

2019 U.S. Municipal Green Bond & Resiliency Outlook: Will The Self-Labeled Market Rebound?

March 14, 2019

Key Takeaways

- U.S. 2018 self-labeled green bond volume was far lower than the two prior years, but the number of issues saw a decline more in line with the municipal bond market generally, and the number of new issuers was consistent with 2016-2017.
- The U.S. self-labeled municipal green bond market is still heavily concentrated, with the top-ten issuers representing half of total volume in the last five years. In our view, consistent market growth will be contingent on the entry of new issuers across different sectors and geographic regions.
- We expect sustainable-labeled financing--including green bonds--to continue to grow as issuers incorporate broader sustainability considerations into their investment decisions.
- Green labels aside, we believe a large portion of the municipal market finances infrastructure with environmental benefits and is significantly larger than the self-labeled market.
- Though recognition of risks and costs involving climate change and disastrous weather-related events will continue to increase for many U.S. municipal issuers, we believe the high costs and lack of clear funding streams will constrain the number of issuances for adaptation projects in the near term.

The U.S. municipal market for self-labeled green bonds bucked global trends in 2018 and declined for the first time since 2013, although this was in line with broader volume decreases in public financings reflecting tax law changes, which eliminated the ability of issuers to advance refund existing debt. For market participants concerned about "additionality" (i.e., labeling the refinancing of green assets also as "green" without a corresponding net increase in environmental benefits), the U.S. tax code change may be viewed positively.

If the U.S. self-labeled green market has reset at a new baseline like the broader municipal market, the big question is where does it go in 2019? S&P Global Ratings anticipates the use of self-labeled green bonds will grow in 2019 as more issuers look to credential eligible financing to meet policy objectives and tap into a broader investor base that focuses on sustainability. However, our outlook is less certain over the longer term, as other types of sustainable-labeled

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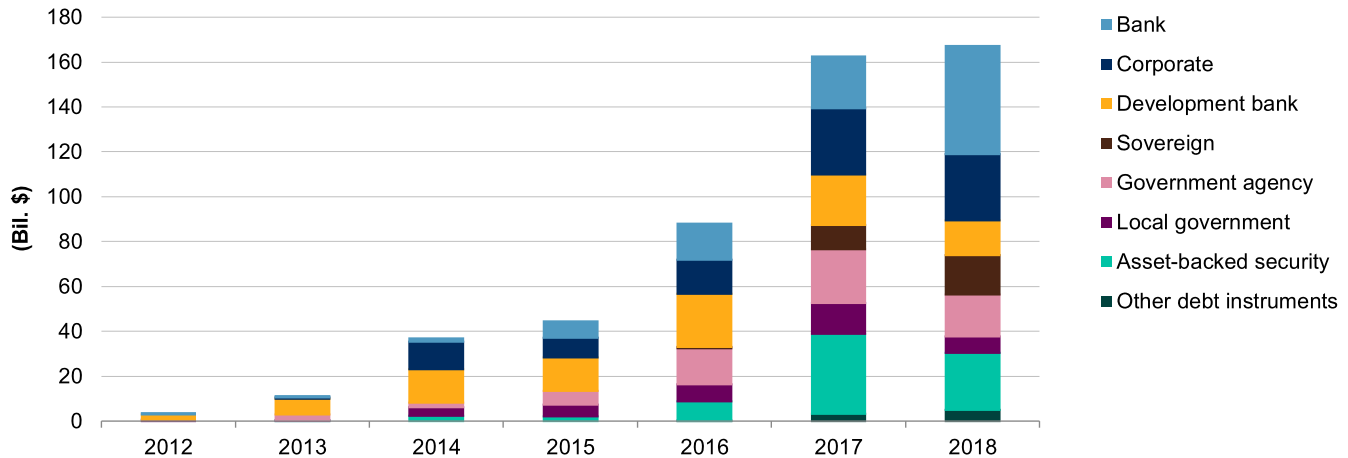
financings may replace green-labeled financings as issuers incorporate broader sustainability considerations into their investment decisions. Uncertainty regarding the presence of a clear pricing advantage for issuers to sell labeled green bonds in the U.S. municipal market, and asset-level reporting requirements will also likely continue to limit further green issuance. The extent to which investors will look beyond labels and to a project's measurable environmental or resiliency benefits--in a segment of the fixed-income market that almost inherently finances green infrastructure--remains to be seen.

State Of The Global And U.S. Corporate Green Market

As apparent from two months' hindsight, 2018 was a bit of a rebuilding year for green bond growth. Global growth in annual green bond issuance slowed to 3% in 2018, from 85% in 2017 (see chart 1); for more information, see "Green Finance: Modest 2018 Growth Masks Strong Market Fundamentals For 2019" (published on Jan. 29, 2019, on RatingsDirect). In the U.S., the slowdown in new green-labeled issuance from U.S. municipalities mirrored that in the broader U.S. fixed-income market, following in part from the revision of the U.S. tax code in late 2017 (the Tax Cuts and Jobs Act of 2017 effective Jan. 1, 2018), which reduced an issuer's ability to refinance existing debt. However, contraction in local government green bond volume was more than offset by growth in financial institutions, which saw a strong increase in the number of new issuers as well as the total amount of issuance.

Chart 1

Annual Green-Labeled Issuance By Issuer Type



Source: Climate Bonds Initiative.

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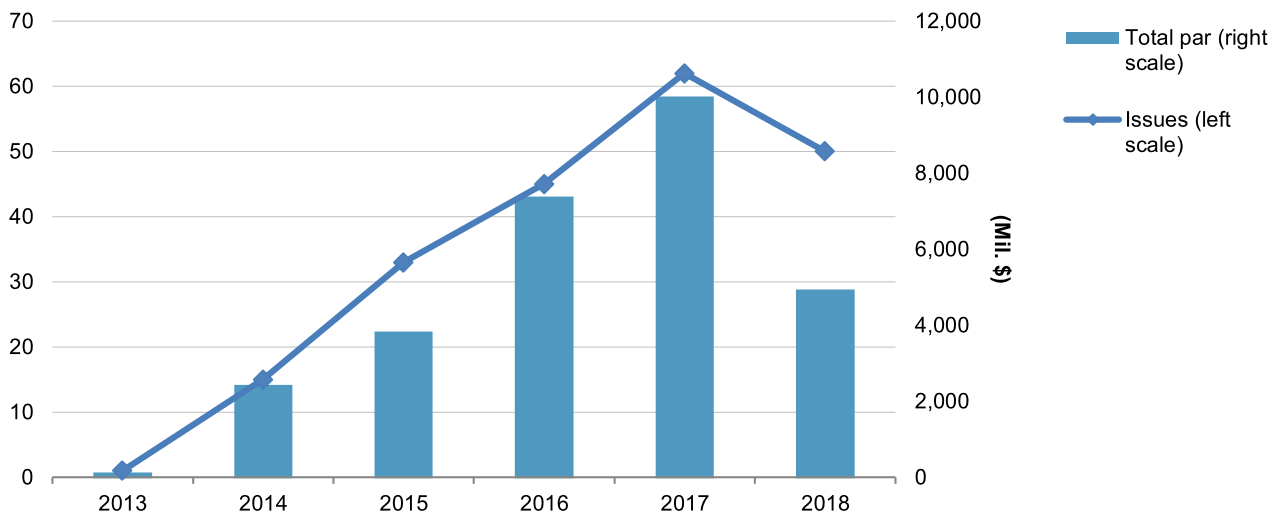
One factor we believe may be material to the green bond market trends observed in 2018 is the past year's expansion of the market for bonds carrying the "sustainability" label. We believe sustainability bonds appeal to many issuers, given the broader umbrella of environmental, social, and governance (ESG) purposes they may be issued for, and given the appeal to many investors interested in aligning their investments with not only environmental, but also social benefits.

State Of The U.S. Municipal Green Market

The headline for the 2018 municipal green bond market may appear to be the sharp decline in the total par amount issued compared to the prior year—a contraction far steeper than the decline in the total municipal market (see chart 2). After nearly \$10 billion in issuance in 2017, total par declined to \$4.9 billion in 2018—a 50% drop from 2017 and 33% less than was issued in 2016.

Chart 2

U.S. Municipal Green Bond Issuance - Par And Issues



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However, this headline belies more of a mixed story. While the total volume halved, the number of green bond issues declined less than 20%, and the number of unique issuers of green bonds fell less than 15%. These declines are much more in line with overall municipal market trends, which we believe largely reflected changes in the tax code that eliminated tax-exempt advanced refundings.

A Note On The Sample

Our sample includes those bonds registered as green bonds by the Climate Bonds Initiative, municipal bonds that received Green Evaluations by S&P Global Ratings, and other self-labeled green bonds identified by S&P Global Ratings based on our review of offering statements.

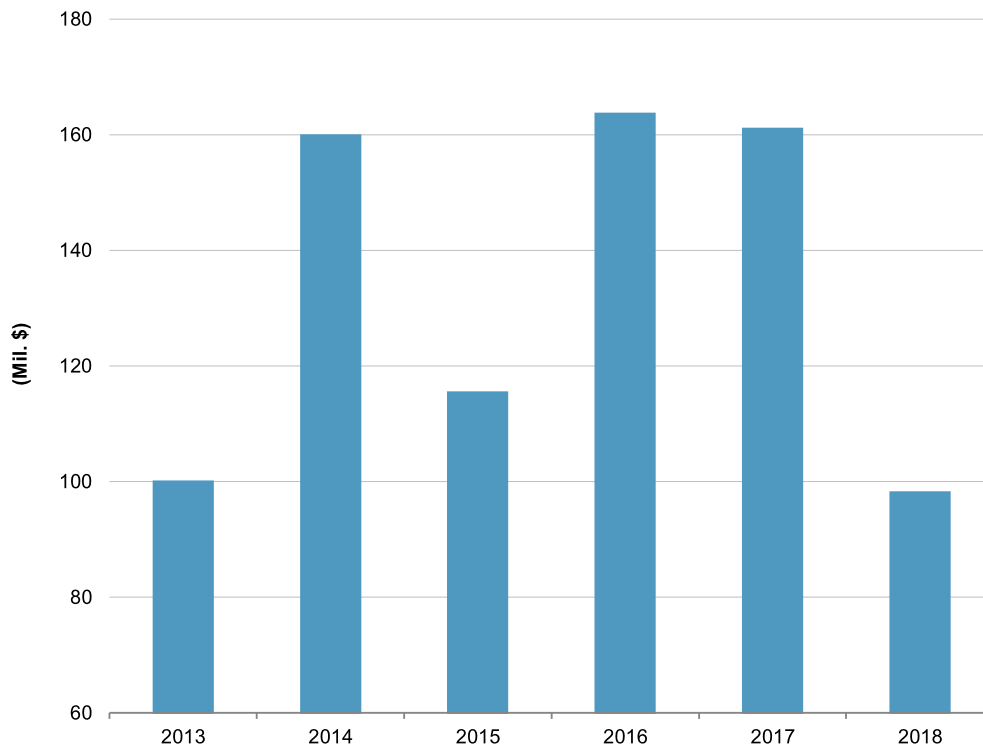
While the total volume halved, the number of green bond issues declined by less than 20%, and the number of unique issuers of green bonds declined by less than 15%.

The average par for green bonds issued by U.S. municipal issuers in 2018 was less than \$100 million, in contrast to average par greater than \$160 million in recent years, and the smallest average figure since we started tracking the municipal green market. Our research finds that a

decline in the amount and size of a small number of mega-issues drove this trend. By our count, there was one green issue with a par amount over \$500 million in 2018 (the same as 2015), in contrast to three such issues in 2016 and 2017. Given the relatively small size of the market, the presence or absence of these mega-issues can make for a large variance in its overall size.

Chart 3

U.S. Municipal Green Bonds - Average Par



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The Municipal Green Market Is Still Very Concentrated

The U.S. municipal green bond market remains very concentrated among a handful of issuers in a handful of sectors. The top 10 issuers (by total par amount) over the past five years represented more than 50% of green municipal issuance in that period. The New York Metropolitan Transportation Authority (MTA) represents nearly 20% of the municipal green bond market over the past five years. Given its outsized role in that market, we note that MTA's substantially lower green bond issuances were another major source of the market's volume decline in 2018. In 2018, the authority issued just \$207 million in green bonds, in contrast to \$1.4 billion in 2016 and \$3.7 billion in 2017.

Table 1

Top Ten Green Bond Issuers In U.S. Public Finance, 2013-2018

	Number of issues	Par (mil. \$)	Percentage of par
New York MTA	9	5,267	18%
Central Puget Sound Transit Authority	2	1,343	5%
Indiana Finance Authority	9	1,315	5%
California Infrastructure and Economic Development Bank	3	1,310	5%
San Francisco Public Utilities	6	1,187	4%
Massachusetts Water Resources Authority	4	1,063	4%
Los Angeles	6	960	3%
New York State Housing Finance Agency	10	954	3%
Denver City and County Department of Aviation	1	922	3%
Iowa Finance Authority	3	832	3%
Other	153	13,407	47%

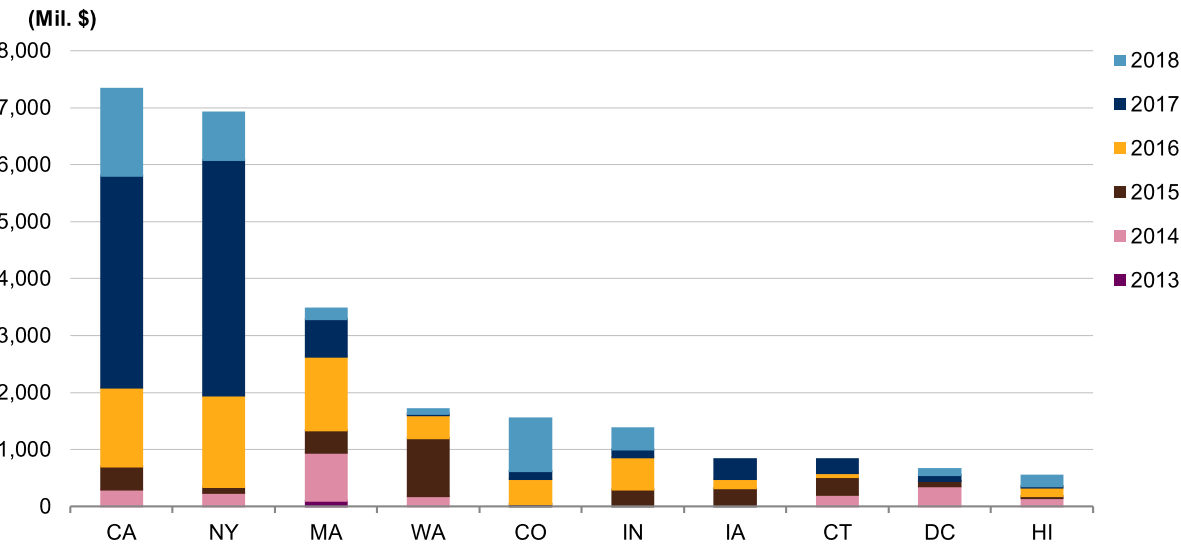
The largest issuers are mostly in coastal states, including California, New York, Massachusetts, and Washington. This high concentration is in contrast to the much more geographically diverse set of states where at least one borrower has issued municipal green bonds in the past five years. We believe the concentration in coastal states reflects the political, governing board as well as policy support for environmentally beneficial projects. A desire to expand the investor base by large issuers is also a consideration to pursue the green label and seek third-party certification.

Other factors behind the geographic concentration include:

- The presence of major cities in these states, as most of the largest issuers are in major metropolitan areas with substantial infrastructure needs.
- The presence of financial centers which may be more willing to explore new ways of trying new types of debt to attract investors.
- Differences in legislation, such as city-level requirements for municipal projects to include green elements that positively contribute to climate change mitigation or adaptation goals.
- Differences in political culture, where, despite growing public and scientific consensus, there remain parts of the U.S. where policies and projects related to environmentally responsible development are limited or absent from the political discourse.
- Exposure to sea level rise due to coastal locations.

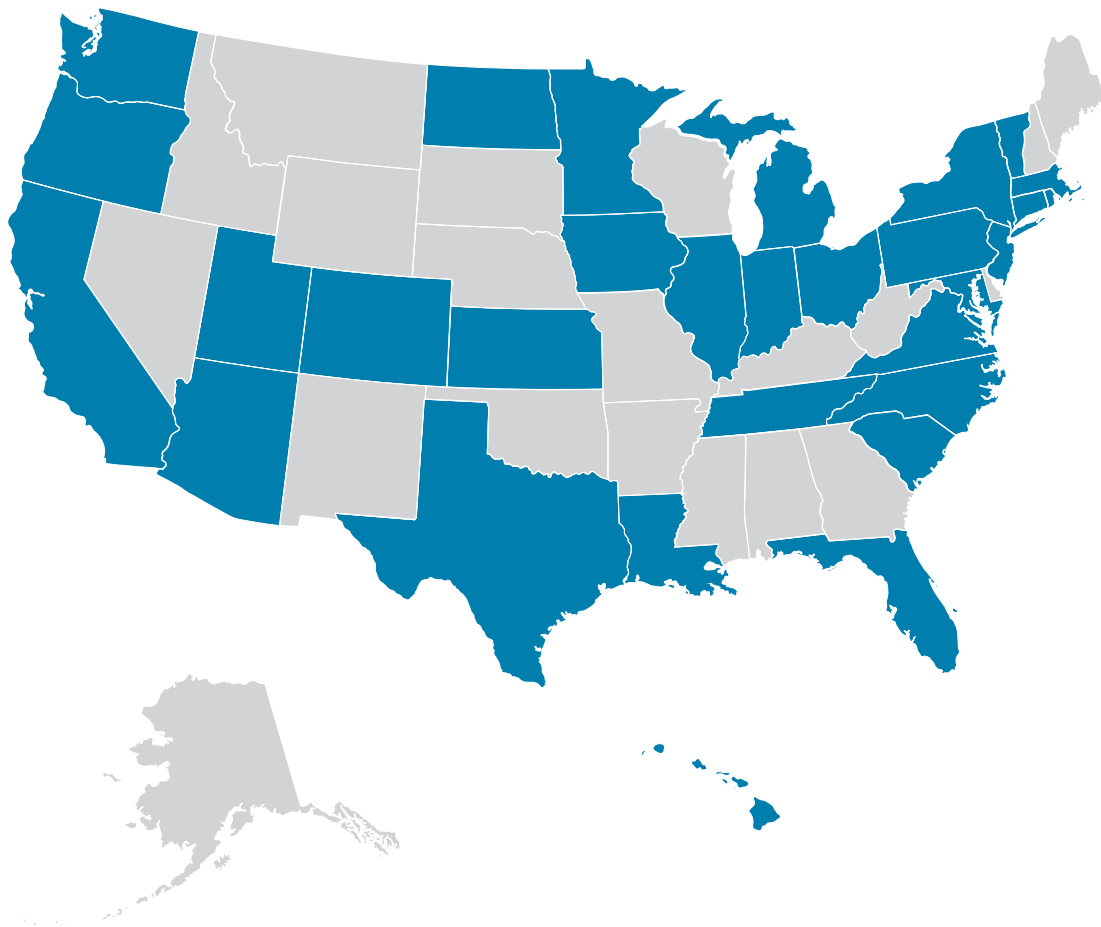
Chart 4

Top 10 States By Par Issued (2013-2018)



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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.

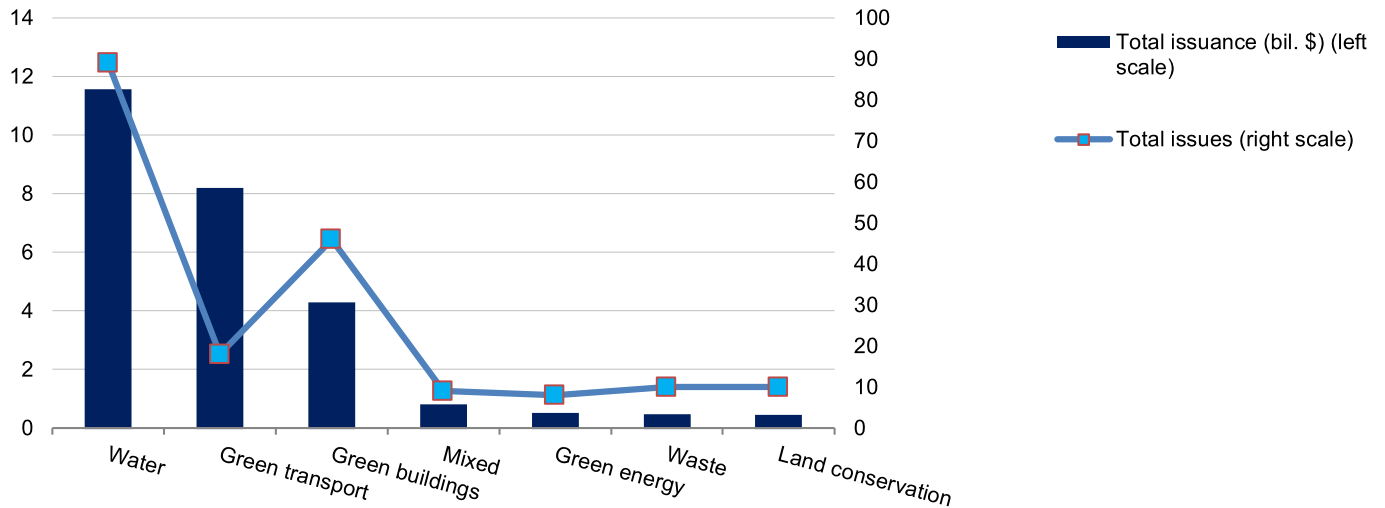
In our analysis, we find that two sectors dominate the municipal green bond market: transportation and water infrastructure (the latter includes drinking water, wastewater, and stormwater as many financings fund projects in more than one of these three subsectors). This differs from the global green bond market, where green energy has seen the most issuance. While the U.S. public and cooperative power market has been moving away from coal-fired plants and replacing that generation with primarily natural gas and renewable sources of generation, almost all renewable sources of power are constructed and owned by taxable private entities due to the presence of tax incentives. Publicly owned power distributors may purchase power from these investor-owned or independent power producers entities.

This concentration in water and transportation holds true both for the market's major issuers, as well as for the market overall. The names of the issuers may make the sector distribution appear more diverse than it actually is. For example, the Indiana Finance Authority, California Infrastructure and Economic Development Bank, and Iowa Finance Authority have names that suggest they would fund projects in multiple sectors--and some of them do. However, our

analysis finds that these entities primarily issued green bonds for state revolving funds to make loans to public water and sewer utilities for capital investment projects.

Chart 6

Green Bond Issuance And Number Of Issues, 2015-2018



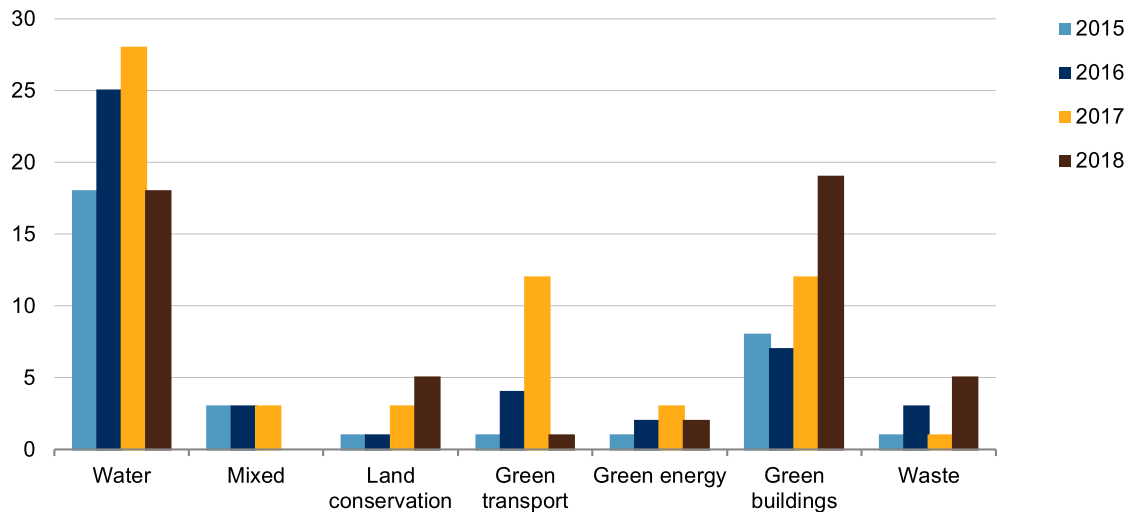
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Since 2015, water and wastewater projects have dominated the municipal green bond sector, both in terms of the number of issues and volume. Many other sectors, such as green energy, waste, and land conservation, have seen consistent issuances, but marginal volume. While the transportation sector had a very strong 2017, with almost \$5 billion in issuance, that year appears an anomaly in hindsight. After 12 separate transportation sector issues in 2017, there was only one in 2018. In contrast, growth in the green buildings sector appears a little more consistent, particularly in terms of the number of issues.

The municipal green bond sector has been dominated by water and wastewater projects.

Chart 7

U.S. Municipal Green Bond Issuance By Sector (2015-2018)



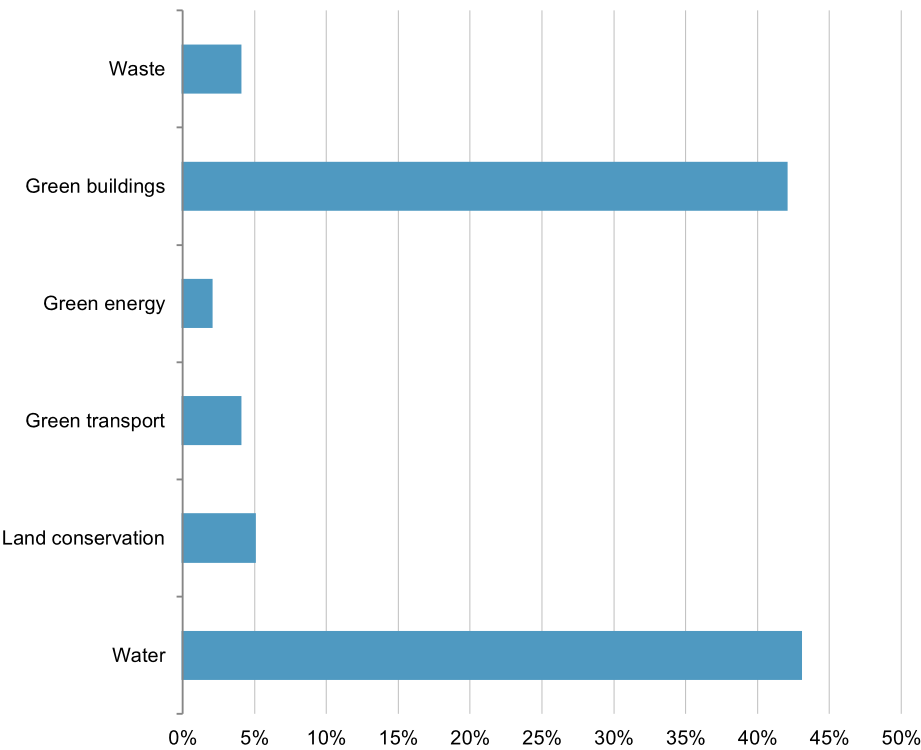
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The green buildings sector saw the largest number of issues and highest par amount of all green bond sectors in 2018. This represents the first time any sector has surpassed the water and wastewater sectors in both volume and number of issues. Further, unlike the highly concentrated 2017 growth in green transportation bonds, these bonds funded green buildings constructed by a wide variety of issuers, including municipalities, economic development and housing authorities, a hospital, a university, and an airport.

If growth in the green buildings sector continues, combined with continued but irregular transportation mega-issues, we would expect water, transportation, and green buildings to eventually become more equal participants in the municipal green market. However, without the expansion of the issuer pool, annual results will continue to have markedly different profiles.

Chart 8

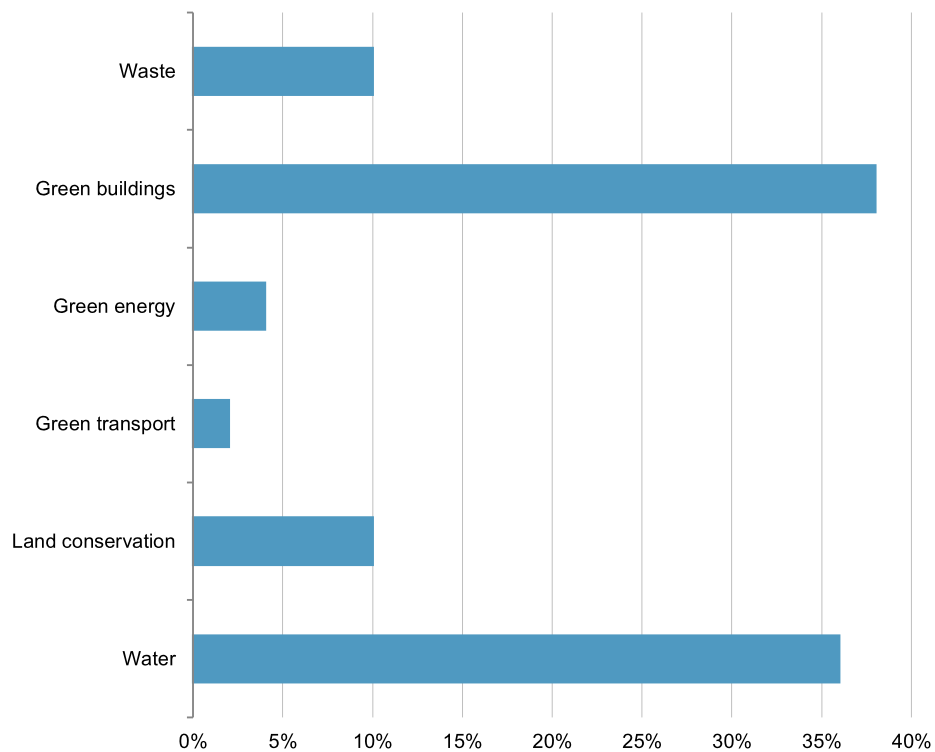
U.S. Municipal Green Bond Issuance (2018) By Par



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Chart 9

U.S. Municipal Green Bond Issuance (2018) By Issues



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Another type of diversity is the credit quality of the issuer, and in 2018--partly due to the diminished presence of some of the market's large, highly rated issuers--the market included a higher proportion of mid-investment-grade issues in contrast to the historical dominance of high-investment-grade ones. While we consider it too early to consider this a trend, we will continue to monitor the creditworthiness of issuers and green issuance to see if there is more diversity as the green market continues to develop. We believe that this could also be a factor in whether a pricing advantage for green bonds emerges over time, as the growth of the green bond market has coincided with a strong period in the credit cycle. As the credit cycle progresses, market participants will be eager to observe whether green bond spreads widen and whether evidence for a clear pricing differentiation emerges.

Self-labeled green issuance and the challenges of understanding pricing of green vs non-green

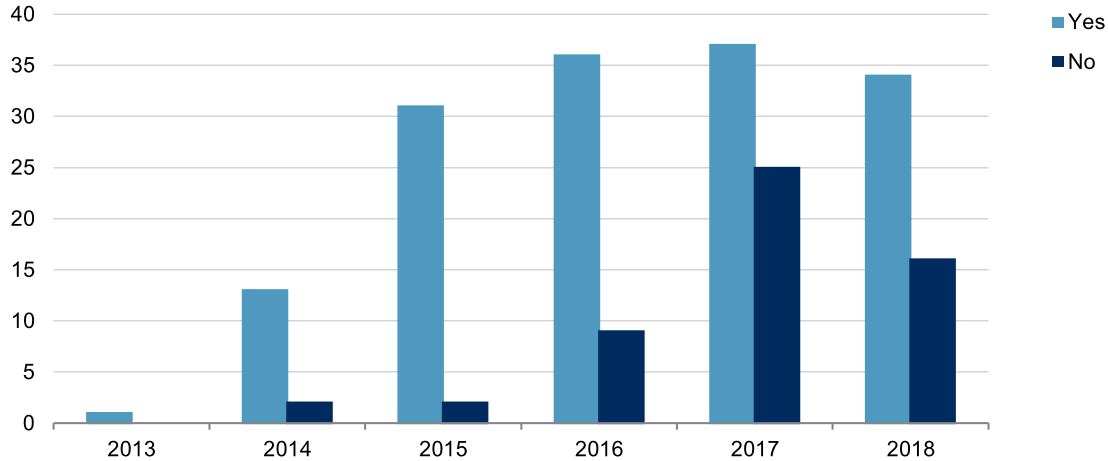
Disclosure has been one of the green market's greatest challenges. Based on our conversations with issuers, the absence of a clear pricing advantage for green bonds is one of the major factors constraining market growth. As stated in "Green Evaluation: Why Corporate Green Bonds Have Been Slow To Catch On In The U.S." (published Feb. 4, 2019), the evidence for a green premium—the "greenium"—remains anecdotal and inconsistent, particularly when factoring in

If growth in the green buildings sector continues, combined with ongoing but irregular transportation mega-issues, we would expect water, transportation, and green buildings in time to be more equal participants in the municipal green market.

compliance and reporting costs. The municipal market is overwhelmingly made up of obligors that exist for providing basic social and public goods, such as infrastructure. The additional costs associated with greater disclosure requirements and required to obtain external certification can be difficult to justify given that municipal and cooperative issuers have a public interest in maintaining service affordability. Self-labeled green bonds have lower disclosure costs, but do not provide the same market transparency about the environmental benefit of a given asset.

Chart 10

Total Green Bond Issues With External Review Reports: Municipal (2013-2018)

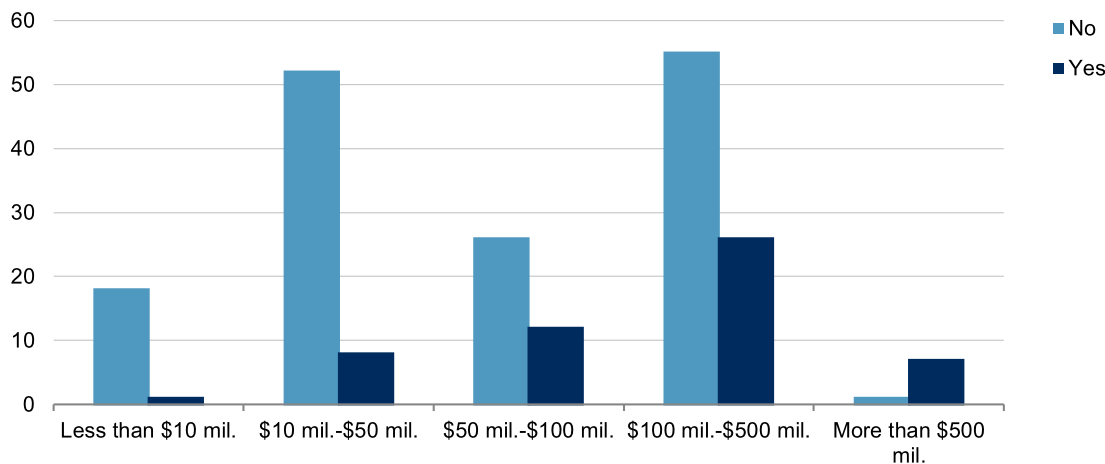


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Despite the obstacles that may complicate the pursuit of third-party verification for municipal green bond issuers, we observed in our report, "2018 U.S. Municipal Green Bond & Resiliency Outlook" (published Feb. 28, 2018) that a rising number of issuers are seeking third-party verification. Although the number declined, there was not a dramatic retreat in 2018. In our view, third-party verification contributes to the development of a more robust and transparent green bond market, which we expect would likely support a broader investor base and enhance marketplace transparency with respect to the greenness of particular issues and assets. While the percentage of issues with external verification did not increase in 2018, it remained strong at approximately 35% issues in our sample, higher than any year besides 2017.

Chart 11

Relative Number Of Green Bonds With External Verification, By Size, 2013-2018



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Further, as the size of the issuance increases, the relative costs of external verification decline, and the potential or perceived relative benefits increase. Of the eight issues over \$500 million, only one did not have some form of external verification--the reverse of what we see in green bond issues under \$10 million. This is also consistent with the slight decline in the percentage and number of issues in 2018 with external verification; as shown above, average par was significantly lower than in the two years prior.

The future of U.S. municipal green bonds

In the long run, we believe that U.S. municipal issuers have a natural advantage in issuing green- and sustainability-labeled bonds. For example, we have previously highlighted the strong alignment between the goals of public water and sewer utilities and ESG principles (see "For Water Utilities, ESG is Just Business as Usual," published Dec. 12, 2018). Local environmental policies will continue to generate growth in the green building sector. One such example is Denver's Executive Order No. 123, which requires all new city buildings and major renovations to achieve LEED Gold certification and adhere to the U.S. Environmental Protection Agency's Energy Star program standards and other applicable best practices for sustainability and energy efficiency.

We anticipate that a very large percentage of public sector construction will be built to meet national or internationally recognized energy efficiency standards. For example, nearly 56% of the \$128 billion in U.S. airport capital needs from 2019-2023 are for terminal development projects. Capital needs associated with climate change adaptation may present another area for future green bond growth in a variety of public sectors, although we believe challenges remain that may inhibit substantial growth in adaptation issuance in the near term.

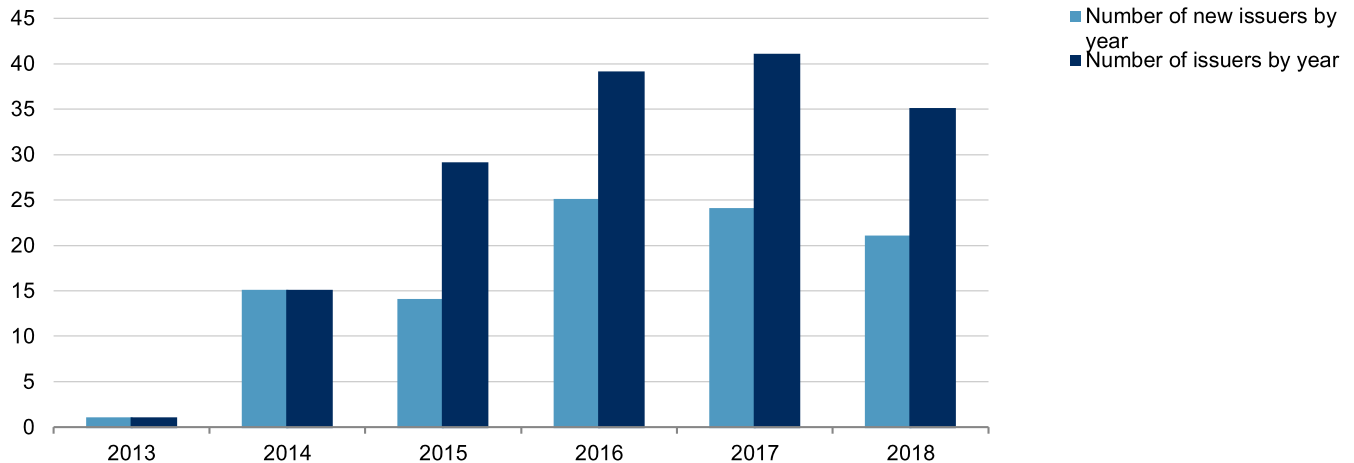
If the U.S. municipal green bond market is going to continue to grow, it will be important for new issuers--diverse in terms of geography, sector, and credit quality--to participate by providing investors the transparency and ongoing disclosure that demonstrate a commitment to

If the green bond market is going to grow, it will require the participation of new issuers who are diverse in terms of geography, sector, and credit quality.

environmental mitigation. Until that occurs, the market will continue to experience high annual variance as major transit and water borrowers meet their capital needs. Even as the total number of issuers participating in the market has increased, the growth rate among first-time issuers has remained stagnant over the last three years; 40% of issuers for the last two years had previously issued green bonds. That said, the number of participants in the market, and the states they represent, has continued to show small growth.

Chart 12

Number Of Green Bond Issuers And New Issuers By Year



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Resiliency Remains In The Headlines

The world keeps warming and with it, the growing awareness that the nation's infrastructure, especially near coastlines, is at risk of costly damage due to the effects of climate- or weather-related events. The economic and financial implications are substantial, as evidenced by the price tags of damage from weather-related events, and the amount of economic assets increasingly concentrated in coastal urban areas.

Adaptation projects improve the resilience of buildings and other infrastructure against the risks associated with extreme weather or longer-term shifts, such as sea level rise in general. As sea levels get higher and storm and wildfire damage intensifies, we expect the motivation for municipal issuers to invest in improving infrastructure resilience through adaptation projects will only increase. The ongoing challenge remains: How will these municipal bodies, many of which are cash-strapped, fund costly adaptive capital improvements?

As sea levels continue to rise and storm and wildfire damage intensifies, we expect municipal issuers to invest more in improving infrastructure resilience through adaptation projects.

U.S. Municipal Market Adaptation Issuances In 2018

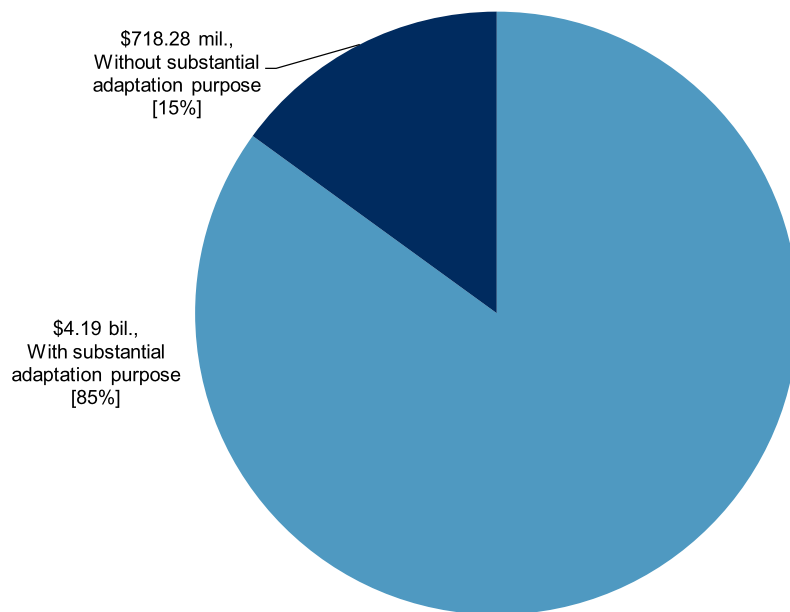
In 2018, labeled green bonds issued to fund mitigation projects once again vastly outweighed those issued for adaptation projects. Our analysis finds that approximately one-fifth of labeled

green bonds issued in 2018 had substantial adaptation components. The nine issuances we identified in 2018 with substantial adaptation components amounted to approximately \$718 million in total par, which was about 15% of the total par of labeled green bonds issued that year (see chart 13).

However, these figures are only estimates as there remain very few labeled adaptation-only issuances. They represent those issuances we identified as having a substantial adaptation component, although in reality, some mitigation issuances undoubtedly have adaptation elements, just as many issuances with substantial adaptation components also include mitigation or nongreen components.

Chart 13

U.S. Municipal Market Adaptation Issues (2018)



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There were six unique issuers for the nine green bond issuances with substantial adaptation purposes in 2018. Stormwater system improvements and coastline protection constitute the primary use of proceeds for these issuances. Specific purposes include expanding stormwater system capacity and reworking drainage systems to reduce the risk of backups that could lead to floods during major storm events. Bonds issued by Tampa, Fla., Columbia, S.C., and Bloomington, Minn. included projects related to these stormwater system improvements.

The Louisiana Local Government Environmental Facilities and Community Development Authority (LCDA) issued three series of green bonds in 2018 with substantial adaptation components, each for a specific parish and primarily for land conservation purposes. LCDA's bonds will be used by three local parishes for projects including river dredging and rock breakwater construction, to

better protect coastal areas in the face of rising sea levels and intensifying storms.

Two of the largest issuances in 2018 with substantial adaptation elements were the Public Utilities Commission of the City and County of San Francisco's (SFPUC) \$229 million series 2018A and \$179 million series 2018C wastewater revenue bonds. The SFPUC issued the bonds to finance a portion of its sewer system improvement program (SSIP), a \$7 billion 20-year capital plan that includes "modify the system to adapt to climate change" among its six primary program goals.

Like some other municipal entities (i.e., Denver, discussed above, and New York, discussed below), SFPUC now counts climate change adaptation or resilience as a design criteria for infrastructure projects. Combined, the SFPUC's two issuances accounted for 59% of the total par amount of green bonds issued with substantial adaptation components in 2018, per our findings. As more municipal entities incorporate design criteria that mandate new build or renovation projects include adaptation or resilience components, the number of issuances with such components will likely increase.

Public risk, public responsibility to fund

Although climate- and weather-related risks threaten private and public sector actors alike, we believe that most adaptation projects will ultimately be the responsibility of state and local governments. We believe that private-sector investment in adaptation infrastructure will likely be limited in scale and focused on protecting specific privately owned assets. Rather, the benefits of adaptive infrastructure can generally be quantified through a benefit-cost analysis that considers avoided future damages (For more on how we evaluate the resilience benefit of adaptation projects, see "Determining The Resilience Benefit Of Climate Adaptation Financing," published Dec. 7, 2018).

In our view, most investment in significant adaptation projects will likely remain within the public sector, because adaptive infrastructure does not typically produce cash flows, and therefore produces limited direct benefits for private investors. In addition, protecting public assets and communities requires broad-based improvements, whether hard engineering like a flood wall or levee protecting a neighborhood or entire city, or soft engineering like early-warning systems and evacuation plans. The broad-based nature extends not only to the benefits but also to the construction or implementation process and costs across a wider swath of assets, and it may be difficult to tie development costs to the parties receiving the benefits.

Expanding dialogue, rising costs

Cities across the country have declared resiliency a priority, and many have implemented plans intended to guide decision-making to incorporate resiliency principles. New York City's Climate Resiliency Design Guidelines provide a standard methodology for planners, architects, and engineers in constructing new or improving existing municipal buildings and infrastructure. Los Angeles established chief resilience officers for over 30 municipal departments to promote the advancement of resilience-related initiatives in departmental planning and operations. The Greater Miami and the Beaches coalition of municipalities is working to articulate resilience priorities and develop specific initiatives to support plans by their communities--which are among the most exposed in the U.S. to rising sea levels--to adapt their infrastructure.

The costliness of maintaining infrastructure that is not resilient to weather-related risks has been made clear through several catastrophic events. Hurricane Katrina hit Louisiana in 2005, New Orleans' levees failed to hold, and billions of dollars in damage occurred. The federal government committed \$14.5 billion to build more resilient levees, but even that staggering investment will

SFPUC's 2018A-C wastewater revenue bond issuance was the largest combined issuance in 2018 with a substantial adaptation component, per our analysis, and its policies require it to design its infrastructure projects to be resilient to climate change risks.

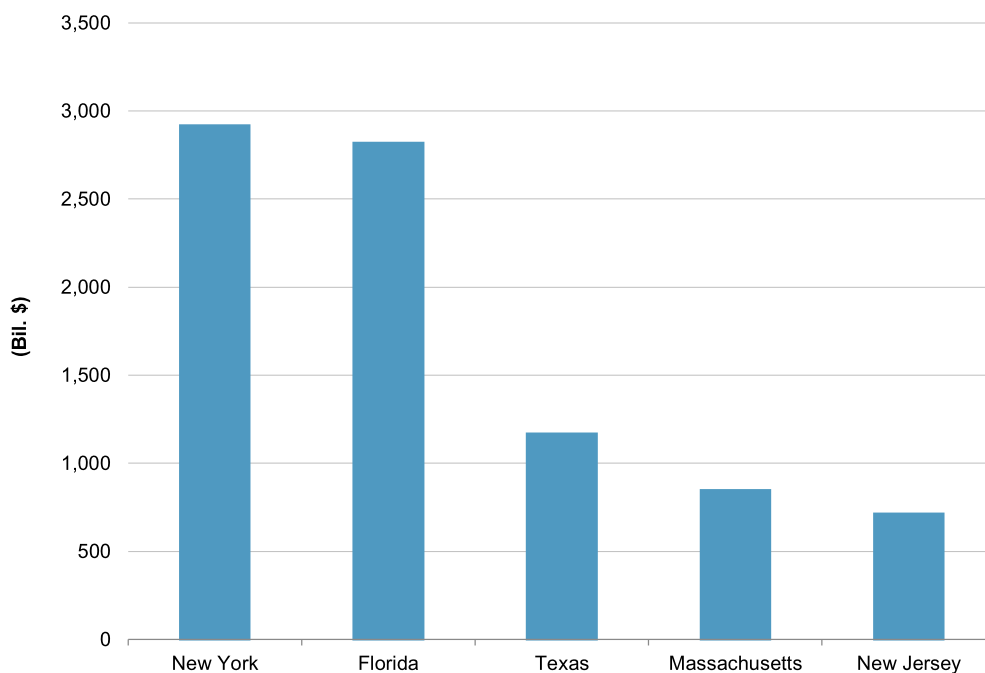
The benefits of avoided future damages may nudge officials toward increasing investment in adaptation projects.

construct levees resilient in the face of a 100-year storm, whereas Katrina was a 400-year storm. In the aftermath of the storm, we lowered our ratings on New Orleans' general obligation (GO) debt seven notches, to 'B' from 'BBB+' and the ratings remained in junk territory for several years (We currently rate the city's GO debt 'AA-' (see our most recent summary analysis on New Orleans, published March 21, 2018). According to the National Oceanic and Atmospheric Administration (NOAA), damage from Hurricane Katrina amounted to \$161 billion in total costs, while 2017's Hurricane Harvey caused \$161 billion in damage.

The risks are stark in purely financial terms. NOAA estimates that New York (\$2.92 trillion), Florida (\$2.86 trillion), Texas (\$1.17 trillion), Massachusetts (\$849 billion), and New Jersey (\$713 billion) are the states most exposed to hurricane damage, based on each state's amount of insured coastal properties. For municipal issuers on coastlines in these states, the benefits of avoided future damages may nudge officials toward increasing investment in adaptation projects.

Chart 14

States With Greatest Amount Of Property Exposed To Hurricane Damage



Source: National Oceanic and Atmospheric Administration, based on amount of insured coastal properties.

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The risks extends beyond hurricanes, rain events, and flooding. PG&E Corp., Calif., an investor-owned utility, incurred a \$10.5 billion charge in the fourth quarter of 2018, given the role its transmission lines are assumed to have played as a causal factor in the catastrophic Camp Fire in Northern California. On Jan. 7, 2019, S&P Global Ratings downgraded PG&E five notches, to 'B'--from 'BBB-' deep into junk territory—from 'BBB-' (see "PG&E Becomes the First Fallen Angel of 2019," published Feb. 26, 2019). The company entered bankruptcy proceedings and has publicly recognized that its infrastructure has not been sufficiently adapted to withstand the risks

related to increasing threats from wildfires and extreme weather events. On Jan. 16, 2019, S&P Global Ratings downgraded PG&E a further seven notches, to 'D'. "Pacific Gas & Electric Co. Downgraded To 'D' from 'CC' On Missed Interest Payment, Pending Chapter 11 Bankruptcy," published Jan. 16, 2019.

Although we believe the credit quality of public power utilities is better protected from wildfire-related liability exposures than investor-owned utilities, we believe the financial and credit risks highlighted by PG&E's role in the recent wildfires serve as a cautionary tale for public and private sector entities alike. (See "California Public Power Utilities Are Better Able To Temper Wildfire Related Liability Exposures Than IOU Counterparts," published Feb. 28, 2019).

Examples Of Funding Strategies In Action And Proposed

In addition to the issuances discussed above, in 2018 and through the first two-and-a-half months of 2019, we observed a few examples of municipal leaders taking the first steps toward identifying funding to support adaptive infrastructure. In March 2018, Massachusetts Governor Charlie Baker introduced legislation including \$300 million for investments in adaptive infrastructure. Governor Baker signed the bill, the title of which begins with the words "An Act Promoting Climate Change Adaptation" into law in August.

Already in 2019, Governor Baker has indicated he is seeking to add more dollars to the climate change adaptation funding efforts. He called for a 0.2% increase to the state deeds excise tax to fund projects to make Massachusetts' infrastructure more resilient in the face of climate- and weather-related events. The governor estimates this would accumulate approximately \$1 billion in dedicated funding over the first ten years. The state would likely direct the accumulated capital toward adaptive infrastructure, including new or raised sea walls and flood-control systems. The urgency is clear and growing, as state agencies expect sea levels to rise as much as 40 inches by 2070.

In Branford, Conn., municipal leaders have established a fund to support improvements to make the community more resilient to sea-level rise. Branford leaders have taken steps to transfer money from the general fund to a new coastal resiliency fund. The town has dedicated a percentage of its property tax levy to the fund, providing a clear revenue stream to augment the initial \$1 million investment. It plans to invest the monies to begin accumulating interest income and amassing more ammunition to support its fight against the rising sea levels that threaten its community.

Pennsylvania Governor Tom Wolf announced on March 7, 2019 a new, \$4.5 billion plan to prioritize and fund resilience projects in the state. Under his proposal, a new severance tax on natural gas drilling activities would fund adaptive infrastructure projects, including flood controls and land restoration. Though the proposal faces significant political hurdles before adoption, we believe it is instructive in its scale and ambition, with respect to the future of adaptation funding at the state and local level.

Funding Strategies In A Difficult Funding Environment

Although municipal leaders' recognition of the importance of investing in more resilient infrastructure appears to be growing, we believe many municipal borrowers will struggle to add debt to fund projects that some constituents will see as offering benefits that may only materialize over the long term. At present, we observe that factors such as rising labor costs, increasing pension and retirement obligations, relatively high debt burdens, and anemic federal support for infrastructure are constraining many municipal budgets. While some municipal issuers--namely those boasting especially strong balance sheets or possessing the political capital and will--may choose to establish and fund new reserves dedicated to funding adaptive infrastructure, we believe many others will need to look to new or external revenue sources to fund these types of projects.

Funding strategies are likely to include dedicated tax measures and establishment of dedicated reserves from cash already on hand. The appeal of a dedicated tax measure is that a new revenue stream can amass significant capital relatively quickly, and issuers can match revenue to (debt service) expenditures. Through the dedicated nature, the funds could accumulate over time

Some issuers will choose to establish new reserves dedicated to funding adaptive infrastructure, though others will seek new or external revenue sources.

protected from external interference and changing administrative priorities. In the context of adaptation and resiliency financing, we believe issuers may hesitate to request, and may struggle to receive, the political support necessary to impose new taxes to fund projects that some may feel offer uncertain benefits over an uncertain time horizon.

Although state revolving funds and infrastructure banks may--and in many cases already do--support adaptation projects through both loan and grant funding, their borrowers will ultimately need to dedicate financial resources to repay debt or provide local match funding. We believe the funding challenge will likely remain a primary hindrance limiting growth in green bonds issued for adaptation projects.

This report does not constitute a rating action.

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