The purpose of the Energy Programs Consortium (EPC) is to foster coordination and cooperation among state and federal agencies in the areas of energy policy and program development. EPC is a joint venture of the National Association of State Community Services Programs (NASCSP), representing the state weatherization and community service programs directors; the National Association of State Energy Officials (NASEO), representing the state energy policy directors; the National Association of State Regulatory Utility Commissioners (NARUC), representing the state public service commissioners; and the National Energy Assistance Directors’ Association (NEADA), representing the state directors of the Low Income Home Energy Assistance Program.

EPC provides technical assistance to state, local, and national governments to develop energy efficiency, water conservation, transportation, resilience and renewable finance programs. We examine options for state, local, and national governments to issue bonds to support the financing of energy projects. We also coordinate efforts with the National Association of State Energy Officials (NASEO), the U.S. Department of Energy (DOE), the National Renewable Energy Laboratory (NREL) and Lawrence Berkeley National Laboratory (LBNL) to provide model documents and other QECB resources.

EPC

1350 Connecticut Avenue NW, Suite 1100  68 Jay St., Suite 517
Washington, D.C. 20036        Brooklyn, NY 11201
202.333.5915  718.596.5700

www.energyprograms.org
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The idea of “green bonds” goes back at least a decade, to the first issuance in 2007.¹ Development banks like the World Bank were the pioneers, and it only took a few years for the concept to filter down to state and local governments in the U.S. In 2013, Massachusetts issued the first labeled green municipal bond in the U.S.² By the end of 2016, about $7.5 billion in labeled municipal green bonds had been issued. Labeling bond issuances as green can attract new investors for an issuance and give them confidence regarding the utilization of bond proceeds, but there can be significant transaction costs that may not be recouped by any price break or “green premium”. It is perhaps not surprising, then, that the volume of unlabeled municipal bonds used for green purposes is larger.

¹ The first labeled green bond was issued in 2007 by the European Investment Bank (EIB). The €600 million in proceeds were earmarked for renewable energy and energy efficiency projects and have been used for 145 projects in 47 countries. The next year, the World Bank followed suit, issuing SKr 3.35 billion in 2008 to support climate-focused projects in Sweden. http://www.eib.org/investor_relations/cab/index.htm?lang=en; http://www.eib.org/attachments/fi/projects-supported-by-cabs.pdf

² These were general obligation bonds issued in June 2013 by the Commonwealth of Massachusetts. 59 percent of the $100 million proceeds were used for energy efficiency and conservation, 24 percent for land acquisition and open space protection, 15 percent for clean water, and 3 percent for river revitalization and habitat restoration. See http://www.massbondholder.com/sites/default/files/files/Second%20Green%20Report%20-%20FINAL.pdf. For the purposes of this paper, “municipal bonds” will be used to mean bonds issued by state and local governments and subdivisions or instrumentalities thereof within the United States.
than that of the labeled universe: we found 795 unlabeled U.S. municipal bonds issued from 2005-2017 for green purposes, totaling $79.8 billion, compared to 118 labeled green municipal bonds between 2013 and 2017, totaling $18.2 billion. See the “Green Muni Market Statistics: Unlabeled Green Bonds” section below.

The purpose of this report is to provide insight into the state of the growing U.S. green bond market, and particularly the centrality of state and local issuers to that market. The following section will define green municipal bonds. The third section explores trends in labeled green municipal bond issuance, QECB issuance, CREBs and New CREBs issuance, and unlabeled green municipal bond issuance. The fourth section will summarize the various green bond labeling options currently available. Finally, the fifth section offers some conclusions.

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3 This is true even when we limit the amount of unlabeled issuance to 2013-2017. In that timeframe, $34.4 billion unlabeled green municipal bonds were issued compared to $18.2 billion of labeled green municipal bonds. Furthermore, the unlabeled figure may be even higher. For example, PACE companies Renovate America, Renew Financial, and Ygrene Energy Fund have cumulatively issued $3.1 billion in PACE asset-backed securities, which are often secured by municipal PACE bonds issued by PACE districts such as the Western Riverside Council of Governments (WRCOG) and LA County. These are typically limited obligation improvement bonds that are then bought by the PACE administrators to serve as collateral for their PACE securitizations. EPC attempted to include municipal PACE bonds in this analysis, but there wasn’t enough information on EMMA to accurately represent them in this report. For more information about PACE, see EPC’s paper and updates on the topic, from which this data is drawn: http://www.energyprograms.org/programs/pace/
Green municipal bonds are at the intersection of “municipal bonds” and “green bonds”. They are debt securities issued by cities, counties, states, and other municipalities to finance projects with positive environmental impacts or refinance bonds previously issued for such purposes. Examples of green projects include: water efficiency improvements, mass transportation, energy efficiency upgrades, renewable energy, habitat conservation, environmental remediation, afforestation, and climate mitigation and adaptation measures in infrastructure development.

EPC found $18.2 billion in labeled municipal green bonds issued since 2013 and $79.8 billion in unlabeled green municipal bonds issued between 2005 and 2017. See the “Green Muni Market Statistics: Unlabeled Green Bonds” section below.

WHAT ARE BONDS?

A bond is a financial instrument, a type of debt security that public, private, and nonprofit issuers can use to fund a capital expenditure. In bond issuance, bond purchasers or investors are essentially lending money to the issuer in a form that may be more readily tradable than a traditional loan. Unlike stocks and other equity investments, bonds are fixed-income securities: the amount borrowed...
(the “principal”) is paid off periodically at pre-determined interest rates (which may be fixed or float as a spread above a variable index rate such as LIBOR) over its maturity period.

A bond issuer may hire a rating agency to assign a credit rating to the bond. These credit ratings serve as an indicator of the issuer’s creditworthiness. Investors use these ratings as a measure to determine an issuer’s ability to repay and the risk of default. Some credit rating agencies, including Moody’s, now offer ratings as to a bond’s “greenness” as well.

Between 2013 and 2017 YTD, approximately $28.5 trillion have been issued in the U.S. bond markets.4

**WHAT ARE MUNICIPAL BONDS?**

The overwhelming majority of state and local spending – approximately 90 percent – is financed through debt.5

**Municipal bonds** make up about 6% of the US bond market. Of the nearly $30 trillion in bonds issued in the US since 2013, approximately $1.6 trillion were municipal bonds.6 Nearly all U.S. municipal issuers have investment-grade ratings: 93 percent are rated A or higher by Moody’s compared to only 21 percent of global corporate issuers.7

Municipal bonds may be issued on a tax-exempt basis, meaning that bondholders of municipal bonds do not have to pay taxes on their earnings from interest payments.8

**WHAT ARE GREEN BONDS?**

At a minimum, green bonds are generally expected to comply with the International Capital Market Association’s (ICMA) Green Bond Principles described in the “Green Bond Labeling” section below. In short, green bond issuers are expected to provide more information about the use of bond proceeds than they might otherwise provide. Issuers may “self-label” and provide any additional information, opinions, or verifications deemed cost-effective.

The green bond space consists of both labeled and unlabeled issuances. Advocates note that green labeling provides a clear, easily identifiable signal to socially- and environmentally-conscious, mission-oriented investors looking to making investments with positive environmental impact;

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labeling makes it easier to search for, find, and track green bonds in databases like Electronic Municipal Market Access (EMMA) and Bloomberg Terminal. Critics note the additional cost in diligence and disclosure regarding use of proceeds, costs of opinion providers and verifiers, and the lack of concrete evidence of pricing advantages conferred by green labeling. As with credit ratings, green investors may do their own due diligence for consistency with their own definitions of “green”, rather than relying on such labels or third party opinions. Barclays MSCI, Bank of America Merrill Lynch, Standard & Poor’s, and Solactive, for example, have all developed green bond indices that follow their own definitions of “green”. 
State and local governments have been issuing bonds to finance green projects since at least 2005, long before the idea of green bonds labelling emerged. In total, unlabeled issuance volume has been much higher than labeled issuance. However, when using comparable time frames, labeled issuance has been on par with unlabeled issuance: in 2016, labeled issuance reached $7.5 billion, compared to $8.9 billion in unlabeled issuance.

We will provide statistics about both labeled and unlabeled green municipal bond issuances, as well as Qualified Energy Conservation Bonds (QECBs) and New Clean Renewable Energy Bonds (CREBs), to provide a better picture of the significance of this market.

In all, EPC identified a $100 billion green municipal market (labeled and unlabeled), representing about 2 percent of all municipal bonds and only 0.1 percent of all bonds issued in the U.S. between 2005 and 2017.
Labeled Green Bonds

Massachusetts issued the first labeled green municipal bonds in the United States in June 2013. From 2014 to 2016, labeled green municipal bond issuance almost quadrupled. By the end of 2016, the U.S. labeled green municipal bond market grew to 45 issuances totaling $7.5 billion. Cumulatively, there have been at least 118 issuances totaling about $18.2 billion. See Figures 1 and 2. See Appendix A for a full list of issuances to date.

While growth has been rapid, labeled green municipal bonds make up just a tiny part (1.11 percent) of the larger U.S. municipal bond market and an even smaller part (0.06 percent) of the wider U.S. bond universe. Total issuance of green-labeled municipal bonds amounts to $18.2 billion as of May 2017, compared to a $1.6 trillion U.S. municipal bond market and a $28.5 trillion U.S. bond market. See Figure 3.

9 The proceeds of the $100 million general obligation bonds were dedicated to a variety of green projects. In the final allocation, 59 percent of proceeds were used for energy efficiency and conservation, 24 percent for land acquisition and open space protection, 15 percent for clean water, and 3 percent for river revitalization and habitat restoration. See http://www.massbondholder.com/sites/default/files/files/Second%20Green%20Report%20-%20FINAL.pdf
10 Total amount issued between 2013 and 2017 – see http://www.sifma.org/research/statistics.aspx
Since 2013, 24 states have joined Massachusetts in issuing labeled green municipal bonds. The top three issuers are: New York (15 issuances totaling $3.85 billion), California (18 issuances totaling $3.77 billion), and Massachusetts (15 issuances totaling $2.84 billion). See Figures 4 and 5. In addition to these frequent issuers, Indiana (ranked 5th – 6 issuances totaling $858 million) and Iowa (ranked 9th – 2 issuances totaling $485 million) are also significant sources of labeled green municipal bonds.
FIGURE 5: STATES THAT HAVE ISSUED Labeled GREEN MUNIS

1. New York: 15 issuances, $3.85 billion
2. California: 18 issuances, $3.77 billion
3. Massachusetts: 15 issuances, $2.84 billion
4. Washington: 5 issuances, $1.6 billion
5. Indiana: 6 issuances, $858 million
6. Colorado: 3 issuances, $622 million
7. Connecticut: 5 issuances, $580 million
9. Iowa: 2 issuances, $485 million
10. Arizona: 3 issuances, $456 million
11. Illinois: 4 issuances, $371 million
12. Ohio: 4 issuances, $352 million
13. Hawaii: 3 issuances, $329 million
14. Maryland: 1 issuance, $313 million
15. Texas: 3 issuances, $306 million
16. New Jersey: 5 issuances, $179 million
17. Virginia: 3 issuances, $171 million
18. Vermont: 4 issuances, $142 million
19. Rhode Island: 5 issuances, $137 million
20. Florida: 3 issuances, $124 million
21. North Carolina: 1 issuance, $51 million
22. Minnesota: 4 issuances, $42 million
23. Utah: 1 issuance, $21 million
24. Oregon: 1 issuance, $16 million
25. Kansas: 1 issuance $11 million

FIGURE 6: LABELED - USE OF PROCEEDS BREAKDOWN

The top use of proceeds for all labeled green municipal bonds to date have been related to water: 47 percent of labeled green municipal bonds have been issued for water projects. Typical water projects include improvements to existing wastewater and sewer systems that will control for water pollution.

The second most common use of proceeds is the green buildings category (20 percent). Bond proceeds that fall under this classification are often used to enhance the overall environmental performance of public buildings such as schools, multifamily housing projects, and municipal buildings.

The remaining use of proceeds categories for labeled green municipal bonds are clean energy (8 percent), public transportation (8 percent), land conservation (3 percent), waste management (3 percent), and some combination of all of the above (11 percent). See Figure 6.

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11 In Figure 6, clean energy includes energy efficiency and renewable energy. Water deals with safe drinking water, water treatment, water pollution. Land conservation represents sustainable land use or habitat conservation. Green buildings are comprehensive upgrades, which might include a combination of installing energy and water efficiency measures, switching to renewable energy, using recycled and regionally-sourced materials in construction, and incorporating design elements to encourage green behavior. Public transportation represents any type of mass commuter program. Waste management involves improvements to solid waste facilities and programs. Please note that these categories are defined differently for QECBs and unlabeled issuances (see figures 11 and 22) below due to differences in reporting on each type of bonds.
Twenty-three (23) percent of the 118 green-labeled municipal bonds issued to date are general obligation bonds that pledge the full faith and credit of the municipality as security. This is significant because general obligation issuers often have the power to levy ad valorem taxes on all taxable property in the municipality. The remainder (77 percent) are revenue bonds that are secured only by a specific income source, such as the net revenues of the issuing entity or the revenue stream of the underlying project being financed. See Figure 7.

Within the labeled green municipal bond world, approximately 81 percent (95 out of 118 identified issuances) are self-labeled without any external verification or certification. Nine (9) percent have sought Climate Bond Certification from nonprofit Climate Bonds Initiative (11 out of 118)\(^\text{12}\) and 2 percent have received Green Bond Assessments from Moody’s (2 out of 118).\(^\text{13}\)

Another 8 percent (10 out of 118) have engaged second opinion providers to evaluate and verify their green bond frameworks. Of these, 7 used Sustainalytics, 2 used Vigeo, and 1 used CH2M Hill. See Figure 8.

\(^{12}\) Municipal issuers that have issued Climate Bond Certified debt includes the San Francisco Bay Area Rapid Transit District, the Metropolitan Transportation Authority, the New York State Housing Finance Agency, and the Public Utilities Commission of the City and County of San Francisco.  

\(^{13}\) Both issuances (DC Water and Sewer Authority, February 2017, $100m issuance & Upper Mohawk Valley Regional Water Finance Authority, August 2016, $8.8m issuance) that received assessments received the highest possible score of GB1.
Apart from the green bond label, there exist other bond labels that signal a green use of proceeds. Among these are Qualified Energy Conservation Bonds (QECBs), Clean Renewable Energy Bonds (CREBs), and New CREBs.

QECBs\textsuperscript{14} are bonds issued by states, territories, local governments, and tribal governments to finance renewable energy and energy efficiency projects. QECBs can only be used to finance qualified energy conservation projects as defined in section 54D of the U.S. Internal Revenue Code, which includes capital expenditures:

1. To reduce energy consumption in publicly owned buildings by at least 20%
2. To implement green community programs
3. For rural development
4. For certain renewable energy facilities
5. For certain mass commuting projects

QECB issuance can be an attractive, low-cost financing option for many municipalities because of its direct subsidy structure. The interest that investors earn on QECBs is taxable, but the federal government offers a direct cash rebate to the bond issuer to subsidize the issuer’s interest costs. Alternatively, QECBs can be issued as a tax credit bond in which bondholders receive tax credits rather than interest payments.

QECBs were first authorized by Congress in the 2008 Energy Improvement and Extension Act. The original legislation authorized just $800 million of QECBs nationwide; this allocation was subsequently expanded to $3.2 billion by the American Recovery and Reinvestment Act of 2009.

To date, there have been 243 known QECB issuances and a total issuance volume of $1.3 billion. See Figures 9 and 10 below. There may be additional issuances unknown to EPC; the IRS does not publish statistics about QECB utilization.\textsuperscript{15}

\textbf{FIGURE 9: NUMBER OF QECB ISSUANCES PER YEAR, 2010-2017}

\begin{center}
\begin{tabular}{|c|c|c|c|c|c|c|}
\hline
\hline
Number of Issuances & 47 & 58 & 38 & 29 & 17 & 24 & 20 & 8 \\
\hline
\end{tabular}
\end{center}

\textsuperscript{14} For more information about QECBs, see EPC’s paper and monthly updates on the topic, from which this data is drawn: http://www.energyprograms.org/programs/qualified-energy-conservation-bonds/

\textsuperscript{15} https://www.irs.gov/tax-exempt-bonds/qualified-energy-conservation-bonds-faqs
The vast majority of QECB proceeds have been allocated for energy efficiency (76.4 percent) and renewable energy projects (18.2 percent). Other uses include public transportation (2.5 percent), loan programs for energy retrofits (1.2 percent), public education to encourage green behavior (0.4 percent), and some combination of these categories (1.2 percent). See Figure 11.

Energy efficiency projects that have been financed by QECB proceeds include commercial PACE programs, comprehensive improvements to municipal buildings, and upgrades to university campuses.

In the renewables category, QECBs have been issued for solar, wind, geothermal, and combined heat and power (CHP) projects. QECB proceeds have also been raised for residential energy and water efficiency loan programs serving single-family and multifamily households.

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16 The use of proceeds categories analyzed here for QECBs differ from those analyzed for labeled and unlabeled issuances because of differences in reporting.
17 Examples: $571,430 QECB issuance by the Missouri Clean Energy District to fund a multifamily PACE project (November 2014); 1.5m QECB issuance by Boulder County, Colorado to finance commercial PACE projects (November 2010)
18 Example: $6.25m QECB issuance by the Philadelphia Municipal Authority to fund efficiency upgrades to city buildings
19 Example: $8.5m QECB issuance by Ohio University to finance energy efficiency upgrades at its Athens, Ohio campus
20 Example: $2.8m QECB issuance by Casa Grande, Arizona (February 2012)
21 Example: $3m QECB issuance by Fairhaven Wind in Massachusetts (November 2011)
22 Example: $2.5m QECB issuance by Dane Co (Mount Horeb) ASD in Wisconsin (April 2011)
23 Example: $16.9m QECB issuance by Development Authority of Fulton County in Georgia (May 2012)
24 Example: $10.3m QECB issuance by St. Louis County, Missouri for a single-family residential program (April 2011)
25 Example: $24.3m QECB issuance NYSERDA for a single-family and multifamily loan program (August 2013)
QECBs have been issued in 37 states. The largest issuers have been California (20 issuances totaling $313 million), Illinois (11 issuances totaling $92 million), and Ohio (22 issuances totaling $81 million). See Figures 12 and 13.

**FIGURE 12: GEOGRAPHICAL DISTRIBUTION OF QECB ISSUANCES**

**FIGURE 13: STATES THAT HAVE ISSUED QECBs**

1. **California**: 20 issuances, $313 million
2. **Illinois**: 11 issuances, $92 million
3. **Ohio**: 22 issuances, $81 million
4. **Michigan**: 12 issuances, $52 million
5. **Colorado**: 15 issuances: $49 million
6. **Washington**: 13 issuances, $46 million
7. **Wisconsin**: 16 issuances, $45 million
8. **Kentucky**: 4 issuances, $44 million
9. **Pennsylvania**: 7 issuances, $42 million
10. **New York**: 9 issuances, $42 million
11. **Texas**: 9 issuances, $41 million
12. **Alabama**: 8 issuances, $39 million
13. **Minnesota**: 8 issuances: $39 million
14. **Virginia**: 9 issuances, $38 million
15. **Louisiana**: 2 issuances, $38 million
16. **Massachusetts**: 13 issuances, $36 million
17. **Tennessee**: 7 issuances, $34 million
18. **Georgia**: 3 issuances, $29 million
19. **Kansas**: 3 issuances, $29 million
20. **Arizona**: 9 issuances, $25 million
21. **Indiana**: 3 issuances, $24 million
22. **Nebraska**: 4 issuances, $18 million
23. **Missouri**: 5 issuances, $16 million
24. **South Carolina**: 3 issuances, $13 million
25. **Arkansas**: 3 issuances, $11 million
26. **Connecticut**: 2 issuances, $11 million
27. **Maryland**: 2 issuances, $11 million
28. **Oregon**: 2 issuances, $10 million
29. **Montana**: 2 issuances, $8 million
30. **Nevada**: 2 issuances, $8 million
31. **North Carolina**: 4 issuances, $7 million
32. **Utah**: 2 issuances, $7 million
33. **South Dakota**: 3 issuances, $7 million
34. **New Hampshire**: 2 issuances, $5 million
35. **Maine**: 1 issuance, $4 million
36. **New Mexico**: 1 issuance, $4 million
37. **North Dakota**: 1 issuance, $4 million
CLEAN RENEWABLE ENERGY BONDS (CREBs)

Clean Renewable Energy Bonds (CREBs) are tax credit bonds issued by governmental entities, public power utilities, electric cooperatives, and other lenders to finance renewable energy projects. Projects that can be financed with CREB proceeds include solar, wind, biomass, solid waste, and hydroelectricity.

CREBs were first introduced under the Energy Policy Act of 2005, which authorized $800 million of CREBs to be issued between January 1, 2006 and December 31, 2007. The Tax Relief and Health Care Act of 2006 increased this allocation by $400 million and extended the issuance expiration date to December 31, 2008. By November 2006, the initial $800 million had been fully allocated to 610 projects; by February 2008, the remaining $400 million had been allocated to 312 projects.26 This original $1.2 billion CREB allocation is sometimes referred to as “Old CREBs”.

In 2008, the Internal Revenue Code was modified and Old CREBs were replaced by New CREBs. New CREBs follow a number of amended rules,27 including a 70 percent reduction on the tax credit, and a requirement that 100 percent of proceeds be used for capital expenditures related to qualified renewable energy projects. In addition, the New CREBs allocations were to be split three ways equally between state and local governments, public power providers, and cooperative electric companies.

The enactment of the Energy Improvement and Extension Act of 2008 provided for an $800 million New CREBs allocation. The American Recovery and Reinvestment Act of 2009 authorized an additional $1.6 billion, increasing the national bond volume cap for New CREBs to $2.4 billion.28 See Figure 14. As of February 2017, New CREBs allocations have been exhausted29 and the IRS is no longer accepting applications for allocations.30

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26 http://programs.dsireusa.org/system/program/detail/2510
30 https://energy.gov/eere/slc/new-clean-renewable-energy-bonds
Of the $2.4 billion allocated, EPC was able to identify 38 New CREB issuances with a total issuance volume of $685.3 million. The majority of New CREBs were issued between 2010 and 2012; there are no known issuances in 2013 and 2014. See Figure 15 below.

FIGURE 15: NUMBER OF NEW CREB ISSUANCES AND ISSUANCE VOLUME PER YEAR, 2010-2017

Only nine states have issued New CREBs. California dominates in New CREB issuance, accounting for 42 percent (or 16) of all 38 identified issuances. However, the largest issuer in terms of issuance volume is Washington, which has issued 8 New CREBs since 2010, totaling $369 million. California ranks second with $138 million in New CREB issuance volume. See Figures 16 and 17.

FIGURE 17: STATES THAT HAVE ISSUED NEW CREBS

1. Washington: 8 issuances, $369 million
2. California: 16 issuances, $138 million
3. Ohio: 1 issuance, $116 million
4. Wisconsin: 2 issuances, $27 million
5. Indiana: 6 issuances, $12 million
6. New York: 2 issuances, $11 million
7. Massachusetts: 1 issuance, $6 million
8. Delaware: 1 issuance, $3 million
9. Arizona: 1 issuance, $2 million
UNLABELED GREEN MUNICIPAL BONDS

Beyond the labeled green bond space, there exists a much larger unlabeled green municipal bond market. **Unlabeled green bonds** raise proceeds for projects with environmentally-beneficial purposes but lack a green label, self-labeled or otherwise.

EPC used the EMMA database to identify unlabeled green municipal bond issuances. To find unlabeled green bond issuances, EPC searched key terms such as “renewable energy” and “energy efficiency” on EMMA, adhering to a broad definition of “green” that EPC believes is in alignment with the ICMA Green Bond Principles. For example, EPC included the key term “hydroelectric” although EPC is aware that some investors would not consider this to be a green use of proceeds in certain circumstances. EPC then reviewed the use of proceeds section of bond prospectuses to confirm that proceeds were being used for green purposes. To the best of its abilities, EPC tried to include only those issuances that allocated the vast majority of bond proceeds raised to green projects. However, due to a lack of reporting, the actual use of proceeds and final allocations cannot be confirmed.

Using this methodology, EPC has catalogued 795 unlabeled green municipal bonds issued between 2005 and 2017 to finance various green infrastructure projects including those related to public transportation, water, clean energy, land conservation, and waste management.

**FIGURE 18: NUMBER OF UNLABELED GREEN MUNI ISSUANCES PER YEAR, 2005-2017**

A total of $79.8 billion in unlabeled green municipal bonds was issued between 2005 and 2017. As is the case with labeled green municipal bonds, unlabeled green municipal bond issuance has been

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31 List of key terms used: bioenergy, bus rapid transport, carbon, Central Puget Sound, clean air, clean energy, compost, conservation, efficiency, energy efficiency, energy efficient, geosequestration, geothermal, green building, green space, hydro, hydroelectric, hydroelectricity, land conservation, LED, LEED, mass transit, mass transportation, methane, Metropolitan Transportation Authority, PACE, Property Assessed Clean Energy, public transportation, recycle, recycling, renewable, renewable energy, retrofit, sequestration, solar, transportation authority, wastewater, water efficiency, water pollution, wetland, wind, wind energy
experiencing a generally upward trend. Issuance count, as well as issuance volume, in recent years has on average been higher than in earlier years. See Figures 18 and 19. The trends seen in labeled and unlabeled issuance indicate an increased interest in green projects on the state and local levels.

**FIGURE 19: UNLABELED GREEN MUNI ISSUANCE VOLUME PER YEAR IN USD, 2005-2017**

Since 2005, unlabeled green muni bonds have been issued in 44 states, as well as the District of Columbia and Guam. See Figures 20 and 21. The largest issuing states were: New York (63 issuances totaling $27.8 billion), California (131 issuances totaling $7.1 billion), and Ohio (102 issuances totaling $6.2 billion). The only states that do not appear to have issued any unlabeled green bonds within the last 12 years are: Iowa, North Dakota, New Hampshire, Vermont, West Virginia, and Wyoming. (Please let us know if you are aware of any potential issues we should explore).

**FIGURE 20: GEOGRAPHICAL DISTRIBUTION OF UNLABELED GREEN MUNI ISSUANCES**
FIGURE 21: STATES THAT HAVE ISSUED UNLABELED GREEN MUNIS

1. New York: 63 issuances, $27.8 billion
2. California: 131 issuances, $7.1 billion
3. Ohio: 102 issuances, $6.2 billion
4. Washington: 31 issuances, $4.8 billion
5. Utah: 17 issuances, $3.6 billion
6. Illinois: 17 issuances, $3.6 billion
7. Texas: 47 issuances, $3.4 billion
8. Georgia: 15 issuances, $3.2 billion
9. Missouri: 30 issuances, $2.6 billion
11. Maryland: 10 issuances, $2 billion
12. Hawaii: 5 issuances, $1.8 billion
13. Florida: 10 issuances, $1.4 billion
14. Pennsylvania: 9 issuances, $1.2 billion
15. Minnesota: 17 issuances, $978 million
16. Rhode Island: 20 issuances, $843 million
17. Virginia: 8 issuances, $720 million
18. New Jersey: 17 issuances, $697 million
19. Arizona: 8 issuances, $664 million
20. Indiana: 4 issuances, $621 million
21. Arkansas: 27 issuances, $548 million
22. Colorado: 20 issuances, $547 million
23. Nebraska: 1 issuance, $7 million
24. Nevada: 5 issuances, $446 million
25. Guam: 3 issuances, $435 million
26. Kentucky: 54 issuances, $384 million
27. Connecticut: 10 issuances, $332 million
28. Michigan: 42 issuances, $242 million
29. Alaska: 4 issuances, $203 million
30. Tennessee: 3 issuances, $124 million
31. Oregon: 7 issuances, $106 million
32. North Carolina: 2 issuances, $101 million
33. South Carolina: 3 issuances, $101 million
34. Alabama: 3 issuances, $83 million
35. Montana: 9 issuances, $77 million
36. Louisiana: 1 issuance, $75 million
37. Delaware: 1 issuance, $67 million
38. Kansas: 5 issuances, $40 million
39. Maine: 3 issuances, $40 million
40. Idaho: 1 issuance, $40 million
41. Mississippi: 2 issuances, $32 million
42. Oklahoma: 1 issuance, $25 million
43. New Mexico: 1 issuance, $13 million
44. South Dakota: 1 issuance, $11 million
45. Wisconsin: 1 issuance, $7 million
46. Nebraska: 1 issuance, $7 million

The top use of proceeds among identified unlabeled green municipal bond issuances was water-related (47.7 percent). This was followed by clean energy (27.3 percent), public transportation (18.7 percent), land and wildlife conservation (3.8 percent), waste management (1.8 percent), and clean air (0.3 percent).\(^\text{32}\) See Figure 22. Within clean energy, energy efficiency improvements are more common than renewable energy projects. The number of energy efficiency-related issuances is more than twice that of renewable energy-related issuances.

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\(^{32}\) The use of proceeds categories for unlabeled issuances differ from those of labeled issuances. There is no green building category here. Though EPC searched keywords such as “green buildings” and “LEED”, it is likely that issuances that would fall in the “green buildings” category are listed under different descriptions.
TOTAL GREEN MUNICIPAL BOND MARKET

In total, EPC has found approximately $100 billion in labeled and unlabeled green municipal bond issuance: $18.2 billion of labeled green municipal bonds, $1.3 billion of QECBs, $685 million of New CREBs, and $79.8 billion of unlabeled green municipal bonds.33

The general trend from 2005 and to 2017 has been an increase in green issuances within the municipal bond market, demonstrating a sustained, and growing, interest in green projects. Green municipal bond issuance in 2016 was $17 billion, the highest issuance volume yet and an eight-fold increase from the $2 billion issued in 2005. See Figure 23.

Furthermore, municipal bonds represent a sizeable piece of the green bond market pie. According to non-profit Climate Bonds Initiative’s estimates, banks, corporations, municipalities, and supranational organizations have cumulatively issued $216 billion in labeled green bonds since 2012.34 Based on these figures, U.S. labeled municipal green bonds represent 15.4 percent of labeled green bonds issued worldwide.

33 The green municipal bond market may be even larger. For example, Property Assessed Clean Energy (PACE) securitizations by PACE companies Renovate America, Renew Financial, and Ygrene Energy Fund are often secured by municipal PACE bonds issued by PACE districts such as the Western Riverside Council of Governments (WRCOG) and LA County. These are typically limited obligation improvement bonds that are then bought by the PACE administrators to serve as collateral for their PACE securitizations. EPC attempted to include municipal PACE bonds in this analysis, but there wasn’t enough information on EMMA to accurately represent them in this report. However, we do know that these PACE administrators have cumulatively securitized $3.1 billion of PACE assessments to date. For more information about PACE, see EPC’s paper and updates on the topic, from which this data is drawn: http://www.energyprograms.org/programs/pace/

34 Calculated using figures from CBI’s labeled green bond database and 2016 State of the Market report. According to CBI, labeled green bond issuance volume between 2012 and May 2016 was $118 billion. Issuance up to May 2016 totaled $28 billion. Total issuance for the year of 2016 was $81 billion, and issuance for 2017 YTD is $45 billion. $118 billion - $28 billion + $81 billion + $45 billion = $216 billion in labeled green bonds. See https://www.climatebonds.net/ and https://www.climatebonds.net/files/files/CBI%20State%20of%20the%20Market%202016%20A4.pdf.
Green bond labeling can be as simple as declaring one’s own issuance as green by self-labeling.\textsuperscript{35} To avoid charges of “greenwashing”, however, various standards, certification and verification options have emerged, including:

- **Guidance/Standards:**
  - International Capital Market Association (ICMA)’s Green Bond Principles;
  - Ceres Investor Network on Climate Risk (INCR)’s “A Statement of Investor Expectations for the Green Bond Market”.

- **External Review – Certification & Verification:**
  - Second-party opinions that review an issuer’s green bond framework. Second opinion providers include the Center for International Climate and Environmental Research –

\textsuperscript{35} Examples of self-labeled bonds include: $450m issuance by the California Infrastructure and Economic Development Bank to finance water pollution control projects (March 2017); $20m issuance by Martha’s Vineyard Land Bank Commission to finance sustainable land use projects (March 2017). Examples of marketed green bonds include: $312.7m Climate Bond Certified, Sustainalytics-verified issuance by the Metropolitan Transportation Authority to finance public transportation projects (February 2017); $259m Climate Bond Certified, Sustainalytics-verified issuance by the Public Utilities Commission of the City and County of San Francisco to finance water improvement projects (December 2016).
Third-party certification where external verifiers check a bond’s greenness against set criteria: Climate Bonds Initiative (CBI)’s Climate Bonds Standard;
- Green bond ratings from credit rating agencies like Moody’s Green Bond Assessments.

This section will summarize each of these in turn.

ICMA’s Green Bond Principles

The Green Bond Principles (GBP)\textsuperscript{36} were created in 2014 by the International Capital Market Association (ICMA) to provide guidance to the development of the rapidly growing and largely unregulated green bond market. The GBP are voluntary process guidelines promoting transparency and disclosure and are intended for issuers, investors, and underwriters alike.

According the 2016 annual edition of the GBP, the GBP is made up of four pillars:

1. **USE OF PROCEEDS**
   Proceeds of a Green Bond should be dedicated to Green Projects that “provide clear environmental benefits, which will be assessed and, where feasible, quantified by the issuer.” Categories broadly recognized by the GBP as eligible include:

   - Renewable energy;
   - Energy efficiency;
   - Pollution prevention and control;
   - Sustainable management of living natural resources;
   - Clean transportation;
   - Terrestrial and aquatic biodiversity conservation;
   - Sustainable water management;
   - Climate change adaptation; and
   - Eco-efficient products

However, the GBP is not specific in their description of these categories and excuses itself from “[taking] a position on which green technologies, standards, claims and declarations are optimal for environmentally sustainable benefits”, leaving these project categories up to broad interpretation.

2. **PROCESS FOR PROJECT EVALUATION AND SELECTION**
   To promote transparency in the green bond market, the GBP encourage green bond issuers to disclose its green bond process and framework. Issuers should outline:

   - The process used to determine how projects fit within the eligible Green Projects categories;

\textsuperscript{36} ICMA GBP, updated as of June 16, 2016: http://www.icmagroup.org/Regulatory-Policy-and-Market-Practice/green-bonds/green-bond-principles/
• The related eligibility criteria; and
• Environmental sustainability objectives.

It is also recommended that issuers seek external review to validate their green bond frameworks against the GBP.

3. MANAGEMENT OF PROCEEDS
Issuers should credit and track the net proceeds of green bonds in a sub-account and inform investors of the intended use of proceeds for unallocated amounts. The GBP further recommends that the issuer use an auditor to verify the internal tracking method.

4. REPORTING
Issuers should report use of proceeds annually until all proceeds are used up. These annual reports should include descriptions of the projects funded by green bond proceeds, amounts allocated to each project, and the expected impact. In addition, the GBP encourages the use of both qualitative and quantitative performance measures, such as energy capacity, electricity generation, and greenhouse gas reductions.

The GBP recommends obtaining external review to confirm that an issuance’s green bond framework is robust. External review may involve: consultant review, such as second opinions; verification, such as auditors; certification, in which a green bond framework is evaluated against a set external standard; and/or ratings by qualified third parties, such as credit rating agencies.

Ceres INCR’s Statement

In 2015, Ceres’s Investor Network on Climate Risk (INCR) released “A Statement of Investor Expectations for the Green Bond Market”. The statement supports adherence to the GBP but outlines further guidance in four areas:

1. ELIGIBILITY: GENERAL CRITERIA FOR GREEN PROJECTS
The Statement agrees with the eligible categories listed by the GBP. The distinction is that the Statement recognizes that some projects could simultaneously benefit and degrade the environment, such as a project proposal for an energy efficient shale operation. It may make more sense to issue conventional bonds for such projects rather than under a green label to avoid reputational damage to both the issuer and the investor.

2. INITIAL DISCLOSURES AND INTENDED USE OF PROCEEDS
The Statement likewise calls for high standards of transparency in green bond issuance. As encouraged by the GBP, issuers should disclose the green bond framework used, the intended use of proceeds, and the management process for tracking proceeds. Issuers should also disclose the projected and actual environmental impacts and the share of bond proceeds being used for new projects versus for refinancing. The Statement also recommends that green bond proceeds be allocated within a reasonable period of time after issuance and that issuers describe how they will report impacts.
3. REPORTING ON USE OF PROCEEDS AND PROJECT IMPACTS/BENEFITS
Issuers should report use of proceeds and impacts annually. INCR recognizes that there currently lacks a standard method of impact reporting and that there is need to establish uniform reporting standards in the green bond market.

4. INDEPENDENT ASSURANCE
It is recommended that issuers verify their tracking procedures with financial auditors and their green bond frameworks with second opinions.

Second Opinions

Second opinions are a form of external, independent review that issuers may consider obtaining to validate their green bond labels and increase investor confidence in the bond’s greenness. Second opinions scrutinize an issuer’s framework for selecting eligible green projects. The criteria and methodology used in second opinion review vary from provider to provider, but second opinions will typically evaluate an issuer’s green bond framework, adherence to the GBP, and governance and transparency procedures. Second opinion providers for green bond review include: CICERO, DNV GL, Vigeo, Sustainalytics, Deloitte, EY, KPMG, and Oekom.

Opinion provider processes vary, but Sustainalytics’ evaluation process is an illustrative example. First, it evaluates an issuance’s green bond framework, specifically looking at elements such as: (1) the use of proceeds; (2) the project selection process; (3) the management of proceeds; and (4) reporting and disclosure procedures. After evaluation, Sustainalytics issues its opinion on the green bond framework.

A limitation of second opinion review is that it only verifies the environmental integrity of a bond pre-issuance and does not analyze ex post impacts.37

Climate Bonds Standards

Developed by nonprofit Climate Bonds Initiative (CBI), the Climate Bonds Standard & Certification Scheme is the only existing form of third-party certification available that verifies a bond’s environmental integrity against an external set of fixed criteria. The Climate Bonds Standard consists of sector-specific eligibility criteria. The sectors include: energy, low carbon buildings, industry & energy-intensive commercial, waste & pollution control, transport, information technology & communications, nature based assets, and water. Projects that meet the criteria set forth by the

Climate Bonds Standard can seek certification through an approved third-party verifier. Issuers independently contract with third-party verifiers, who then confirm that the bond issuance meets the requirements of the Standard and sends a formal assurance report to the Climate Bonds Standards Board. The Climate Bonds Standard Board reviews the issuer’s application and assurance report and issues the final approval and certification. Issuers of Climate Bond Certified U.S. municipal bonds include: the Metropolitan Transportation Authority (MTA), New York State Housing Finance Agency, and the Public Utilities Commission of the City and County of San Francisco.

The Climate Bonds Standard & Certification Scheme has both pre-issuance and post-issuance requirements. Pre-issuance certification allows issuers to advertise the bond as Climate Bond Certified to investors. However, to ensure that bond proceeds are allocated as promised, the certification scheme includes post-issuance requirements that need to be met to retain the Climate Bond Certified mark.

To apply for pre-issuance certification, issuers submit three documents to the Climate Bonds Standards Secretariat to be reviewed by the Climate Bonds Standards Board: the Climate Bond Information Form, the Verifier’s Report for Pre-Issuance, and the Certification Application & Agreement. The Climate Bond Information Form compiles details on the issuer, the bond in question, planned use of proceeds, project selection, proceeds management, and reporting procedures. The Verifier’s Report for Pre-issuance comes from a third-party verifier that issuers independently contract with. The Verifier’s Report confirms the eligibility of the projects that will be financed by the bond’s proceeds against the Climate Bonds Standard and the issuer’s internal processes for tracking and reporting use of proceeds. The Certification Application & Agreement is a legal document to be looked over by the issuer’s legal department. Bond issuances that satisfy the pre-issuance requirements are given the Climate Bond Certified mark for use at roadshows.

After issuance, issuers must work with the original verifier once again to prepare a Post-Issuance Verifier’s Report confirming that the bond meets post-issuance requirements. Requirements include allocating bond proceeds to the nominated projects and assets, crediting net proceeds to a separate

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42 See https://www.climatebonds.net/standards/standard_download for the pre-issuance and post-issuance requirements of the Climate Bonds Standard.

43 The Climate Bond Information Form and Certification Application & Agreement documents are available at: https://www.climatebonds.net/standards/certification/get-certified.
sub-account to ensure non-contamination of proceeds, and reporting on the use of proceeds and their expected impacts. The Post-Issuance Verifiers Report is sent to the Climate Bonds Secretariat along with an updated Climate Bond Information Form for review. If approved, the Climate Bond Certification is valid for the entire life of the bond.

The costs of obtaining a Climate Bond Certified mark include contracting with a verifier for pre-issuance and post-issuance assurance and registering the bond with the Climate Bonds Standard Board. The cost of hiring a verifier is decided between the issuer and verifier. The certification fee associated with registration is equal to one tenth of a basis point of the bond principal; for example, the certification fee on a $500 million bond would be $5,000.\(^4^4\) There may be additional costs related to managing, tracking, and reporting the bond’s use of proceeds.

### Green Bond Ratings

Some credit rating agencies have started to develop green bond ratings to help regulate and standardize green bond issuance.

An example is Moody’s Green Bonds Assessment (GBA). The GBA does not serve as a credit rating. Rather, it evaluates the bond issuer on five weighted factors to form an opinion on the effectiveness of an issuer’s green bond framework and on the likelihood that bond proceeds will be appropriately allocated to green projects.

The five factors evaluated in the GBA are: organization (15 percent), use of proceeds (40 percent), disclosure on the use of proceeds (10 percent), management of proceeds (15 percent), and ongoing reporting and disclosure (20 percent). Each factor is given a score between 1 and 5 based on the various sub-factors. The five scores are then aggregated based on the weights assigned above into a final grade, which ranges from GB1 (Excellent) to GB5 (Poor). A score of GB1 means that “prospects for achieving stated environmental objectives are excellent”. After an assessment is issued, it may still be subject to change to reflect new information based on the issuer’s future reporting and disclosures.\(^4^5\)

One way to differentiate between Moody’s GBA and other forms of external review is that it allows for a more nuanced evaluation of green bond issuance that acknowledges that there could be gradations of “greenness”. Moody’s GBA assesses greenness on a 1 to 5 scale while second opinions and CBI’s Climate Bond Certification either verifies a bond’s greenness or doesn’t.

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\(^4^4\) https://www.climatebonds.net/standards/certification/get-certified

\(^4^5\) https://www.moodys.com/researchdocumentcontentpage.aspx?docid=PBC_188333
The billions of dollars in green municipal bonds issued since 2005 illustrates the vast opportunity for retrofitting and modernizing U.S. infrastructure. Between 2005 and June 2017, state and local governments in the US have issued at least $100 billion in bonds for purposes that could be called “green”. This figure does not even include the billions in municipal PACE bonds, for reasons discussed in the “Green Muni Market Statistics: Total Green Municipal Bond Market” above. State and local governments issuing these type of bonds may want to consider green labelling (whether self-labelling or with opinions or verification) to attract new investors and potentially achieve some pricing benefit. At the same time, investors interested in high credit quality issuers financing projects with positive environmental impact may find wider investment opportunities by expanding their horizons to consider the municipal bond market more generally, where many unlabeled bonds are issued for green purposes.