Research Article

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Evolution of U.S. State and Local Government Green Bond Issuance

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This paper aims to inquire empirically about an increasingly important phenomenon in the state and local government bond market -- the issuance of green bonds. Green bonds have the same security as traditional bonds but include a green label to signify that the bond proceeds will be used to finance projects that benefit the environment. We investigate U.S. state and local government green bond trends and characteristics using a database of all green and non-green bonds issued in 2013-2021. We also report findings from our interviews with early issuers and our analysis of more recent green bonds, focusing on external verification and disclosure. From a volume perspective, we find that the municipal green bond market has been dominated by large issuers in several states. However, the issuance of green bonds is more dispersed. The number of states with at least one green bond issuer within a year and the number of unique issuers per year have grown significantly. Water and wastewater projects remain the most common type of state and local government green bonds, but there has been growth in green bonds for housing and public power. One of the biggest changes has been the increase in the use of external parties to verify what constitutes green; however, the reporting of environmental metrics remains limited.

Keywords: Climate, Green Bonds

Green bonds have the same security and structure as traditional bonds, but they are labeled "green" to indicate that the bond proceeds will be used for projects that benefit the environment. They are designed to appeal to investors who value environmental or sustainability investments. In 2013, the Commonwealth of Massachusetts became the first U.S. state or local government to issue green bonds (Climate Bonds Initiative [CBI], 2023a). More than ten years later, the state and local government green bond market continues to grow but still accounts for a relatively small share of the total municipal market (Farmer, 2023).

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Despite the growth in state and local government green bonds, relatively little information is publicly available on this segment of the municipal debt market. Official statements for individual green bond issues are usually available from the issuer or through the Electronic Municipal Market Access database.[1] However, data on aggregate state and local government green bond issuance trends and characteristics tends to be limited to those with access to private commercial databases. Some publicly available information is available through special reports issued by bond rating companies or other organizations.

We seek to address that gap by analyzing how the issuance of green bonds by state and local governments in the United States has evolved. We begin with background information on green bonds, followed by describing trends and characteristics of green bond issuances. We then present information about the experiences of the early green bond issuers. The following section presents findings from recent green bond issuances, focusing on external verification and disclosure. We summarize our findings, key issues that will be important in the future of the state and local government green bond market, and suggestions for future research.

Background on Green Bonds

State and local governments have issued green bonds to finance various projects that benefit the environment. Examples include water or wastewater projects, public transit improvements, and efficient buildings. The International Capital Markets Association (ICMA, 2021) has identified eligible green projects, including renewable energy, pollution prevention and control, and climate change adaptation.

Within the United States, private firms, state and local governments, and the Federal National Mortgage Association (Fannie Mae) are the major issuers of green bonds. The biggest issuer is Fannie Mae, which issues green bonds to finance single-family and multi-family units that meet energy- and water-saving standards (Statista Research Department, 2024). The U.S. federal government has not yet issued green bonds, although the Treasury Advisory Borrowing Committee has explored this possibility (U.S. Treasury, 2024).

Green bonds can provide multiple benefits to the issuers. They can help expand the number of investors and provide more opportunities for investor engagement. Green bonds can also enhance an issuer's reputation for environmental stewardship by aligning capital financing with environmental or sustainable goals (California Commission on Debt and Investment Advisory Council, 2023; Principles for Responsible Investment, 2023a). Studies are mixed on whether green bonds issued by state and local governments result in lower interest costs than traditional bonds (see literature review below).

Other considerations may also impact the decision of whether to issue green bonds. Some states or communities seek to be environmental, sustainability, and governance (ESG) leaders.[2] In contrast, at least a dozen states have passed anti-ESG laws (Malone & Holland, 2023). For example, the State of Florida passed legislation in 2023 that prohibits state and local governments from issuing bonds that are labeled green (State of Florida, 2023). The Government Finance Officers Association (GFOA) recommends that issuers consider tangible and intangible benefits and costs when deciding whether to issue green bonds (GFOA, 2022).

The U.S. market for state and local government green bonds does not have any special restrictions or federally imposed regulations. Other countries such as China, Japan, the United Kingdom, and the European Union have established guidelines or frameworks. Within the U.S.,

the California Green Bond Market Development Committee, which the California state treasurer chairs, has released guidelines for municipal green bond disclosure (California Green Bond Market Development Committee, 2023).

Several international organizations have established guidelines or standards for green bonds, which state and local governments in the United States can incorporate into their procedures and documentation.

- The International Capital Market Association, a trade association representing banks, asset managers, issuers, and others, created the Green Bond Principles in 2014. These principles include four pillars: (1) use of proceeds, (2) a process for project evaluation and selection, (3) management of proceeds, and (4) reporting (International Capital Markets Association, 2021).
- In 2015, the United Nations released the *2030 Agenda for Sustainable Development* (2015), which included 17 sustainability goals and a taxonomy of green projects. The goals that are the most closely related to green bonds include Goal 6, Clean Water and Sanitation; Goal 7, Affordable and Clean Energy; Goal 9, Industry, Innovation, and Infrastructure; Goal 11, Sustainable Cities and Communities; Goal 13 Climate Action; and Goal 15 Life on Land (CBI, 2018).
- The CBI, an international nonprofit that seeks to mobilize capital for climate action, has established Climate Bond Standards, a green bond taxonomy, and a process for climate bond certification. CBI provides education and tracks the green bond market to support the 2016 Paris Agreement on Climate Change (CBI, 2023b).

One of the concerns with green bonds is the issue of greenwashing. This refers to deceptively labeling bonds as green when the use of the bond proceeds does not comply with what is normally considered green. Monitoring and enforcing legitimate green bonds is difficult because of the voluntary nature of green bonds and the lack of a single global standard for what qualifies as green. A related challenge is that the green provisions usually are not included in the bond covenants, and therefore, investors lack actionable rights if the green provisions are not upheld (Baker McKenzie, 2019).

State and local government green bond issuers can self-certify their bonds as green or seek external verification. External verifiers can assess whether the bonds comply with the Green Bond Principles, the Climate Bond Standards, sector-specific criteria, or other reputable frameworks. This can result in a third-party assurance, a second-party opinion, a green bond rating, or certification as "climate bonds," depending on who conducted the assessment, the criteria and procedures used, and the assessment findings (CBI, 2023c).

Since 2018, one of the municipal bond insurance firms has offered an external verification of eligible bonds. This service is free to state and local governments who purchase insurance from that firm for the bond issue. The verification requires that the bonds be used for eligible green projects and satisfy the requirements set by the insurance firm, which are consistent with the Green Bond Principles. This has significantly increased the use of external verification by municipal green bond issuers (BAM Greenstar, 2024).

State and local governments issue green bonds in hopes of attracting investors who are interested in green projects. The question then becomes whether investors will accept a lower

yield in recognition of the environmental benefits. (Empirical studies on this issue are addressed in the following section.) If this occurs, then the green bond market may be able to achieve what is referred to as "additionality." This occurs when green bonds facilitate green projects that would not otherwise get financed or lead to an improvement in the design or features of a project to increase its positive impact on the environment (Salakhova, 2023). Additionality also occurs when green projects are undertaken at a faster plan than would otherwise occur.

Literature Review

Relatively little research has been conducted on state and local government green bonds; however, one topic that has received attention is whether state and local government green bonds have lower interest rates than non-green bonds (referred to as a "greenium"). Using data on green bonds issued between 2013 and 2018, Larcker and Watts (2020) matched green bonds and non-green bonds issued by the same issuer at the same time and found no significant difference in yields. Baker et al. (2022) compared equivalent green and non-green bonds but did not confine their comparison to bonds issued by the same issuer. They found that green bonds had an after-tax yield of five to nine basis points lower than equivalent non-green bonds. Baker et al. added a caveat that when the same government issued green and non-green bonds simultaneously, the differences in yields were insignificant (the same finding as Larcker & Watts).

Using data from 2013 to 2022, Li, Wang, and Yu (2023) matched state and local government green bonds with comparable non-green bonds and found that after 2018, the green bonds, on average, had a 2.3 basis point lower yield than non-green bonds. The difference in yields was higher for shorter maturities. The green bonds after 2018 also, on average, had an underwriter discount that was four basis points lower. (Before 2018, green bonds had higher yields and underwriter discounts.)

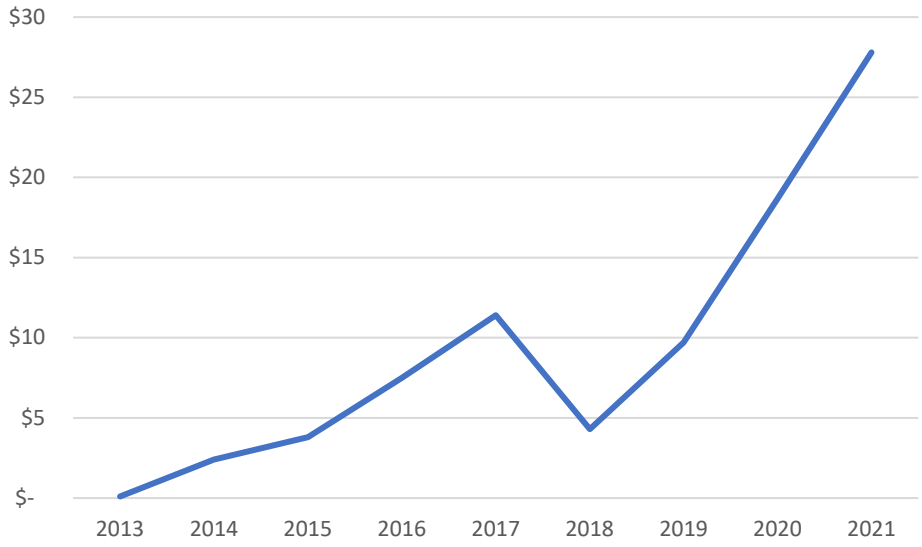
Singla, Shumberger, and Swindell (2021) examined factors that may influence the use of alternative funding or financing tools. They found that budgetary imbalances may affect the use of alternative financing tools, such as green bonds. However, they reported that the number of governments using green bonds or that plan to issue green bonds within the next five years was low, 0.6 percent and 5.5 percent, respectively.

Other articles have examined green bonds among particular state and local governments. Bunch and Strauss (2021) examined the issuance of green bonds in Illinois. They found that green bonds were being used for various projects, such as the state's revolving loan program for water and wastewater projects, school facilities, a natural gas plant fueled by landfill gas, and the dredging of a lake. Chen and Bartle (2017) present a case study of St. Paul's sewer green bonds, noting the need to work with municipal financial experts and understand the underlying goals of the designation rather than issuing green bonds as a novelty.

Our Approach

This paper presents a descriptive analysis of state and local government green bond issuance to address the gap in information about state and local government green bond issuance and how it has evolved. We start by examining trends and characteristics of state and local government green bond issuance for 2013-2021 using data from the Mergent Municipal Bond Securities

Figure 1. State and Local Government Green Bonds Issued, 2013-2021, billions



Source: Authors' analysis of Data from the Mergent Municipal Bond Securities Database

Database. We look at changes in the issuance of municipal green bonds over time, the differences between green and non-green bonds, and the differences between early green bond issuance (2013-2017) and more recent issuance (2018-2021).

We then discuss the experiences of the early state and local government green bond issuers. This is based on interviews with 28 government officials directly involved in issuing one or more green bonds during 2014-2016. This included finance officials from six state governments, eight local governments, three universities, one school district, two mass transit districts, six water/sewer districts, and one port district. Several interviews were conducted in person, but most occurred by phone. These interviews primarily were conducted in 2015 and 2016.

Lastly, we analyze two important issues – external verification and disclosure – based on a review of 113 official statements from state and local government green bonds issued in the second quarters of 2021, 2022, and 2023. We obtained the official statements from the Electronic Municipal Market Access (EMMA) database maintained by the Municipal Securities Rulemaking Board (MSRB), individual issuer websites, and others. The list of green bonds was compiled using data from the CBI website.

Results

Analysis of Trends and Characteristics

The volume of state and local green bond issues has increased over time (see Figure 1). In 2014 and 2015, the amount of state and local government green bonds issued was $2.4 billion and $3.8 billion, respectively. The volume in 2017 and 2018 was impacted by issuers pushing bonds into 2017 before tax changes, such as a ban on advance refunding bonds, went into effect due to the passage of the Tax Cuts and Jobs Act in 2017. A few years later, the pandemic introduced

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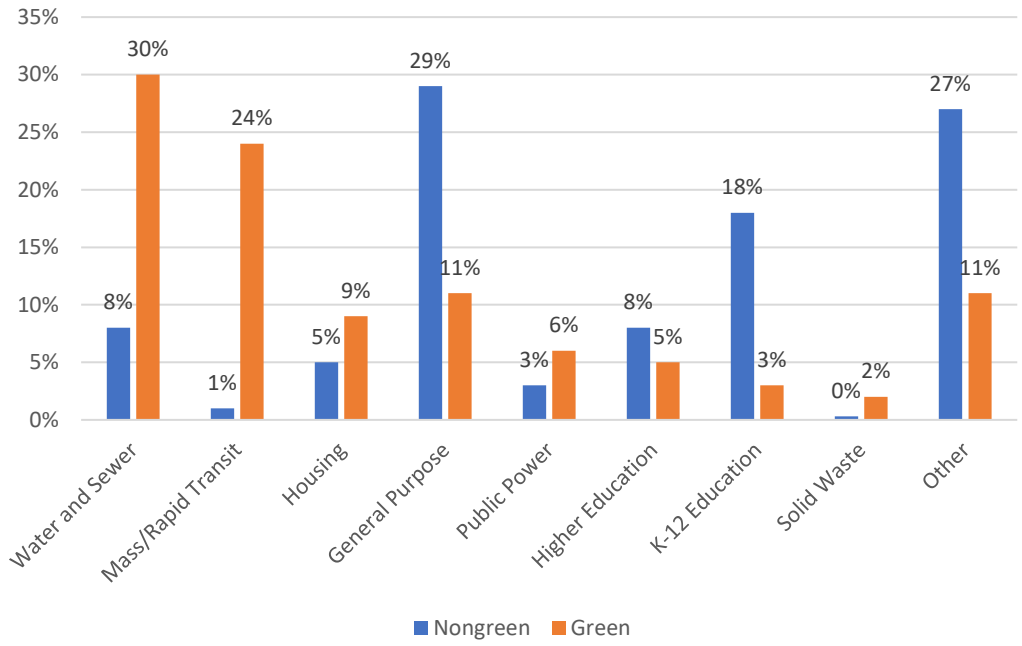
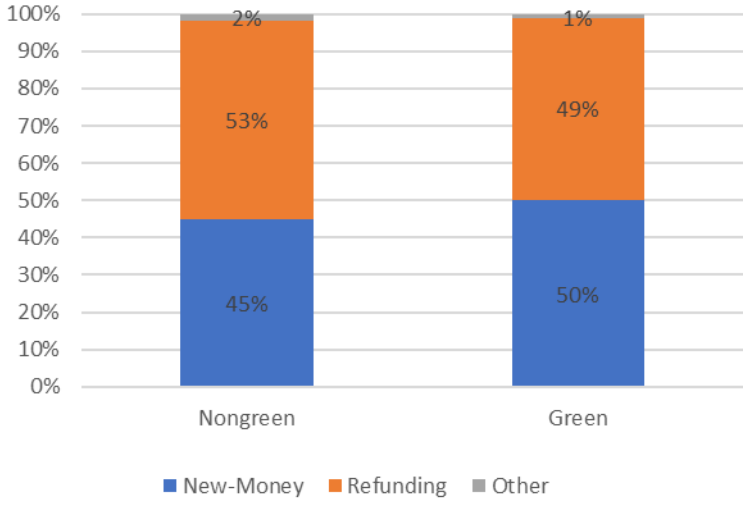
Figure 2. Use of Bond Proceeds for Non-green vs. Green Bonds, 2013-2021



Source: Authors' analysis of data from the Mergent Municipal Bond Securities Database

Figure 3. New-Money vs. Refunding Bonds for Non-green vs. Green Bonds, 2013-2021

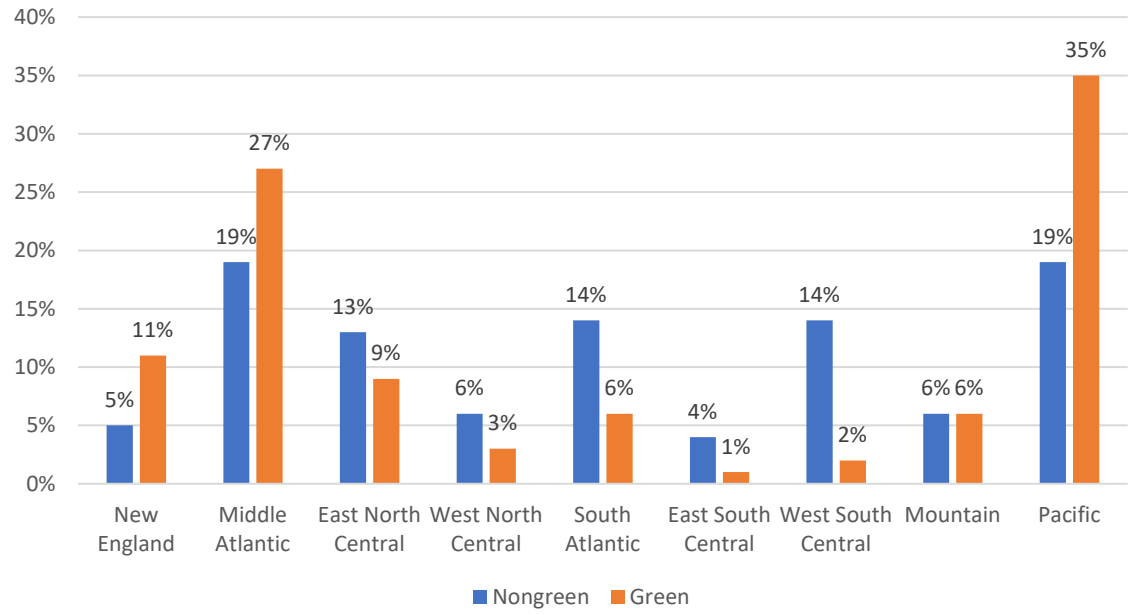


Source: Authors' analysis of data from the Mergent Municipal Bond Securities Database

uncertainty into the economy and bond market; however, green bonds continued to grow to $18.7 and $27.8 billion in 2020 and 2021, respectively.[3]

Despite this growth, the state and local government green bond market still accounts for a relatively small portion of the total bond market. In 2021, the amount of state and local government green bonds issued was about six percent of the total volume of state and local government bonds issued that year.

Figure 4. Location of Non-green vs. Green Issues 2013-2021



Source: Authors' analysis of data from the Mergent Municipal Bond Securities Database

To learn more about the characteristics of the state and local government green bond market, we compared green bonds versus non-green bonds. (Non-green bonds include all bonds without the "green" bond designation.) Water and sewer projects account for the largest portion of state and local government green bonds (see Figure 2). These projects account for 30 percent of green bonds, compared to only 8 percent of non-green bonds. Similarly, mass transit accounts for 24 percent of green bonds compared to 1 percent of non-green bonds. The next highest categories are general purpose (including buildings) and other (both at 11 percent); however, these two categories account for a much higher percentage of non-green bonds (29 percent and 27 percent, respectively).

As shown in Figure 3, refunding bonds account for close to half of green (49 percent) and non-green bonds (53 percent). Since the projects have already been undertaken, the issuance of green bonds for refunding purposes does not directly result in new projects that benefit the environment. Presumably, the issuers are classifying these bonds as green on the basis of the nature of the projects that were initially financed with the bonds being refunded.

The largest volume of non-green bonds was issued in the Middle Atlantic and the Pacific regions, which accounted for 19 percent each (see Figure 4). These two regions also accounted for the largest portion of green bonds, but at higher levels – 27 percent and 35 percent, respectively. New England and East North Central were the next highest regions for green bonds. The New England region accounted for a higher percentage of the green bonds than the non-green bonds (11 percent compared to 5 percent). The East North Central region accounted for fewer green bonds than the non-green bonds (9 percent compared to 13 percent).

To examine the evolution of state and local government green bonds, we compared those issued in 2013-2017 and those issued in 2018-2021. Water and sewer and mass/rapid transit account for the largest categories in early and more recent periods (see Figure 5). However, water and sewer decreased as a percent of the total (from 39 percent to 26 percent), while

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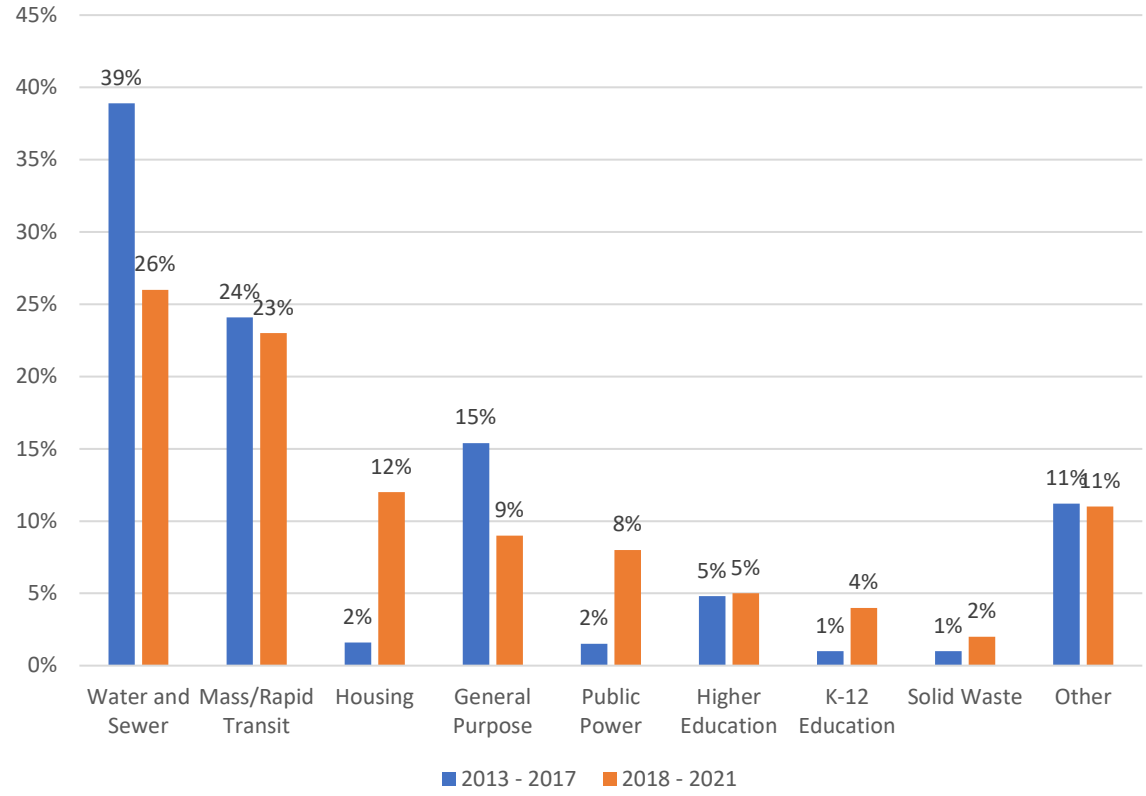
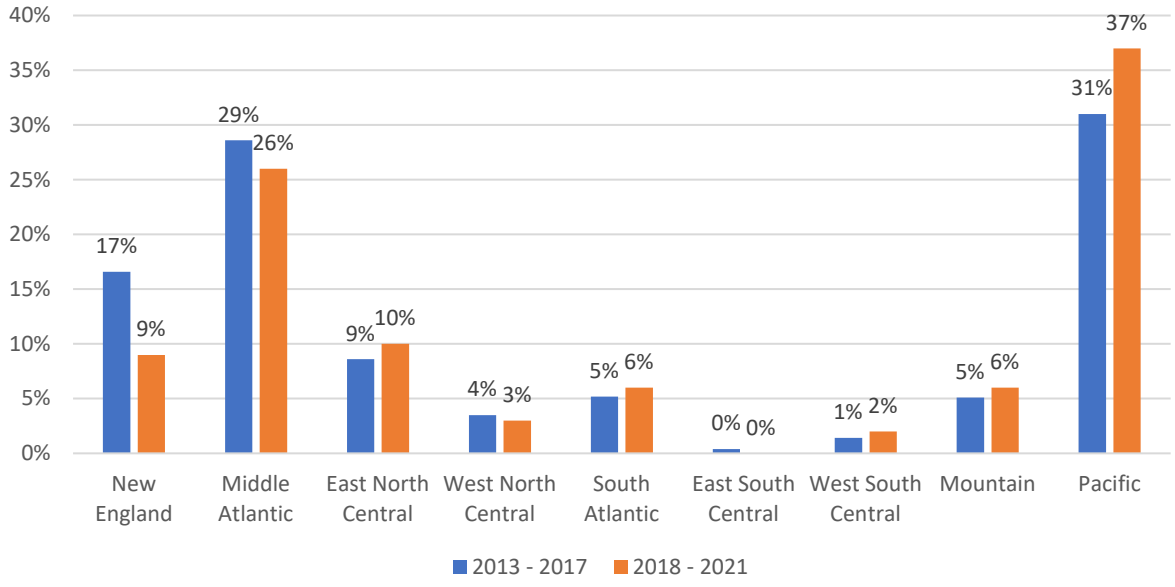
Figure 5. Use of Bond Proceeds for Early vs. More Recent Green Bonds



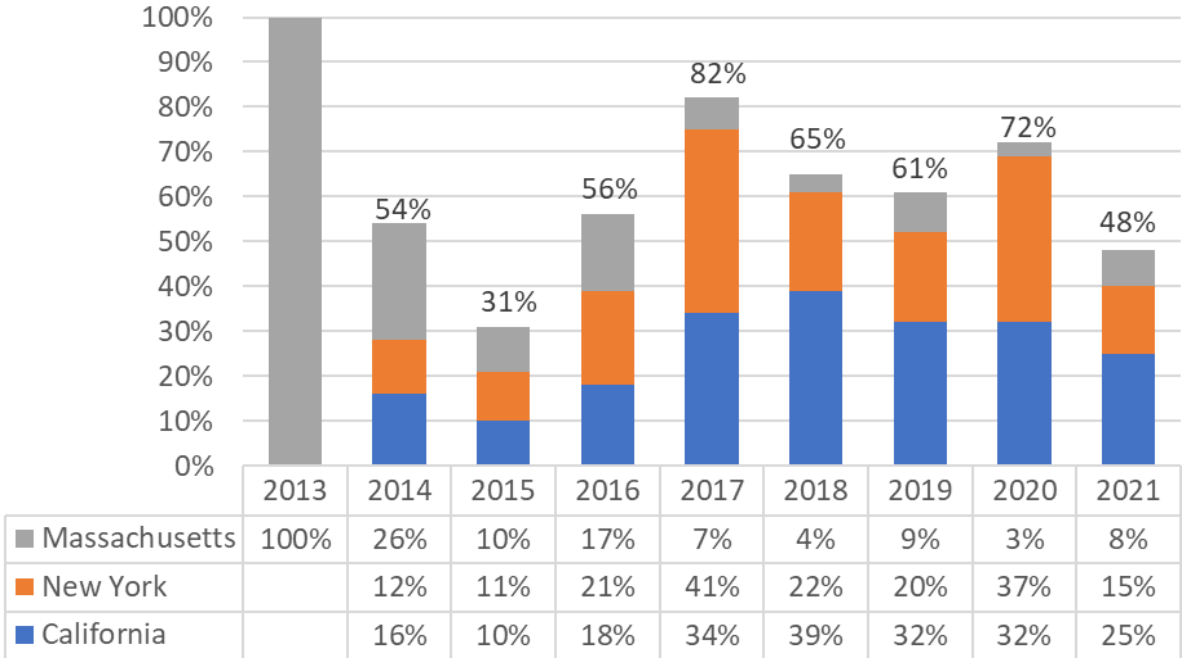
Source: Authors' analysis of data from the Mergent Municipal Bond Securities Database

Figure 6. Location of Early vs. More Recent Green Bond Issuers



Source: Authors' analysis of data from the Mergent Municipal Bond Securities Database

Figure 7. Percent of Municipal Green Bond Volume Attributed to Three States



	2013	2014	2015	2016	2017	2018	2019	2020	2021
Massachusetts	100%	26%	10%	17%	7%	4%	9%	3%	8%
New York		12%	11%	21%	41%	22%	20%	37%	15%
California		16%	10%	18%	34%	39%	32%	32%	25%

Source: Authors' analysis of Data from the Mergent Municipal Bond Securities Database

mass/rapid transit remained about the same (24 percent compared to 23 percent). Green bonds issued for housing increased from 2 percent to 12 percent and green bonds for public power increased from 2 percent to 8 percent. Refunding bonds accounted for about half of the green bonds in the early (52 percent) and more recent periods (48 percent).

From a regional perspective, the largest amount of green bonds issued occurred in the Middle Atlantic and Pacific regions in both the early and more recent years. The Pacific states accounted for 31 percent in the early period and increased to 37 percent in recent years. The Middle Atlantic states accounted for 29 percent in the early period and dropped a bit to 26 percent in the more recent years. The largest change occurred in New England, which accounted for 17 percent of the green bonds in the early period but decreased to 9 percent in the more recent period.

Three states (California, New York, and Massachusetts) accounted for one-half or more of the amount of state and local government green bonds issued in seven of the nine years in the period 2013-2021 (see Figure 7). From a dollar perspective, the market is dominated by large issuers. The five largest issuers during 2013-2021 accounted for about one-fourth of the total municipal green bonds issued, and the 10 largest issuers accounted for 37 percent of the total. The five largest issuers during this period were the (1) Metropolitan Transportation Authority in New York, (2) New York State Housing Finance Agency, (3) San Francisco City and County, (4) Massachusetts State Water Resources Authority, and (5) Indiana State Finance Authority.[4]

The distribution of green bonds by dollar amount issued masks the diffusion of green bond issuance by state and local governments. The number of states with one or more state or local government green bond issuance(s) in a particular year has increased over time (see Table 1). During the first five years (2013-2017), the highest figure was 22 states in 2017. That figure nearly doubled to 39 states in 2021.

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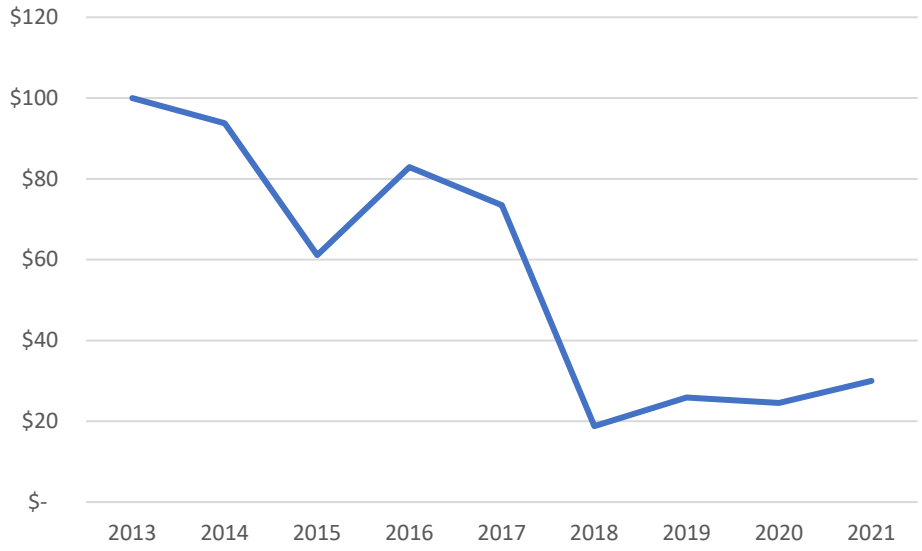
Table 1: State and Local Government Green Bond Issues, 2013-2021

Year	No. of States with at Least One Green Bond Issue	No. of Unique Green Bond Issuers
2013	1	1
2014	11	13
2015	20	32
2016	21	42
2017	22	48
2018	26	55
2019	33	98
2020	37	137
2021	39	213

Source: Authors' analysis of data from the Mergent Municipal Bond Securities Database

Figure 8. Median Size of the Municipal Green Bond Issue by Year, millions



Source: Authors' analysis of Data from the Mergent Municipal Bond Securities Database

The number of unique green bond issuers also has increased. During the first five years, the highest number of unique green bond issuers in a year was 48. In 2021, 213 unique state and local governments issued green bonds. The median size of the green bond issue also has declined over time, from $94 million in 2014 to $30 million in 2021 (see Figure 8).

Early Green Bond Issuers

Next, we take a closer look at the early green bond issuers. We focus on what motivated these issuers to issue green bonds, how they decided which projects qualified as "green," and the extent to which they used external verifiers or incorporated additional environmental reporting. As previously discussed, this information was obtained from interviews conducted primarily in

Table 2. Major Themes from Interviews in 2015 and 2016 with Early Issuers of Green Bonds

Motivation for Issuing Green Bonds	Who Initiated the Ideas to Issue Green Bonds
Desire to attract more investors	Underwriter
Consistent with organization's goals	Finance director
Provide leadership in the market	Elected official
Identification of a Green Project	**Types of Projects**
Review of what other issuers have done	Water, wastewater, stormwater
Internal review: finance officials, engineers	Buildings (LEED certification)
Input from underwriters	Public transit
Some entities say all their projects are green	Others
Other entities take a conservative approach	
Results	**Ease of Administration**
Sold all the bonds (with the exception of one issuer)	Not much different from other bonds
Attracted new investors	New challenges for some issuers
No interest savings (with a couple of exceptions)	
Favorable press coverage	
External Verification	**Reporting of Environmental Metrics**
Not used by most of the interviewees (costs, not needed due to the nature of the projects)	Limited reporting of environmental impacts
A few received Climate Bond certification	More common if large issuers or Climate Bond certified
	Some issue post-issuance reports on the use of bond proceeds

2015 and 2016 with government officials involved with the issuance of green bonds from 2014 through 2016. (See Table 2 for a summary of the interview findings.)

The interview findings suggest that there were two major motivators for the issuance of green bonds. The first relates to an environmental-related mission or goals. Comments included: "It aligns with our mission," "We have an aggressive goal regarding sustainability," and "Our government prides itself on eco-tourism, including being green." The other explanation was that governments issued green bonds to increase the number of investors. One issuer stated that their underwriter recommended green bonds, adding that "our underwriters know we encourage underwriters to include good ideas and marketing." Several other issuers also mentioned that underwriters had either initiated the idea or supported the issuer's proposal to issue green bonds.

When interviewees were asked how they identified which projects to finance with the green bonds, their responses varied, ranging from "everything we do is green" to "we selected the greenest of the green." The former response came from several issuers focusing on water or wastewater projects. But other issuers, including some water/wastewater issuers, took a more granulated perspective. One indicated that the engineers validated which projects were "green."

Some of the early issuers also noted that they solicited input from their underwriters or studied how prior green bond issuers had defined green projects. The desire for the "greenest of the green" reflected the sentiment that other projects might be green but were not as easy to justify. That person noted that the government might need an external verifier for those other projects.

The interviewers provided some examples of projects that were further analyzed as to whether they qualified as "green." For example, a public transit government assessed whether the following would qualify as green: parking lots for mass transit commuters to park their vehicles, parking lots to park train cars when unused, and art in mass transit facilities. They concluded that the first two items qualified as green projects, but the art did not.

Another issue was whether refunding bonds should qualify as "green." The perspectives of the interviewers varied. Some thought the answer was yes if the original financed projects would qualify as green. Others thought refunding bonds were questionable because they were not adding any new environmental benefits.

Most of the government officials who were interviewed said they did not use an external party to verify the greenness of the projects. Responses included "ours were green," "an external review is good if a government has sufficient funds – we don't," and "if investors do not trust us as issuers…" Some of the interviewees said their government opted for an external reviewer. One explained: "Our underwriter said investors value this." Another said: "A private firm helped us identify criteria to select capital projects and then certified those projects."

Information about the nature of the green bonds and their impact also varied among the early issuers. Most of the issuers included information prior to the issuance about the nature of the projects to be financed by the green bonds. Some official statements referenced the Green Bond Principles, but little information was provided about the estimated environmental impacts of the projects.

Post-issuance reporting beyond the normal disclosure reporting for municipal bonds was limited. When it was included, it usually said that the issuer would identify which projects had been funded through the green bonds until all the bond proceeds had been spent. There typically was little mention of follow-up reporting on the environmental impacts.

However, there were exceptions. DC Water, for example, included a letter from an independent sustainability consultant in the official statement for its green bonds. The letter included ESG information about the issuer and the types of post-issuance green bond performance metrics that would be used. This included measures such as the removal of nitrogen, phosphorus, and suspended solids and the percentage reduction in combined sewer overflows (District of Columbia Water and Sewer Authority, 2014).

When reflecting on the issuance of the green bonds, most interviewers said that the additional work was not overly burdensome. Some described the process as being the same as normal, noting that they had already set up accounts to track projects and the use of proceeds. Others said more work was involved in getting all the stakeholders on the same page, segregating and tracking the bond proceeds, and marketing the green bonds. One added that the process involved more participation by the engineers and got the engineers and finance officials to communicate more with each other.

Most of the interviewees said they would consider the issuance of green bonds in the future. Some said they attracted a few new investors and had strong demand overall. However, one issuer said their green bonds were undersubscribed, commenting that might have occurred due to the issuer's relatively low credit rating. Most said that the green bonds did not result in

lower interest rates, with one stating: "There was not much benefit at this time – this is an immature market." Another interviewee whose government-issued green and non-green bonds simultaneously said there was no pricing difference. A couple of issuers commented that there may have been some interest savings. Several commented on the positive public relations due to issuing green bonds.

External Verification and Disclosure Among More Recent Green Bonds

The interviews with the early green bond issuers in 2015 and 2016 found relatively low use of external verifiers and limited reporting of environmental metrics. To assess how much this may have changed over time, this section reports on the findings from a review of a sample of 113 official statements for state and local government green bonds issued during 2021, 2022, and 2023.

The review found increased use of external verification. About 62 percent of the bonds in the sample had some type of external verification, including about 15 percent with a climate bond verification and an additional 47 percent with a second-party opinion or other external verification. While the interviews with the early issuers found that external verification was restricted mainly to large issuers, external reviews have now gained traction among mid and smaller issuers. This may be attributable, at least in part, to the bond insurance company that provides a free review for eligible bonds that the firm insures. About 60 percent of the green bonds in the sample with a second-party opinion received that opinion from that bond insurance company.

Almost all official statements referenced the Green Bond Principles, especially pillar one, which refers to using proceeds. About 80 percent of the official statements referred to at least one of the United Nation's sustainability goals. The goals most frequently cited goals were #6 Clean Water and Sanitation; #9 Industry, Innovation, and Infrastructure; and #11 Sustainable Cities and Communities.

The level of detail on the nature of the projects to be financed varied. Some official statements referred to broad uses such as water or wastewater systems, while others referred to particular types of projects (e.g., water pumps, meter systems, pipes for transmission, collection, or distribution). About 45 percent of the green bond issues in this sample used the bond to refund bonds or refinance projects previously financed with general revenues or commercial paper. This reduces the risks associated with bond proceeds being redirected for other projects but as discussed previously, does not directly result in new environmental benefits.

Some official statements included a disclaimer noting that there was no guarantee that the use of bond proceeds would conform with future revisions in the Green Bond Principles. Some statements used tentative language regarding reporting. For example, one issuer said it would report on metrics "when feasible," and another said it would provide a report "when feasible."

Most of the green bond official statements included little, if any, environmental metrics on the expected benefits of the projects. However, there were exceptions, primarily among bonds used to finance public transit, efficient buildings (such as higher education buildings), or some water projects. Bonds that received the climate bond certification also included more environmental metrics than most other bonds.

Many official statements did not mention post-issuance disclosure specifically related to the green aspects, but there were some exceptions. Of those that did mention post-issuance reporting, the most common provision was that the issuer would disclose information on the use of proceeds until the bond proceeds had been spent. For green bonds that were being used for

buildings, such as higher education facilities, some said they would post the LEED certification later. Some noted that the issuer already had a LEED certificate on the building. Some also indicated that an external party would prepare or verify a report that would be released 24 months after the issuance discussing the environmental impacts.

Some official statements indicated that the issuer would provide information about the project's environmental impacts post-issuance. For example, the Buffalo Sewer Authority issued green bonds to finance its Rain Check Projects, which include green infrastructure to minimize combined sewer overflow events. The projects include installing tree planters, rain gardens, permeable pavement, and underground infiltration. The official statement said the authority would be measuring, verifying, and publicly reporting the environmental benefits of the funded projects. The authority designated its 2021 green bonds as environmental impact bonds (within the broader green bond designation) and included an outcome threshold target for 2028. If the authority meets that threshold (subject to independent verification), it can call the bonds seven years after the original issuance (Buffalo Sewer Authority, 2021).

Some green bond issuers, particularly larger ones, have websites containing information about their environmental/sustainability goals and projects. For example, the New York Metropolitan Transportation Authority (MTA), which is by far the largest state and local government green bond issuer in the United States, has a website that describes its climate sustainability and resiliency goals, related projects, carbon accounting, and its use of climate bonds (MTA, 2024). The MTA provides an annual statement on its website and in the Electronic Municipal Market Access database certifying that it complies with the climate bonds standards and other provisions of the CBI-certified climate bonds.

Conclusion

The municipal green bond market has continued to evolve since its inception in 2013. Our research found that the volume of bonds issued, the number of states with green bond issuers, and the number of unique bond issuers per year have increased over time. Other major changes include a growth in the use of green bonds for housing and public power, a decline in the size of the median green bond issue, and an increased use of external verifiers. Areas that have not experienced as much change include the continued dominance of large issuers (particularly in New York and California), the use of about half of the green bond proceeds for refunding bonds, and the limited reporting of environmental impacts.

Our findings suggest that the green bond market for state and local governments will likely continue to grow; however, uncertainty remains in key areas. Will the United States adopt green bond standards? Will the use of external verifiers continue to expand? Will reporting of environmental impacts increase or remain the same? Moreover, how will current sentiments about ESG impact the state and local government green bond market?

Although the role and expectations of investors were beyond the scope of our analysis, this area is ripe for future research. Investors will likely play a major role in how the state and local government green market continues to evolve. Future research could address the types of environmental information investors want and whether they would be willing to accept a lower return in exchange for increased evidence/verification of positive environmental impacts.

Another important issue concerns additionality. Are green bonds leading to new or expanded environmental projects that would not otherwise happen? Much of what is being

financed with state and local government green bonds, such as water or public transit projects, would likely occur without green bonds. Plus, we found that about half of the green bond proceeds are being used for refunding bonds, which do not result in new environmental benefits. Future research could address the types of changes in the state and local government green bond market that could help facilitate additionality.

Endnotes

[1] Information on the Electronic Municipal Market Access database and can be obtained from emma.msrb.org.

[2] Other municipal ESG bonds include social, sustainability, sustainability-linked, and environmental impact bonds (Principles for Responsible Investment, 2023b).

[3] A report prepared by S&P Global (2024) includes a graph showing the municipal green bond volume at about $22 billion in 2021, significantly lower than the $27.1 billion we report based on the data from the Mergent Municipal Bond Securities Database. We reviewed the data from the Mergent database and observed no double counting or apparent errors.

[4] Recent large issuers include the California Community Choice Financing Authority and the New York Transportation Development Corporation (Statista, 2024).

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