

**The U.S. Municipal Green Bond Market:
An Examination of the Use of Proceeds**

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Abstract

Green bonds represent a new financial product line developed with the goal of allocating more capital towards projects that have positive environmental and/or climate benefits. Green bonds have all the characteristics of traditional bonds with the additional feature designating that the “use of proceeds” from the bond goes toward driving positive environmental outcomes. The issuance of green bonds by both governments and businesses has been growing and is expected to reach \$300bn USD in 2020. However, despite the increase in issuance, there is a lack of clarity on whether green bonds are actually allocating new capital toward environmentally beneficial projects or if projects that would have likely received funding anyway are simply adopting the green labeling.

In this study, we consider a sample of more than 2,000 green bonds issued over the 2010-2016 period. We analyze the official statement filings for each bond and among other screens, record whether each bond provides “new capital” or if the green bond was issued to refund an existing bond. Our results suggest that as much as 60% of green bonds reflect refunded or continuing projects rather than new capital aimed at climate benefits. These findings suggest that stronger regulation is needed to both appropriately define what can be considered a green bond and more clarity can be given as to how that capital is being used to finance environmentally supportive projects.

I. INTRODUCTION

With the issuance of the first green bond by the World Bank in November 2008, a new financial product line was launched with the goal of allocating more capital towards projects that have positive environmental and/or climate benefits.¹ Green bonds have all the characteristics of traditional bonds with the additional feature designating that the “use of proceeds” from the bond goes toward driving positive environmental outcomes. Continuing the similarities, all governments and businesses that are eligible to issue bonds can also issue green bonds. With investor demand continuing to grow and entities using green bonds to align with announced sustainability initiatives, the issuance of green bonds has been booming. Moody’s Investors Service expects green bond issuance to reach \$300bn USD in 2020. However, despite the increase in issuance, there is a lack of clarity on whether green bonds are actually allocating new capital toward environmentally beneficial projects or if projects that would have likely received funding anyway are simply adopting the green labeling.

II. GREEN BOND HISTORY

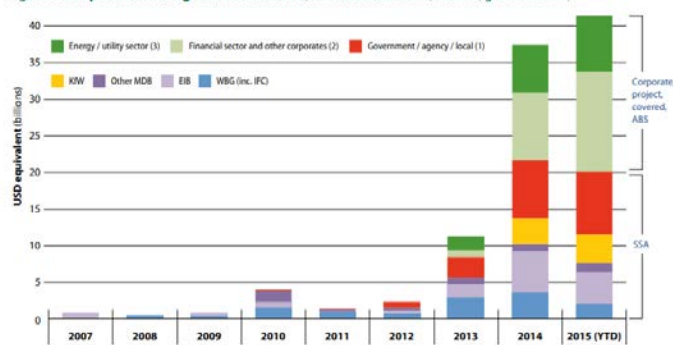
There is actually some debate about who issued the first green bond. Though the World Bank bond issued in 2008 is often cited as the first labeled green bond, much of the foundation behind the bond was established in 2007 by the European Investment Bank who issued a Climate Awareness Bond.² This confusion on what is considered a green bond is not unique to the origin story. As noted in the chart from the OECD, green bonds were exclusive to the World Bank and other multi-development banks up until 2010 with small governmental use beginning in 2011.

¹ Climate Bonds Initiative “Explaining Green Bonds”

² European Investment Bank “10 Years of Green Bonds”

However, in 2005, as part of the Energy Tax Incentives Act, the US government authorized the original Clean Renewable Energy Bonds program (CREBs). In 2008, the US Congress also passed the Energy Improvement and Extension Act which authorized the issuance of Qualified Energy Conservation Bonds (QECCBs). For the purpose of this research and by the broader investment community, both the CREBs and QECCBs are considered to be green bonds even when lacking the official green label.³⁴ The first “officially labeled” green municipal bond was not issued until 2013 when the Commonwealth of Massachusetts issued a bond to provide financing for improvements to water quality, energy efficiency and pollution cleanup.⁵

Figure 2: Composition of the green bond market (as of November 2015, USD Bn, gross issuance)



Note: SSA: Sub-sovereign, Supranational and Agency; Muni: Municipal; ABS: Asset Backed Securities. (1) includes national development banks, sub-sovereign jurisdictions including municipalities, agencies, and local funding authorities. (2) includes financial sector bonds and all other corporates that are not energy/utility sector, as well as covered, project and ABS not energy/utility related. (3) includes corporate bonds issued by energy/utility companies as well as covered, project and ABS related to energy/utility companies
Source: OECD analysis based on Bloomberg and World Bank data

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In addition to the confusion surrounding green bond origins, there has been confusion as to what can be labeled a green bond. The original bonds issued by the European Investment Bank were self-labeled and self-assessed. Bonds issued by the World Bank were also issued under their own green bond label but at least incorporated a second opinion from CICERO, an independent research-based opinion provider. For many years, it was the case that an issuer could self-

³ Energy Efficiency & Renewable Energy “Qualified Energy Conservation Bonds (QECCBs) & New Clean Renewable Energy Bonds (New CREBs)

⁴ Energy Programs Consortium “Qualified Energy Conservation Bonds (QECCBs)

⁵ Municipal Securities Rulemaking Board “Green Municipal Bonds 101”

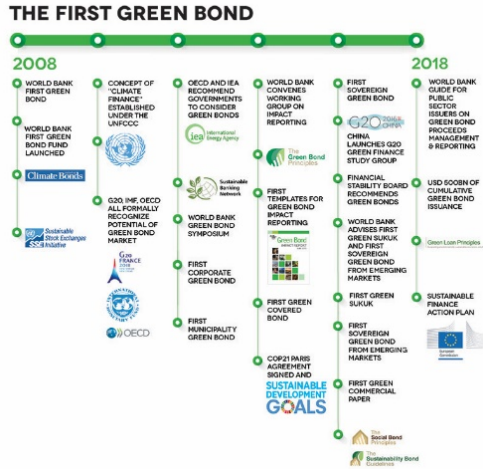
⁶ Kaminker, Christopher “Green Bonds: Mobilising the Debt Capital Markets for a Low-Carbon Transition”

determine that the bonds being issued were green and, if they felt compelled or wanted to provide assurance to investors, might seek an independent assessment.⁷ This led to significant variation in what was considered a green bond. For example, two of the leading institutions, the Climate Bonds Initiative (CBI), a non-profit focused on mobilizing the green bond market, and Bloomberg compiled aggregate issuance of green bonds from 2007 through the second quarter of 2017. The CBI list had 1092 issued bonds equal to \$234 billion while the Bloomberg list had 779 issued bonds worth \$216 billion and only 624 issued bonds worth \$169 billion appeared on both lists.⁸ Much of the difference between the two lists was prior to 2014 when a consortium of 13 investment banks came together and with “guidance from issuers, investors, and environmental groups” introduced the Green Bond Principles.⁹ While still a voluntary process, the Green Bond Principles promote transparency and disclosure among issuers and provide guidance on how to launch a credible green bond. As the green bond market continued to develop, the CBI, Moody’s and others have designed standards on which to evaluate the credibility and compliance of newly issued bonds.

⁷ Climate Bonds Initiative “Green Bond Labels and Standards”

⁸ Ehlers, Torsten and Frank Packer “Green Bond Finance and Certification”

⁹ Kidney, Sean “Thirteen Major Banks Issue ‘Green Bond Principles’ to Guide Development of Green Bonds Market”



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III. LITERATURE REVIEW

Despite green bonds being a relatively new instrument, their growing prevalence has led to numerous research studies being conducted across various aspects of their universe. However, because of limits in available data sets, many of the findings are only just beginning to be recognized and there is still much debate as to the accuracy of some findings.

For example, because the number of corporate green bonds until recently has been rather limited, it was only in 2019 that Caroline Flammer had a large enough sample size to complete her study on how individual company’s stocks performed after the announcement of a green bond issuance. While her findings indicated that the stock performance was positive correlated with the announcement, she also noted that the announcement was material to how corporations treated their environmental footprint going forward. However, because of the lack of regulation regarding what can be termed a “green bond”, she could only showcase statistically significant

¹⁰ The World Bank “10 Years of Green Bonds: Creating the Blueprint for Sustainability Across Capital Markets”

results in instances where the company was able to receive certification by an independent third-party.¹¹

These certifications have been a source of scrutiny themselves. As the green bond market has expanded, so has the number of options regarding certification. Torsten Ehlers and Frank Packer have worked together to research how these various certifications have evolved and how the standardization of certification providers would improve transparency within the bond market.

Characteristics of different green bond identification and certification schemes Table 1

	CBI Climate Bonds Certification	Green bond indices ¹	CICERO Second Opinions	Moody's Green Bond Assessments	Standard & Poor's Green Evaluations
Use of funds must be tied to green investment	Yes	Yes	Yes	Yes	Yes
Eligibility criteria differ by sector	Yes	Yes			Yes
Ex post monitoring/assessment				Yes	
Granular assessments of greenness			Yes	Yes	Yes
Quantitative weights for specific factors				Yes	Yes

¹ Bank of America Merrill Lynch, Barclays MSCI, Standard & Poor's and Solactive.

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In addition to their analysis on the types of certifications, they have also researched how the pricing of green bonds compared to their traditional counterparts and whether the certification changed how the bonds were initially priced. Their results indicated that on average, green bonds were issued at lower spreads than conventional bonds with a difference of 18 basis points.¹³

The topic of green bond pricing has been one of the most heavily researched topics in the field. A major reason for the research is that because issuers spend additional costs on obtaining certifications and there are restrictions as to how the proceeds can be used, the economic assumption is that there must also be a financial benefit to issuing a green bond rather than just

¹¹ Flammer, Caroline "Green Bonds: Effectiveness and Implications for Public Policy"

¹² Ehlers, Torsten and Frank Packer "Green Bond Finance and Certification"

¹³ Ehlers, Torsten and Frank Packer "Green Bond Finance and Certification"

issuing a traditional bond and using it on a green project. However, with all the numerous studies, there have often produce conflicting results as to whether green bonds are issued at a premium (sometimes called a “greenium”) when compared to their traditional counterparts. For example, Maria Jua Bachelet, Leonardo Becchetti and Stefano Manfredonia have done a study in which they examine a sample of green bonds matched against a comparable “brown” bond and are focused in how the yield, variance and liquidity differ when the “only” difference in the bonds is their environmental slant. Their research went further as they were able to segregate bonds by issuer type, to consider whether they were institutional or private, and whether the bond had a third-party certification. With this expanded segmentation, their research concluded that overall green bonds traded at higher yields as well as had more liquidity and less volatility when compared with traditional counterparts.¹⁴

However, David Larcker and Edward Watts have completed a similar study in which they conclude that the premium for green bonds is “effectively zero”.¹⁵ In fact, they come to this conclusion despite two of the papers they cite in their study, who have a similar target sample, reaching radically different results. One of the papers identified a premium of close to 6 basis points in favor of green bonds while the other paper identified a discount or negative premium of approximately 8 basis points. David and Edward account for this discrepancy by concluding that biases in the research stage of the studies led to the larger disparity found in the competing results. To help support this theory of bias, they cite a survey done of firms investing in bonds and the most common response was that firms would not accept lower yields just to invest in green bonds.¹⁶ However, the analysis of this survey does not consider the point raised in Ehlers,

¹⁴ Bachelet, et al. “The Green Bonds Premium Puzzle: The role of Issuer Characteristics and Third-Party Verification”

¹⁵ Larcker, David F, and Edward M. Watts “Where’s the Greenium?”

¹⁶ Larcker, David F, and Edward M. Watts “Where’s the Greenium?”

Packer research, that certain firms and funds have green mandates and that due to limited supply of green products, the competing demand may result in yield differences.

Further in defense of this argument, Malcom Baker, Daniel Bergstresser, George Serafeim and Jeffrey Wurgler researched how “ownership” of green bonds impacts price. Their prediction which was supported by the data was that green bonds tended to be owned by a more concentrated group of investors than a similarly risky traditional bond. Additionally, these owners were more likely to have a “green” focus in their investment orientation.¹⁷ This would suggest that while the survey responses were factual in saying they would not accept a lower yield, not all possible respondents were accurately surveyed.

Many studies also tend to focus on whether a premium exists at the point of issuance. This is important for the issuer since it can help determine whether it is fiscally prudent to spend the extra money on labeling a bond green. However, while “green” investors may have enough demand for current conditions, to spur mainstream adoption, traditional investors, those who were likely included in the survey must also be incentivized to invest in green bonds. To this end, Andreas Karpf and Antoine Mandel chose to focus on how green US municipal bond returns fared against their brown contemporaries and how they trade in the secondary market. Their research concluded that the market actually penalizes green bonds in a statistically significant manner when compared to traditional bonds.¹⁸ This would indicate that while the issuer may have received initial benefits those who invested in green bonds underperformed. If this research holds true, green bonds will likely eventually be limited to only those fiduciaries who are able to sacrifice returns for a secondary objective. Thankfully for those interested in

¹⁷ Baker, Malcolm et al. “Financing the Response to Climate Change: The Pricing and Ownership of U.S. Green Bonds”

¹⁸ Karpf, Andreas and Antoine Mandel “Does it Pay to be Green?”

seeing the green bond market continue to grow, their research is directly contradicted by Candace Partridge as part of her thesis paper. Studying the same green US municipal bond market, she concluded that when compared to the closest index, there is a “statistically significant green premium present in the secondary muni bond market of at least 3 basis points”.¹⁹ Eventually, as the market for green bonds continues to develop and researchers are able to get better data, it will be possible to get agreed upon findings as to both how green bonds are priced and how they perform relative to traditional counterparts.

However, despite the breadth of the research done on green bonds, there has been very little work done on whether green bonds are actually driving the necessary capital needed to make the global environmental changes.

IV. DATA SELECTION

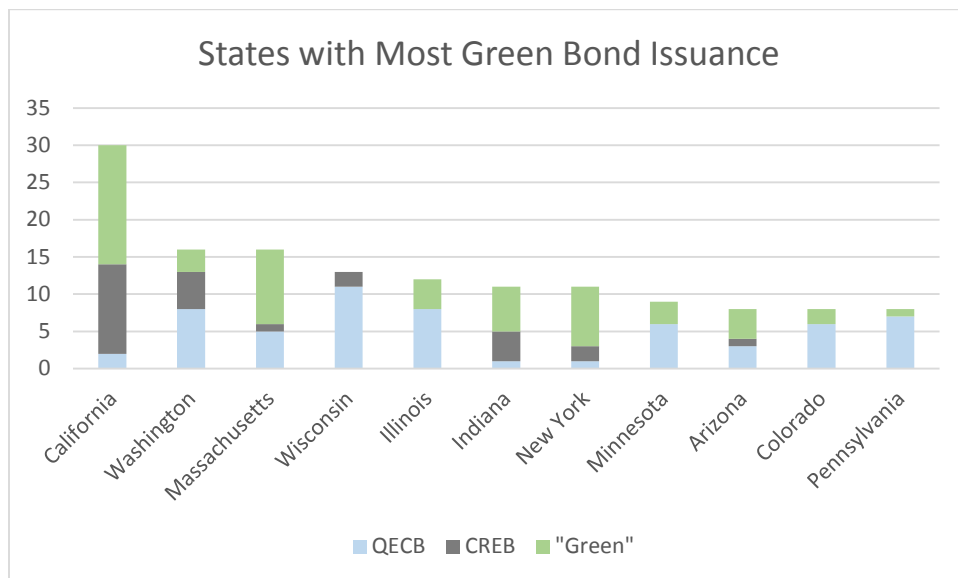
After Supernationals, local governments were among the early leaders in green bond adoption. In order to garner a large enough sample size both in terms of variance in issuers and in a time frame of issuance, the choice was made to focus on the US municipal green bond market. The time frame of 2010-2016 was chosen as it provided a large enough sample from each year both in the number of unique bonds as well as the number of unique issuers.

¹⁹ Partridge, Candace C. “Green Municipal Bonds and the Financing of Green Infrastructure in the United States”

Year	Unique Bonds	Unique Issuers	\$(M)
2010	116	32	466
2011	97	34	137
2012	106	24	180
2013	78	15	261
2014	309	22	2130
2015	593	38	2940
2016	784	39	6530
Totals	2083	204	12644

Access to the compiled list of green municipal bonds over this time frame was provided by NYU Professor Jeffrey Wurgler who was using the same data set as part of independent research he was doing.

In addition to analyzing the bonds by the number of issuers, they were also analyzed by their distribution throughout the US and whether they contained either the QECB or CREB designation.



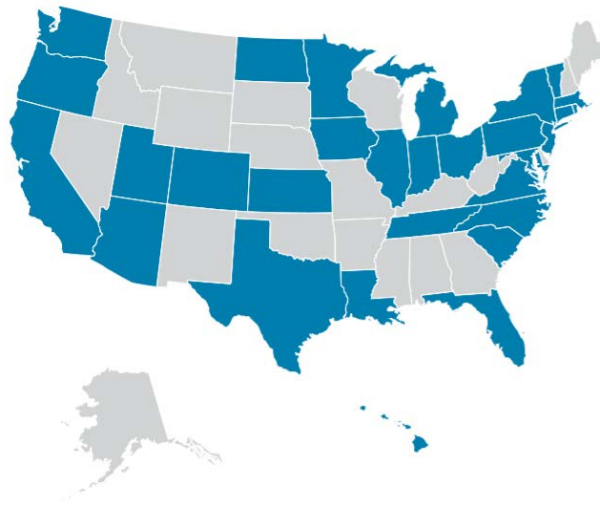
²⁰ Baker, Malcolm et al. "Financing the Response to Climate Change: The Pricing and Ownership of U.S. Green Bonds"

Besides this list highlighting many of the more progressive states, it also shows some of the deviation of green bond issuers vs traditional municipal bonds. While California is typically one of, if not the largest issuer and New York, Illinois and Pennsylvania are all highly active, states like Indiana and Arizona make up a disproportionately high percentage of the green bond market. Similarly, states like Texas and Florida who are typically larger municipal issuers are both in the bottom half of active issuance from this data set.²¹

Despite the variance from state to state, the overall diversity of green bond issuance is prevalent with at least one green bond issued in 37 states and the District of Columbia. This number is even more expansive than the findings from S&P Global who used a data set from 2013-2018. The differences from this stem both from the differences in time period as well as the inclusion of QEGBs and CREBs as green despite not having the official green label. However, the similarities from the graphs indicate that green issuance extends beyond political boundaries or regional geography.

²¹ Municipal Securities Rulemaking Board “MSRB Muni Facts”

States With At Least One Green Bond Issuer, 2013-2018



All states colored blue have issued at least one green bond. Source: S&P Global Ratings. Copyright © 2019 by Standard & Poor's Financial Services LLC. All rights reserved.

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V. METHODOLOGY

The initial database of municipal green bonds included the issuing entity's name, the date of issuance and the corresponding CUSIP number of the bond. Using the Electronic Municipal Market Access, (EMMA) <https://emma.msrb.org/>, which is a free service provided by the Municipal Securities Rulemaking board, it was possible to use the CUSIP bond number to access the disclosure documents the entity is required by law to publish that provide the official statement of each bond. These filings contain all material details relevant to an investor regarding the issuing entity and, which is vital to this project, on the use of proceeds from the bond issuance. Through analyzing these official statement filings, each bond has been categorized through a variety of screens. One of the first screens is whether the bond was part of the QECCB or CREB programs. Because these programs provided tax incentives to the issuer and in some cases were designed to provide funding for upgrading existing energy systems it was important to be able to segregate this subset out from the rest of the green bonds. Additionally, as

²² Burke, Erin Boeke and Andrew Bredeson "2019 U.S. Municipal Green Bond & Resiliency Outlook"

both of these programs were eliminated under the Tax Cuts and Jobs Act signed into law on December 22nd 2017 and effective as of January 1st 2018, being able to differentiate the capital that flowed toward green projects as a result of these shuttered programs is important when attempting to extrapolate uses of capital going forward.^{23,24}

Additional screens focused on whether a particular bond provides “new capital” to the green marketplace or if the green bond was issued to refund an existing bond. When a bond was designated as being a refunding bond, it was also categorized whether it was refunding another green bond from the data set or if it was refunding an older traditional bond. One example of a refunding bond from a traditional project was a bond issued by the City of Honolulu. The bonds in question were used to “refund bonds previously issued to finance the acquisition, construction and expansion of its H-Power waste disposal facility”.²⁵ This project was originally completed in 1990 and underwent an expansion in 2012 but these bonds were not issued until October 2016. While the project meets all the criteria to be designated green by the standards in 2016, such a designation did not exist in 1990.

When “new capital” was being delivered to the market, the bond was further categorized based on whether the use of proceeds went to funding a “new project” or if the funds were being used to provide additional capital for an existing project. A bond fell into the category of funding a new project in a variety of ways. An example of one of the more common instances of a new project can be seen in the Vermont Educational and Health Buildings Revenue Bonds. In this instance, the funds raised from Saint Michael’s College green bond issuance are deposited into a segregated construction fund and along with other available capital will finance the construction

²³ Office of Energy Efficiency & Renewable Energy “Qualified Energy Conservation Bonds”

²⁴ Office of Energy Efficiency & Renewable Energy “New Clean Renewable Energy Bonds”

²⁵ City and County of Honolulu “Official Bond Statement”

and equipping of a new residence hall. In order to qualify for the green status of the bond, the project incorporates geothermal energy which allows the building to be nearly emission and carbon free as well as having the building designed to be more energy efficient with high performance windows and insulation.²⁶

When analyzing whether a project was new or continuing there were many instances of judgement calls. For example, the Maryland Economic Development Corporation issued green bonds for financing the purple line light rail construction project. The light rail system already existed in Maryland so this is not a new development. However, the purple line is a completely new section of the system and so could be categorized as such.²⁷ In instances like this, the judgement was made that despite the purple line being a new development, because the existing system on which this line was dependent was already in place, this was an expansion of an existing project.

Another judgement was made in many of the instances of “improving energy efficiency”. Particularly in the QEGBs and CREBs, but throughout the sample, many of the bonds were vague in the description of use of proceeds. Many times, the explained use of proceeds alluded to improving energy efficiency in various types of municipal buildings. For example, the School District of Jefferson, in Jefferson County, Wisconsin took part in a QEGB where the proceeds were used for “construction and equipping additions to the high school including upgrading HVAC systems.”²⁸ In situations like this, though the system would not exist without the larger municipal building, unless there was a clear indication that these energy improvements were just

²⁶ Vermont Educational and Health Buildings Financing Agency Revenue Bonds “Official Bond Statement”

²⁷ Maryland Economic Development Corporation “Official Bond Statement”

²⁸ Jefferson County, Wisconsin “Final Official Statement”

upgrading a system, the assumption was made that a new system was being installed and as such was considered to be a new project.

VI. RESULTS

While the original data set contained 2083 unique bonds, 3 of the issued bonds did not have official statement documents submitted through EMMA and so were not considered as part of this analysis. Of the remaining bonds that were successfully categorized approximately 80% were classified as “new money” with the remaining 20% deemed to be refunding existing projects. Of those classified as refunding, only 1 issuer was actually refunding a bond from within the data set. However, bonds categorized as “refunding” were used to retire bonds from as far back as 2002 and in one instance as recent as 2016. Of the bonds that were classified as new money, approximately 77% were classified as beginning a new project with the rest said to be funding expansion or continuation of existing projects.

Within the data set, there were 307 bonds with the QECCB designation, and 174 bonds classified as CREB which accounts for approximately 24% of evaluated bonds. As noted earlier in this report, since the QECCB and CREB designation is no longer viable after changes to the tax law, they were analyzed independently. Of the 307 bonds that contain the QECCB designation, 300 of them are classified as new money. Likewise, of the 174 CREBs, 153 were categorized as new money. Since the QECCB and CREBs often had the vaguest language associated with their use of proceeds, it was unsurprising to discover that 279 of the QECCBs and 130 of the CREBs that were categorized as new money were also classified as providing funding for a new project.

When the two special tax bonds are removed from the data set, within the remaining 1599 bonds, the percentage of new money drops to only 75% indicating that a higher percentage of special

tax bonds were classified as new than the overall sample. Similarly, when removing the special tax bonds, the percentage of new money that is also used to fund new projects drops to only 55%. A major source of this difference stems from labeled green bonds having a clearer description of their use of proceeds. With more information, it was easier to identify how the project fit within the categorization and thus less judgement calls were needed.

VII. ANALYSIS

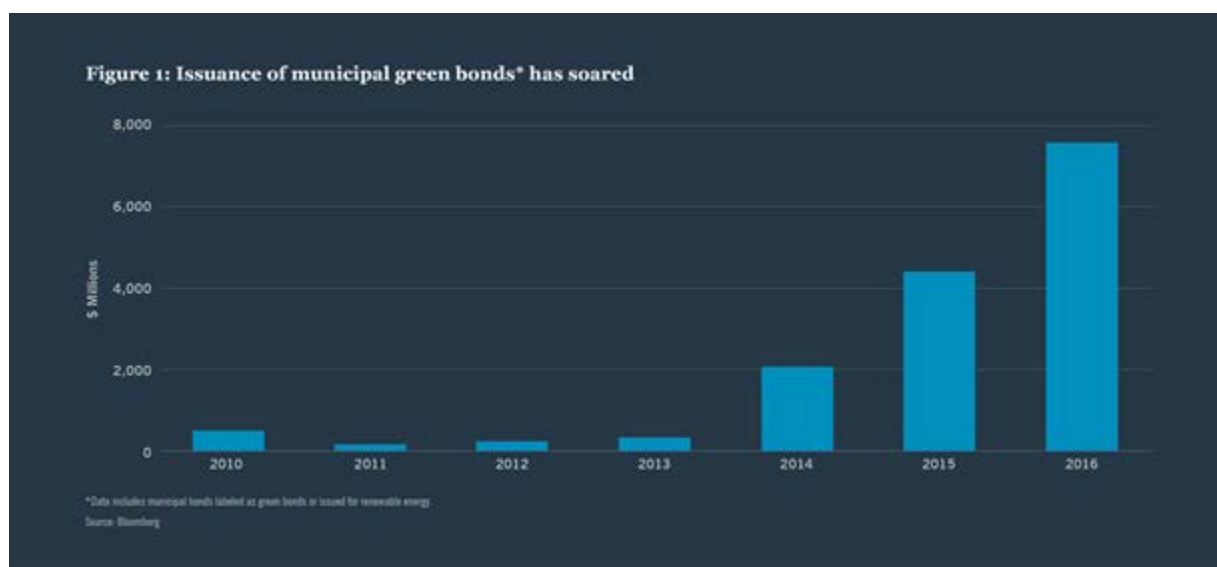
Morgan Stanley estimates that it will take \$50 trillion dollars to halt global warming and reduce carbon emissions to zero by 2050.²⁹ While still a newer product, with the mandate that they fund environmentally friendly projects, green bonds can be one of the major sources of capital to reach that target. However, if instead of providing capital new capital to address climate change, green bonds are being used to refund existing bonds or complete projects that were likely to have been financed by traditional methods, they are not making any progress into the climate goal.

When considering all bonds in the sample, approximately 40% (20% refunded and 20% continuing projects) could be said as not materially contributing to this long-term climate goal. This number increases to almost 60% (25% refunded and 35% continuing projects) when you segregate out those bonds that are part of the discontinued QECCB and CREB programs.

The reason it is important to recognize what percentage of green bonds are driving new capital how they fit into the broader municipal bond market. While the US municipal bond market is approximately \$3.8 trillion, the green bond component accounts for typically 1-2% of that. However, as evidenced by the graph below, the growth in the market from 2010-2016 was extensive. Though not shown here, issuance hit a peak of just under \$10 billion in 2017. Part of

²⁹ Klebnikov, Sergei “Stopping Global Warming Will Cost \$50 Trillion”

this was due issuers rushing to complete issuance before the expected legal changes that removed QECCB and CREB but also was part of the continuing growth. 2018 saw the expected dip after the law passed but the trend has continued in 2019 and the beginning of 2020. Should growth projections continue, it is not unreasonable to expect \$50 billion in annual issuance within the next decade. This could account for a significant percentage of the annual spending needs to combat climate change but if 60% of capital is not financing the change then the impact would be significantly less.

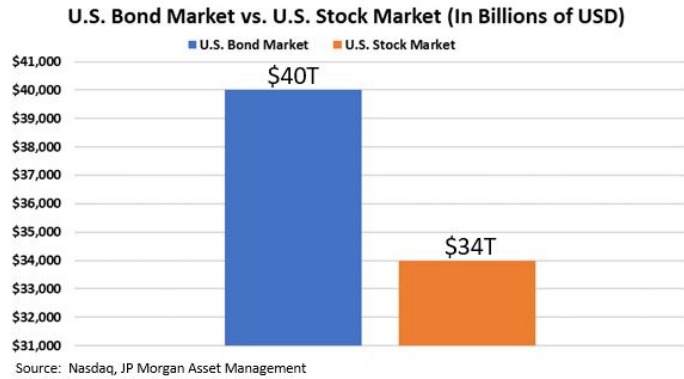


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VIII. CONCLUSION

The reason for the excitement behind green bonds is that the public debt markets are significantly larger than the public equity markets. With the US bond market valued at \$40 trillion vs the US stock market at \$34 trillion, the bond debt market is about 15% larger.

³⁰ Liberatore, Stephen M. “Green Muni Bonds: Responsible Investing in a Centuries-Old Asset Class”



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With estimates from the US SIF Foundation indicating that 1 out of every 4 dollars invested going toward sustainable, responsible or impact investing, the opportunity exists for the bond market to provide the necessary capital to combat climate change.³² However, given the current state of the market where over half of the future money invested through green bonds is not being allocated toward that agenda, it would suggest that stronger regulation is needed to both appropriately define what can be considered a green bond and more clarity can be given as to how that capital is being used to finance environmentally supportive projects.

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³¹ Phillips, Tim and Robert Dinelli “Clash of the Market Titans”

³² Field, Anne “SRI Investing in the US Now \$12 Trillion in AUM”

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