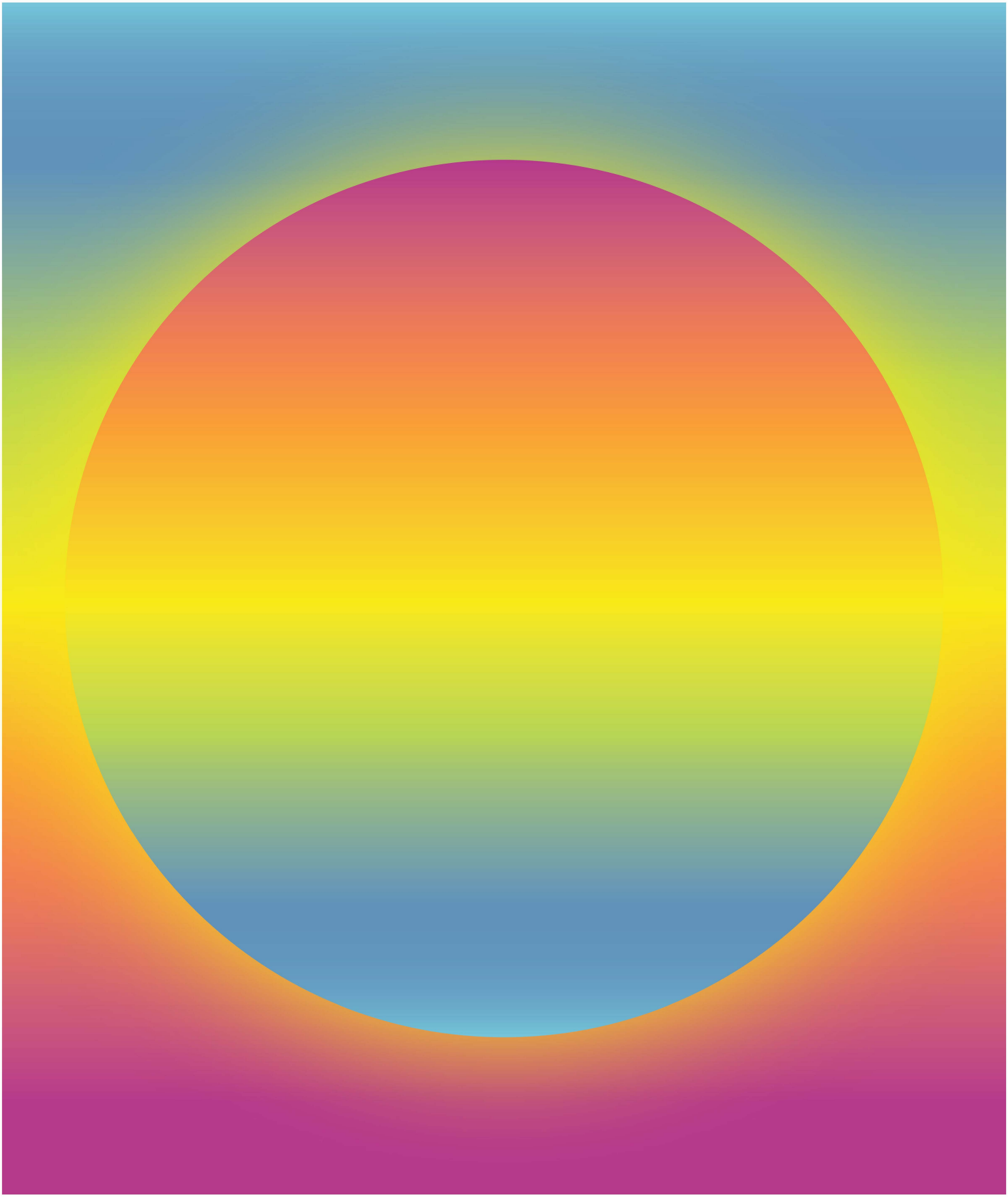

CLIMATE CHANGE DISCLOSURE AMONG CALIFORNIA ENTERPRISE ISSUERS

CALIFORNIA DEBT AND INVESTMENT ADVISORY COMMISSION | CDIAC NO.20.08

CALIFORNIA DEBT AND INVESTMENT ADVISORY COMMISSION

The California Debt and Investment Advisory Commission (CDIAC) provides information, education, and technical assistance on debt issuance and public funds investments to local public agencies and other public finance professionals. CDIAC was created to serve as the state's clearinghouse for public debt issuance information and to assist state and local agencies with the monitoring, issuance, and management of public debt.

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EXECUTIVE SUMMARY

In 2010, the Securities and Exchange Commission (SEC) published interpretive guidance on disclosure of the risks of climate change. Although the guidance was focused on corporate disclosure, it highlights the importance of providing prospective investors with the full picture of risk for a publicly-traded security. The SEC regulates municipal issuers indirectly through its relationship with underwriters, and market expectations have recently evolved to favor disclosure of risks associated with climate change. In 2018, climate change disclosure – or lack of climate change disclosure – became the focus of litigation by ExxonMobil against a group of California cities and counties that had filed suit against the company for future damages from sea-level rise and coastal flooding due to greenhouse gas emissions from fossil fuel products sold by the company. The ExxonMobil litigation countered that the public agency claims were not made in good faith, because these climate-related issues had not been included in the cities' and counties' recent bond disclosures. While the litigation against the public agencies did not move forward, it did prompt public agencies to begin to review and disclose their climate change risk in their offering documents.

To understand how California's municipal bond market is accounting for risks of climate change, The California Debt and Investment Advisory Commission (CDIAC) conducted a content analysis of official statements (OSs). CDIAC reviewed almost 200 OSs for enterprise-revenue bonds issued between July 2016 and June 2019 and examined several factors that might be correlated with an issuer's thoroughness of climate change disclosure, including: the issuer's self-assessment of climate risk, issuance size, bond insurance, debt purpose, geography, year, issuance frequency, and special bond types such as refinanced bonds (also known as refundings) and green bonds. CDIAC examined how many times climate change was mentioned in the disclosure documents and rated each OS based on an internal scoring rubric created by CDIAC for this study.

CDIAC found a wide range of practices among the issuers in the study sample. Despite growing market expectations to report climate risk, the majority of issuers in the study did not mention climate change anywhere in their disclosure documents. Paradoxically, issuers that did discuss climate change in the official statement were more likely to have a thorough description of the agency's climate risk than a standard, "boilerplate" disclosure for climate change.

Large issuance size and high issuance frequency were strongly correlated with robust disclosures of risks due to climate change. Issuers of green bonds were also especially likely to mention climate change and to earn a high score on the CDIAC rubric. Refundings and insured bonds, however, were less likely to contain discussions of risks of climate change in the OS.

Disclosure practices related to climate change also varied by geography. Issuers in coastal counties and urban counties generally tended to include a more thorough disclosure than inland and rural counties. That said, there were exceptions to every trend, and individual issuer practices appeared to be the determinate factor in whether climate risk was included in the disclosure documents. This report found cases where comparable issuers with similar physical risks of climate change had significantly different disclosure practices related to climate change. This analysis also found that climate change was not mentioned in any disclosure documents from issuers in 14 of the 39 counties in the report sample.

Disclosure practices related to climate change also appeared to improve over time. Bonds issued in 2019 were much more likely to mention climate change and earn a high score on the CDIAC study rubric even after controlling for potential sampling bias. However, there were still a number of issuers that sold bonds in 2019 that did not mention climate change anywhere in the OS.

This report offers a snapshot of how climate risk has been incorporated into disclosure practices in California's municipal market. Although there are valid reasons why an issuer may omit climate change in the disclosure documents for a bond, such as a threshold for materiality, this study has found evidence that disclosure practices related to climate change in California's municipal market may not reflect actual climate risk. If this is the case, there appears to be a disconnect between issuer disclosure practices and market expectations from investors and regulators.

Although projected effects of climate change have received additional attention in recent years, a consideration of climate change in disclosure documents is a relatively new and evolving expectation. CDIAC encourages more consistency in how climate risk is disclosed to investors as well as continued development of best practices for disclosure of potential impacts of climate change.

INTRODUCTION

Municipal securities are often issued by public agencies to finance large public infrastructure projects critical to the agency's mission. Many of these bond-financed infrastructure projects have useful lives that extend well past 30 years, and, accordingly, public agencies often issue 30-year bonds to finance the projects. Prospective investors need timely and accurate information from issuers to weigh the risks of their investment over this long time horizon. Public agencies prepare and publish offering documents for these securities, known in the municipal market as preliminary official statements (POSs) and official statements (OSs) after the bonds are priced. These initial disclosure documents are expected to contain pertinent information about the issuer's financial condition, the project being financed, plan for repayment, tax treatment of interest received by the investor, underwriting terms, the published ratings for the securities, relevant litigation, continuing disclosure agreement, and relevant risk factors which investors would deem material.[1] The standard of disclosure for all issuers is set forth in Section 17(a) of the Securities Act of 1933 and Rule 10b-5 adopted by the Securities and Exchange Commission (SEC) pursuant to the Securities and Exchange Act of 1934 (collectively the "anti-fraud provisions") and Rule 15c2-12 adopted by the SEC pursuant to the Securities and Exchange Act of 1934 (initial and continuing disclosure).[2] Outside of the context of these SEC rules, however, there is no set standard for the content or structure of disclosure documents. It is the responsibility of the issuer to determine which factors are material to the agency and then include discussions of those factors when disclosing to investors.

The SEC published interpretive guidance on corporate disclosure of risks of climate change in 2010, which detailed the need to disclose material risks of climate change stemming from regulation, international accords, and physical impacts of climate change.[3] Although the SEC regulates municipal issuers indirectly through its relationship with underwriters, market expectations are evolving to favor disclosure of risks associated with climate change. Disclosure of projected effects of climate change gained additional attention after ExxonMobil pursued litigation against a group of California cities and counties that had filed suit against the company for future damages from sea-level rise and coastal flooding due to greenhouse gas emissions from fossil

[1] California Debt and Investment Advisory Commission, *California Debt Financing Guide*, 6-20, (Sacramento: 2019), Accessed March 26, 2020, www.treasurer.ca.gov/cdiac/debtpubs/financing-guide.pdf.

[2] CDIAC, *California Debt Financing Guide*, i-16.

[3] "SEC Issues Interpretive Guidance on Disclosure Related to Business or Legal Developments Regarding Climate Change," *U.S. Securities and Exchange Commission*, Published January 27, 2010, Accessed June 17, 2020, www.sec.gov/news/press/2010/2010-15.htm.

fuel products sold by the company. ExxonMobil countered by asserting that the claims made by those plaintiffs were not made in good faith, because they had not been included in the cities' and counties' bond disclosures.[4]

In addition, credit rating agencies, led by Fitch Ratings, Moody's, and S&P Global, have published reports alerting public agency issuers about plans to incorporate climate risk analysis into their ratings.[5] Fixed-income investors have also placed an increasing emphasis on climate risk when considering investment decisions. In June 2020, the California Public Employees' Retirement System (CalPERS) published its first report in line with recommendations from the Taskforce on Climate-related Financial Disclosure (TCFD) and explicitly endorsed mandatory reporting of climate risk.[6]

Climate change is expected to affect the frequency and severity of extreme and long-term climate events, including wildfires, droughts, heat waves, sea-level rise, flooding, hurricanes, windstorms, and decreased snowpack that affects water supply and agriculture.[7] Adverse consequences of climate change have already been documented in California, where the state has experienced 7 of its 10 warmest years on record from 2012-2018, and warming is expected to continue, likely causing two to three times more heat-related deaths by 2050.[8] The state has experienced a growing trend of wildfires, with three-quarters of California's 20 largest wildfires occurring since 2000.[9] California's coastline is also at risk of damage from sea-level rise, with a statewide $17.9 billion worth of residential and commercial buildings likely at risk of inundation by 2050.[10] Without proper mitigation, these higher sea levels could impact hundreds of thousands of California residents by 2100.[11] To mitigate this future damage, coastal communities are spending billions to raise sea walls and create other physical barriers. Failing to account for increased risks of these extreme events could leave investors vulnerable to potentially catastrophic losses resulting from losses to California municipal issuers due to climate change. In addition to physical risks resulting from climate change, companies and public agencies are vulnerable to transition risks resulting from changing legal and regulatory standards that have the potential to increase costs spent on compliance and new technology along with additional risks.

To gain an understanding of current disclosure practices of risks from climate change, the Cali-

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[4] Richard Halstead, "Exxon Strikes Back Against Bay Area Communities Over Climate Change Lawsuit," *The Mercury News*, Published May 7, 2018, Accessed September 4, 2020, www.mercurynews.com/2018/05/07/exxon-strikes-back-against-bay-area-communities-over-climate-change-lawsuit/.

[5] Christopher Flavelle, "Moody's Buys Climate Data Firm, Signaling New Scrutiny of Climate Risks," *The New York Times*, Published July 24, 2019, Accessed April 9, 2020, www.nytimes.com/2019/07/24/climate/moodys-ratings-climate-change-data.html.

[6] Anne Simpson and Yu Meng, "CalPERS' Investment Strategy on Climate Change: First Report in Response to the Taskforce on Climate-related Financial Disclosure (TCFD)," *CalPERS*, Published June 15, 2020, Accessed June 17, 2020, www.calpers.ca.gov/docs/board-agendas/202006/invest/item08c-00_a.pdf.

[7] Alvar Escriva-Bou, et al., "Climate Change," *Public Policy Institute of California*, 1, Published January 2020, Accessed February 25, 2020, www.ppic.org/wp-content/uploads/californias-future-climate-change-january-2020.pdf.

[8] Louise Bedsworth, et al. (California Governor's Office of Planning and Research, Scripps Institution of Oceanography, California Energy Commission, California Public Utilities Commission), "Statewide Summary Report, California's Fourth Climate Change Assessment," Publication number: SUMCCCA4-2018-013, Published 2018, Accessed September 2, 2020, www.climateassessment.ca.gov/state/overview/.

[9] Escriva-Bou, et al., "Climate Change," 1-3.

[10] Bedsworth, et al., "Statewide Summary Report, California's Fourth Climate Change Assessment."

[11] Gabriel Petek, *Preparing for Rising Seas: How the State Can Help Support Local Coastal Adaptation Efforts, 6*, (Sacramento: Legislative Analyst's Office, 2019), Accessed June 17, 2020, https://lao.ca.gov/reports/2019/4121/coastal-adaptation-121019.pdf.

fornia Debt and Investment Advisory Commission (CDIAC) conducted a content analysis of OSs of public enterprise revenue bonds issued by California public agency issuers between July 1, 2016 and June 30, 2019.[12] The goal of this research project was to study the extent to which initial disclosure practices in the municipal bond market are accounting for risks of climate change and identify whether any factors (e.g. issuance size, debt type, geography, etc.) had an effect on the disclosure of climate risk. CDIAC reviewed each OS for the discussion of physical and transition risks of climate change as well as whether the issuer explicitly included climate change considerations in the agency's risk mitigation policies. CDIAC found a spectrum of practices from this study of 171 unique issuers over the three-year period.

Recommendations for specific best practices for disclosure of such climate change risks were outside the scope of this study. However, this analysis of initial disclosure of climate risk is intended to contribute to a further understanding of disclosure practices, and to also identify potential discrepancies with investor expectations in the municipal market.

REPORT METHODOLOGY

To understand the current level of climate change disclosure by California issuers, CDIAC undertook a review of OSs to study the extent to which initial disclosure practices in the municipal bond market are accounting for physical and transition risks associated with climate change and the potential impact on each applicable public agency issuer's ability to repay the bonds. This study of the California municipal bond market featured both quantitative and qualitative research methods in order to evaluate the integration of climate risk in initial disclosure practices. It should be noted, however, that the impact of climate change is not expected to be uniformly felt across the state, so some variation in disclosure practices may reflect that. Moreover, the OSs reviewed reflect disclosures made by governmental issuers in different sectors. As a consequence, the choice of what to disclose may be driven in part by the diversity of those issuers.

Study Sample

CDIAC Research staff reviewed 171 long-term, publically-offered enterprise revenue bonds[13] issued during fiscal years (FYs) 2017, 2018, and 2019.[14] Public enterprise revenue bonds were selected because there is a direct link between risks to enterprise operations and the repayment of outstanding bonds.[15] Limiting the sample to this group of issuers also concentrated the sample to a feasible number of records to evaluate while decreasing extra variation in the sample from multiple issuer types. Only publicly-sold bonds were included in the study, with private placements and loans excluded from the sample.

To refine the study sample, CDIAC considered only *unique* issuers. In cases where an issuer sold long-term debt more than once in the three-year period, only the most recent bonds (and corresponding OSs) from each issuer were included in the sample. All other bonds from issuers already represented in the sample were excluded. This allowed all issuers to constitute the same share of the project sample, regardless of issuance size or frequency. Otherwise, issuers that sell bonds more frequently would dilute the results from

[12] Debt issuance was reported to CDIAC. CDIAC's DebtWatch database was used to identify the public enterprise revenue bonds reported to CDIAC and issued between July 1, 2016 through June 30, 2019.

[13] Records were excluded if the type of debt was classified as commercial paper or as any type of anticipation note.

[14] Fiscal years 2017, 2018, and 2019 include the period of time between July 1, 2016 and June 30, 2019.

[15] Issuers that cited other forms of repayment in addition to enterprise revenue (e.g. property taxes, etc.) were excluded from the sample.

smaller issuers that are not selling debt in the market as often.

In addition, records from local obligors issuing through a joint-powers authority (JPA) or other authority were also excluded, because the OSs for those records were the same as the ones for the issuing authority in the sample. In other words, the OS was reviewed in those cases, but the evaluation results were associated with the JPA as opposed to the local obligor. Each OS was counted and evaluated only once.

After applying all of the aforementioned exclusion criteria, the "population" of OSs to evaluate filtered to 171.[16] The CDIAC Research team was able to review each OS, so there is no sampling error for this study.

Data Source

Analysis for this project relied on data from CDIAC's Debt Issuance Database, which contains information on all public agency debt issued in California and reported to CDIAC. This data is available online through CDIAC's DebtWatch[17] website. In addition, each OS in the project sample was retrieved from the Electronic Municipal Market Access (EMMA) website,[18] and was evaluated based on the rubric framework described below.

CDIAC Rubric

CDIAC formulated a rubric to evaluate each OS for this project. The CDIAC rubric tracked several criteria, which were grouped in levels by "scores" ranging from zero through five. Each score on the rubric was composed of specific criteria relating to the thoroughness of disclosure of the issuer's climate risk (see Appendix A). Each specific criterion in the rubric was tracked for each issuer in addition to the overall score (Figure 1).

SCORES ON THE CDIAC RUBRIC. The first two scores on the CDIAC rubric were in cases where the issuer did not mention climate change anywhere in the OS. Issuers that discussed risks from natural disasters without mentioning climate change earned a score of one. Issuers that did not mention climate change or natural disasters in the OS were assigned a score of zero.

For scores two through five, the criteria for each score built on each of the previous levels. Issuers were given a score of two if a statement mentioned "climate change"[19] but did not otherwise include a meaningful discussion of related risks. To earn a score of three, the issuer needed to include at least a general discussion of physical and transition risks of climate change. Scores of four were assigned when the disclosure documents contained discussions of issuer-specific physical and transition risks of climate change. To score a five – the highest score – an issuer needed to disclose *quantified* issuer-specific risks. (See Appendix A for a full list of criteria for each score in the CDIAC rubric.)

The intention of the rubric was to capture both "breadth" in terms of the kinds of risks related to climate change and "depth" in the thoroughness of the disclosure of the issuer's climate risk.

"BREADTH" OF CLIMATE RISKS:

- Physical risks to infrastructure or operations affected by climate change

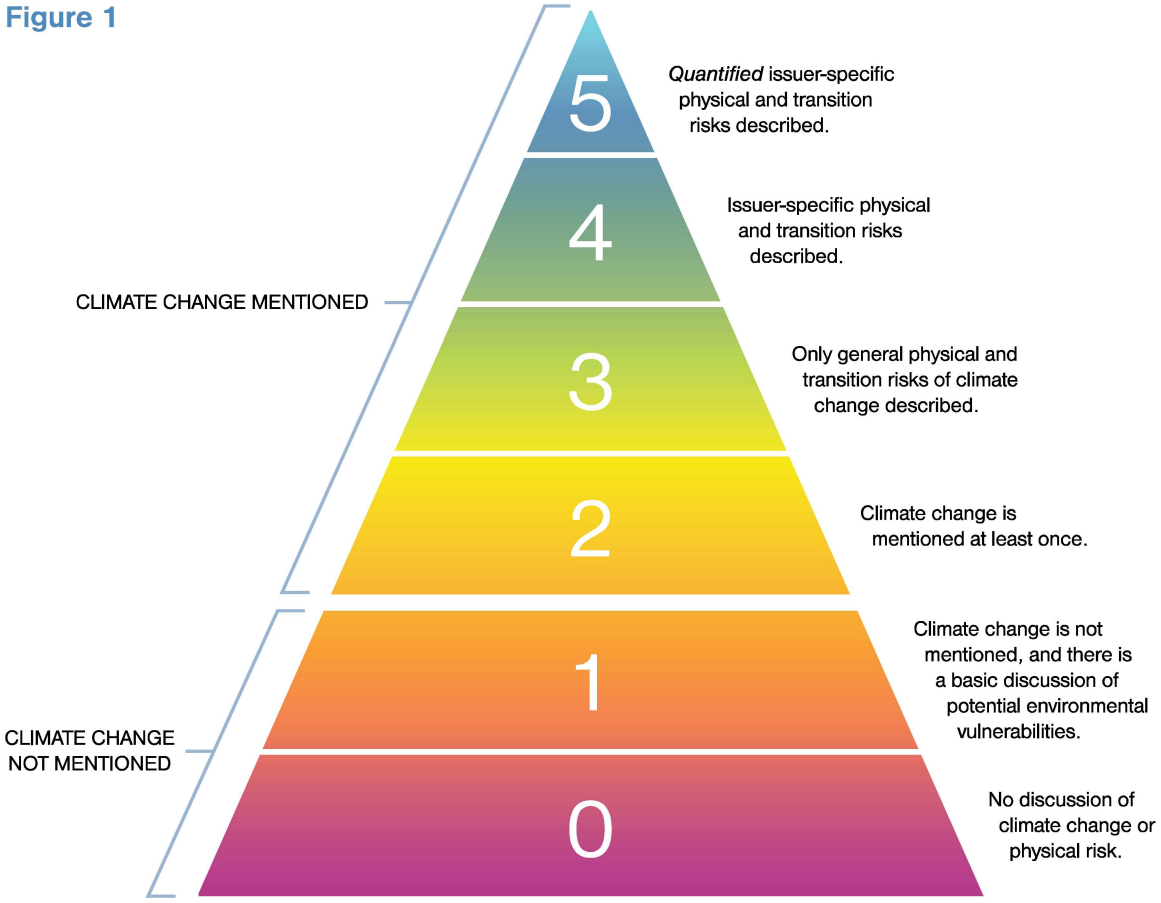
[16] The list of records to review was randomized in case a representative sample needed to be taken.

[17] The DebtWatch website is publicly available without a subscription at https://debtwatch.treasurer.ca.gov/. Records on DebtWatch are updated monthly.

[18] The EMMA website is a service of the Municipal Securities Rulemaking Board (MSRB), https://emma.msrb.org/.

[19] Climate change references also included language such as "changing climate" or other similar references relevant to climate change. References to "climate" in the context of typical weather patterns for the region were not counted.

Figure 1



- Transition risks to a low-carbon, climate-resilient environment.

PHYSICAL RISKS of climate change relate to the increased likelihood and severity of acute (event-driven) or chronic (longer-term) shifts. Consensus from the scientific community suggests that climate impacts in California include sea-level rise, ocean acidification, wildfires, changes in precipitation (flooding, drought, and decreased snowpack), increased temperatures, and wind events, etc.[20]

TRANSITION RISKS of climate change relate to the increased future costs of compliance and liability in the conversion to a low-carbon environment.[21] This also includes risks from technological change; decreased market share due to a host of factors, including policy, regulation, and market dynamics; as well as possible legal or reputational damage that can result from shift in social norms about ethical business practices related to energy use and emissions.

"DEPTH" OF CLIMATE RISKS:

- Thoroughness in description of climate-related risks
- Integration of climate-risk mitigation throughout operations
- Internal monitoring and tracking of relevant environmental outputs

[20] Escriva-Bou, et al., "Climate Change," 1.

[21] "Firms Face Physical, Regulatory and Legal Risks From Climate Change: Most Still do not own up to Their Vulnerabilities," *The Economist*, Published September 21, 2019, Accessed March 9, 2020, www.economist.com/business/2019/09/21/firms-face-physical-regulatory-and-legal-risks-from-climate-change.

- Quantified analysis of potential effects of climate change

The CDIAC rubric incorporated some elements of frameworks published by other organizations, including the Task Force on Climate-related Financial Disclosures (TCFD),[22] CalPERS and Wellington Management,[23] and Hawkins Delafield & Wood.[24] The format from the Hawkins Advisory brief was adapted from guidance related to cybersecurity risks. Although the TCFD has not yet released guidance specifically for government entities, many of the TCFD recommendations are applicable to public agencies as well.

Additional Data Elements

In addition to tracking the specific criteria and score on the rubric, CDIAC tracked additional data points while reviewing each statement, including:

- The number of times "climate change" and "global warming" were referenced in the OS
- The parts of the OS in which "climate change" was mentioned
- Whether the bond was a green bond, Climate Bond Certified, or another special bond type
- Whether the issuance was covered by bond insurance (as well as the insuring company)
- Whether the statement described any project-specific risks due to climate change
- Whether language in the OS linked climate risks to repayment of bond proceeds
- Which types of environmental vulnerabilities (e.g. sea-level rise, flooding, extreme heat, wildfires, etc.) were listed as climate risks for the issuer
- Whether the OS referenced external reports related to climate change

The evaluation process also tracked other supplementary information such as the total issuance amount, whether the issuance was a (full or partial) refunding, whether there was a taxable component for the bond, whether the issuer was a JPA, and the number of pages in each OS.

Process

Consistency in estimates was a fundamental priority of the CDIAC Research team for this project. Two members of the CDIAC research team separately reviewed each OS, and the same two researchers evaluated all 171 statements. The two researchers evaluated each OS using a hard-copy template and then met and confirmed the results together. The researchers discussed and resolved any discrepancies prior to data entry in an electronic survey collector, all in a concerted effort to make the results for this study as consistent as possible.

The CDIAC rubric applied well to the majority of statements. In some cases, OSs scored very well in some areas but did not satisfy criteria from the lower scores. For example, an OS may have had a very detailed discussion of regulatory requirements and transition risks, but no discussion of physical risks of climate change (or vice versa). The CDIAC research team reviewed those situations on a case-by-case basis and made joint determinations for the best

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[22] Task Force on Climate-Related Financial Disclosures, *Final Report: Recommendations of the Task Force on Climate-related Financial Disclosures*, (Basel: 2017), Accessed March 12, 2020, www.fsb-tcfd.org/wp-content/uploads/2017/06/FINAL-2017-TCFD-Report-11052018.pdf.

[23] Wellington Management, *Physical Risks of Climate Change (P-ROCC): A New Framework for Corporate Disclosures*, (2019), Accessed March 12, 2020, www.wellington.com/uploads/2019/10/21eb89c87e979daca0b3fe271c7408e1/physical-risks-of-climate-change_procc_framework.pdf.

[24] Hawkins Delafield & Wood LLP, *Hawkins Advisory: Cybersecurity*, (2018), Accessed March 12, 2020, www.hawkins.com/about/publications/2018-05-29-cybersecurity-municipal-disclosure/_res/id=Attachments/index=0/Hawkins%20Advisory5292018.pdf.

score in the CDIAC rubric. Since rubric criteria were tracked separately from the final rubric score, it was possible for an issuer to meet individual rubric criteria outside of the score that was ultimately assigned.

Limitations

The intention of this study was to analyze and report on initial disclosure practices for risks related to climate change in California's municipal bond market. As is the case in every study, the analyses in this report were constrained by limitations that could not be fully mitigated. These limitations are explained in more detail below.

CDIAC relied on the contents of the issuer's initial disclosure documents to complete the analysis, as CDIAC did not have the staff capacity to track down additional or referenced information to incorporate into the issuer's score on the study rubric. For example, a number of issuers referred to external reports related to climate mitigation or resilience in their OS, such as annual sustainability reports, strategic plans, disclosure through the Carbon Disclosure Project (CDP), etc. It was outside of the context of this research to independently review and verify the contents of those external reports. CDIAC has noted at least one recent instance where an issuer was downgraded by a rating agency for not adequately accounting for climate risk based on information contained in a supplementary analysis outside the scope of this report.

It is also not possible to know if any omissions of climate change in disclosure documents were because climate change was determined to not be a material risk. An issuer (and/or counsel firm) may have considered potential effects of climate change and determined that climate change did not pose a material risk to its operations and/or repayment of bond proceeds. In that case, the issuer could have a low score on the CDIAC rubric despite taking risks of climate change into account. The CDIAC rubric cannot fully account for the unique context of each issuer; even issuers with lower scores on the rubric may be faithfully representing the material risks to their entity in their disclosure documents. If so, it is possible that some of the results from the analyses in this report are overestimated. CDIAC staff considered this limitation and attempted to account for that possibility over the course of the study.

Although there was no sampling error for this study, some of the analyses in this report had few observations for specific criteria. This was especially the case for the geographic analysis of issuers located in each county. This issue is mitigated by the lack of sampling error, but the small number of observations could lead to volatility in the results of the analysis.

REPORT FINDINGS

Throughout the course of this study, CDIAC found that disclosure of climate risk was correlated with multiple factors. This report includes comparisons between measures of disclosure of risks of climate change with risks from natural disasters, issuance amount, debt purpose, bond insurance, repayment risk, year, and geography. This report also analyzes disclosure of climate risk for refundings and green bonds.

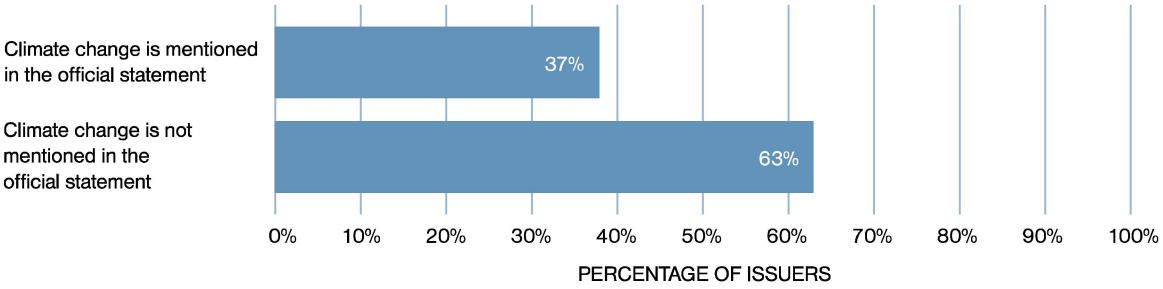
Disclosure of Natural Disasters and Physical Climate Risk

Almost all (98%) of the issuers in the study disclosed at least some risks from natural disasters in the OS whether they mentioned climate change in the OS or not. Almost all (97%)[25] also mentioned risks from natural disasters that the scientific community has linked to climate change

[25] A small amount of issuers only mentioned risks from earthquakes and seismic activity. These issuers were not counted as disclosing risks of natural disasters linked to climate change.

Figure 2

DISCLOSURE DOCUMENTS IN CDIAC STUDY WITH CLIMATE CHANGE MENTIONED
FISCAL YEARS 2017 - 2019



(e.g. droughts, floods, wildfires, sea-level rise, reduced snowpack, extreme heat, etc.).[26] Although virtually all of the issuers in the sample referenced natural disasters in the OS, only 37% of issuers in the study mentioned climate change anywhere in their disclosure documents (Figure 2).

Although fewer than half of issuers mention climate change in their disclosure documents, the vast majority of issuers consider natural disasters to be a potential material risk to their entity. This discrepancy suggests the possibility that effects of climate change could be a material risk to more issuers than those that have referenced risks of climate change in their OS. Although investors are likely ultimately concerned with the impacts of natural disasters, climate change is expected to increase the frequency and severity of extreme climate events. Not considering potential effects of climate change in a risk assessment could leave an issuer more vulnerable to adverse consequences on an issuer's operations and/or financial condition.

Score Distribution

Of the 37% of issuers in the study that mentioned climate change in the disclosure documents, there was a variety of ways issuers reflected risks of climate change in the OS. Figure 3 shows the distribution of scores on the CDIAC rubric for all issuers included in the study sample.

As mentioned earlier, the majority of issuers discussed risks from natural disasters without mentioning climate change. Those issuers earned a score of one on the CDIAC rubric. If a statement mentioned climate change but did not include a discussion of physical and transition risks of climate change, those issuers earned a score of two. A score of two was the least common among the issuers who mentioned climate change (only four percent of all issuers).

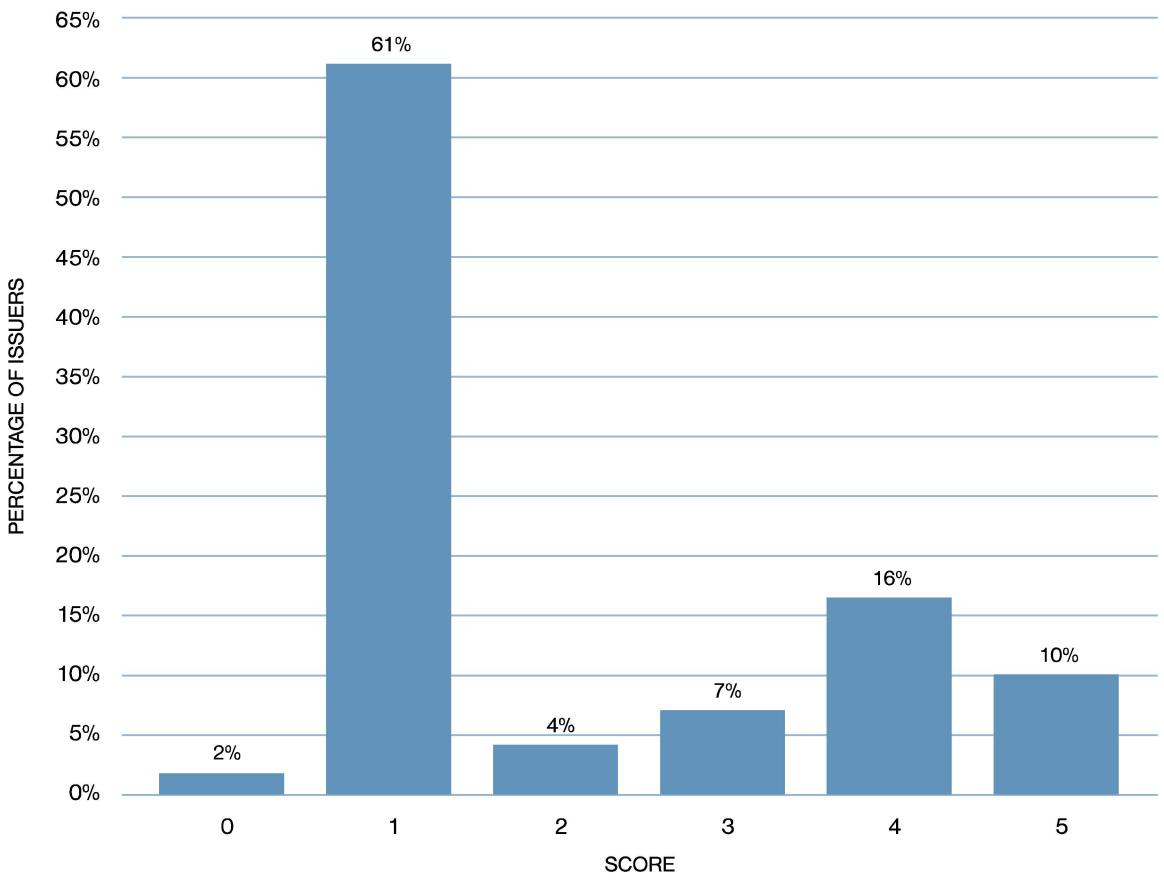
The distribution of scores on the CDIAC rubric is not a typical or expected shape. For example, there are more issuers with scores of five (10%) than issuers with scores of three (7%). There were also more scores of four (16%) than scores of two and three combined. The shape of the distribution suggests that if an issuer mentioned climate change, they were more likely to have well-developed disclosure of climate risks as opposed to using non-specific, "boilerplate" language.

An important takeaway is that several issuers in the study have found ways to successfully disclose – and even quantify – risks of climate change to their entities. There may be value in future study

[26] Escriva-Bou, et al., "Climate Change," 1.

Figure 3

DISTRIBUTION OF SCORES ON CDIAC STUDY RUBRIC, FISCAL YEARS 2017 - 2019



of best practices for municipal issuers to identify and disclose risks of climate change.

Correlation with Issuance Amount

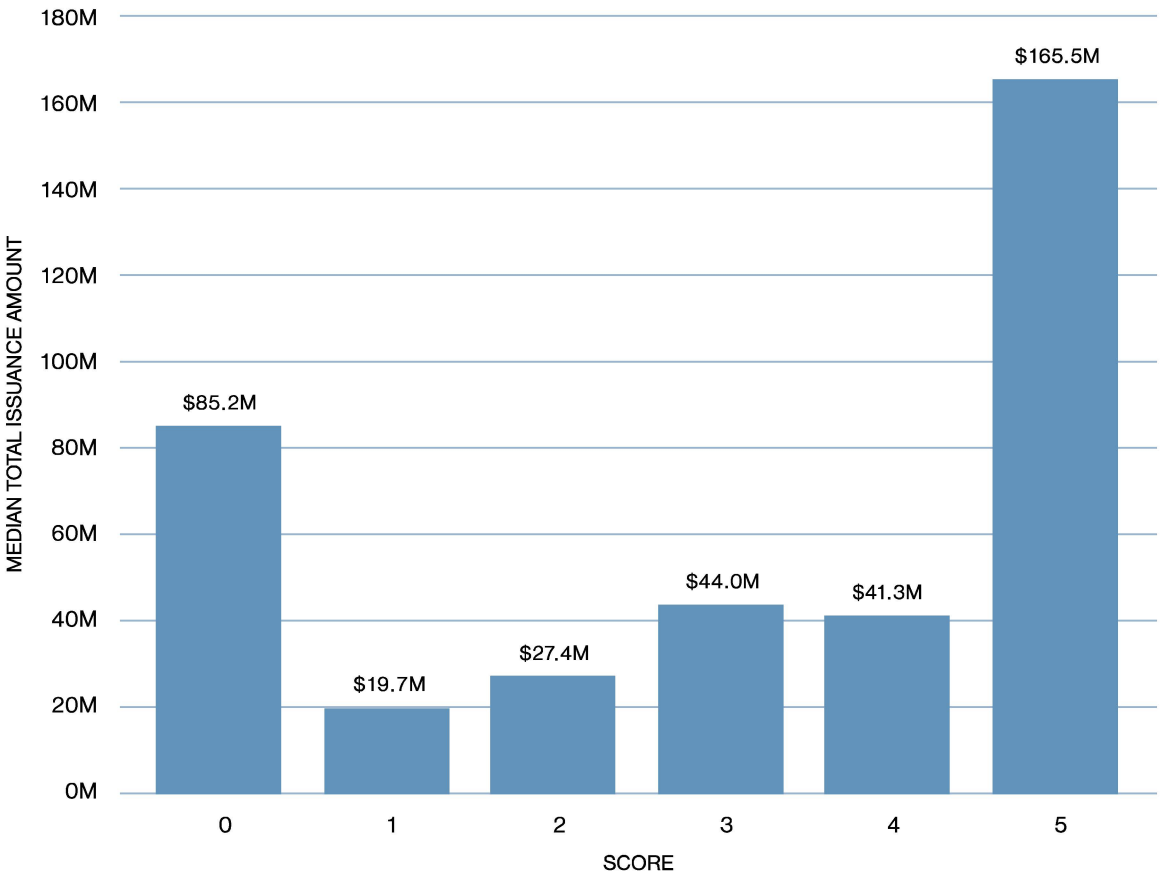
It is possible that larger issuers with more resources dedicated to debt issuance may have more well-developed disclosure practices. Although finding and using data for issuer size was outside of the scope of this study, CDIAC used a proxy to estimate this potential relationship: issuance size. This study found that scores on the CDIAC rubric were generally correlated with issuance size, especially for bonds with high scores on the rubric. There were some exceptions, however, including bonds with scores of zero.

The median[27] issuance amount of issuers that scored zero was significantly higher than the median issuance amount for all other scores except five. (See Figure 4.) There were, however, only three scores of zero in the sample. Since there were so few scores of zero on the CDIAC rubric, the reason for these scores was likely driven by factors other than issuance size. For example, all of the bonds with scores of zero

[27] CDIAC used the median issuance amount instead of the average issuance amount to avoid bonds with large issuance amounts from skewing the sample. This is consistent with best practices of estimating a "middle" point in a sample with a distribution skewed by outliers.

Figure 4

MEDIAN ISSUANCE AMOUNT, BY SCORE ON CDIAC STUDY RUBRIC, FISCAL YEARS 2017 - 2019
MEDIAN TOTAL ISSUANCE AMOUNT IN MILLIONS



were either a full or partial refunding. (See the section on Refundings in this report for a more detailed explanation.)

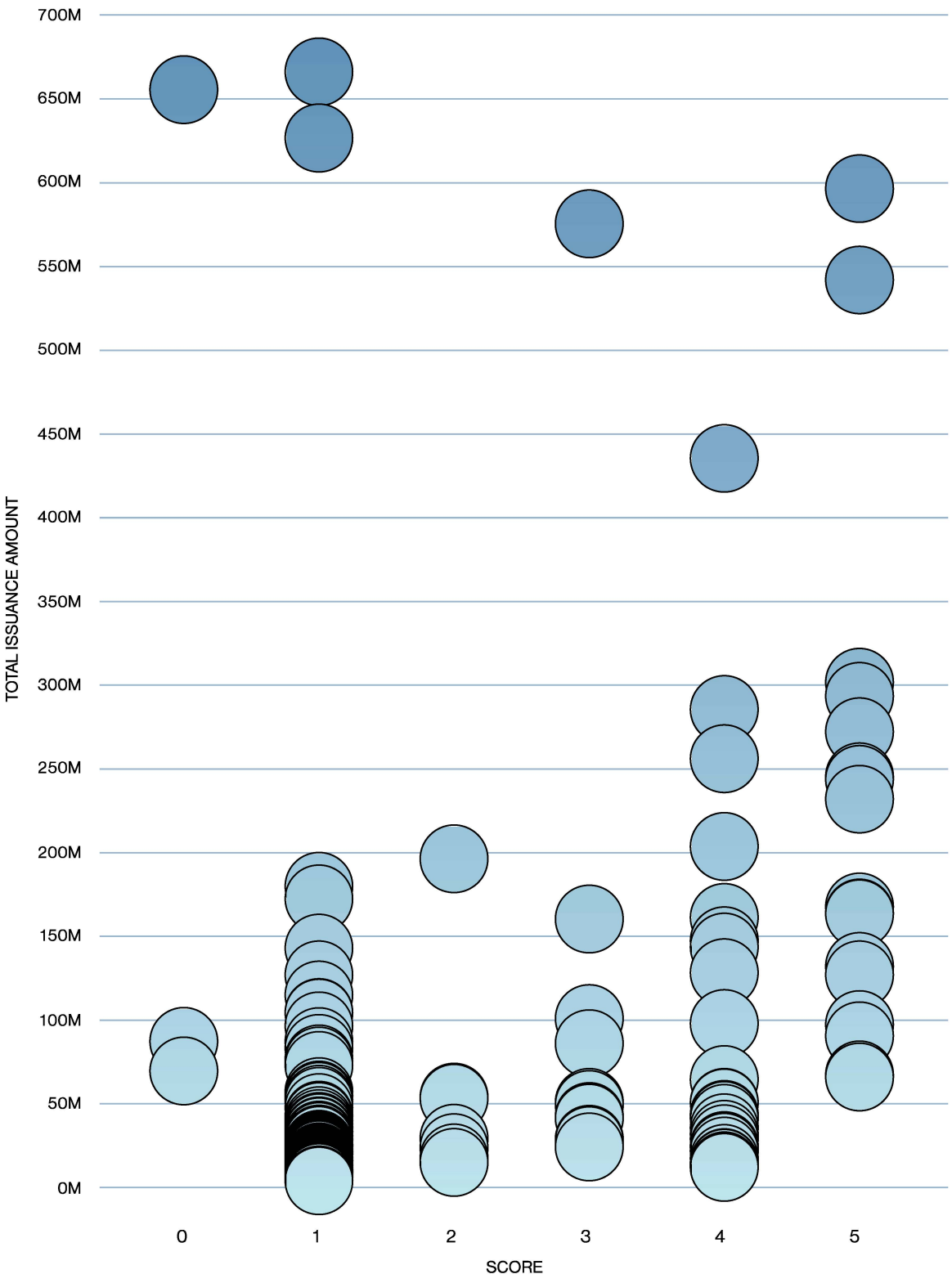
The lowest median issuance size was for issuers with a score of one on the CDIAC rubric. The median issuance size for issuers with scores of one was just under $20 million, which was less than the median issuance amount for the study sample ($27.4 million). A score of one was also by far the most common, as over 60% of issuers in the sample scored a one on the CDIAC rubric. Median issuance amount trended up for scores of one through three, and decreased slightly for issuers with scores of four on the CDIAC rubric.

The biggest takeaway from Figure 4 is the median issuance amount for issuers with scores of five on the CDIAC rubric. Median issuance size for issuers with scores of five was over four times the median issuance size for issuers with scores of four. This finding suggests that large issuers were more likely to have well-developed disclosure of climate risk than smaller issuers. Whereas no issuers with a principal amount below the median scored a five, an issuer financing at least $200 million was as likely to earn a score of five as they were to earn any other score on the CDIAC rubric.

Figure 5 shows all of the issuers in the sample, each as a separate circle on a graph organized by issuance amount and score on the CDIAC rubric. The color for each circle is shaded based on the issuance amount; a darker blue color corresponds with a larger issuance. As seen in the

Figure 5

ALL SCORES IN CDIAC STUDY RUBRIC, BY ISSUANCE SIZE, FISCAL YEARS 2017 - 2019
TOTAL ISSUANCE AMOUNT IN MILLIONS



figure, the highest concentration of bonds in the sample is for issuers with scores of one and relatively low issuance amounts. This graph is further evidence for a correlation between larger issuance amounts and higher scores on the CDIAC rubric (with some notable exceptions in the lower scores).

One potential explanation why large issuers tended to have more thorough disclosure includes more resources available to dedicate to debt functions, including those related to disclosure. Staff from larger entities may generally have more opportunities to invest time and resources in attending trainings and reading publications that discuss recent developments in disclosure trends. If so, this may directly affect issuer practices for disclosure of climate risk, because expectations about disclosure of effects of climate change have evolved significantly over the past few years. Staff from large organizations might also have more ability to specialize and conduct more thorough research about possible environmental considerations that are relevant to the issuing organization. For example, larger agencies may have more capacity to conduct their own internal risk analyses or pull from existing resources from research organizations on how climate change may affect the agency's operations in the future.

It is also possible that some larger agencies may also have more capacity to dedicate towards collaboration with other organizations that specialize in environmental disclosure. For example, the issuers in the study sample that independently disclose environmental impacts through CDP all mentioned climate change in their disclosure documents, and almost all of them scored five out of five on the study rubric. All of the issuers in the study that independently disclose environmental impacts through CDP had high issuance amounts.

Special Bond Types

GREEN BONDS

"Green bonds"[28] are bonds that finance environmentally-beneficial projects,[29] including ones that are considered to be "climate resilient." Some typical examples of green bonds include (but are not limited to) projects featuring renewable energy, improvement of water quality, environmentally-sustainable waste management, and conservation of biodiversity.[30] It is important to note that not all "green" bonds support climate-resilient projects or portfolios. Conversely, not all climate-resilient projects are considered "green."

Of the 171 bonds examined in this study, there were 11 green bonds (6% of the sample). Compared to the general study sample, green bonds were almost twice as likely to disclose risks of climate change.

Figure 6 gives a closer look at the distribution of green bonds on the CDIAC rubric. Eight of the 11 green bonds in the study sample mentioned climate change, and almost half disclosed issuer-specific climate risks. In both of these cases, green bonds had higher rates of disclosure of risks of climate change than non-green bonds.

The distribution of scores for green bonds is also much more balanced than in the general distribution. The most common scores for green bonds were one and five — the latter being the highest

[28] "Green bonds" for the purposes of this study included bonds labeled as "green" whether through self-certification or verified by a third party. Other special "labeled" bond types, such as social or sustainability bonds, were also tracked in the data collection phase, but the sample size was too small to factor into the full report analysis.

[29] California Debt and Investment Advisory Commission, *Issue Brief: Green Bonds*, 1, (Sacramento: 2014), Accessed March 23, 2020, www.treasurer.ca.gov/cdiac/publications/1409.pdf.

[30] CDIAC, *Issue Brief: Green Bonds*, 1-2.

Figure 6

DISTRIBUTION OF GREEN BONDS SCORES ON THE CDIAC STUDY RUBRIC
FISCAL YEARS 2017 - 2019

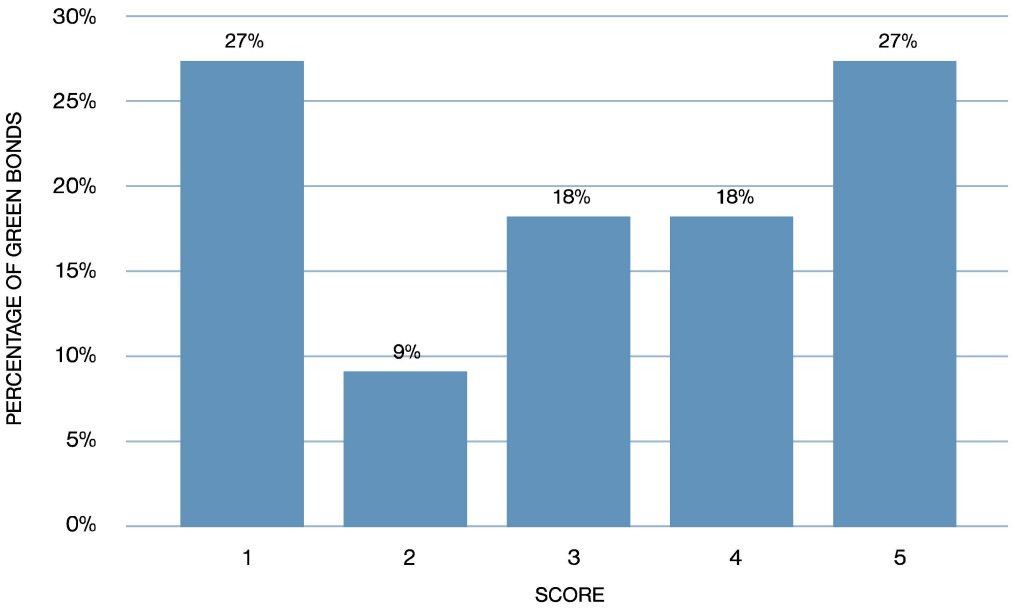


Figure 7

SCORES OF GREEN BONDS ON THE CDIAC STUDY RUBRIC
BY FISCAL YEAR, FISCAL YEARS 2017 - 2019

SCORE	FY 2017	FY 2018	FY 2019
1	2	1	
2			1
3			2
4	1		1
5			3

NUMBER OF GREEN BONDS
0 3

in the CDIAC rubric. There are also no scores of zero for green bonds in this study.

Although green bonds tended to have higher scores on the rubric than non-green bonds, there were three cases where climate change was not mentioned at all in the OS. Two of the three cases occurred in FY 2017, the earliest year in the sample. Figure 7 shows the breakdown of green bonds in the study sample by fiscal year.

Looking across years, issuers of green bonds in FY 2019 were more likely to have high scores on the CDIAC rubric. It is important to note that since the sample for this study only included the most recent bond from each issuer, a direct comparison of issuer practices in the study sample across years is not possible. (See "Year of Sale and Issuance Frequency" subsection.) That said, a review of recent green bonds by CDIAC Research staff still reflects a discernable shift in disclosure practices of climate risk in more recent years.

REFUNDINGS

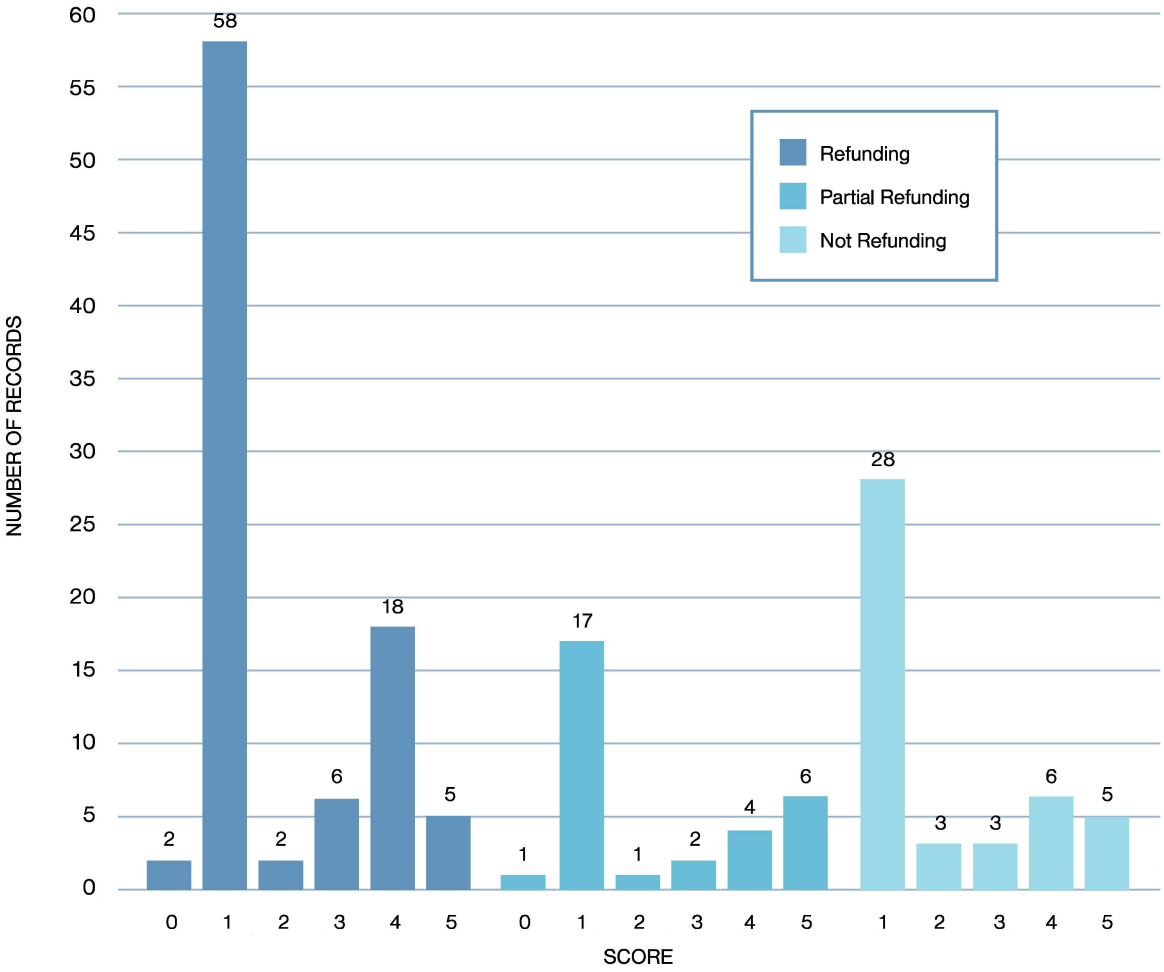
"Refunding" bonds can be issued to repay the principal, interest or redemption costs of previously-issued bonds.[31] Previous CDIAC research noted different disclosure practices for refundings,[32] which gave cause for additional study in this analysis.

Refundings made up the majority of bonds evaluated in this study. When adding in partial refundings, more than 70% of the study sample had some refunding component.

Non-refundings were more likely than refundings to mention climate change; however, the majority of non-refundings still had no mention of climate change in the OS. Figure 8 shows the distribution of scores for refundings, partial refundings, and non-refunding deals in the sample.

Figure 8

DISTRIBUTION OF SCORES ON CDIAC RUBRIC FOR REFUNDINGS
COMPARISON WITH PARTIAL AND NON-REFUNDINGS, FISCAL YEARS 2017 - 2019



[31] CDIAC, *California Debt Financing Guide*, 4-41.

[32] California Debt and Investment Advisory Commission. *A Preliminary Review of the Initial Disclosure Practices of California's Conduit Borrowers*, 4, (Sacramento: 2015), Accessed March 24, 2020, www.treasurer.ca.gov/cdiac/issuebriefs/201509.pdf.

Only one-third of full refundings mentioned climate change in their disclosure documents compared to 38% for non-refundings. All of the scores of zero were for either a full or a partial refunding. This is potentially significant given that refundings and non-refundings are subject to the same disclosure regulations. Investors expect the disclosure for a refunding deal to be as current and robust as the disclosure for a bond exclusively comprised of "new money." In many cases, refundings have a shorter maturity than non-refundings, which could influence an issuer's assessment of climate risks that an investor would deem material. That said, several refundings with comparable maturity dates to bonds comprised exclusively of new money did not mention risks of climate change anywhere in the OS.

For the refundings with a similar maturity as typical non-refundings that did not mention climate change, it is possible that an issuer views the disclosure documents for a refunding deal as an "update" of the disclosure for the previous issuance as opposed to one where decisions about disclosure are a broader conversation about what needs to be included. It is important to note that issuers of refundings should be aware that disclosure for refundings is subject to the same regulations and requirements as for non-refundings. Best practices for appropriate disclosure include processes to determine potential material risks to repayment of bonds, regardless of risks described in past disclosure documents.

Bond Insurance

An issuer can choose to purchase bond insurance from an insuring agency prior to issuing debt. The role of the bond insurer is to guarantee payments to investors in the event of issuer default.[33] Forty-eight issuers in this study (28%) purchased bond insurance. Figure 9 shows the distribution of scores for issuers that insured their bonds compared to issuers that chose not to purchase insurance.

Issuers that purchased bond insurance were less likely to mention climate change (29%) or disclose issuer-specific climate risks (21%) than other issuers (41% and 32%, respectively). Additionally, none of the issuers with bond insurance achieved a score of five.

It is not entirely clear why insured bonds were less likely to mention climate change in the OS. Many smaller issuers find that purchasing bond insurance lowers their total costs of issuance because it allows them to issue debt at a lower interest rate.[34] Given that this study found evidence of a negative correlation between disclosure practices and issuance size, some of the results for issuers with bond insurance may be contributable to a smaller average issuance size. If so, the relationship seen in this study between bond insurance and disclosure practices of climate risk might be overstated.

Although insured bonds tended to have lower scores in this analysis, the majority of issuers without bond insurance still did not mention climate change in their OS (see Figure 10). Bond insurance is not a full explanation for omission of climate change in an issuer's disclosure documents.

Link to Debt Repayment

During the evaluation process, CDIAC tracked whether each OS contained language that linked potential effects of climate change to the ability of the issuer to repay the bond proceeds – whether or not the issuer expected climate change to affect its repayment ability.

Less than 20% of OSs examined in the study contained language that linked effects of climate change to the issuer's ability to repay bond proceeds. This included cases where the OS explicitly

[33] CDIAC, *California Debt Financing Guide*, 2-18.

[34] CDIAC, *California Debt Financing Guide*, 2-17.

Figure 9

DISTRIBUTION OF SCORES ON THE CDIAC RUBRIC FOR INSURED BONDS
COMPARISON WITH NON-INSURED BONDS, FISCAL YEARS 2017 - 2019

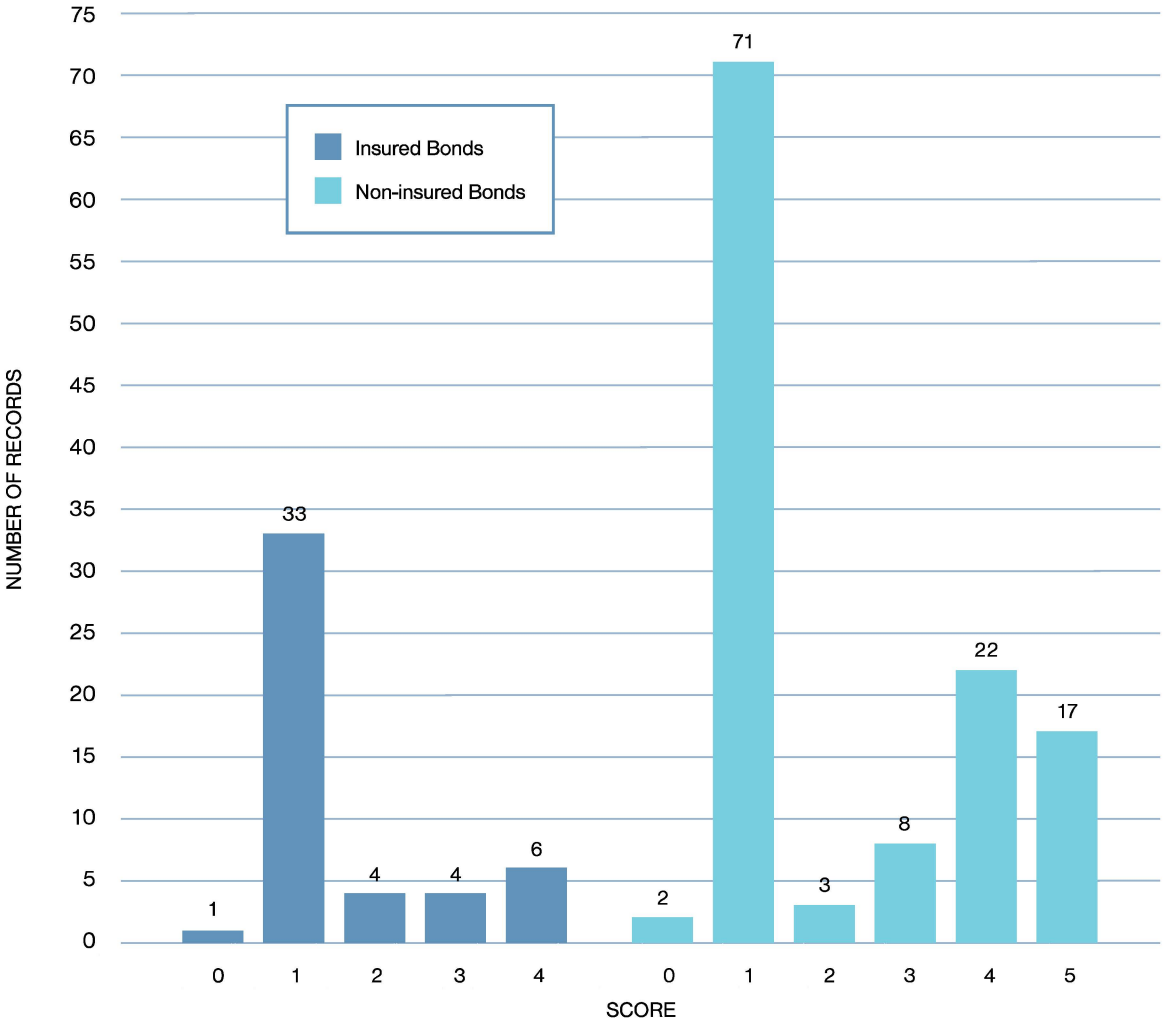


Figure 10

DISTRIBUTION OF SCORES ON CDIAC RUBRIC FOR INSURED BONDS
COMPARISON WITH NON-INSURED BONDS, FISCAL YEARS 2017 - 2019

	0	1	2	3	4	5
BOND INSURANCE	1	33	4	4	6	
NO BOND INSURANCE	2	71	3	8	22	17

NUMBER OF BONDS

0 71

noted that there was no expected risk of climate change affecting repayment. A majority of issuers did not have any language commenting on risks of climate change in the context of repayment of bond proceeds.

The remaining issuers in the sample – approximately 30% – had language suggesting that natural disasters were a risk that could result in the nonpayment of debt service payments. In the vast majority of these cases, the natural disasters cited in the OSs included ones that are linked to effects of climate change, such as flooding, wildfires, severe drought, etc. However, less than a quarter of these issuers mentioned climate change anywhere in the OS. Similarly, many OSs referenced potential risks from possible future legislation and litigation, but only a small share of issuers referenced these risks in the context of climate change.

Instead of finding a correlation with expected risks, this study found that language linking climate change to repayment of bond proceeds was more likely as issuance size increased. Issuers with language in the OS describing the relationship between climate change and potential repayment of bond proceeds had a median issuance amount over four times the size of the median issuance amount of all other issuers (see Figure 11).

This correlation between issuers linking climate change to repayment and issuance size is especially notable given that larger issuers tend to have a higher threshold for materiality. For example, a smaller issuer may consider a risk to be material based on the percentage of the operating budget or general fund, whereas a larger issuer may conclude that same risk is not material, given its larger operating budget. The high median issuance amount for issuers with relevant discussions of repayment risks suggests that even large issuers are finding that climate change poses a material risk to that entity, and/or discussing climate change in the context of repayment risk is a message that is valuable to communicate to the investor community.

Some of this relationship with issuance size can be explained by the strong correlation between issuance size and rubric score described earlier in the report, but not all. For example, more than one-third of issuers with a score of five on the CDIAC rubric did not have language in the disclosure documents linking climate change to repayment of bond proceeds. Even after accounting for issuers that did not mention climate change anywhere in the OS, the median issuance amount for the issuers linking climate change to repayment was still double that of the issuers that had not.

Disclosure of Climate Risk by Debt Purpose

AVERAGE SCORE ON THE CDIAC RUBRIC. This study evaluated disclosure statements from public enterprise revenue issuers in California over the past three fiscal years. Within that group of issuers, there were many different sectors and purposes for the issued debt. Figure 12 shows all of the different purposes of debt in the study sample and the distribution of scores for each debt purpose.

The most common debt purpose was for issuers in the water supply, storage and distribution sector, which comprised 75 out of 171 bonds in the sample. Only one-third of these issuers mentioned climate change in the OS. The next most common debt purpose represented in the sample was the sector for wastewater collection, which had 45 bonds in the sample. Less than one-fifth of issuers in the wastewater collection and treatment sector mentioned climate change in the OS. Together, these two complementary sectors made up over 70% of the sample. Although the sample is heavily weighted with issuers in these two sectors, this is a reflection of the market for enterprise-revenue bond issuers for the period between July 2016 and June 2019, as there was no sampling error in this study.

Issuers in the power generation and transmission sector earned, on average, the highest scores on the CDIAC rubric. Of 16 issuers, 15 de-

Figure 11

MEDIAN ISSUANCE AMOUNT FOR ISSUERS IN STUDY SAMPLE
BY REPAYMENT LINK TO CLIMATE CHANGE, FISCAL YEARS 2017 - 2019

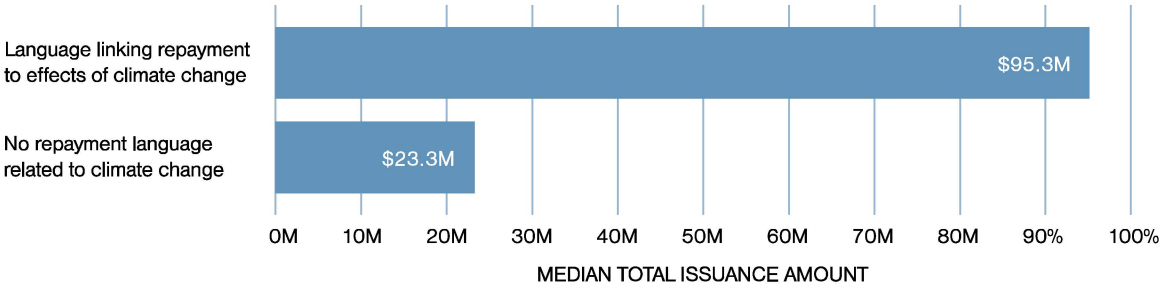


Figure 12

SCORES ON THE CDIAC STUDY RUBRIC, BY DEBT PURPOSE, FISCAL YEARS 2017 - 2019

PURPOSE TYPE	0	1	2	3	4	5
Airport		2	1	2	2	2
Bridges and Highways					1	
College, University Facility	1	1				
Health Care Facilities		4				
Hospital		1				
Multifamily Housing		1				
Multiple Capital Improvements, Public Works		4			2	
Parking		1				
Ports, Marinas		1			1	1
Power Generation/Transmission		1		3	9	3
Public Building		1				
Public Transit		1		1		
Solid Waste Recovery Facilities		1		1	1	
Street Construction and Improvements			1			
Wastewater Collection, Treatment	1	36	1	1	2	4
Water Supply, Storage, Distribution	1	49	4	4	10	7

NUMBER OF BONDS

0 49

scribed at least general physical and transition risks of climate change, and three-quarters of the issuers disclosed issuer-specific risks. Some of the issuers who would fall into this category are electric utility entities. Utilities are highly regulated, and the disclosure documents for those utilities tended to have very thorough sections on relevant regulations related to energy and greenhouse gas emissions. In addition, electric utilities that issued bonds in fiscal year 2019 were more likely to contain a discussion of risks due to wildfires, which is likely due at least in part to the passage of California Senate Bill 901, which requires electric utilities to prepare wildfire mitigation plans and submit those plans to the California Public Utilities Commission on an annual basis.[35]

Debt issued for airports had the next highest distribution of scores on the CDIAC rubric, with almost 80% of those issuers mentioning climate change. Almost half of the issuers of debt for airports in the sample disclosed issuer-specific risks of climate change.

AVERAGE NUMBER OF MENTIONS OF CLIMATE CHANGE IN THE OS. In addition to scores on the CDIAC rubric, this study also tracked the number of times the term "climate change"[36] was mentioned in each OS. The number of mentions of climate change does not fully account for the level of appropriate disclosure of climate risk, but it does serve as a strong proxy. Mentions of climate change in and of themselves don't guarantee full disclosure of climate change; however, issuers with more mentions of climate change were found to be more likely to have well-developed disclosure of climate risk, and climate change was also more likely to be integrated into the operations of the issuer.

Figure 13 shows the average number of times climate change was mentioned for issuers in each of the sectors mentioned above.

The issuers with the most references of climate change were, on average, in sectors related to airports and power generation/transmission, followed by debt purposes related to bridges and highways and then by ports and marinas. The average number of mentions for airports is a bit of an outlier due to a much larger number of mentions of climate change in disclosure documents from San Francisco. After controlling for outliers in San Francisco, entities issuing debt for airports dropped from the first to the fourth-highest rank.

Even more telling than the sectors with the highest average number of mentions of climate change are the sectors that didn't mention climate change at all. Debt purposes with zero issuers that mentioned climate change included university facilities, health care facilities, hospitals, multifamily housing, parking and public buildings. Although these sectors seem like they may be less affected by some effects of climate change than some other sectors such as utilities or airports, the issuers of these projects all have physical facilities that could be impacted by natural disasters that the scientific community has linked to climate change. These organizations could be just as materially impacted by physical risks of climate change such as wildfire or flood, for example. Even without physical damage to a property, these issuers may also be at risk of high costs of energy use during heat waves, higher costs of regulations, and/or many other potential risks associated with effects of climate change. Without mentioning climate change in the OS at all, investors – and regulators – are unable to determine whether the omission was due to a risk being immaterial or whether that risk was never considered when preparing the disclosure documents.

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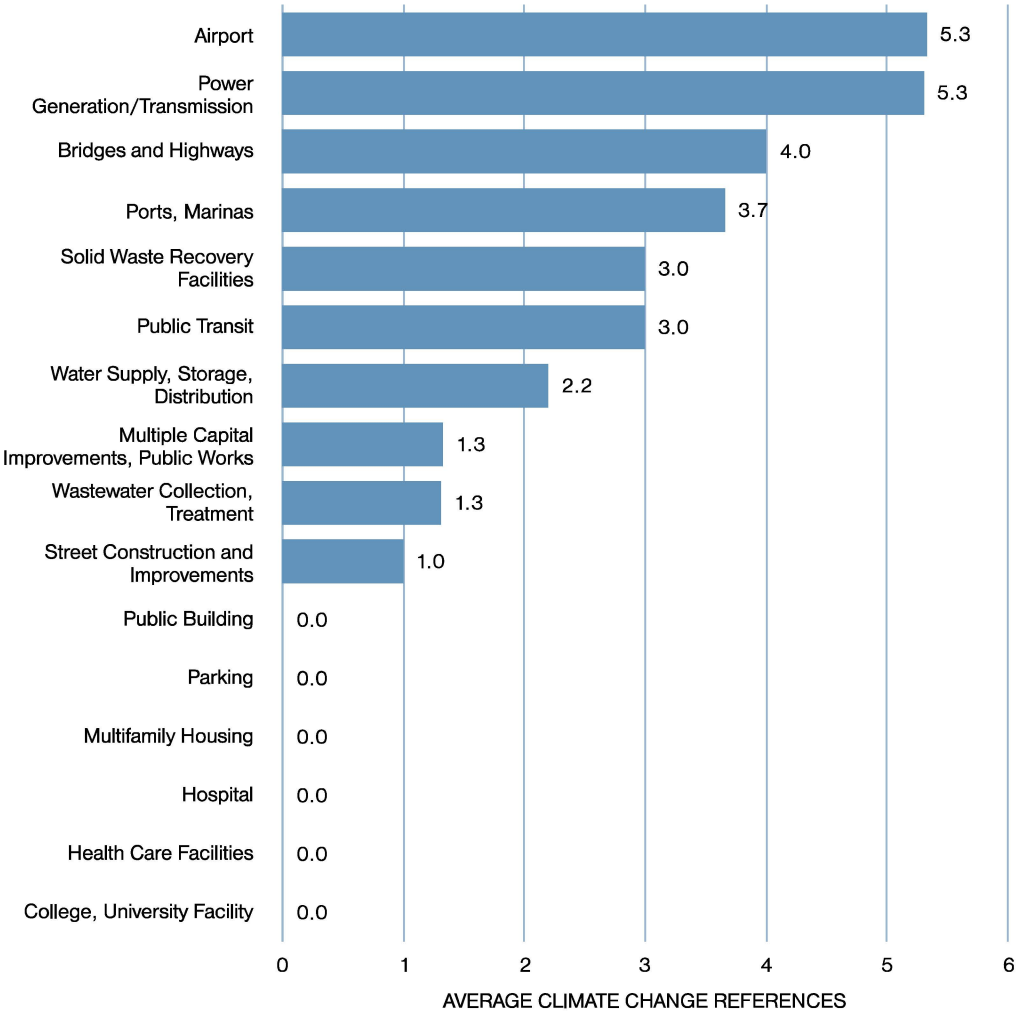
[35] Chapter 626, Statutes of 2018 (SB 901), requires submittal of wildfire mitigation plans to the California Public Utilities Commission, https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180SB901 (Accessed April 6, 2020).

[36] Similar terms such as "climatic changes," "changing climate" or related terms in the context of climate change were also counted. References to "global warming" were tracked separately, since some issuers mentioned global warming in the OS in the context of specific legislation, whether or not climate change was considered as a separate risk.

Figure 13

AVERAGE NUMBER OF REFERENCES OF CLIMATE CHANGE IN DISCLOSURE DOCUMENTS BY SECTOR, FISCAL YEARS 2017 - 2019



Geographic Analysis

Different geographies in California will be affected by climate change in different ways. For example, coastal areas are especially vulnerable to sea-level rise, whereas forested areas are generally more vulnerable to wildfires. While it is outside the scope of this analysis to analyze the potential risk of climate change for each issuer based on its specific location, CDIAC analyzed trends in disclosure of climate risk based on the issuer's county.

CDIAC SAMPLE BY COUNTY. The sample in this study included bonds from issuers in 39 of California's 58 counties. The county with the most bonds in the sample (22 bonds) was Los Angeles County, which is also the most populous county in California.[37] Counties not represented in the CDIAC sample[38] tended to be more rural and some of the least populous counties in the state.[39] Those counties were not included in the CDIAC study because there were no municipal issuers registered in that county that sold enterprise-revenue bonds in FYs 2017, 2018, or 2019.

AVERAGE SCORE BY GEOGRAPHY. Average scores on the CDIAC rubric varied widely in different geographies in California. There were some general trends for scores on the rubric for specific geographies. For example, counties located on the coast were more likely to have higher average scores. However, average scores on the CDIAC rubric by county also varied significantly within similar geography types (Figure 14). Some issuers located in the same area had very different levels of disclosure.

The counties with the highest average scores on the CDIAC rubric were San Luis Obispo[40] and Monterey,[41] both with an average score of four out of five. Despite a positive correlation between issuance amount and score on the CDIAC rubric, the median issuance amount in the sample for both of these counties ($18.6 million and $23 million, respectively) was below the median issuance amount for the sample as a whole ($27 million). San Francisco had the next highest average score of 3.75 between four issuers, but with a much higher median issuance amount of over $150 million. The next counties with the highest average scores on the CDIAC rubric were Shasta, Sacramento, Alameda, Stanislaus, Contra Costa, Los Angeles, San Joaquin and San Diego. A full list of average scores on the CDIAC rubric by county is available in Appendix B to this report.

This report did not include general obligation bonds issued by the State of California since only issuers with an enterprise revenue repayment source were considered. The State's general obligation bonds are also often sold for benefit of specific programs, which incorporate multiple projects that can sometimes be located in different locations. This report did include four issuers considered agencies of the State of California, which together scored an average of 2.25 out of 5. The median issuance from these State of California agencies was $476 million, which was more than three times the median issuance size for San Francisco County.

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[37] Department of Finance, "E-1 Population Estimates for Cities, Counties and the State with Annual Percent Change — January 1, 2018 and 2019," *State of California, Department of Finance*, Published May 2019, Accessed March 30, 2020, www.dof.ca.gov/Forecasting/Demographics/Estimates/E-1/.

[38] Counties that did not have any issuers in the CDIAC study include Alpine, Calaveras, Colusa, Del Norte, Glenn, Inyo, Lake, Lassen, Mariposa, Modoc, Mono, Nevada, Plumas, San Benito, Santa Cruz, Sierra, Siskiyou, Tuolumne and Yuba counties.

[39] Department of Finance, "E-1 Population Estimates for Cities, Counties and the State with Annual Percent Change — January 1, 2018 and 2019."

[40] Two issuers in the sample were located in San Luis Obispo County, both of which were from the water supply, storage, and distribution sector.

[41] One issuer in the sample was located in Monterey County, which was in the solid waste recovery facilities sector.

Figure 14

AVERAGE SCORE ON CDIAC STUDY RUBRIC, BY COUNTY, FISCAL YEARS 2017 - 2019

Urban counties tended to have issuers with higher scores on the CDIAC rubric than more rural counties, with a few notable exceptions.[42] Orange and Riverside counties are considered urban, but both had an average issuer score on the CDIAC rubric of less than two out of five. Conversely, Shasta County tied Sacramento County for the fourth-highest average score. However, although much of Shasta County is considered rural, Shasta County is classified as an urban county by several definitions.[43] Since there was only one issuer in Shasta County in this study, it is possible that this issuer is an outlier and that adding more issuers in the sample would give a different score.

Seven of the 11 highest average scores were in coastal counties. This could be, at least in part, due to concerns of sea-level rise caused by global climate change. The California Coastal Commission requires that local governments in the Coastal Zone account for sea-level rise in the process of local coastal planning and permitting for coastal development.[44] There was also legislation passed in 2019, Assembly Bill 691, that required sea-level rise assessments to be conducted and reported to the State Lands Commission for all legislatively-granted public trust lands.[45] These assessments are reported to the State Lands Commission and are freely available to access online.[46] There have also been several reports released on the potential effects of sea-level rise on California's coastline, including from the California Climate Change Center,[47] California Coastal Commission,[48] California Ocean Protection Council,[49] and the Legislative Analyst's Office,[50] among others. All of these assessments and reports contribute to the public awareness about potential risks and costs related to sea-level rise caused by global climate change. Issuers that are aware of these risks are required to disclose them in an OS if they are deemed to be "material" to the entity.[51]

Although issuers located in coastal counties tended to score higher on the CDIAC rubric, some coastal counties had low average scores on the rubric. Humboldt, Marin, Mendocino, Ventura, Sonoma, and Orange counties all had average scores on the CDIAC rubric below two. In other words, issuers in those counties were, on average, not likely to mention climate change at

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[42] Classifications of rural and urban coun ties differ depending on which criteria are used. See, for example: "California - Rural Definitions: State-Level Maps," *Economic Research Service, United States Department of Agriculture*, Published September 4, 2007, Accessed March 30, 2020, www.ers.usda.gov/webdocs/DataFiles/53180/25559_CA.pdf?v=0.

[43] Ibid.

[44] Chapter 965, Statutes of 1992, scientific recommendations related to sea-level rise are necessary for coastal planning, conservation, and development decisions, https://coastal.ca.gov/coastact.pdf (Accessed September 4, 2020)

[45] Chapter 592, Statutes of 2013 (AB 691), requires assessments of sea-level rise of state lands, https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201320140AB691 (Accessed April 6, 2020)

[46] "AB 691 - Actively Planning for Sea-level Rise Impacts," *State Lands Commission website*, Updated March 2020, Accessed March 31, 2020, www.slc.ca.gov/ab691/.

[47] Matthew Heberger, et al., *The Impacts of Sea-level Rise on the California Coast*, (Sacramento: California Climate Change Center, 2009), Accessed April 2, 2020, https://pacinst.org/wp-content/uploads/2014/04/sea-level-rise.pdf.

[48] California Coastal Commission, *Sea Level Rise Policy Guidance: Interpretive Guidelines for Addressing Sea-level Rise in Local Coastal Programs and Coastal Development Permits*, (San Francisco: 2018), Accessed August 19, 2020, https://documents.coastal.ca.gov/assets/slr/guidance/2018/0_Full_2018AdoptedSLRGuidanceUpdate.pdf

[49] G. Griggs, et al. (California Ocean Protection Council Science Advisory Team Working Group), *Rising Seas in California: An Update on Sea-level Rise Science*, (Sacramento: California Ocean Science Trust, 2017), Accessed April 2, 2020, www.opc.ca.gov/webmaster/ftp/pdf/docs/rising-seas-in-california-an-update-on-sea-level-rise-science.pdf.

[50] Petek, *Preparing for Rising Seas: How the State Can Help Support Local Coastal Adaptation Efforts*.

[51] CDIAC, *California Debt Financing Guide*, i-16.

all in their disclosure documents. A number of issuers in coastal counties did not mention climate change or vulnerability to sea-level rise in the OS; however, a quick online search found that several of the issuers in these counties were at risk of experiencing coastal flooding due to sea-level rise by 2050.[52] Besides sea-level rise, these issuers may also be vulnerable to other effects that the scientific community has linked to climate change, such as decreased snowpack levels, extreme weather (i.e. heat waves), windstorms, wildfires, etc.

Some issuers within the same geographic area that are likely to face many of the same risks from natural disasters had very different levels of disclosure. In one coastal county, one issuer had a detailed description of risks of climate change to the location of the entity, and thus scored a four out of five on the CDIAC rubric. A similar agency located less than one mile away did not mention climate change anywhere in its OS. Examples like these suggest that issuer practices – as opposed to actual exposure to risks from climate change – may be driving some of the variation in disclosure of climate risk.

MENTIONS OF CLIMATE CHANGE IN THE OFFICIAL STATEMENT. In addition to evaluating disclosure documents according to the rubric, CDIAC also tracked how many times the term "climate change" was mentioned in the OS. The county with the most mentions of climate change per OS was San Francisco with an average of 11 mentions per OS. The number of mentions for issuers in San Francisco was almost twice as many as the two counties with the next highest average number of mentions of climate change per issuer, which were Alameda (6.17) and Monterey (6.00) counties.

Perhaps even more telling than the counties with the highest number of mentions of climate change per OS were the counties with the lowest average number of mentions. Fourteen of the 39 counties in this study had zero issuers that mentioned climate change: Kern, Marin, Napa, Madera, Solano, Amador, Butte, El Dorado, Humboldt, Mendocino, Sutter, Tehama, Trinity, and Tulare counties. It is possible that a larger sample size could change the calculated results for these counties. However, five issuers in the study were located in Kern County and four were located in Marin. Despite having multiple issuers in the sample in both of those counties, none of those issuers mentioned climate change anywhere in the OS.

As mentioned previously, there can be very valid reasons why an issuer could decide that climate change is not a material risk to the issuer (and therefore not necessary to disclose in the OS). However, even considering only counties with zero issuers that mentioned climate change, there are clear examples of counties that have already experienced extreme natural disasters that the scientific community has linked to climate change. California has experienced increasingly devastating wildfires over the past several years, including the 2019 Camp Fire, which was the deadliest wildfire ever recorded in California's history as well as one of the most destructive.[53] Multiple sources have linked the increased frequency and severity of wildfires in California to effects of climate change.[54] The Camp

[52] Surging Seas Risk Finder Tool, *Climate Central website*, Published 2016, Accessed April 3, 2020, https://riskfinder.climatecentral.org/

[53] Cleve R. Wootson Jr., "The Deadliest, Most Destructive Wildfire in California's History has Finally Been Contained," *The Washington Post*, Published November 26, 2018, Accessed April 3, 2020, www.washingtonpost.com/nation/2018/11/25/camp-fire-deadliest-wildfire-californias-history-has-been-contained/.

[54] See, for example: Alejandra Borunda, "Climate Change is Contributing to California's Fires," *National Geographic*, Published October 25, 2019, Accessed April 3, 2020, www.nationalgeographic.com/science/2019/10/climate-change-california-power-outage/#close, and Rong-Gong Lin II, Matt Hamilton, and Joseph Serna, "As Autumn Rain in California Vanishes Amid Global Warming, Fires Worsen," *The Los Angeles Times*, Published November 13, 2018, Accessed April 3, 2020, www.latimes.com/local/lanow/la-me-rain-fires-california-20181113-story.html.

Fire took place in Butte County, which is one of the counties with zero issuers that mentioned climate change in their disclosure documents. This particular issuance in Butte County took place in 2016, which was prior to the Camp Fire. A future OS from this issuer may address risks from climate change more explicitly.

Humboldt County is another county with zero issuers that mention climate change in their OS. One issuer located within Humboldt County is located on the bank of a river less than 10 miles from the Pacific Coast. The issuer does not mention climate change anywhere in its OS; however, according to one calculation, the issuer's location has an estimated 85 percent risk of experiencing flooding of four feet due to coastal flooding by 2050.[55] The OS for that issuer discloses that the issuer has not obtained flood insurance, and that the issuer's repayment of bonds could be at risk in the case of a severe flood: "If there were to be an occurrence of a flood or severe seismic activity in the City, there could be substantial damage to the Water System, the cost of repair of which could exceed the net equity available therefore. In the event of significant flood or earthquake damage to the Water System, there can be no assurance that Net Revenues would be sufficient to pay principal of and interest on the Bonds."[56]

LIMITATIONS TO GEOGRAPHIC ANALYSIS. While there are 171 observations in this study, splitting those observations by county led to very small sample sizes for each area. Small sample sizes make results more volatile, and a larger sample may yield different results. For example, 11 of the 39 counties had scores based on only one issuer, and the practices of that issuer may or may not be reflective of general practices in that region. Although this study did not have any sampling error since all bonds in the population were evaluated, one potential next step of this analysis may be to expand the size of a future study to include more issuers for each county. If so, the expanded sample could capture more variation within each county.

Since issuers in several rural counties are not included in this study, it is possible that expanding the sample to include additional counties could lead average scores to be different than what is described in this report. This study evaluated the full population of bonds based on the criteria described in the methodology, and there was no sampling error. The underrepresentation of rural counties is likely an accurate representation of geographic issuance trends in the California municipal market.[57]

Year of Sale and Issuance Frequency

This report evaluated disclosure documents from 171 different issuers from fiscal years 2017, 2018, and 2019. Multiple fiscal years were included in the study to incorporate more issuers in the sample and capture additional variation in disclosure practices. Including issuers in the sample only once meant that CDIAC evaluated only the most recent set of disclosure documents for each issuer, which are expected to improve over time. It also allowed for a more balanced look at different issuer practices without crowding out smaller issuers that do not issue bonds as often.

Since only the most recent bond from each issuer was included in the sample, a direct comparison between years in this study is not possible. Figure 15 shows the count of bonds in this study by fiscal year.

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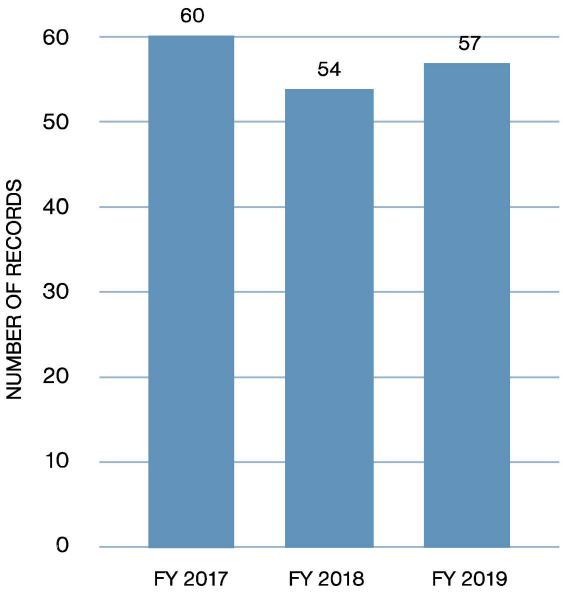
[55] Estimated effects of coastal flooding for this issuer was found using the Surging Seas Risk Finder Tool on the *Climate Central website*: https://riskfinder.climatecentral.org/.

[56] This language is taken from page 43 of the official statement of the described issuer. The statement is not linked in this report in order to leave out the name of the issuer mentioned in this example.

[57] Nova Edwards, *An Overview of Local Government General Obligation Bonds Trends: 1985-2005*, (Sacramento: California Debt and Investment Advisory Commission, 2008), Accessed March 30, 2020, www.treasurer.ca.gov/cdiac/publications/trends.pdf.

Figure 15

NUMBER OF ISSUERS IN CDIAC STUDY SAMPLE BY YEAR, FISCAL YEARS 2017 - 2019



The most popular year for bonds in the study was FY 2017. Although the number of bonds in this study for FY 2019 is smaller than in FY 2017, the share of bonds in the report from FY 2019 is actually larger than in reality. That is because issuers that sold bonds in the market more frequently were included only in the more recent year as opposed to all of the years in which the issuer sold bonds.

Without controlling for the sample differences between years, CDIAC did find that issuers from 2019 did, on average, have higher scores on the CDIAC rubric and were more likely to mention climate change. In fact, the issuers from 2019 in the sample were actually more likely to mention climate change than not. This is a much higher rate than seen in the general sample, in which less than four in ten issuers mentioned climate change in the sample. Conversely, only 20% of the issuers in the sample from 2017 mentioned climate change, and zero issuers in that year earned a score of five out of five on the CDIAC rubric. Both of these findings suggest that bonds in the sample from FY 2019 were more likely to account for risks of climate change than bonds in previous years.

A subsequent question is whether this difference between years was due to a change in issuer disclosure practices or due to the structure of the sample – or possibly both. Although a direct comparison between years was not possible using the study sample, CDIAC conducted a supplemental analysis of the issuers who issued bonds in multiple years. These issuers would only be counted once in the sample despite having multiple bond issuances in the sample period.

There were some major differences between the issuers that sold bonds multiple times in the three-year period and the other issuers in the sample. The issuers with multiple bond sales in the three-year period, on average, had higher issuance amounts and higher scores on the CDIAC rubric. The median issuance amount for issuers with multiple issuances between 2017 and 2019 was over $91 million, which was over three times the median issuance amount for the general sample. The average rating for those same issuers was more than three out of five, compared to barely two out of five for the general sample. These issuers were more likely to mention climate change and pushed up the average scores for issuers in the sample in 2019, making a direct comparison across years more difficult. This also suggests that issuance frequency has a positive correlation with disclosure practices of climate risk. In other words, issuers that sold bonds in the market more frequently were more likely to mention climate change and have higher scores on the CDIAC rubric. This could be due to the fact that climate risk is an emerging topic that has gained more interest in recent years. It could also be due to a positive correlation with issuance amount, where issuers that sell bonds in the market more frequently are also issuing larger amounts of debt. Selling bonds in the market more often also gives the issuer more frequent opportunities to receive feedback from underwriters and other participants on financing teams, which could lead to changes in an issuer's disclosure practices. This study found evidence that larger issuance amounts

were strongly correlated with higher scores on the CDIAC rubric.

Although there are major differences for many of the issuers in the sample from FY 2019, scores for bonds in 2019 tended to be higher than in previous years even after excluding issuers with multiple bonds sales. After excluding issuers with multiple bond sales between FY 2017 and 2019, half of the issuers that were left from FY 2019 mentioned climate change, compared to only 38 percent of the general sample. This finding suggests that, in all cases, issuers that sold bonds in 2019 were more likely to have better developed initial disclosure of climate risk.

CONCLUSION

Accessing the municipal market now brings expectations that public agency issuers are considering and disclosing the risks of climate change on both the financed project as well as the issuer's ability to repay bondholders. CDIAC conducted a content analysis of the OSs of public enterprise revenue bonds publically offered by California's municipal issuers to see what issuers are disclosing to the market, and whether disclosure of climate risk has improved over time. With no consistent best practices focused on the disclosure of climate change risks in the municipal market, it is not surprising that CDIAC's analysis revealed a wide spectrum of disclosure practices; however, there were some key points, described below.

The majority of issuers did not mention risks resulting from climate change in their official statements, despite the fact that virtually all of the issuers in the study sample included risks from natural disasters in the OS. When an issuer does not mention climate change in the OS, investors are not able to distinguish between issuers that determined that climate change did not pose a material risk to the entity and issuers that never considered how climate change could adversely affect the issuer's operations and/or financial condition.

There is a strong relationship between issuance size and thoroughness of disclosure of climate risk. This was especially the case for very large issuances (over $200 million), with some notable exceptions of large issuances of public debt that scored zero out of five on the CDIAC rubric. Large issuers of public debt tended to have much more thorough disclosure of risks of climate change despite the fact that large issuers tend to have a higher threshold for what constitutes a material risk to the issuer. Smaller issuers were, on average, not likely to mention climate change anywhere in the OS.

Disclosure practices varied for special types of bonds, such as green bonds and refundings. Issuers of green bonds were much more likely to mention climate change in the official statement, and discussions of potential risks from climate change, on average, tended to be much more thorough. On the other hand, issuers of refundings in the study sample were less likely to mention climate change in the official statement. The reduction of the maturity length associated with refundings did not fully mitigate this finding.

A wide spectrum of disclosure practices and patterns was identified among issuers with different debt purposes. Issuers issuing debt for water supply or wastewater treatment were the most common in the sample, but issuers of bonds for power utilities, airports, and ports were the most likely to mention climate change in the OS.

Disclosure practices varied among – and even within – geographic regions. This report found evidence of cases where disclosure of potential effects of climate change did not tend to reflect actual climate risk. In 14 of 39 California counties included in this report, zero issuers mentioned climate change in any of their disclosure documents.

Although the structure of the sample for this study made it impossible to compare issuers across different years directly, this report found evidence that issuances from more recent years were more likely to have more thorough discus-

sions of climate change in the OS. This is an encouraging sign that disclosure practices related to climate risk may be improving in the municipal market. Conversely, it is also further evidence that disclosure of climate risks in the municipal market might reflect adoption of new disclosure practices in addition to actual risk to the issuer and its operations.

There may be valid reasons for the differences in the disclosure of risks of climate change uncovered throughout this study. CDIAC cannot conclude whether the contents in the initial disclosure documents in the report sample reflect a sufficient assessment of risks of climate change for each issuer. However, the content analysis in this study found inconsistencies in the treatment of climate change as a potential material risk.

CDIAC recognizes that climate change is still an emerging topic, and that there is a lack of clear guidance on the appropriate level of disclosure of climate risk in the municipal market. CDIAC continues to encourage more consistency in disclosure practices for issuers in the municipal market, and hopes to assist in the future with identification of best practices to share with its stakeholders.

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APPENDIX A: CDIAC STUDY RUBRIC

Level 0: No mention of climate change or risks from natural disasters

- ✓ Climate change is not mentioned in the official statement
- ✓ No discussion of risks from natural disasters or other environmental factors

Level 1: Accounts for risks from natural disasters, but no mention of climate change

- ✓ Climate change is not mentioned in the official statement
- ✓ Basic discussion of natural disaster/environmental risk – no attribution to climate change

Level 2: Basic (not meaningful) climate change disclosure

- ✓ Climate change is mentioned at least once in the official statement
- ✓ Basic discussion of natural disaster/environmental risk

Level 3: Basic discussion of general transition and physical risks due to climate change

- ✓ Criteria from level 2
- ✓ Discussion of regulations related to carbon emissions and/or other relevant environmental factors
- ✓ Discussion of potential physical risks of climate change

Level 4: Issuer-specific evaluation of risks due to climate change

- ✓ Criteria from level 3
- ✓ Discussion of issuer-specific physical risks
- ✓ Discussion of issuer-specific transition risks to a low-carbon environment
- ✓ Discussion of risk management activities related to climate change
- ✓ Discussion of insurance for natural disasters related to climate change

Level 5: Quantified issuer-specific risks

- ✓ Criteria from level 4
- ✓ Issuer tracks the internal emissions of CO_2 and/or other relevant environmental output
- ✓ Analysis of the probability of incidents related to climate change that could affect the issuer's property and/or operations
- ✓ Discussion of the magnitude of potential risks due to effects of climate change

APPENDIX B: CDIAC STUDY RESULTS BY COUNTY

AVERAGE SCORE ON CDIAC STUDY RUBRIC AND MENTIONS OF CLIMATE CHANGE
IN OFFICIAL STATEMENTS, BY COUNTY, FISCAL YEARS 2017 - 2019
MEDIAN ISSUANCE AMOUNT IN MILLIONS OF DOLLARS

COUNTY	NUMBER OF RECORDS	AVERAGE SCORE NUMBER	AVERAGE CLIMATE CHANGE REFERENCES	MEDIAN TOTAL ISSUANCE AMOUNT
San Luis Obispo	2	4.00	3.5	$18.6M
Monterey	1	4.00	6.0	$23.0M
San Francisco	4	3.75	11.0	$152.0M
Shasta	1	3.00	5.0	$39.5M
Sacramento	6	3.00	3.8	$95.7M
Alameda	6	2.83	6.2	$56.7M
Stanislaus	7	2.71	2.1	$95.9M
Contra Costa	6	2.67	3.8	$32.7M
Los Angeles	22	2.64	3.7	$24.8M
San Joaquin	4	2.50	3.0	$35.2M
San Diego	7	2.43	2.7	$53.2M
Santa Clara	5	2.40	4.6	$48.8M
San Mateo	10	2.10	1.6	$21.7M
Yolo	3	2.00	1.7	$22.9M
Santa Barbara	3	2.00	1.7	$10.0M
Placer	6	2.00	1.5	$32.7M
Merced	4	2.00	2.3	$14.6M
Imperial	5	2.00	1.2	$15.6M
Sonoma	4	1.75	1.3	$10.9M
Riverside	7	1.71	0.9	$81.1M
Orange	9	1.67	1.6	$41.7M
Ventura	4	1.50	1.3	$24.2M
Kings	2	1.50	0.5	$23.6M
Fresno	5	1.20	0.2	$12.6M
Tulare	1	1.00	0.0	$18.2M
Trinity	1	1.00	0.0	$20.8M
Tehama	1	1.00	0.0	$8.6M
Sutter	1	1.00	0.0	$23.4M
Solano	2	1.00	0.0	$24.6M
San Bernardino	9	1.00	0.1	$31.2M
Napa	3	1.00	0.0	$12.5M
Mendocino	1	1.00	0.0	$5.7M
Marin	4	1.00	0.0	$32.5M
Madera	2	1.00	0.0	$15.9M
Kern	5	1.00	0.0	$23.1M
Humboldt	1	1.00	0.0	$5.4M
Butte	1	1.00	0.0	$27.0M
Amador	1	1.00	0.0	$28.5M
El Dorado	1	0.00	0.0	$85.2M

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