is key to the deployment of capital at scale in low-carbon infrastructure.

The commoditization of the asset class could create a more liquid and deeper market, which could potentially broaden the investor base and render green bonds a core fixed income holding over time. The current investor base for green bonds includes corporate and public pension plans, high-grade fixed income managers (including those with ESG mandates), insurance companies, banks and family offices (with impact mandates). This investment base may expand over time to include retail investors as the market grows.

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## Benchmark and Strategy Indices Provide the Next Phase of Market Innovation

Indices have been an integral part of market development and maturation. They aim to provide transparency into the characteristics of markets they represent and independently track their performance. Independent and transparent indices serve as the basis for a wide range of investment strategies, which can foster liquidity in those markets. While many climate- and carbon-oriented equity indices exist, green fixed income indices are just emerging. S&P DJI and InfraCredit believe that green indices may incorporate labeled and unlabeled segments of the market (see Exhibit 2) to provide investors with the ability to pursue differentiated green strategies.

Given the current issuance levels and investor interest in the green-labeled bond market, S&P DJI and InfraCredit believe an index that captures the trends in the labeled segment would enhance market efficiency and contribute to market development. This could lead to subsets of the broader market that are mutually exclusive, but additive, and may include labeled and non-labeled segments, to provide the foundation of an asset class benchmark. Exhibit 3 depicts the possible evolution of green bond indices as the market grows.

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### Exhibit 3: Expected Evolution of Green Bond Indices



Source: InfraCredit and S&P Dow Jones Indices LLC. Charts and tables are provided for illustrative purposes.

In general, S&P DJI and InfraCredit expect the development of green bond indices to mirror that of the green bond market, and for the indices to pattern themselves after their general fixed income counterparts. For example, such indices may include global and regional subfamilies, as well as different types of issuers and rating levels.

## 4. INTRODUCING THE S&P GREEN BOND INDEX

This Section provides the details of S&P DJI's debut green bond index, the S&P Green Bond Index. This index includes green-labeled bonds with pricing history and supporting public corporate disclosure on the use of proceeds.

The S&P Green Bond Index, launched on July 31, 2014, is the first index from a global index provider that is designed to track the global green bond market. Bonds in the index must be flagged as "green" by Thomson

By applying a set of rigorous criteria, the S&P Green Bond Index includes only those green-labeled bonds whose issuers have properly and clearly disclosed information about the use of proceeds.

Reuters and CBI. Moreover, in order for such a bond to be eligible, the issuer must clearly indicate the bond's "green" label and the rationale behind it. Such disclosures must be made through public sources that are credible and related to the company.

The market feedback obtained by S&P DJI during an investor survey conducted prior to making decisions on the final design of the index suggested that the biggest investor concern is the quality of the information disclosed by issuers at various stages of the bond life. The quality of information supporting the green label rests on two main pillars—a clear delineation of the use of proceeds, and the integrity of the project selection process. These two pillars are usually the focal points of independent verifications and audit processes. Investors seem to be uncomfortable when the disclosure of these two aspects is highly variable depending on the issuer and, therefore, are looking for some degree of due diligence to verify the true greenness of a bond.

The S&P Green Bond Index methodology takes a discerning view on the quality of disclosed information by looking at how the rationale for the greenness is presented and explained. By applying a set of rigorous criteria, the S&P Green Bond Index includes only those green-labeled bonds whose issuers have properly and clearly disclosed information about the use of proceeds. In this way, the index calls for a higher standard of transparency and accountability in the green bond market.

The S&P Green Bond Index was developed by S&P Dow Jones Indices and InfraCredit. The index methodology is maintained, calculated and managed independently by S&P Dow Jones Indices according to standard policies and procedures<sup>8</sup>.

The index is designed for use by institutional investment managers, mutual fund managers, ETF providers and professional advisors. It can be seen as a benchmark with the caveat that the green-labeled bonds represent only a segment of the green fixed income market previously discussed. However, the index may still serve as an objective and transparent measure of the performance and risk characteristics of this evolving market segment.

Based on new issuance and maturity, the bonds in the index are subject to change every month, effective after the close of the last business day of the month. Each bond must have a maturity greater than or equal to one month from the rebalancing date. No bond matures in the index.

<sup>8</sup> See [S&P Green Bond Index Methodology](#).

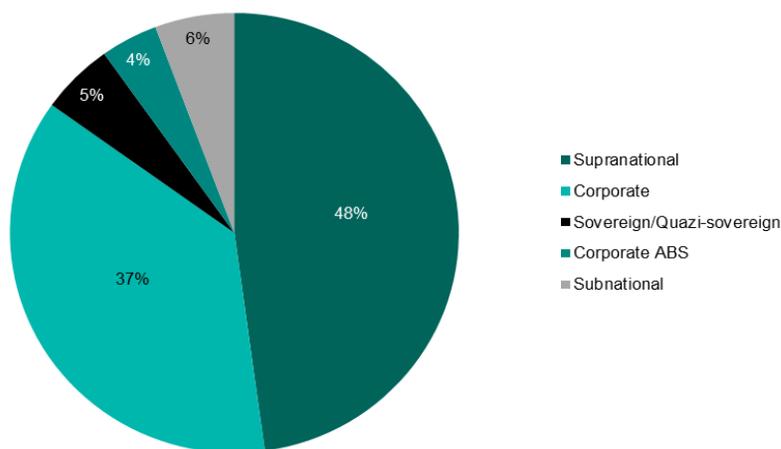
## Key Characteristics of the S&P Green Bond Index

### Size, Issuer Type, and Composition

Covering approximately 150 green bonds from around the world with history since the beginning of their presence in 2007, the S&P Green Bond Index includes bonds issued by multilateral, government and corporate issuers.

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**Exhibit 4: S&P Green Bond Index Composition by Type of Issuer**

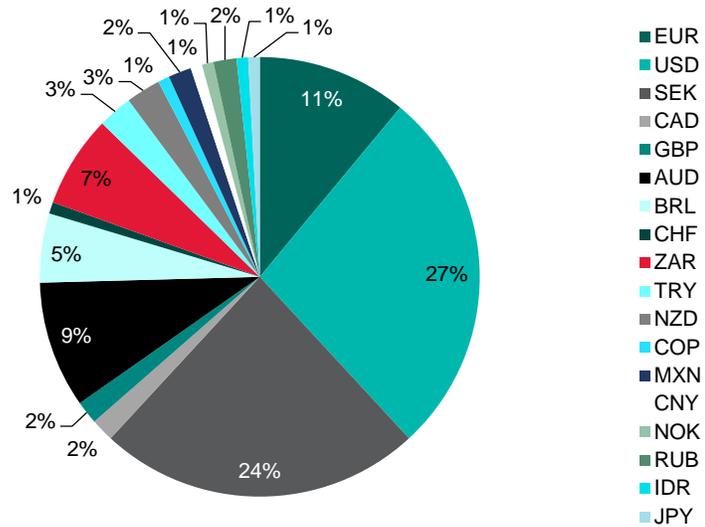


Source: S&P Dow Jones Indices LLC. Data as of June 30, 2014. Charts and tables are provided for illustrative purposes.

### Index Composition by Issue Currency

Green bonds issued by any country and in any currency are eligible. The chart below shows the index value composition by currency. Historically, the pioneering issues have been denominated in U.S. dollar and Swedish krona, but the rapid development of the European corporate green bond market has led to an increasing number of issues denominated in euro.

**Exhibit 5: S&P Green Bond Index Value Composition by Currency**



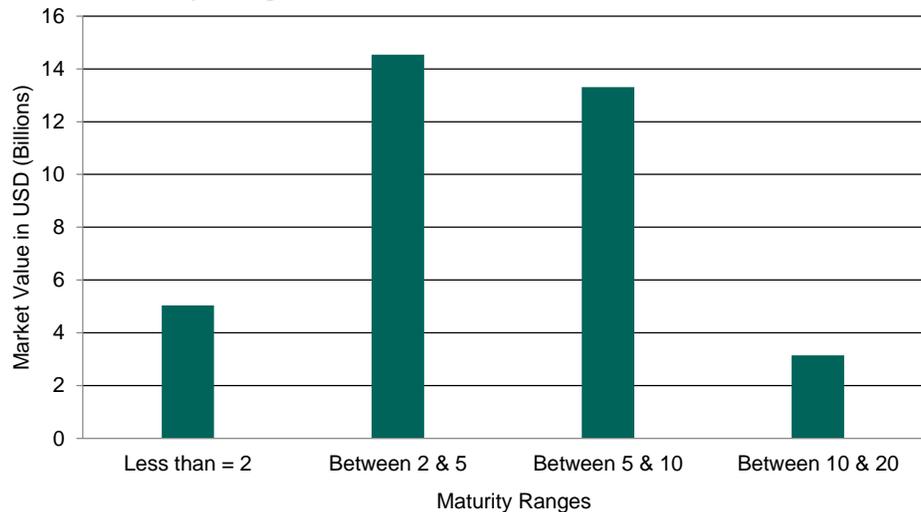
Source: S&P Dow Jones Indices LLC. Data as of June 30, 2014. Charts and tables are provided for illustrative purposes.

Historically, the pioneering issues have been denominated in U.S. dollar and Swedish krona, but the rapid development of the European corporate green bond market has led to an increasing number of issues denominated in euro.

**Average Size and Maturity of Bonds**

The average size of a bond issue in the S&P Green Bond Index is USD 330.3 million, which is slightly more than one-half the average size of a bond issue in the S&P U.S. Bond BMI, at USD 610.7 million. The average years to maturity of a bond in the S&P Green Bond Index is 5.1 years. The following chart shows the maturity ranges in the index as of July 1, 2014.

**Exhibit 6: Maturity Ranges in the S&P Green Bond Index**



Source: S&P Dow Jones Indices LLC. Data as of June 30, 2014. Charts and tables are provided for illustrative purposes.

The following coupon types may be included in the index: fixed, zero, step-up (with a predetermined schedule), fixed-to-float (provided they are fixed and one month prior to their float date) and floating. At the moment, the index consists of fixed and floating coupons; the latter includes only 14

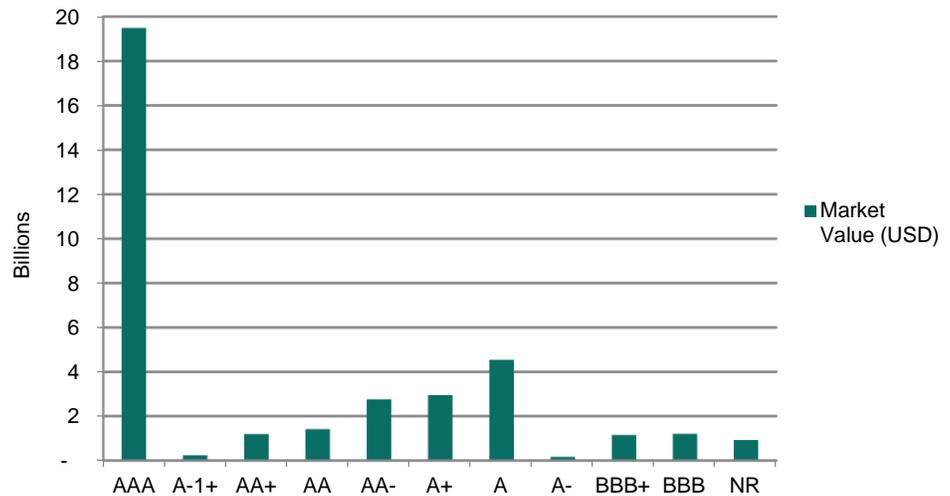
issues. As of July 2014, the average coupon rate in the index is 2.02% and the average yield is 1.66%. This reflects the current state of this market segment, which is still largely represented by the top investment-grade bonds.

Distribution of Credit Ratings

Exhibit 7 shows the credit rating distribution of the 118 outstanding green-labeled bonds included in the index. ‘AAA’ rated issuers dominate the index, given the historical presence of the multilaterals.

At this stage, there is no other fixed income benchmark that could fully mirror the S&P Green Bond Index in terms of credit standing and tenure.

**Exhibit 7: Credit Rating Distribution of the S&P Green Bond Index**



Source: S&P Dow Jones Indices LLC and Reuters. Ratings have been presented in accordance with the S&P rating scale. Data as of June 30, 2014. Charts and tables are provided for illustrative purposes.

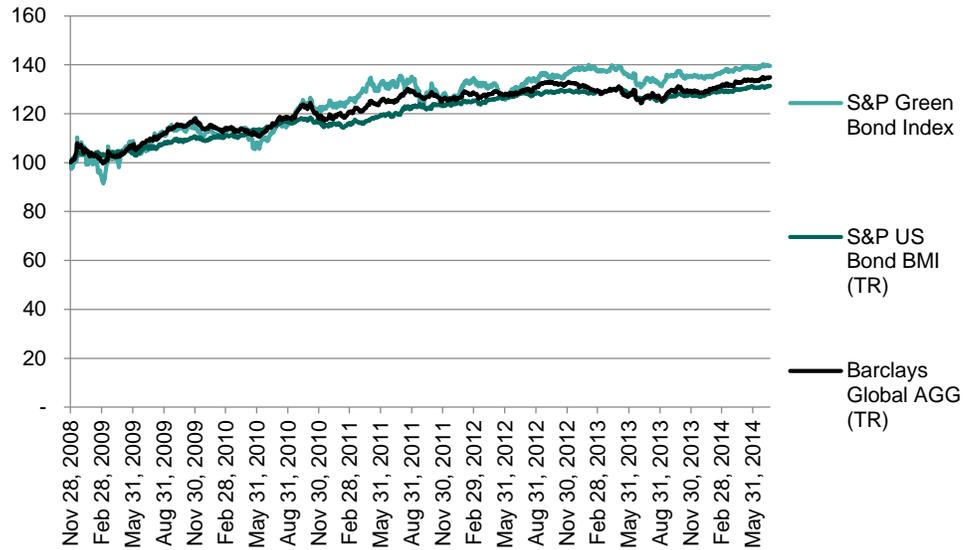
**Historical Performance of the S&P Green Bond Index Relative to Benchmarks**

At this stage, there is no other fixed income benchmark that could fully mirror the S&P Green Bond Index in terms of credit standing and tenure. We therefore chose the Barclays Global Aggregate Index and the S&P U.S. Bond BMI as benchmarks. Exhibit 8 shows the comparative performance of the three indices since 2008.

While the performance of the S&P Green Bond Index in Exhibit 8 looks stronger than that of the other two indices, there are several important limitations of comparability that must be kept in mind, in addition to the differences in credit and maturity profiles previously mentioned.

- First, the aggregate outstanding amounts of green bonds in different years were too different to be able to drive any conclusions related to average performance of this still evolving universe.
- Second, the currency mix in this index has been fairly unstable, which could be expected to contribute additional volatility to the index.

**Exhibit 8: Comparative Returns of the S&P Green Bond Index, Barclays Global Aggregate Index and S&P U.S. Bond BMI**



Source: S&P Dow Jones Indices LLC and/or its affiliates. Data as of June 30, 2014. Index performance is based on USD total return index levels. Past performance is no guarantee of future results. Charts and tables are provided for illustrative purposes and may reflect hypothetical historical performance. Please see the Performance Disclosures at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

Due to the short history of the S&P Green Bond Index, S&P DJI and InfraCredit believe that the last 12 months, maybe 24 months, would better show comparability for the current index profile.

Due to the short history of the S&P Green Bond Index, S&P DJI and InfraCredit believe that the last 12 months, maybe 24 months, would better show comparability for the current index profile. The performance characteristics of the index and two other benchmarks for these periods are shown in Exhibit 9.

<b>Exhibit 9: Comparative Performance Characteristics of the S&amp;P Green Bond Index, Barclays Global Aggregate Index and S&amp;P U.S. Bond BMI Over the Last Two Years</b>			
<b>Total Return (%)</b>	<b>S&amp;P Green Bond Index</b>	<b>S&amp;P U.S. Bond BMI (TR)</b>	<b>Barclays Global AGG (TR)</b>
1 Year	6.36	3.79	7.39
2 Year	7.32	3.35	5.05
<b>Annualized Return (%)</b>			
1 Year	6.36	3.79	7.39
2 Year	3.59	1.66	2.49
<b>Standard Deviation (%)</b>			
1 Year	4.55	2.65	4.20
2 Year	5.25	2.60	4.25
<b>Sharpe Ratio (%)</b>			
1 Year	1.16	1.44	1.50
2 Year	0.53	0.53	0.40

Source: S&P Dow Jones Indices LLC and/or its affiliates. Data as of June 30, 2014. Index performance is based on USD total return index levels. Past performance is no guarantee of future results. Charts and tables are provided for illustrative purposes and may reflect hypothetical historical performance. Please see the Performance Disclosures at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

## 5. CONCLUSIONS

By applying a rigorous set of disclosure criteria to the labeled part of the green market, it promotes issuer discipline and accountability.

- There is consensus today on the negative impact of climate change and the high levels of cost-effective debt capital required to invest in projects that produce environmental benefits.
- The continued growth of the green bond market, which will likely include diverse issuers with varying funding needs, has the potential to attract both traditional and ESG mandate-driven fixed income investors.
- Green standards will need to evolve to bring consistency and rigor. Currently, green standards are in flux, with the market reliant on only voluntary standards. The market standards still need to be refined with respect to whether a green bond is green or the extent to which a green bond is green.
- As the market achieves scale and scope, the development of green indices and index-based investment strategies will facilitate the evolution of green bonds into an asset class, deepening and broadening the investor base, and possibly reducing the overall cost of capital.

The S&P Green Bond Index, launched in late July 2014, is an important step towards meeting market needs. By applying a rigorous set of disclosure criteria to the labeled part of the green market, it promotes issuer discipline and accountability. Clear-cut green attributes may exist not only for labeled bonds, but also for part of the unlabeled market, which may be added to the index series at a later stage.

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Infrastructure Credit Alpha Group LLC (InfraCredit) is a credit and investment research affiliate of Emerging Energy and Environment Group (EEE Group), an asset management firm, investing in clean and renewable energy infrastructure via its private equity funds. Based in Stamford, CT, EEE Group has teams in Mexico City and Rio.

## PERFORMANCE DISCLOSURES

The S&P Green Bond Index was launched on July 31, 2014, and all performance information presented prior to the launch date is back-tested (see below). The back-test calculations are based on the same methodology that was in effect when the index was officially launched. Complete index methodology details are available at [www.spdji.com](http://www.spdji.com).

S&P Dow Jones Indices defines various dates to assist our clients in providing transparency on their products. The First Value Date is the first day for which there is a calculated value (either live or back-tested) for a given index. The Base Date is the date at which the Index is set at a fixed value for calculation purposes. The Launch Date designates the date upon which the values of an index are first considered live; index values provided for any date or time period prior to the index's Launch Date are considered back-tested. S&P Dow Jones Indices defines the Launch Date as the date by which the values of an index are known to have been released to the public, for example via the company's public Web site or its datafeed to external parties. For Dow Jones-branded indices introduced prior to May 31, 2013, the Launch Date (which prior to May 31, 2013, was termed "Date of Introduction") is set at a date upon which no further changes were permitted to be made to the index methodology, but that may have been prior to the Index's public release date.

Past performance of the Index is not an indication of future results. Prospective application of the methodology used to construct the Index may not result in performance commensurate with the back-test returns shown. The back-test period does not necessarily correspond to the entire available history of the Index. Please refer to the methodology paper for the Index, available at [www.spdji.com](http://www.spdji.com) for more details about the index, including the manner in which it is rebalanced, the timing of such rebalancing, criteria for additions and deletions, as well as all index calculations.

Another limitation of using back-tested information is that the back-tested calculation is generally prepared with the benefit of hindsight. Back-tested information reflects the application of the index methodology and selection of index constituents in hindsight. No hypothetical record can completely account for the impact of financial risk in actual trading. For example, there are numerous factors related to the equities (or fixed income, or commodities) markets in general which cannot be, and have not been accounted for in the preparation of the index information set forth, all of which can affect actual performance.

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