Ceres

Can Investors Price the Risk?

Assessing Municipal Bond Climate Disclosure and Financial Resilience

August 2026

Acknowledgments

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Thanks also to the colleagues at Ceres who provided invaluable editorial review and design support with this project, including Charles Gibbons, Heather Green, Steven Rothstein, Brian McCartan, Jim Coburn, and Kirsten James. We also thank our external reviewers, Ruth Ducret and Rob Fernandez with Breckinridge Capital Advisors.

This report was made possible by data provided by Cotality and Kestrel.

About Ceres

Ceres is a nonprofit advocacy organization working to accelerate the transition to a cleaner, more just, and resilient economy. With data-driven research and expert analysis, we inspire investors and companies to act on the world's sustainability challenges and advocate for market and policy solutions. Together, our efforts transform industries, unlock new business opportunities, and foster innovation and job growth—proving that sustainability is the bottom line. For more information, visit ceres.org.

About Ceres Accelerator for Sustainable Capital Markets

The Ceres Accelerator for Sustainable Capital Markets is a center within Ceres that aims to improve the practices and policies that govern capital markets by engaging federal and state regulators, financial institutions, investors, and corporate boards to act on climate change as a systemic financial risk. For more information, visit ceres.org/accelerator.

Cotality's Comprehensive Climate Risk Analytics

Cotality's Climate Risk Analytics offers a comprehensive model of the future of climate risk at an unprecedented level of granularity. The solution assesses the impact of climate change across all properties in the continental U.S. by combining extensive property data, replacement costs, and natural hazard information with proprietary climate models. It delivers over 20 detailed risk measures, including average annual loss (AAL) and multiple probable maximum loss (PML) calculations across 17 peril scenarios and various timeframes (Base, 2030, 2040, 2050). Using climate scenarios defined by the IPCC's 6th Assessment Report, these analytics are available as raw data or as a normalized 0–100 composite risk score (CRS) to measure overall risk. This enables financial institutions, corporations, and government agencies to accurately assess their financial exposure, comply with disclosure requirements, and build resilience.

Contents

This report is intended to serve as a reference guide for municipal governments on best practices related to climate risks disclosure in financial markets. However, Ceres is not a registered municipal advisor. Recommendations outlined in this report are general in nature and are not intended as prescriptive for any specific organization. Organizations should contact their general counsel, auditors, bond counsel, and financial advisors prior to implementing any climate risk disclosure framework.

Executive Summary

As wildfires, droughts, and storms become more intense and more frequent, municipalities face escalating risks that threaten their infrastructure, tax bases, and long term fiscal stability. In 2025 alone, the U.S. experienced 23 separate billion dollar disasters totaling more than $115 billion in damages—nearly four times the annual average in the 1990s.

Municipal credit markets are at the center of these escalating risks. The $4.4 trillion municipal bond market finances more than 70% of U.S. infrastructure and is the primary source of capital for rebuilding after disasters and preparing for future threats. Extreme weather disasters don't just destroy infrastructure and drive demand for emergency funding, they also erode tax revenues underpin a municipality's ability to finance and pay its debt.

There are early signs that the market is beginning to recognize these credit risks. Rating agencies downgraded more than a dozen Los Angeles-related credits after the January 2025 Palisades wildfires, citing a weakening fiscal position and mounting litigation liability. And the share of bond offerings referencing climate change jumped from 16.5% in 2017 to 53.5% in 2025, according to data from sustainability intelligence platform Kestrel. Yet, more disclosure is not the same as quality, and progress isn't keeping pace with the risks.

This first-of-its-kind report asks a central question: *Are municipal issuers giving investors what they need to assess and price climate risk?* To answer, we analyzed 60 recent bond offerings from the 20 U.S. metro areas most exposed to severe weather hazards.

Our report finds that current municipal bond disclosure practices have not consistently translated an issuer's underlying climate risk and resilience into information that investors can readily use to assess and price risk.

33% of bond offerings make no mention of climate or extreme weather

12% of bonds provide the financial reporting needed to evaluate how risks are measured and managed

Key Findings

Building on our 2025 report Leading with Transparency: A Guide to Strengthening Climate Disclosure and Resilience in the Municipal Bond Market that identified how climate risks intersect with municipal finance and made the case for stronger climate disclosure, this report examines where the gaps exist and provides examples to demonstrate what better disclosure looks like.

1 Generic language dominates, with issuers omitting location-specific perils

Two thirds of sampled bonds discuss climate-related severe weather risk, but most use broad, boilerplate language. Phoenix, Arizona, among the 50 largest metro areas assessed (though not the 20 highest-risk metros in the 60-bond analysis), has the highest projected annual heatwave days. Its 2024 bond offering only briefly mentions heat mitigation projects, without a comprehensive risk strategy.

2 Even when climate risks are disclosed, the information isn't decision-useful

Bonds that follow the Task Force on Climate-related Financial Disclosures (TCFD) framework often skip areas investors rely on to assess accountability and track progress. Only 15% disclose who is accountable for managing climate risk, and just 12% disclose the quantitative metrics that help investors measure risk and track progress on managing those risks.

3 Disclosures look backward, while investors evaluate exposure to future weather disasters

Most bond offerings document past disasters, but say little about the future—even though municipal bonds run 20 to 30 years. They rarely provide analysis of the financial implications of potential future disasters or describe how they plan to prepare by investing in adaptation or emergency planning.

4 Bonds facing similar climate risks provide materially different levels of disclosure

Sometimes, bonds issued in the same counties have different levels of climate-risk disclosure. For example, one bond would specify the flood risk, but the other would not mention such vulnerabilities.

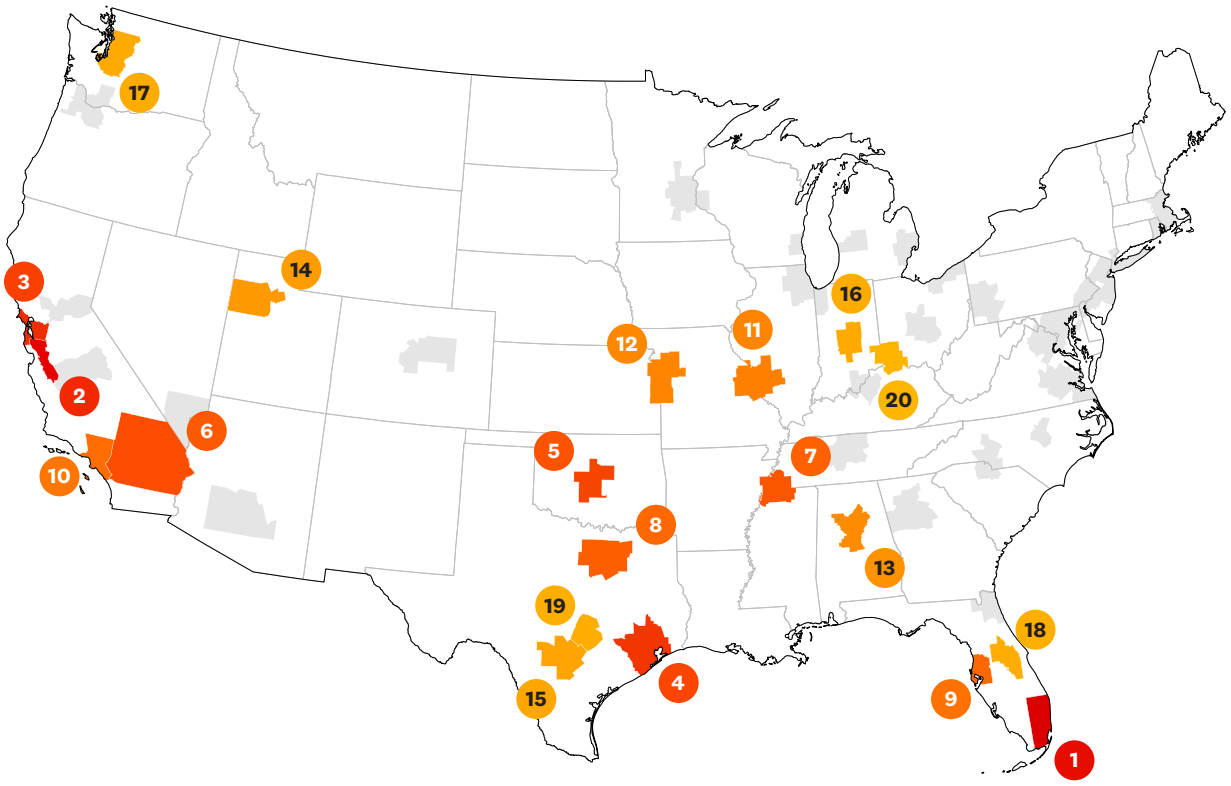
5 Disclosures fail to capture investments in resilience

Municipalities actively taking steps to reduce climate risk, such as relocating wastewater treatment plants out of flood plains, are not reflecting those actions in their bond documents. Investors cannot price what they cannot see.

Recommendations for Issuers

1. **Make resilience work visible to the market.** Issuers with sustainability and resilience programs should incorporate them into their official statements.
2. **Disclose the perils that are specific to the issuing jurisdiction.** Generic climate language should be replaced with specific risk data paired with discussion of mitigation measures.
3. **Fully adopt the Task Force on Climate-related Financial Disclosures (TCFD) framework.** Issuers should identify who is responsible for climate risk oversight, describe their risk management strategy, and establish at least one or two quantifiable metrics.
4. **Enhance forward-looking planning and risk management.** Material climate risks should be accompanied by future projections.
5. **Coordinate with other issuers in the same metro area to improve the quality of disclosure and acknowledge interdependencies.** Pooling resources to develop shared disclosure frameworks and regional risk assessments reduces the burden on individual issuers while raising the floor for all.

Figure 1 • The 20 Highest-Risk U.S. Metropolitan Statistical Areas among the Most Populous MSAs



1 Miami-Fort Lauderdale-West Palm Beach, FL
2 San Jose-Sunnyvale-Santa Clara, CA
3 San Francisco-Oakland-Fremont, CA
4 Houston-Pasadena-The Woodlands, TX
5 Oklahoma City, OK
6 Riverside-San Bernardino-Ontario, CA
7 Memphis, TN-MS-AR
8 Dallas-Fort Worth-Arlington, TX
9 Tampa-St. Petersburg-Clearwater, FL
10 Los Angeles-Long Beach-Anaheim, CA
11 St. Louis, MO-IL
12 Kansas City, MO-KS
13 Birmingham, AL
14 Salt Lake City-Murray, UT
15 San Antonio-New Braunfels, TX
16 Indianapolis-Carmel-Greenwood, IN
17 Seattle-Tacoma-Bellevue, WA
18 Orlando-Kissimmee-Sanford, FL
19 Austin-Round Rock-San Marcos, TX
20 Cincinnati, OH-KY-IN

Composite Risk Score 0 25 50 75 100

Next high-risk MSAs (ranked 21–50) among the top 50 most populous MSAs

Figure 2 · Peril Exposure for the 20 Highest-Risk Areas among the 50 Largest U.S. Metropolitan Statistical Areas

	Metropolitan statistical area	All perils	Flood	Hurricane wind	Wildfire	Severe conv. storm	Heatwave	Earthquake
1	Miami-Fort Lauderdale-West Palm Beach, FL	92	61	98	23	9	99	7
2	San Jose-Sunnyvale-Santa Clara, CA	82	15	0	17	2	32	100
3	San Francisco-Oakland-Fremont, CA	73	20	0	29	2	24	99
4	Houston-Pasadena-The Woodlands, TX	71	68	60	6	27	92	21
5	Oklahoma City, OK	66	13	0	9	98	69	37
6	Riverside-San Bernardino-Ontario, CA	63	34	0	54	4	69	93
7	Memphis, TN-MS-AR	60	23	15	0	56	70	83
8	Dallas-Fort Worth-Arlington, TX	57	13	13	7	90	80	19
9	Tampa-St. Petersburg-Clearwater, FL	54	58	57	18	11	97	9
10	Los Angeles-Long Beach-Anaheim, CA	52	12	0	48	3	48	92
11	St. Louis, MO-IL	46	47	0	0	57	59	67
12	Kansas City, MO-KS	45	22	0	60	84	56	26
13	Birmingham, AL	40	65	16	11	45	74	34
14	Salt Lake City-Murray, UT	36	4	0	0	5	48	81
15	San Antonio-New Braunfels, TX	32	30	25	2	64	91	3
16	Indianapolis-Carmel-Greenwood, IN	30	18	0	5	53	51	58
17	Seattle-Tacoma-Bellevue, WA	30	8	0	9	3	15	85
18	Orlando-Kissimmee-Sanford, FL	29	11	53	2	16	98	15
19	Austin-Round Rock-San Marcos, TX	29	18	26	2	65	88	3
20	Cincinnati, OH-KY-IN	26	29	0	27	44	54	42

100–86: Extreme Complete property damage and losses

85–71: Very High Very high property damage and losses

70–56: High High property damage and losses

55–36: Moderate Moderate property damage and losses

35–21: Low Slight property damage and losses

20–0: Very Low Very low to no property damage and losses

Methodology

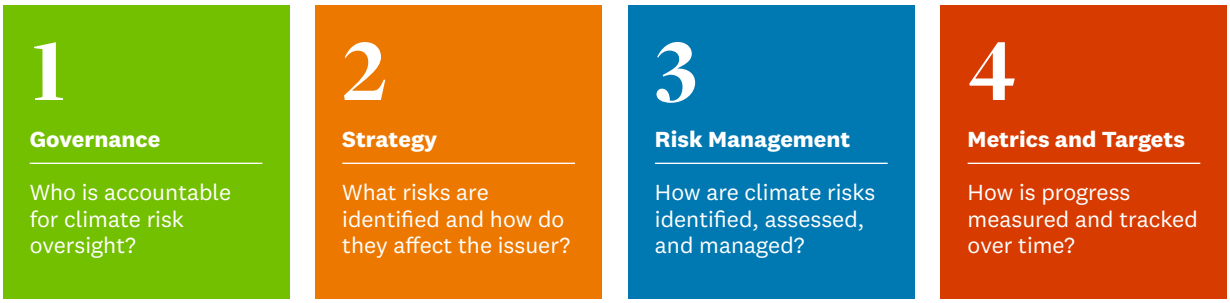
This report analyzes 60 recent municipal bond offerings (Official Statements, or OS) from issuers in 20 metropolitan statistical areas (MSAs). The sample issuances were identified and assessed in three steps.

First, the report identifies the 50 most populous U.S. MSAs using 2024 U.S. Census data as illustrated in Figure 1.

Second, we assessed climate exposure across the 50 most populous metropolitan statistical areas using Cotality's Composite Risk Score as a proxy for overall exposure and identified the 20 highest-risk metropolitan statistical areas as illustrated in Figure 2.

Third, to create a diversified sample, we selected three recent bond offerings from each of the 20 MSAs and evaluated their climate disclosure. These 60 bonds reflected a variety of bonds (general obligation (GO) and revenue) and issuer profiles (cities, counties, utilities, transportation authorities). Each high-risk bond offering was scored across the four pillars of the Task Force on Climate-related Financial Disclosures (TCFD). The TCFD is the global foundation for climate financial reporting and is now embedded in IFRS S2 standards adopted by jurisdictions representing 60% of global GDP. Scores range from 0 (no meaningful disclosure) to 4 (all pillars addressed). See the appendix for the full methodology and ratings of all the 60 official statements.

Figure 3 • The 4 TCFD Pillars and What They Help Investors Understand



Key Finding #1

Generic language dominates, with issuers omitting location-specific perils

A third of the 60 municipal bonds sampled from the 20 highest-risk metro areas make no mention of climate or extreme weather risk in their official statements. And among the two-thirds that include a section on climate or extreme weather-related risk, most do so in boilerplate language that omits any specific information about the risks tied to their actual geography or most material threats.

Issuers frequently overlook or neglect to disclose the specific perils most relevant to their location—even when those risks are well understood and already reflected in investment decisions. This is notable, given that different metropolitan areas face distinct primary hazards: wildfire in the West, hurricanes, flooding in coastal regions, and extreme heat and water stress in the South and Southwest, with many large metro areas exposed to multiple risks simultaneously (Figure A2, Appendix).

For example, Phoenix-Mesa-Chandler, Arizona, is projected to experience the highest number of heatwave days among large U.S. metro areas—approximately 146 days annually—and also faces moderate flood and wildfire risk (Figure A2, Appendix). The region also faces high water stress, with ongoing regulatory discussions around Colorado River allocation underscoring the long-term uncertainty around water access.

However, in its 2024 general obligation bond offering, the City of Phoenix makes a passing reference to a few heat and flood mitigation projects but does not offer a comprehensive risk mitigation strategy. The OS contains no dedicated discussion of extreme heat exposure, water stress, no assessment of potential impacts on infrastructure or fiscal conditions, and no integrated view of how these risks are managed. Investors are left without a clear understanding of the city's exposure to its most material climate risks.

Implications

Generic disclosure practices can obscure local climate vulnerabilities, making it harder for investors to accurately assess and price risk. Investors need decision-useful information on climate and extreme weather events because those events can pose long-term financial threats to municipal bond issuers, including:

- Loss of assessed value for property tax
- Direct damage to physical infrastructure due to extreme weather events
- Higher operating expenses, including higher heating and cooling bills and costs related to providing emergency services and relocation expenses
- Higher insurance and claims costs

When an issuer provides vague disclosures, despite the region's clear risk profile, it creates a credibility gap with investors that can affect borrowing costs.

Pitfalls: Generic and boilerplate language of climate risks

"As greenhouse gas emissions continue to accumulate in the atmosphere as a result of economic activity, climate change is expected to intensify, increasing the frequency, severity and timing of extreme weather events such as coastal storm surges, drought, wildfires, floods and heat waves, and raising sea levels. The future fiscal impact of climate change on the City is difficult to predict, but it could be significant and it could have a material adverse effect on [the City] by requiring greater expenditures to counteract the effects of climate change or by changing the operations and activities of City residents and business establishments."

Boilerplate language is not informative. Most such statements contain a caveat that the issuers cannot predict whether climate risks will occur and what their financial impact might be, offering investors no basis for assessing risks.

At the other end of the disclosure spectrum sits Miami-Dade County, whose broader metro area—Miami-Fort Lauderdale-West Palm Beach—ranks first among the 50 largest U.S. metro areas in overall climate risk exposure, with high or extreme exposure to heatwave, flood, and hurricane wind (Figure A2, Appendix).

Miami-Dade County's OS (2025) below covers three TCFD pillars except for Metrics and Targets and clearly points readers to external documents with more detailed information. The OS also discusses how flood mitigation efforts improved Miami-Dade County's rating under the National Flood Insurance Program, resulting in direct savings for the county and its taxpayers, and points readers to reports that detail the county's progress in meeting its climate mitigation and adaptation goals.

Best Practice: Stating Specific Peril Risks and Mitigation Strategies

Miami-Dade County, FL – GO Refunding Bonds, Series 2025

"The State is naturally susceptible to the effects of extreme weather events and natural disasters including floods, droughts, hurricanes, and heat waves, which could result in negative economic impacts on coastal communities. [...] The County is addressing the threat of climate change through: (1) incorporating climate change goals into the Comprehensive Development Master Plan, policies, and code; (2) conducting regular community-wide greenhouse gas emissions inventories and implementing a Climate Action Strategy to reduce emissions; (3) assessing the vulnerability of key public infrastructure and implementing a countywide Sea Level Rise Strategy; (4) designating Adaptation Action Areas (AAA) aimed at addressing sea level rise, flooding, and environmental hazards in some of the County's most vulnerable neighborhoods [...] (5) applying the County's Local Mitigation Strategy designed to reduce or eliminate long-term risk to human life and property from hazards; (6) developing and implementing policies and initiatives to reduce the impacts of extreme heat across the community; and (7) creating a County-led multi-jurisdictional advisory board, informing the county mayor and board's decisions on issues related to Biscayne Bay; and (8) assessing the economic value of Biscayne Bay, issuing the 2023 Biscayne Bay Economic Study Update.

The County manages the hazards of flooding pursuant to its Flood Response Plan. [...] In January 2024, the county's rating under the program moved from a5 to a3. The new rating will result in an estimated $12 million savings annually, by providing qualifying residents and business owners [...] a 35% discount on flood insurance premiums. The County details its progress in implementing its climate mitigation and adaptation programs in its Climate Action Strategy 2023 Progress Report and Sea Level Rise Strategy Year 1 Progress Update."

Miami-Dade County's OS identifies flood and sea level rise as distinct risks and responds to each with tailored adaptation and mitigation plans on both state and county levels, including their implications for insurance coverage and credit ratings.

Key Finding # 2

Even when climate risks are disclosed, the information isn't decision-useful

Across the 60 bonds, climate disclosure aligned with the TCFD framework is generally low as shown in Figure 4 below, but it is especially weak in the Governance and Metrics and Targets needed to evaluate how those risks are being managed. Where disclosure exists with Metrics and Targets—an area that is critical to investors—it typically provides narrative description rather than quantitative information required to assess risks.

Why Governance and Metrics and Targets matter to investors

Governance disclosure clarifies who is accountable within bond issuers for managing climate risk, as well as whether and at what level those risks are integrated into decision-making and oversight, specifically the issuer's budget and capital plan. Investors use this to see if climate risks are integrated into issuers' decision-making and performance monitoring. Weak governance can suggest to investors that these risks may not be systematically managed.

Metrics and Targets disclosure provides quantifiable data that helps investors measure risk and track progress toward how municipalities are managing climate risks and building resilience. Investors prefer hard numbers over generic narratives to make informed capital allocation choices, because quantitative data allow investors to compare issuers facing similar risks and assess the potential impact on revenues, costs, and debt service capacity.

Figure 4 • TCFD Alignment among the 60 Sampled Offering Documents

TCFD alignment	Governance	Strategy	Risk management	Metrics and targets
On average	15%	55%	33%	12%
GO bonds	13%	53%	47%	7%
Revenue bonds	16%	56%	29%	13%

Implications

Partial disclosure lacks the depth of information needed for meaningful analysis. Investors cannot distinguish between issuers managing risk and those that are not, or obtain quantitative information related to risk.

The City of Seattle provides a good example of governance disclosure in line with the TCFD framework, while the San Francisco Public Utility Commission (SFPUC) and Los Angeles Department of Water and Power (LADWP) provide a good example of disclosure on Metrics and Targets.

Best Practice – TCFD Pillar, Governance

City of Seattle, TAX GO Bond 2023

"The City's Office of Emergency Management (OEM) is responsible for coordinating the City's response and resources during emergencies and disasters through close coordination with City departments and partner agencies. OEM prepares for emergencies; coordinates with regional, State, and federal response agencies; provides education to the community about emergency preparedness; plans for emergency recovery; and works to mitigate known hazards. It has identified, assessed, and planned for many types of hazards that may impact the City, including geophysical hazards (e.g., earthquakes, landslides, tsunamis, seismic seiches, volcanic eruptions, and lahars) [...] and severe weather (e.g., floods, snow, water shortages, and windstorms)."

The City of Seattle names its OEM as the primary body responsible for weather-related risks, providing a brief description of its mandate. This is one of the few examples of an issuer explicitly assigning governance accountability for climate and weather-related risks.

Limited Practice — TCFD Pillar, Metrics and Targets: Good narrative description but missing quantifiable metrics

San Francisco PUC, Water Revenue Bonds 2025 Series DEF

"[The] City has developed policies for considering the potential impact of sea level rise on City assets, 'Guidance for Incorporating Sea Level Rise into Capital Planning' that requires all assets in the City's 10-year capital plan be evaluated for inundation under a variety of sea level rise scenarios plus a 100-year storm. The SFPUC has assets that are part of the Emergency Firefighting Water System, also known as the Auxiliary Water Supply System, the supplementary and emergency water supply managed by the SFPUC. [...] These assets have projected functional lifespans of between 90 and 100 years. Several of these assets such as buried pipelines, fireboat manifolds, hydrants, and pump stations are in the potential inundation zone toward the end of the 21st century. The City, through its Sea Level Rise Action Plan, will be evaluating the best approaches and potential adaptive management plans for protecting EFWS assets, along with all other public and private assets potentially subject to inundation caused by sea level rise and large storms."

SFPUC identifies a specific sea level rise scenario, a time-bound planning horizon, and assets within the projected inundation zone that are meaningful physical risk metrics that could be further developed into quantifiable Metrics and Targets, such as the number and total value of assets in a 100-year flood zone.

Best Practice — TCFD Pillar, Metrics and Targets

Los Angeles Department of Water and Power, Water System Revenue Bonds 2025 Series B

"The Department has a total of $106.25 million in self-insured retention that serves as its primary layer for wildfire coverage and above that primary self-insurance retention layer, the Department has procured an additional $121.50 million of commercial wildfire insurance, totaling an insurance tower of $227.75 million. The Department augments and supports its wildfire coverage with a Wildfire Self-Insurance Trust Fund. [… As] of May 31, 2025, the Wildfire Self-Insurance Trust Fund had a balance of $45.90 million. Through the utilization of commercial insurance […] the wildfire insurance program currently has a total limit of $273.65 million available for wildfire losses. To further complement its overall wildfire insurance program, the Department has provided for $100 million of wildfire coverage through a CAT Bond. The $100 million wildfire index CAT Bond is for the three-year period from August 2025 to September 2028. [… The] Department continues to maintain a bona fide program of self-insurance as well. As of May 31, 2025, the portion of the Water Revenue Fund set aside for self-insurance had a balance of approximately $30.8 million in a restricted cash account […] to cover a large catastrophic event that could affect the Water Division operations (e.g., liability for a large wildfire)."

LADWP already provides meaningful Targets for measuring capital deployed toward wildfire risk mitigation which is a strong starting point that could be further strengthened by adding Metrics such as the proportion of land, assets or revenues associated with the high-risk areas.

Key Finding # 3

Disclosures look backward, while investors evaluate exposure to future weather disasters

The bonds we reviewed mostly detail past extreme weather events, followed by standard caveats that future conditions are uncertain. Forward-looking information, such as scenario analysis, projected changes in hazard frequency or severity, and estimated future financial impacts, is largely absent. But while investors are already pricing anticipated future risk, issuers are not yet communicating it.

This type of forward-looking analysis is important since municipal bonds are 20-to-30-year instruments. What matters for investors is not only what an issuer has experienced, but what it is likely to face over the life of the bond and how it plans to manage those risks. Future fiscal impacts, such as effects on tax revenues, operating costs, and capital expenditure, can directly affect bond pricing. When issuers don't provide that analysis, investors piece it together from any available information, including external data and proxies, ultimately producing pricing that is uneven and slow to reflect actual risk.

Limited Practice: Good description on past events, but missing forward-looking map

Harris County, Texas 2025 Flood Control Contract Tax Bonds

"Hurricane Harvey made landfall on August 25, 2017 near Corpus Christi, Texas, 200 miles south of the County. The impact of Hurricane Harvey on the County was primarily historic flooding; the County sustained minimal damage from wind, storm surge and other weather effects typically associated with a hurricane. Property values were impacted temporarily for homes that sustained flood damage and were still being repaired on January 1, 2018 [...]. Once fully repaired, these homes generally returned to their pre-storm values. The ad valorem tax values as of January 1, 2019 and the estimated values as of January 1, 2020 were both up overall by 3–6%. [...] Because of Hurricane Harvey and other major flooding events over the last few years, several potential changes to the local system of watersheds, reservoirs and channels are being considered, some of which would require significant additional funding, including State and federal funds and additional County and District resources."

The issuer states Hurricane Harvey's financial impacts including property value effect, tax revenue implications and voter-approved flood control bond that followed. The county acknowledges that the area is susceptible to flooding, storm, and hurricanes and notes that a significant weather event could reduce the value of tax revenues. While the information is valuable, the issuer doesn't provide forward looking risks such as scenario analysis or projected frequency, no target for reducing future exposures.

Harris County, Texas, whose county seat is Houston, the metro area ranked first for composite flood risk and second for hurricane wind among the 50 largest U.S. metro areas (Figure A2, Appendix), illustrates this pattern. Its 2025 Flood Control Contract Tax Bonds offering thoroughly documents Hurricane Harvey's impact in 2017, a genuinely useful context. But the forward-looking picture is absent.

The San Francisco International Airport's Series 2025 revenue bond offering provides a good example of how to incorporate forward-looking climate scenarios and linking them to potential operational and financial impacts and mitigation and adaptation measures.

Best Practice: Forward-looking scenario with mitigation plans

San Francisco International Airport Revenue Bonds, Second Series 2025A/B/C

"The NCA5* [...] found that the Airport is vulnerable to impacts from sea level rise, with flooding potentially exacerbated by storm surges, extreme precipitation and high tides. [...] The NCA5 utilizes a projected flood risk from 3 feet of sea level rise in the San Francisco Bay Area, consistent with an Intermediate scenario in the year 2100. The upper range for long-range planning used by the San Francisco Planning Commission estimates an additional sea level rise of 12 inches by 2030, 24 inches by 2050 and 66 inches by 2100. [...] Coastal areas, including the City, are vulnerable to floods impacting private development and public infrastructure, including the Airport [...] Recent studies have brought particular attention to the need to advance climate adaptation policy to mitigate and/or prevent future coastal flooding of California's airports, including a study published at Climate Risk Management (2022) [...] The NCA5 also recognized that mental and physical health may be adversely impacted by decreases in air quality [...] These threats may require additional changes in Airport infrastructure and/or decrease demand for travel globally or locally, with potential material adverse effects on the Airport's operations and financial condition. Given this, the Airport is developing a Climate Vulnerability and Risk Assessment Plan, which will prepare a new set of resilience-focused Architecture and Engineering Standards to ensure future infrastructure and assets can respond to these future hazard conditions."

The issuer characterizes its specific vulnerabilities to sea-level rise, storm surge, and extreme precipitation using the existing sources such as IPCC report. It quantifies projected sea level rise through 2100 and links the projections directly to mitigation decisions being made today.

*The Fifth National Climate Assessment (NCA5) by the U.S. Global Change Research Program, accessible here: toolkit.climate.gov/NCA5

Key Finding # 4

Bonds facing similar climate risks provide materially different levels of disclosure

Bonds with similar physical risk profiles (such as a city and utility agency in the same area) sometimes provide significantly different levels of risk disclosure. Some issuers we reviewed address three or four of the TCFD pillars, while peers in the same metro area only address one or do not mention climate risk at all in their bond offerings.

Differences in bond structure and revenue exposure, such as utility revenue bonds versus general obligation bonds, can partly explain how risks are articulated. However, even among comparable issuers with similar exposure, material gaps exist.

Limited disclosure: Generic language only

Official Statement A from a water agency in Birmingham metro area

Nature Disasters and Public Health Emergencies

The occurrence of natural disasters, such as tornadoes, earthquakes, flood or droughts, or pandemics, epidemics or other public health emergencies, could damage the facilities of the board, affect water supply, interrupt services or otherwise impair operations and the ability of the system to produce revenues.

The board cannot predict the impact of natural disaster to the revenue of the system.

More comprehensive disclosure: Dedicated section on climate risk and its impact on infrastructure

Official Statement B from a county in Birmingham metro area

Changes in rainfall [...] have been attributed to overall climate change. Historically, the County experienced roughly 54 inches of rainfall annually. During four (4) of the last five (5) years, however, annual rainfall has exceeded the said average by between 7 to 19 inches. [...] Rain volume also impacts the overall system infrastructure needs, including increased size of pipes, offline storage facilities and similar infrastructure, resulting in increased demand for capital improvements and capacity. If the trends in increased rainfall experienced during the past five (5) years continue or increase, the County will likely be required to undergo substantial capital improvements to the System not presently included in its ten (10) year capital improvement plan. [...] Increased rainfall, particularly during spring and summer months, could reduce billed water consumption and reduce revenues.

Implications

This inconsistency indicates that disclosure is not necessarily driven by underlying risk. In the absence of a common baseline, investors cannot rely on offering documents to assess risk consistently among issuers, even in the same region.

The absence of disclosure is itself a signal, particularly when comparable issuers provide more detailed information. Limited or generic disclosure may indicate that risks have not been fully assessed or integrated into planning, potentially making it harder for investors to assess credit analysis, impacting borrowing costs, and reducing market efficiency.

Key Finding # 5

Disclosures fail to capture investments in resilience

Many municipal issuers are already investing in resilience through infrastructure upgrades and risk mitigation strategies, such as relocating wastewater treatment plants out of floodplains or constructing storm-resilient electric power infrastructure, or through comprehensive resilience planning. However, these actions are not consistently reflected in bond offering documents, limiting the market's ability to assess and price underlying risk reduction.

We mapped this disconnect by comparing our TCFD alignment scores of the 60 sample bonds against evaluations of sustainability and resilience from Kestrel Sustainability Intelligence, a sustainability benchmark for the municipal market. Kestrel's Environmental Scores reflect actions by issuers that reduce their exposure to physical and transition risks regardless of whether they are disclosed in bond offering documents. (A high score reflects relative performance within the sample, not a guarantee that all material risks are mitigated or that resilience planning is complete.)

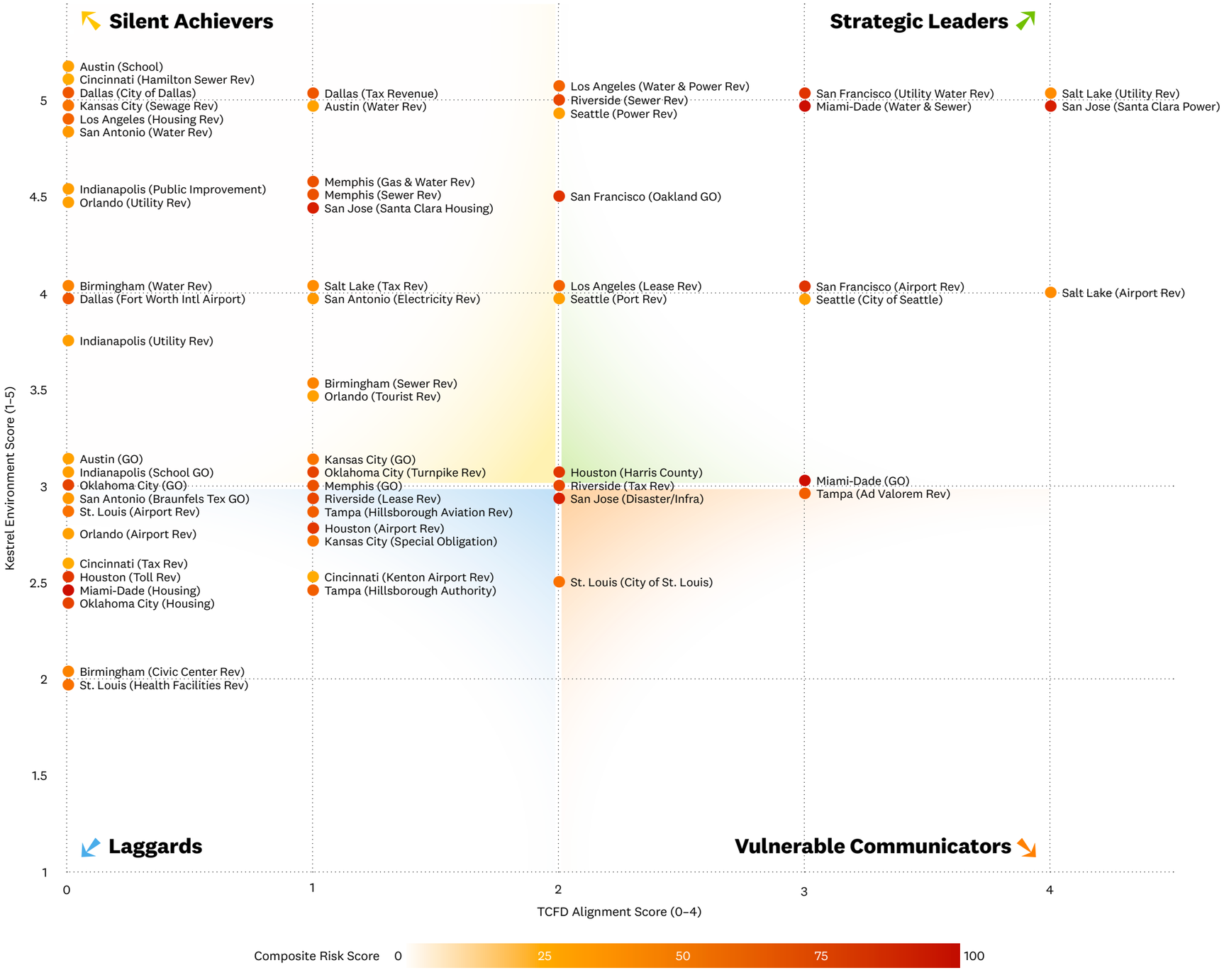
Our analysis identified four categories of issuers (Figure 5):

- **Strategic Leaders (top right):** Those with both high environmental scores and strong disclosure.
- **Silent Achievers (top left):** Those with high environmental scores and weak disclosure. They are implementing meaningful resilience and sustainability measures but have not yet translated that work into structured, market communications.
- **Vulnerable Communicators (bottom right):** Those with strong disclosure quality paired with low environmental scores, signaling that some issuers are speaking the language of climate risk without yet backing it up with commensurate investment.
- **Laggards (bottom left):** Those who are low on both dimensions with limited resilience activity and minimal disclosure.

The analysis demonstrates a disconnect between performance and disclosure:

1. A share of issuers — Silent Achievers — may be actively reducing risk but not communicating those improvements in a way that investors can incorporate into assessment.
2. Municipalities most exposed to climate risk are not reliably investing in resilience and sustainability. While several high-risk issuers are Strategic Leaders or Silent Achievers, many cluster in the middle of the distribution and some fall into the Laggard category, potentially suggesting that adaptation decisions are not yet being guided by underlying climate risk. Higher risk does not reliably predict higher resilience to physical and transition risks.

Figure 5 · TCFD Alignment Score v. Kestrel's Environmental Score



Kestrel's scores are based on a scale of 1 to 5, with high scores reflecting sustainability and resilience. Ceres' TCFD alignment scores compare disclosure maturity on a scale of 0 to 4, with high scores reflecting maturity. The color of the dots signifies Composite Risk Scores by Cotality. The darker the color, the higher the municipality's climate risks. For example, the City of Santa Clara's Electric Revenue Bonds (dark red dot, top right) exemplify the Strategic Leader category, scoring 5 on Kestrel's Environmental Scores and 4 on TCFD alignment within the high-risk San Jose MSA (composite risk score: 82.06).

Implications

Disclosure of adaptation plans can be relevant for assessing municipal issuers' long-term resilience and creditworthiness. A city's long-term resilience and creditworthiness are undermined when its climate adaptation and finance planning are not coordinated or don't support one another.

Kestrel estimates that across the $3.2 trillion municipal bonds its intelligence platform covers, about 15% of bonds exhibit resilience features—meaning that while a meaningful share of issuers are taking steps to reduce their risk exposure, the vast majority are not yet doing so in ways that are visible to the market.

The gap between action and communication may limit the extent to which pricing reflects underlying risk reduction—leaving issuers that have invested in resilience unable to benefit from the lower borrowing costs that transparent, credible disclosure can unlock.

Kestrel Sustainability Intelligence Dataset Reflects Broader Market Trends

Kestrel Sustainability Intelligence provides analysis and benchmarking of bonds for best practices, including identification of resilience features in financed assets. The Kestrel dataset represents a universe of over 16,500 bond series representing $3.2 trillion of infrastructure investment, 73% of the total US $4.4 trillion municipal bond market. It provides a scalable and standardized disclosure solution for primary and secondary market participants. Kestrel transforms fragmented infrastructure and financial disclosures into structured, explainable infrastructure intelligence by evaluating financed activities and their material sustainability attributes alongside climate risk strategies. Its analytics include:

- Summary of sustainability and resilience
- Evaluation of transition-alignment
- Climate risk disclosure scoring
- Green and social bond eligibility
- Resilience in financed assets
- Transparency of financed activities

Kestrel identifies investments and issuers that finance adaptation and resilience—such as hospitals designed to operate during extreme weather events or wastewater systems protected from flooding and high heat. This information can enhance the interpretation of climate risk datasets and provide a clearer view of infrastructure vulnerabilities within a given region. These evaluations use their Resilience Taxonomy for U.S. Infrastructure to assess actions that reduce exposure to physical and transition risks and enable more credible, standardized comparisons across issuers.

Recommendations

Municipal bond issuers in the highest-risk markets are not yet disclosing climate risks in ways that can inform consistent, timely, and comparable risk assessment by investors and other market participants. Below are recommendations for issuers, underwriters, financial advisors, and bond counsels based on our findings and built on the framework from our 2025 Leading with Transparency report.

1 Make resilience work visible to the market

If a municipal issuer has a sustainability and resilience program, it should be explicitly incorporated into bond documents. Identifying and reflecting climate-related investments in official statements is also recommended since it lets investors better incorporate risk mitigation into pricing. If the city or facility has a sustainability report, climate action plan, or annual resilience update, they should reference these documents in the official statement and summarize their key findings for bond investors. Do not assume investors will find these reports independently.

Investors are increasingly using AI models to systematically extract and analyze information, including disclosure that was previously too voluminous or inconsistent to review manually. Information that could go unread is now being fed into investors' rubrics. Issuers and deal teams have a critical opportunity to ensure that the information they consider most material is present in their disclosures before these tools apply their own interpretation.

2 Disclose perils specific to the issuing jurisdiction

Bond disclosure needs to include location-specific data on physical assets (such as municipal infrastructure) and data on types and intensity and frequency of hazards, along with forward-looking risk assessment of how exposure may change over time. When such risk is material, disclosure needs to include discussion of risk mitigation and adaptation strategies, such as investments in physical defenses, insurance coverage, and business continuity plans. This information enables investors to better assess location-specific risk. Engage the jurisdiction's sustainability, resilience, or environmental office to identify the perils and the strategies already in place to address them. There

are also many helpful publicly available resources for identifying key risks such as FEMA's National Risk Index for Natural Hazards and NOAA's Regional Integrated Science and Assessments.

3 Fully adopt the TCFD framework

Full TCFD alignment requires attention to all four pillars, particularly improving clarity on Governance and measurable Metrics and Targets indicators.

- **On Governance** Identify and disclose which department, committee, or official is responsible for overseeing climate-related risks and opportunities. Integrate, or identify the process to integrate, risk oversight into finance, budget, or capital planning processes.
- **On Strategy** Describe the strategy for managing risks, as well as ongoing and planned expenditures in each risk category.
- **On Risk Management** Describe specific risks faced by jurisdiction.
- **On Metrics and Targets** Start by identifying one or two quantifiable metrics most relevant to the risk profile: natural disaster events, projected revenue impacts, percentage of infrastructure assets in high-risk zones, greenhouse gas reduction targets, or insurance coverage levels. Set a baseline and commit to reporting against it regularly.

TCFD's guidance on metrics, targets, and transition plans and CDP's TCFD guidance note for municipal governments are useful starting points for issuers looking to strengthen this pillar of their disclosure.

4 Enhance forward-looking planning and risk management

If any peril is material to the bonds' geography, consider including future exposure where data exists, such as sea-level rise projections by decade, projected changes in flood frequency or future water stress, or expected annual heatwave days under different warming scenarios. Develop and disclose a forward-looking adaptation plan that identifies specific capital investments, timelines, and funding sources for managing the most material climate risks. Ensure collaboration between a jurisdiction's sustainability and finance professionals to gather relevant information.

5 Coordinate with other issuers in the same metro area to improve regional disclosure and acknowledge interdependencies

Regional coordination offers a practical path to closing information gaps while reducing the burden on individual issuers. Issuers within the same metro area often share the same hazards, the same regional climate data, and the same infrastructure interdependencies. Issuers can share resources, insight and best practices by developing a shared regional disclosure framework that establishes a common baseline for climate risk language, peril identification, and adaptation planning across issuers in the same metro area.

Appendix

Methodology

Climate Risk Scoring

To identify the most climate-exposed large metro areas in the United States, we began with the 50 most populous MSAs based on 2024 U.S. Census Bureau population estimates. For each MSA, we worked with Cotality (formerly CoreLogic) to assign weighted average risk scores across multiple peril categories using Cotality's Composite Risk Score—a measure derived from Average Annual Loss, defined as the long-term average loss per year expressed as a rate on reconstruction cost.

Composite Risk Scores range from 0 to 100. A score of 0 indicates that a peril is not modeled for the given location. Where a peril is modeled, a score of 1 represents the lowest risk and 100 the highest. Scores are calibrated to climate scenarios informed by the IPCC's Sixth Assessment Report and modeled at the individual property level. The composite incorporates the following acute perils:

- Composite flood (coastal flood, inland flood, hurricane storm surge, and tsunami)
- Wildfire (fire and smoke)
- Severe convective storm
- Hurricane wind
- Earthquake (ground shake, sprinkler leakage, and fire following earthquake)
- Winter storm

While some components of the composite risk score such as earthquake are not directly climate-induced, the composite risk score nonetheless serves as a useful proxy for overall physical risk exposure given its broad coverage of climate-related hazards. The composite risk score covers acute risks only and does not capture chronic climate risks. We therefore supplemented it with two separate chronic risk measures—heatwave risk score and projected number of extreme heat days annually—to provide a more complete picture of each MSA's overall climate risk profile. These are presented alongside other risk scores in the figures at the end of the appendix.

Assigning a Weighted Average

Cotality's data for a given metro area is not presented as a single aggregate risk score. Instead, the frequency and severity of each peril are estimated based on land-use type, with separate scores assigned across six property classifications: Single-Family Residence, Multi-Family Residence,

Agricultural, Industrial, Commercial, and Municipal. This approach enables differentiation based on detailed property characteristics, including building type, year built, roof age, and first floor height.

Because metropolitan areas vary significantly in their property composition and construction characteristics, a simple average of risk scores across land-use categories would produce an inaccurate representation of overall exposure. We therefore calculated a weighted average based on the number of properties within each land-use category, providing a more accurate picture of each metro area's aggregate risk profile.

Sample Selection

It is important to note that our analysis is limited to the 50 most populous U.S. metro areas and does not represent the full national risk landscape. Some highly exposed regions fall outside our sample because they do not rank among the 50 largest MSAs by population. For example, the New Orleans metro area ranks first in the country for composite flood risk but does not appear among our highest-risk cities because it is not among the 50 most populous MSAs.

From the 50 largest MSAs, we identified the 20 highest-risk metro areas based on the weighted average Composite Risk Scores described above. For each metro area, we identified three recent bond offerings with discrete Official Statements, creating a sample of 60 bond offering documents. We aimed to create diversified samples by including a mix of bond types—general obligation bonds and revenue bonds—as well as a range of issuer profiles, including cities, counties, water and electric utilities, airports, port authorities, and other municipal entities.

Disclosure Quality Assessment

To evaluate the quality of climate-related disclosures within each Official Statement, we applied the Task Force on Climate-related Financial Disclosures (TCFD) framework as our primary assessment rubric. The TCFD recommendations have been widely adopted to inform corporate climate-related reporting and form the basis for climate disclosure regimes established by governments worldwide. Since the Task Force was subsumed by the IFRS Foundation in 2023, its climate disclosure standards have been adopted—or are in the process of being adopted—by nearly 40 jurisdictions representing approximately 60% of global GDP. While TCFD adoption has been most prevalent among corporate issuers, the framework is equally applicable to municipal bond issuers and provides a structured, internationally recognized basis for assessing the completeness and quality of climate risk disclosure.

For each Official Statement, we assessed disclosure quality against the four TCFD pillars by asking one binary question per pillar:

- **Governance** Does the OS describe how climate risks are organized within the jurisdiction and the person responsible?
- **Strategy** Does the OS specify the type and the extent of risks?
- **Risk Management** Does the OS describe the organization's plan for addressing climate risks?
- **Metrics and Targets** Does the OS describe how the issuers will monitor and measure the resilience program over time? Does the OS include the metrics and targets used by the organization to assess and manage climate-related risks?

Each pillar was scored on a binary basis: one point where the answer is yes, zero where it is not addressed. Scores were then aggregated to produce a total TCFD alignment score for each issuer ranging from 0 to 4, where 0 indicates no meaningful climate disclosure and 4 indicates disclosure across all four pillars. This approach prioritizes breadth of coverage over depth—an issuer that addresses all four pillars at a basic level scores higher than one that addresses a single pillar in detail. While this means the framework does not fully capture variation in disclosure quality within each pillar, it provides a consistent and comparable baseline for assessing how comprehensively issuers are engaging with the full scope of climate-related financial risk. A full breakdown of ratings for all 60 bonds is available in Figure A3 in the Appendix. See this document for links to each Official Statement.

Resilience Performance Assessment

To assess how issuers' operational resilience compares to their disclosure quality, we drew on standardized evaluations from Kestrel Sustainability Intelligence. Kestrel's Environmental Scores track the actions issuers are taking to reduce their exposure to physical and transition risks, independent of what is disclosed in their official statements. By mapping our TCFD alignment scores against Kestrel's Environmental Scores for the 60 sample bonds, we were able to identify where strong resilience performance is being communicated effectively to investors—and where it is not.

Figure A1 • Risk Profiles of the 50 Largest Metropolitan Statistical Areas Listed by Population

Metropolitan statistical area	Flood	Hurricane wind	Wildfire	Severe conv. storm	Heatwave
New York-Newark-Jersey City, NY-NJ	26	32	0	9	45
Los Angeles-Long Beach-Anaheim, CA	12	0	48	3	48
Chicago-Naperville-Elgin, IL-IN	14	0	0	40	46
Dallas-Fort Worth-Arlington, TX	14	13	7	91	80
Houston-Pasadena-The Woodlands, TX	68	60	6	27	92
Miami-Fort Lauderdale-West Palm Beach, FL	61	98	23	9	99
Washington-Arlington-Alexandria, DC-VA-MD-WV	4	16	0	19	57
Atlanta-Sandy Springs-Roswell, GA	4	10	0	39	70
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	13	23	0	15	53
Phoenix-Mesa-Chandler, AZ	43	0	50	7	86
Boston-Cambridge-Newton, MA-NH	28	35	0	11	61
Riverside-San Bernardino-Ontario, CA	34	0	54	4	69
San Francisco-Oakland-Fremont, CA	21	0	29	2	25
Detroit-Warren-Dearborn, MI	19	0	0	16	43
Seattle-Tacoma-Bellevue, WA	8	0	2	3	15
Minneapolis-St. Paul-Bloomington, MN-WI	18	0	0	58	41
Tampa-St. Petersburg-Clearwater, FL	58	57	18	11	98
San Diego-Chula Vista-Carlsbad, CA	16	0	71	3	30
Denver-Aurora-Centennial, CO	5	0	29	59	46
Orlando-Kissimmee-Sanford, FL	11	54	6	16	98
Charlotte-Concord-Gastonia, NC-SC	6	22	0	41	66
Baltimore-Columbia-Towson, MD	5	18	0	16	56
St. Louis, MO-IL	47	0	0	57	59
San Antonio-New Braunfels, TX	30	25	11	64	91
Austin-Round Rock-San Marcos, TX	18	26	5	65	88

Figure A1 • Risk Profiles of the 50 Largest Metropolitan Statistical Areas Listed by Population

Metropolitan statistical area	Flood	Hurricane wind	Wildfire	Severe conv. storm	Heatwave
Portland-Vancouver-Hillsboro, OR-WA	6	0	6	4	19
Sacramento-Roseville-Folsom, CA	23	0	50	3	65
Pittsburgh, PA	19	2	0	18	45
Las Vegas-Henderson-North Las Vegas, NV	25	0	24	4	70
Cincinnati, OH-KY-IN	29	0	0	45	54
Kansas City, MO-KS	22	0	0	84	56
Columbus, OH	10	0	0	31	50
Indianapolis-Carmel-Greenwood, IN	18	0	0	53	51
Cleveland, OH	11	0	0	21	22
Nashville-Davidson-Murfreesboro-Franklin, TN	11	0	0	41	65
San Jose-Sunnyvale-Santa Clara, CA	15	0	17	2	32
Virginia Beach-Chesapeake-Norfolk, VA-NC	14	43	0	23	62
Jacksonville, FL	22	42	12	14	93
Providence-Warwick, RI-MA	25	45	0	10	10
Milwaukee-Waukesha, WI	11	0	0	34	37
Raleigh-Cary, NC	4	35	0	34	67
Oklahoma City, OK	13	0	9	98	69
Louisville/Jefferson County, KY-IN	17	0	0	49	59
Richmond, VA	3	23	0	24	63
Memphis, TN-MS-AR	23	15	0	56	70
Salt Lake City-Murray, UT	4	0	60	5	48
Birmingham, AL	65	16	0	45	74
Fresno, CA	33	0	45	4	69
Grand Rapids-Wyoming-Kentwood, MI	12	0	0	21	41
Buffalo-Cheektowaga, NY	29	3	0	9	33
Top 50 metros with slight-to-moderate risk	16	12	9	16	19
Top 50 metros with high risk	4	2	1	6	16
Top 50 metros with very high-to-extreme risk	0	1	1	3	12

Figure A2 • The Top Five Highest-Risk Metro Areas Ranked by Individual Peril

Composite flood	Score
Houston-Pasadena-The Woodlands, TX	68
Birmingham, AL	65
Miami-Fort Lauderdale-West Palm Beach, FL	61
Tampa-St. Petersburg-Clearwater, FL	58
St. Louis, MO-IL	47

Inland flood	Score
Birmingham, AL	70
Houston-Pasadena-The Woodlands, TX	68
St. Louis, MO-IL	53
Phoenix-Mesa-Chandler, AZ	48
Riverside-San Bernardino-Ontario, CA	39

Wildfire	Score
San Diego-Chula Vista-Carlsbad, CA	71
Salt Lake City-Murray, UT	60
Riverside-San Bernardino-Ontario, CA	54
Phoenix-Mesa-Chandler, AZ	50
Sacramento-Roseville-Folsom, CA	50

Severe-convective storm	Score
Oklahoma City, OK	98
Dallas-Fort Worth-Arlington, TX	90
Kansas City, MO-KS	84
Austin-Round Rock-San Marcos, TX	65
San Antonio-New Braunfels, TX	64

Hurricane wind	Score
Miami-Fort Lauderdale-West Palm Beach, FL	98
Houston-Pasadena-The Woodlands, TX	60
Tampa-St. Petersburg-Clearwater, FL	57
Orlando-Kissimmee-Sanford, FL	54
Providence-Warwick, RI-MA	45

Earthquake	Score
San Jose-Sunnyvale-Santa Clara, CA	100
San Francisco-Oakland-Fremont, CA	99
Riverside-San Bernardino-Ontario, CA	93
Los Angeles-Long Beach-Anaheim, CA	92
Seattle-Tacoma-Bellevue, WA	86

Heatwave	Score
Miami-Fort Lauderdale-West Palm Beach, FL	99
Orlando-Kissimmee-Sanford, FL	98
Tampa-St. Petersburg-Clearwater, FL	98
Jacksonville, FL	93
Houston-Pasadena-The Woodlands, TX	92

Annual days of heatwave	Days
Phoenix-Mesa-Chandler, AZ	146
Las Vegas-Henderson-North Las Vegas, NV	113
Fresno, CA	87
Riverside-San Bernardino-Ontario, CA	72
San Antonio-New Braunfels, TX	71

100–86: Extreme	85–71: Very High	70–56: High	55–36: Moderate	35–21: Low	20–0: Very Low
Complete property damage and losses	Very high property damage and losses	High property damage and losses	Moderate property damage and losses	Slight property damage and losses	Very low to no property damage and losses

Figure A3 • Detailed TCFD Alignment for 60 Municipal Bond Issuances from the Top 20 Riskiest Large Metro Areas

(See Official Statements)

	Issuer	GO vs. Revenue	Subtype	G	S	RM	T	Alignment Score
1	**Miami - Ft Lauderdale - West Palm Beach, FL**							
	Miami-Dade Co.	GO	Local general purpose	✓	✓	✓	✗	3
	Housing Finance Auth. of Miami-Dade Co.	Revenue	Housing	✗	✗	✗	✗	0
	City of Fort Lauderdale	Revenue	Water/sewer	✓	✓	✓	✗	3
2	**San José - Sunnyvale - Santa Clara, CA**							
	City of San José	GO	Local general purpose	✗	✓	✓	✗	2
	Co. of Santa Clara	GO	Local general purpose	✗	✓	✗	✗	1
	City of Santa Clara	Revenue	Electric/gas utility	✓	✓	✓	✓	4
3	**San Francisco - Oakland - Fremont, CA**							
	City of Oakland	GO	Public facilities	✗	✓	✓	✗	2
	San Francisco Airport Commission	Revenue	Airport	✗	✓	✓	✓	3
	San Francisco Public Utilities Commission	Revenue	Water/sewer	✗	✓	✓	✓	3
4	**Houston - Pasadena - The Woodlands, TX**							
	Harris Co.	GO	Local general purpose	✗	✓	✓	✗	2
	City of Houston Airport System	Revenue	Airport	✗	✓	✗	✗	1
	Harris Co.	Revenue	Toll roads	✗	✗	✗	✗	0
5	**Oklahoma City, OK**							
	City of Oklahoma City	GO	Public facilities	✗	✗	✗	✗	0
	Oklahoma Housing Finance Agency	Revenue	Housing	✗	✗	✗	✗	0
	Oklahoma Turnpike Auth.	Revenue	Toll roads	✗	✓	✗	✗	1
6	**Riverside - San Bernardino - Ontario, CA**							
	City of Ontario	Revenue	Local general purpose	✗	✓	✗	✗	1
	Riverside Co. Public Financing Auth.	Revenue	Redevelopment agency	✗	✓	✓	✗	2
	Corona Utility Auth.	Revenue	Water/sewer	✗	✓	✓	✗	2
7	**Memphis, TN - MS - AR**							
	City of Memphis	GO	Local general purpose	✗	✓	✗	✗	1
	City of Memphis	Revenue	Water/sewer	✗	✓	✗	✗	1
	City of Memphis	Revenue	Electric/gas utility	✗	✓	✗	✗	1
8	**Dallas - Fort Worth - Arlington, TX**							
	City of Dallas	GO	Water/sewer	✗	✓	✗	✗	1
	Dallas Fort Worth International Airport	Revenue	Airport	✗	✗	✗	✗	0
	City of Dallas	Revenue	Water/sewer	✗	✗	✗	✗	0

Figure A3 • Detailed TCFD Alignment for 60 Municipal Bond Issuances from the Top 20 Riskiest Large Metro Areas

(See Official Statements)

Issuer	GO vs. Revenue	Subtype	G	S	RM	T	Alignment Score
9 Tampa - St. Petersburg - Clearwater, FL							
City of Tampa	Revenue	Local general purpose	✓	✓	✓	✗	3
Hillsborough Co. Aviation Auth.	Revenue	Airport	✗	✗	✓	✗	1
Hillsborough Co. Industrial Development Auth.	Revenue	Hospital	✗	✓	✗	✗	1
10 Los Angeles - Long Beach - Anaheim, CA							
Los Angeles Co. Public Works Financing Auth.	Revenue	Hospital	✓	✓	✗	✗	2
Los Angeles Co. Development Auth.	Revenue	Housing	✗	✗	✗	✗	0
City of Los Angeles Dept. of Water and Power	Revenue	Water/sewer	✗	✓	✓	✓	3
11 St. Louis, MO - IL							
City of St. Louis	GO	Public facilities	✗	✓	✓	✗	2
City of St. Louis	Revenue	Airport	✗	✗	✗	✗	0
Missouri Health & Educational Facilities Auth.	Revenue	Hospital	✗	✗	✗	✗	0
12 Kansas City, MO - KS							
Kansas City, MO	GO	Local general purpose	✗	✗	✓	✗	1
Kansas City, MO	Revenue	Public facilities	✗	✓	✗	✗	1
Kansas City, MO	Revenue	Water/sewer	✗	✗	✗	✗	0
13 Birmingham, AL							
Birmingham - Jefferson Civic Center Auth.	Revenue	Public facilities	✗	✗	✗	✗	0
Birmingham Water Works Board	Revenue	Water/sewer	✗	✗	✗	✗	0
Jefferson Co.	Revenue	Water/sewer	✗	✓	✗	✗	1
14 Salt Lake City - Murray, UT							
Salt Lake Co.	Revenue	Public facilities	✗	✓	✗	✗	1
Salt Lake City	Revenue	Airport	✓	✓	✓	✓	4
Salt Lake City	Revenue	Water/sewer	✓	✓	✓	✓	4
15 San Antonio - New Braunfels, TX							
City of New Braunfels	GO	Local general purpose	✗	✗	✗	✗	0
City of San Antonio	Revenue	Water/sewer	✗	✗	✗	✗	0
CPS Energy	Revenue	Electric/gas utility	✓	✗	✗	✗	1
16 Indianapolis - Carmel - Greenwood, IN							
IPS Multi-School Building Corporation	GO	Schools	✗	✗	✗	✗	0
Indianapolis Bond Bank	Revenue	Airport	✗	✗	✗	✗	0
Citizens Energy Group	Revenue	Electric/gas utility	✗	✗	✗	✗	0

Figure A3 • Detailed TCFD Alignment for 60 Municipal Bond Issuances from the Top 20 Riskiest Large Metro Areas (See Official Statements)

Issuer	GO vs. Revenue	Subtype	G	S	RM	T	Alignment Score
17 Seattle - Tacoma - Bellevue, WA							
City of Seattle	GO	Public facilities	✓	✗	✓	✓	3
Port of Seattle	Revenue	Airport	✗	✓	✓	✗	2
City of Seattle	Revenue	Electric/gas utility	✗	✓	✓	✗	2
18 Orlando - Kissimmee - Sanford, FL							
City of Orlando	Revenue	Stadium	✗	✓	✗	✗	1
Greater Orlando Aviation Auth.	Revenue	Airport	✗	✗	✗	✗	0
Orlando Utilities Commission	Revenue	Electric/gas utility	✗	✗	✗	✗	0
19 Austin - Round Rock - San Marcos, TX							
City of Austin	GO	Local general purpose	✗	✗	✗	✗	0
City of Austin	Revenue	Water/sewer	✗	✓	✗	✗	1
Austin Independent School District	GO	Schools	✗	✗	✗	✗	0
20 Cincinnati, OH - KY - IN							
Port of Greater Cincinnati Development Auth.	Revenue	Public facilities	✗	✗	✗	✗	0
Kenton Co. Airport Board	Revenue	Airport	✗	✓	✗	✗	1
Hamilton Co.	Revenue	Water/sewer	✗	✗	✗	✗	0
Total number TCFD aligned			**9**	**33**	**20**	**7**	