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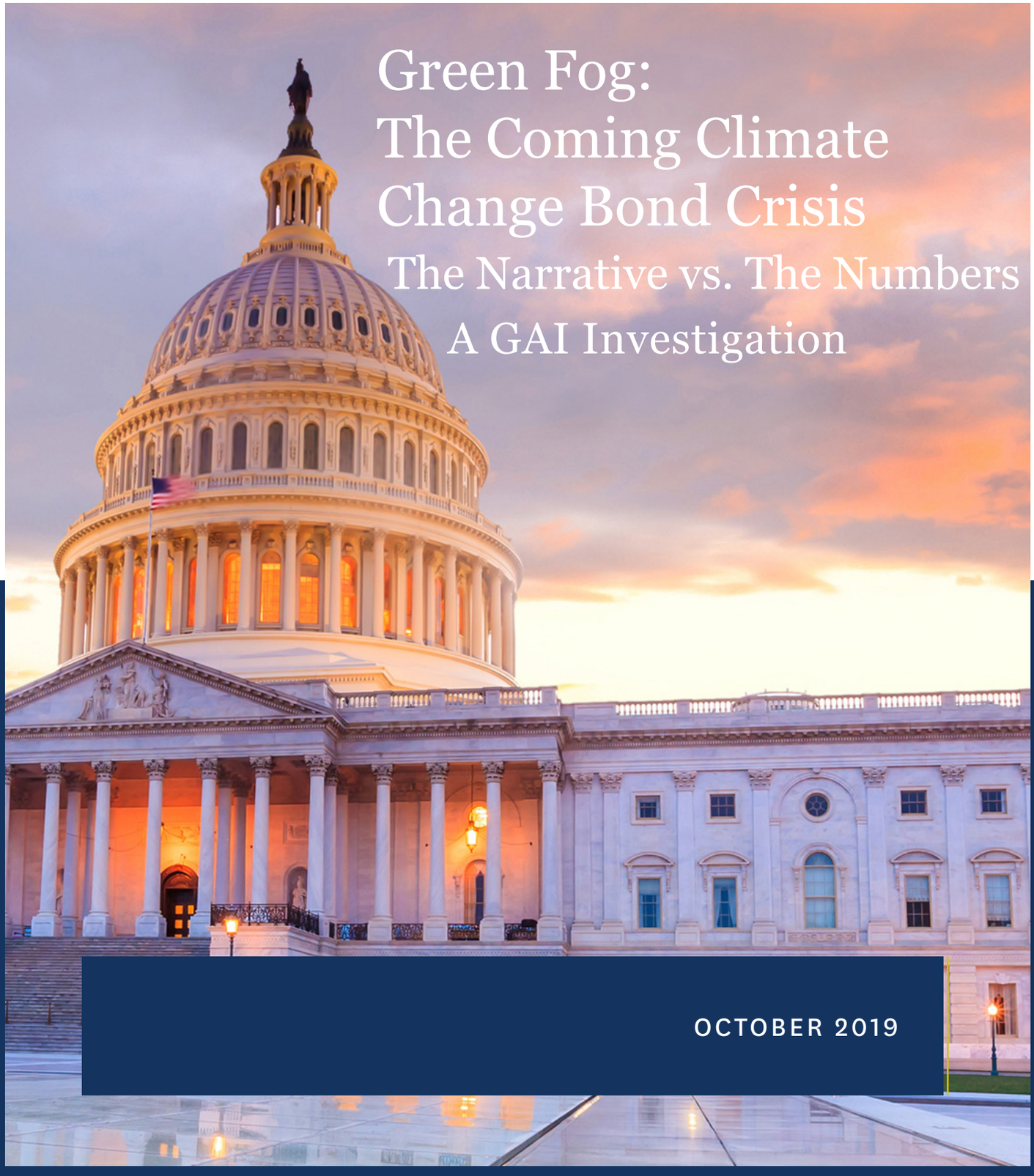

Green Fog:
The Coming Climate Change Bond Crisis

The Narrative vs. The Numbers

A GAI Investigation

OCTOBER 2019

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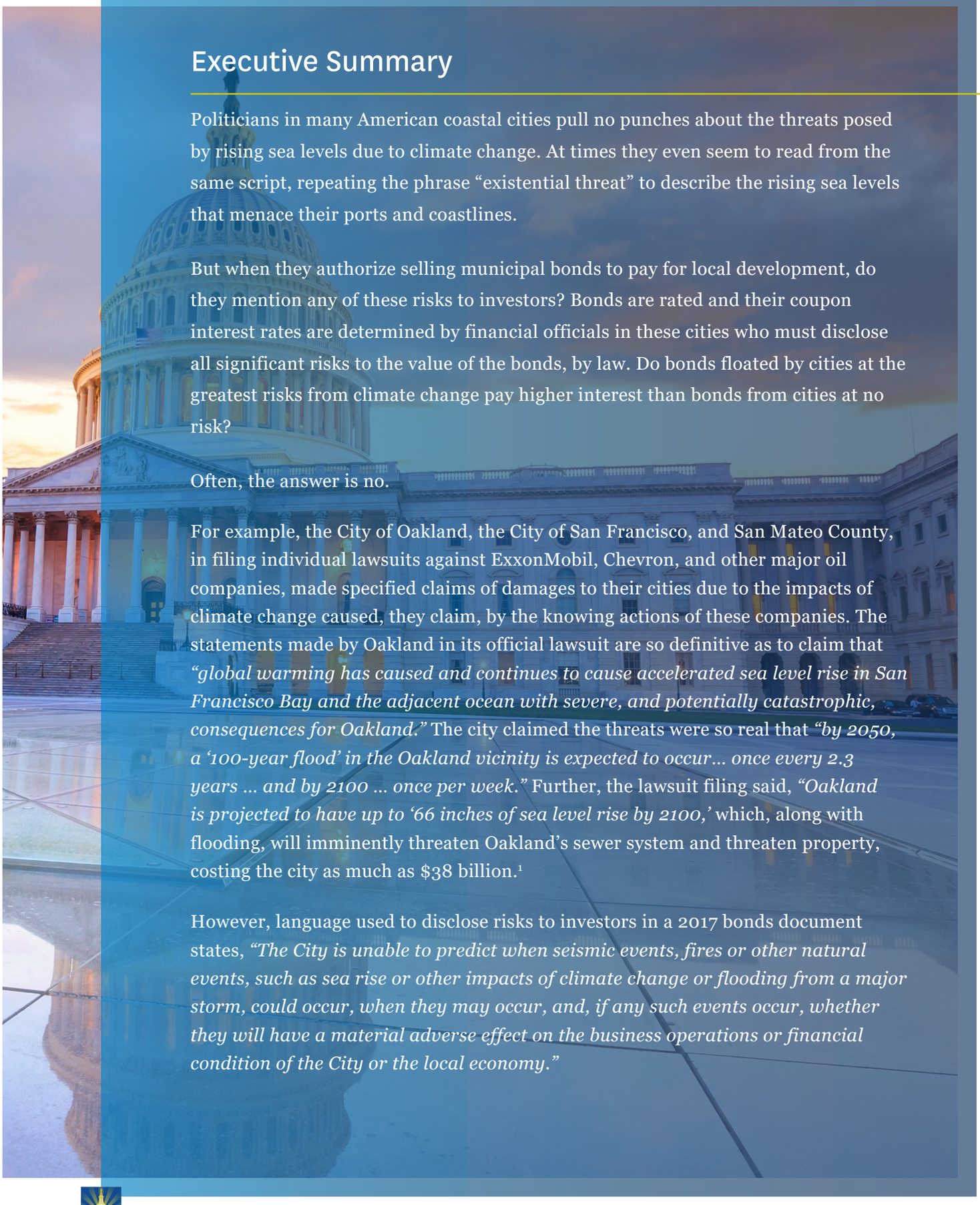


Executive Summary

Politicians in many American coastal cities pull no punches about the threats posed by rising sea levels due to climate change. At times they even seem to read from the same script, repeating the phrase "existential threat" to describe the rising sea levels that menace their ports and coastlines.

But when they authorize selling municipal bonds to pay for local development, do they mention any of these risks to investors? Bonds are rated and their coupon interest rates are determined by financial officials in these cities who must disclose all significant risks to the value of the bonds, by law. Do bonds floated by cities at the greatest risks from climate change pay higher interest than bonds from cities at no risk?

Often, the answer is no.

For example, the City of Oakland, the City of San Francisco, and San Mateo County, in filing individual lawsuits against ExxonMobil, Chevron, and other major oil companies, made specified claims of damages to their cities due to the impacts of climate change caused, they claim, by the knowing actions of these companies. The statements made by Oakland in its official lawsuit are so definitive as to claim that *"global warming has caused and continues to cause accelerated sea level rise in San Francisco Bay and the adjacent ocean with severe, and potentially catastrophic, consequences for Oakland."* The city claimed the threats were so real that *"by 2050, a '100-year flood' in the Oakland vicinity is expected to occur… once every 2.3 years … and by 2100 … once per week."* Further, the lawsuit filing said, *"Oakland is projected to have up to '66 inches of sea level rise by 2100,'* which, along with flooding, will imminently threaten Oakland's sewer system and threaten property, costing the city as much as $38 billion.[1]

However, language used to disclose risks to investors in a 2017 bonds document states, *"The City is unable to predict when seismic events, fires or other natural events, such as sea rise or other impacts of climate change or flooding from a major storm, could occur, when they may occur, and, if any such events occur, whether they will have a material adverse effect on the business operations or financial condition of the City or the local economy."*

Executive Summary (Continued)

San Mateo County made similar claims of certain environmental destruction, including the likelihood of *"a 93% chance that the County experiences a devastating three-foot flood before the year 2050, and a 50% chance that such a flood occurs before 2030."* Yet, a bond disclosure from 2016 issued in San Mateo County expressed almost identical sentiments as Oakland did. *"The County is unable to predict whether sea-level rise or other impacts of climate change or flooding from a major storm will occur, when they may occur, and if any such events occur, whether they will have a material adverse effect on the business operations or financial condition of the County and the local economy."*[2]

This disconnect between describing dire climate-related consequences to a city in great detail when a payout is on the table, versus downplaying the same issues when these cities' own funding is on the line holds true for not just these two counties but for six other California cities or counties seeking legal payouts. San Francisco, the County and City of Santa Cruz, Marin County, and the City of Imperial Beach all used very similar language in their own statements.[3]

The disconnect applies to bond rates as well.

Bonds are rated and their interest rates are determined by financial officials in these cities who must, by law, disclose all significant risks the bonds entail. Are the bonds floated by cities with the greatest risks from climate change paying a better interest rate than bonds from cities on higher ground?

To answer these questions, the Government Accountability Institute (GAI) reviewed bond disclosures from 40 cities. Twenty of these were cities in areas at high risk from rising sea levels or flooding, while the other 20 were mostly inland and freshwater cities not considered at such risk. We wanted to explore whether these threats affected the investment offerings of the cities claiming the highest risks.

GAI also reviewed official statements and policy actions in several of the cities we reviewed. We found:

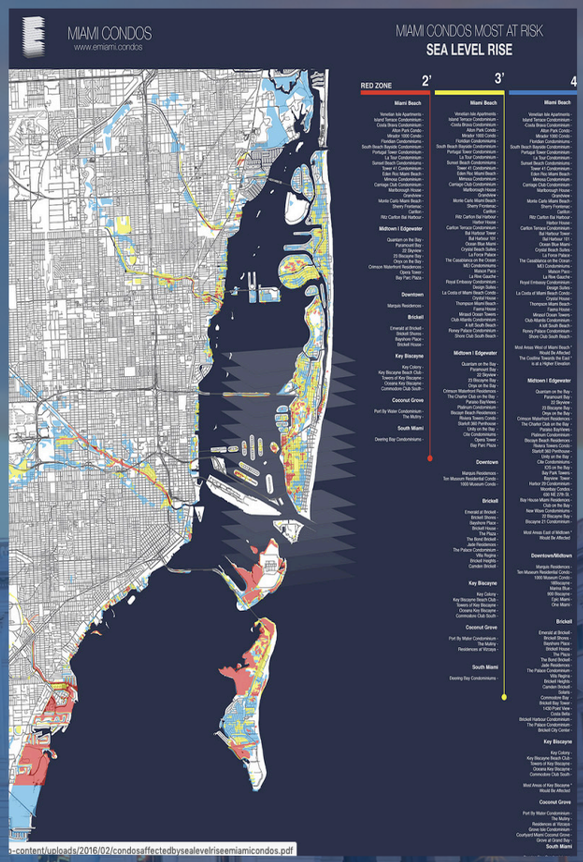
Executive Summary (Continued)

- There was **no** statistical difference between the interest rates and bond maturity terms for high-risk cities versus low-risk cities overall.
- New York City and its own Port Authority **barely mentioned** climate change or rising sea levels in any of their bond disclosures, despite Mayor Bill de Blasio's dire warnings that it is an "existential threat" and a "dagger aimed straight at the heart" of the city.
- Boston Mayor Marty Walsh has repeatedly railed against the dangers of climate change, yet has presided over the permitting of multiple buildings that would flood if his own predictions about climate change were correct, while the City of Boston mentioned "climate change" just **once** in its disclosure statements.

- Three California coastal cities—San Francisco, Los Angeles, and San Diego—**failed to mention** "climate change" or "sea level rise" even once in the disclosure statements for their bonds.
- The city of Oakland said in its 2017 bond disclosure statement that it could not predict when (or even whether) sea level rise or other natural events "will have a material adverse effect on the business operations or financial condition of the City or the local economy." At the same time, Oakland joined a lawsuit against several major oil companies in which it claimed a projection of up to "66 inches of sea level rise by 2100" that "will imminently threaten" the city's sewer system and property with a "total replacement cost of between $22 and $38 billion."[4]

Executive Summary (Continued)

- Low-lying Miami and Miami Beach paid lip service to sea level rise, but did not let it get in the way of lucrative building in flood-prone areas, especially where the mayor owns property. Miami Beach Mayor Philip Levine specifically built his campaign for Florida's governor on fighting sea level rise, yet has presided over recent permitting of numerous buildings that would be threatened by it.



- Miami and Boston invoke the threat of "climate change" to their cities when they seek "climate change" grant funds from the federal government that can be used for other purposes.

- New Orleans continues to face nature's severest hurricanes with flood prevention technology that is obsolete and woefully inadequate. Yet the city fails to budget sufficiently to fix its problems.

- The City of Honolulu and King County (Seattle) provided the most complete statements disclosing the risk of rising sea levels or climate change to their bond issues. But it did not affect their bond coupon rates in any way.

Introduction: Setting the Stage

Climate change continues to dominate public policy debates in the United States, as well as our national political campaigns and international relationships. The scientific findings and proposed remedies vary widely at the national level. Politicians and activists speak past each other about either the validity of the science or the economic effects of the proposed solutions. At the national level, the debates often stray to arguing statistics, computer modeling as a way of predicting the future, and the macroeconomic costs of switching to renewable energy sources versus cheaper, more reliable fossil fuels.

But the city level is where this all becomes real. Coastal cities and states all over the nation are responsible for zoning regulations, infrastructure readiness, and finance. They set the local and statewide building codes. They are responsible for balancing local economic growth, jobs, housing and, of course, tourism. For cities in the path of alleged rising sea levels, whatever their cause, these problems cannot be wished away. Port cities such as Boston, New York, Norfolk, Miami, New Orleans, San Francisco, and Seattle must all respond to what the science purportedly says about the danger.

Even strong believers in climate change predictions deride the "photo-op environmentalism" of some politicians who talk tough but do little, as then-San Francisco mayor Gavin Newsom said at a 2008 conference.[5]

And many predictions from climate scientists say that danger will be enormous, with projections claiming a sea level rise of multiple feet within the next 50-80 years. For city leaders, this means that entire waterfront areas and historic neighborhoods of their cities might be lost to rising sea levels and dangerous flooding.

If an unstoppable threat is indeed at such close quarters, city leaders must balance their fears of climate change and sea level rise with the need to grow their economic bases and protect the vital coastal resources that in many ways define their cities' uniqueness.

Mayors in these cities will often wax eloquent, if not apocalyptic, when they speak about what must be done. After all, these threats are no faraway problem, but a threat to their constituents' livelihoods and way of life.

Introduction: Climate Concerns

In 1988, National Aeronautics and Space Administration (NASA) scientist Dr. James E. Hansen alerted a Congressional committee that, in essence, "humans, by burning of fossil fuels and other activities, have altered the global climate in a manner that will affect life on earth for centuries to come." In his

view, pollution had caused recent temperatures to rise to heights not seen in the 130 years of recorded measurements. Over time, terms such as “greenhouse effect” and “global warming” entered our vocabulary to stay.[6]

Later that year, the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) established the Intergovernmental Panel on Climate Change (IPCC).[7] Over the past three decades, this organization has largely driven climate change discussions and has issued several Assessment Reports.

From the panel’s earliest days in the late 1980s, some of its findings and predictions drew criticism for exaggeration, even among scientists.

In 1989, a report from UNEP’s New York office claimed that “entire nations could be wiped off the face of the Earth by rising sea levels if the global warming trend is not reversed by the year 2000.”[8]

The scientific data were not so clear cut. Scientists began to notice a slowing of global mean temperature increases, even as carbon dioxide emissions worldwide continued to rise sharply.[9] The term “global warming” was replaced by the less specific term “climate change,” yet public perception of a rapidly warming world, wracked by more flooding, stronger hurricanes, and lengthy heat waves continued to grow. Even when confronted with evidence of the slowdown observed in the period of 1998-2012, politicians have continued to insist that the science is settled.

Today, non-scientists in Congress routinely call climate change an “existential threat.” Freshman U.S. Rep. Alexandria Ocasio-Cortez (D-NY) was echoing warnings contained in a 2018 IPCC report when she claimed “the world is going to end in 12 years if we don’t address climate change.”[10] Likewise, her partner in sponsoring legislation known as the “Green New Deal,” U.S. Senator Edward Markey (D-MA), said that through this massive environmental and economic plan, “we will *save all of creation* by engaging in massive job creation” [emphasis added].[11]

Their apocalyptic warnings are echoed by entertainment figures from Hollywood who seek to convince the watching world of the dangers to come.[12] Additionally, while perhaps not the “97 percent consensus” of climate scientists so frequently cited,[13] many scientists risk their reputations to join the chorus of hyperbole and hysteria in declaring the science of climate change a settled matter. Some recent headlines:

- “Planet has only until 2030 to stem catastrophic climate change, experts warn.”[14]
- “We have 12 years to limit climate change catastrophe, warns UN.”[15]
- “Climate change impacts worse than expected, global report warns.”[16]

The Government Accountability Institute (GAI) investigation presented in this report has yielded evidence of people who say they believe one thing but behave out of character with that belief. We found this incongruity existed between the rhetoric and the actions of politicians across the nation in what they say in their bond disclosures, the locations of their permitting decisions, and the use of funds earmarked for "green" projects. In various ways, the case studies we present below will show the type of hypocrisy that might cause a curious taxpayer to consider the disconnect between the alarmists' rhetoric and their behavior.

Bond Comparison: "Let Your Bond Be Your Word"

Like all levels of government, cities raise money for a variety of projects by borrowing. They do this by issuing bonds just as corporations do. The city sells a bond and is then obligated, depending on how the bond is structured, to pay regular interest rates and then the principal once the bond matures. The bond is a legally binding contract between the municipal government and the bearer of the bond.

Part of the contract is the bond's "coupon rate," an old system in which investors would clip and mail coupons to the company or government treasurer's office in order to receive their scheduled interest payment. The coupon rate determines the interest payment amount and frequency for the bonds. Therefore, a $1,000 one-year bond with a 10 percent coupon rate would be a loan to a city of $1,000. The city would pay $100 in interest (10 percent of $1,000) plus the $1,000 back at the end of the year. City officials ultimately determine the coupon rate, but many factors influence it:

- Rating: The rating agencies (Standard & Poor's, Moody's and Fitch) evaluate the financial risk of the city and the specific bond issue and assign a rating. A better rating means a lower risk of default and a lower coupon rate, all other things being equal.
- Conditions: The prevailing economic conditions and rates offered by similar, competing investments influence coupon rates. For an investment to attract investors it must be competitive with other investments.
- Purpose: The objective of the bonds. If the bonds will finance a revenue-generating project (e.g., a toll road), then that makes the bonds a little safer and results in a lower coupon rate. Bonds that are not tied to a specific revenue source are usually called General Obligation (GO) bonds and their risks and coupon rates are based on the credit worthiness of the city and its future economic prospects. If the city faces risks in being able to pay the bonds back, such as a shrinking population or declining asset base, then the coupon rates should be higher.

Bond Study: Parameters and Methodology

For our analysis, we examine how cities factor in ("price") the risk of climate change into their bond rates. Sea Level Rise (SLR) would pose a clear and present danger to the long-term economic prospects of cities. SLR threatens vital infrastructure such as coastal roads, bridges and tunnels. It endangers some of the most valuable real estate in any city—its waterfront commercial and high-value residential properties. It also threatens populations that may be compelled to move inland or leave the city altogether and literally head for higher ground.

All else being equal, all of these factors should make a city's long-term economic prospects less certain. Moreover, SLR will likely require significant additional city expenditures for remediation efforts, diverting funds from expansion and growth in other areas.

These eventualities not only threaten the city's tax base and ability to service its debt, but also mean that the city must spend more of its future funds on things that may not currently be in the budget. The threat posed by SLR should mean a shrinking tax base and, therefore, reduce the city's future ability to service its debt.

Our research methodology was to examine 20 cities considered to be at risk to adverse effects of sea level rise in order to identify how these cities have accounted for these risks. These are mostly coastal cities identified by ClimateCentral.org, a repository website for climate change research cited by many members of the press and referenced in stories by The *New York Times*, The *Atlantic* and many others.[17]

We also examined 20 mostly inland and freshwater cities not considered at risk from sea level rise and examined bond rates for the five longest maturities of recent bond issues for each of those cities. To try to measure the rates' responsiveness to the most recent climate change developments, we focused on bonds issued after 2013, when climate change science, findings, and projections were clearly known and widely reported. Only one city, Des Moines, Iowa, had an earlier bond issue (2011). We controlled for as many variables as we could;

- The average bond maturity for the at-risk sample was 17.95 years; for the no-risk sample it was 17.09 years.
- We examined mostly, but not exclusively, GO bonds. These are bonds not tied to one particular revenue source. They are priced and issued based on the future economic prospects of the city's overall tax base.
- Where GO bonds were not available, we examined similar bond types, avoiding specific revenue-generating

project bonds and focusing on bonds paid for from a broader tax base.

- We also examined the official statements concerning each bond issue. These documents are issued by the city and its agents to explain the purposes and risk factors of the bonds, and describe the city's financial outlook, future prospects, and much more. The statements are usually 150-300 pages long.

Bond Study Results

After compiling 200 bond issuances (100 for the 20 at-risk cities and 100 for the 20 no-risk cities), we found **no statistically significant difference** between the coupon rates offered by at-risk cities and the coupon rates for the no-risk cities. There was a *slight* observed difference between the mean rates offered on similar bonds by at-risk and no-risk cities; the average coupon rate for the at-risk group is 4.21 percent, and for the no-risk group it is 3.99 percent, a difference not large enough to be attributable to anything other than random variation.[18]

The disclosure documents for the at-risk cities did not portray the risks more clearly or urgently. We examined 20 disclosure documents and scanned them for key words and phrases, such as "sea level rise," "flood," "climate change" and even the now deprecated "global warming." Of the 4,361 pages of official documents we reviewed for the 20 at-risk cities, there were fewer than 100 relevant mentions of any one of these terms in the context of the issues addressed in this report. In fact, twelve of the cities did not mention any of the terms even once in such a context.

These findings suggest a disconnect between the rhetoric and actions of the leadership of these bond-issuing entities.

Case Study: New York City

New York City leaders have been particularly outspoken regarding their opinions and concerns about climate change. Its outspoken mayor, Democrat Bill de Blasio, filed a lawsuit against a group of petroleum companies for the harmful effects the city would experience from SLR. That suit was dismissed by a judge last year.[19] He also seeks to divest the city's pension investment portfolio from any stake in fossil fuel companies. Mayor de Blasio has made New York City a signatory of the Paris Agreement (often referred to as the "climate accord") and has called climate change an "existential threat"[20] and "a dagger aimed straight at the heart" of the city.[21]

The mayor is not without justification. According to the respected climate website Climatecentral.org, if current climate models are correct, this suggests that 50,000-100,000 New Yorkers live in a high-risk zone for sea level rise, and as many as 426,000 citizens live with an elevated risk of catastrophic flooding.[22] A significant amount of the city's coastal land is at risk of becoming unusable, according to

the same source. With de Blasio describing this threat in such dire terms, it stands to reason that city leadership would ensure that interested parties such as potential bond investors would understand the threat, and that bond pricing would reflect this "existential" risk.

This would be expected, logical… and wrong.

New York City Bonds

In New York's official bond disclosure document released in conjunction with a $1.1 billion-dollar GO bond series issued in April 2018, there was barely any sign that city leadership is worried about climate change or SLR. In the entire 297-page document, whose sole purpose is to disclose all risks to potential investors in New York City's municipal bonds, as well as legalities and the city's long-term prospects of paying back these bonds and interest as agreed, just four paragraphs are dedicated to the topic of climate change and SLR, despite de Blasio's insistence that it is "a dagger" aimed at the city, and "an existential threat."

Even that measure is generous. The very first topic discussed in this document, paragraph one of page one, addresses a letter written by the National Association of Manufacturers (NAM) to the Securities and Exchange Commission (SEC) on behalf of the oil companies New York had sued. The letter accused New York of lying in its lawsuit. The paragraph from New York's disclosure document, in full:

> On April 12, 2018, the National Association of Manufacturers released a letter (the "NAM Letter") to the Securities and Exchange Commission (the "SEC") dated March 27, 2018, asking the SEC to investigate the possibility that certain California municipalities and The City of New York (the "City"), which are separately suing certain oil companies for damages resulting from climate change, had misleading statements or omissions in their respective bond official statements with regard to the impact of climate change on such municipalities. The City believes that the allegations set forth in the NAM Letter with respect to the City are without merit.[23]

The other three paragraphs in the disclosure document, the last of which addressed Federal Emergency Management Agency (FEMA) maps, are as follows:

> *Climate Change*
>
> In June 2013, the City released a report, updated in April 2015 with the release of One New York: the Plan for a Strong and Just City, which analyzed the City's climate risks and outlined recommendations to address those risks (the "Report"). As stated in the section entitled "Vision 4" in the Report, the City's climate resiliency planning is based on

the climate change impact projections from the New York City Panel on Climate Change ("NPCC"), a body of more than a dozen leading independent climate and social scientists. The NPCC has identified that the City is already experiencing the impacts of climate change and projects dramatic impacts from climate change on the City in the future. The NPCC has published three reports, most recently in 2015, and an updated report is expected in summer 2018. Progress reports on One New York: the Plan for a Strong and Just City are issued on an annual basis, with the last progress report released on April 21, 2017.

Building on the recommendations contained in the Report, the City is in the process of implementing, over the next ten years, climate resiliency projects costing in excess of $20 billion, most of which are dedicated to areas previously affected by Sandy and some of which are directed toward mitigating the risks identified in the NPCC report. Such plans include both stand-alone resiliency projects and the integration of resiliency protection into the City's ongoing investments. These projects are in various stages of feasibility review, design and construction and/or implementation. Funding for these projects is expected to come from City, State and federal sources. Some projects are expected to require additional funding to the extent that they are in the planning stages or current funding does not provide for the costs of construction. In addition to such projects, the City expects that additional resiliency projects will be identified and implemented in the coming years, including additional projects inside and outside of the areas affected by Sandy and addressing risks identified in the NPCC report including coastal storms, sea level rise, extreme heat and intense rainfall.

In 2015, FEMA issued preliminary updated flood insurance rate maps (FIRMs), which would have expanded the 100-year floodplain beyond the areas designated in the flood maps issued in 2007. The City appealed the 2015 preliminary flood maps challenging the modelling FEMA used to develop them. The 2015 preliminary flood maps were adopted into the building code, but the prior 2007 flood maps remain in effect for flood insurance purposes. In 2016, FEMA agreed with the City's appeal, and the City is currently working with FEMA to update the maps. The new maps are expected to generally expand the 100-year floodplain from the 2007 flood maps and may cover different areas than the 2015 preliminary flood maps. Such expansion could negatively impact property values in those newly designated areas. In addition, an increase in areas of the City susceptible to flooding could result in greater recovery costs to the City if flooding were to occur within such larger areas.[24]

While we note that there is some discussion here for potential investors about actions and preparations being taken by the city in response to SLR, it is very general. The city references risks to property values, but makes no mention of how any revenue losses from lower property values might affect the

city's ability to repay its bonds. That appears not to concern the city at all, as if SLR would affect people without affecting the city's tax base. The city bond issues have a variety of maturity dates, yet this growing, long-term threat should imply that the longer an investor holds a bond, the greater the risk he or she would be assuming.

As each year passes, the 100-year flood becomes more likely and sea level rise becomes more real and more potentially devastating. All else being equal, investors holding bonds that mature in a few years are, thus, holding a safer investment than the investors holding longer-term bonds. This should be reflected in the rates the bonds offer.

Even if less than one percent of the document addresses the issue that local U.S. Rep. Ocasio-Cortez called the "millennials' version of World War II,"[25] surely the interest rates on long-term bonds ought to reflect the increased risk?

One particular bond issue, GO Bonds, Fiscal 2018 Series F, offered bonds with maturity dates ranging from 2020 to 2046. According to climate change advocates, the year 2050 is something of a watershed year for SLR.[26] By that time, these advocates project that coastal areas will really see and feel the impact of rising sea levels. As a matter of municipal finance, GO bonds are repaid from general tax revenues, so their safety assumes an expanding tax base (higher property values and more people paying taxes are the biggest sources of revenue increases).

From an investor's point of view, GO bonds maturing in the 2040's are definitely at a higher risk of not being paid, or at least causing some financial distress for the city, if city residents are displaced and declining property values sink the city's tax base over the next 20 to 25 years. Yet, while the average rate on the entire issue is 4.21 percent, the bond with the longest maturity at 2046 was offered at 3.5 percent. The longer-term bonds most subject to the adverse effects of climate change should be offering a higher-than-average coupon rate, since they are inherently riskier, according to the mayor's and other city leaders' own statements. But they do not.

New York has also pushed back on flood maps redrawn by FEMA in 2015 after Hurricane Sandy (often referred to as "Superstorm Sandy") caused widespread damage to the area in late October 2012.[27] These maps are used to determine flood insurance rates for real estate in the city. In assessing New York's vulnerability to future severe storms, FEMA's preliminary flood maps treated Sandy as a "100-year storm."[28] Citing another study, New York City officials claimed that FEMA had erred in its plan, including far too many people and buildings in its designated flood-prone areas.[29] City leaders argued that FEMA's new map would unnecessarily put about 26,000 buildings and 170,000 residents in the flood hazard zone, raising insurance rates and requiring tougher building code specifications or even retrofits to existing buildings.[30] The city cited its own studies, conducted by two scientists from the Stevens Institute of Technology, that determined that Sandy was really a "260-year storm" in

challenging FEMA's revised map.[31]

FEMA is now reevaluating its flood map for New York City. In the meantime, the city will continue to use FEMA's far less restrictive 2007 maps to calculate flood insurance rates.[32]

Port Authority of New York and New Jersey

GAI also reviewed bonds issued by The Port Authority of New York & New Jersey (Port Authority), an inter-jurisdictional agency that "builds, operates, and maintains critical transportation and trade assets. Its network of aviation, rail, surface transportation and seaport facilities annually moves millions of people and transports vital cargo throughout the New York/New Jersey region."[33]

While it is a separate entity with its own bond issuing authority, the Port Authority answers to New York City's leadership as well as New Jersey's. Furthermore, its leadership has "embraced the Paris Climate Agreement."[34] It has set targets for the reduction of greenhouse gas emissions and for energy conservation.[35] This makes sense since a significant number of the Port Authority's assets are vulnerable to SLR. As the operator of several airports built in low-lying areas, not to mention the various ports, tunnels, and bridges connecting New York and its neighbors, the Port Authority's income-producing assets would be adversely affected by any rise in sea level.

Indeed, the Port Authority has been very active in climate change initiatives. The agency also supported ClimAID, a study funded by New York State that assesses the potential effects of climate change statewide and identifies ways to mitigate them.

The Port Authority also participated in New York State's Climate Change Action Council and its Sea Level Rise Task Force. Both groups have released studies examining ways New York State can both respond to and reduce the risks associated with climate change. The Port Authority worked with the New York State Department of Environmental Protection during the drafting of New York's Community Risk and Resiliency Act (CRRA), which establishes official sea level rise projections and *requires* the consideration of climate risk in permit and funding applications and facility-siting regulations.[36] [italics added]

The statutory language requiring consideration of this higher risk would seem to mandate that climate change threats be reflected in the bond rates and disclosure statements. But, when reviewing its sample of GO bonds issued by the Port Authority in 2017 with maturities of 20 to 40 years out, GAI found that Port Authority bonds offered slightly higher rates (5 percent and 5.25 percent) than the sample average (4.2 percent) of the other 19 cities. Even considering some of those cities offered only bonds for specific purposes, these rates were not way out of line—New York City offered a 5 percent rate on two of its maturities and 10 of the other at-risk cities we sampled had at least one maturity offered at 5 percent.[37]

We also reviewed the Port Authority's official documentation associated with this bond issuance, a 256-page document dated April 26, 2017.[38] In that document the term "sea level" does not appear even once. Despite the Port Authority's deep involvement with studies, panels, and committees addressing SLR, it did not mention it to potential bond investors. Sea level rise does not appear to impose any financial risk on the Port Authority's bonds, at least according to its disclosure documentation.

Beyond that, the words "flood" and "flooding" are mentioned just three times, mostly in reference to Superstorm Sandy. "Climate change" is mentioned one time.[39]

The Port Authority's website touts its environmental measures and actions, but its 256-page official, legally binding documentation includes just one small paragraph on climate change issues and no mention of sea level rise, despite running five ports, among other things.

Case Study: Boston

From its mayor and governor to its congressional representatives and senators, Boston speaks with one voice on the threat of climate change and sea level rise. As the city's Democratic mayor since 2014, Marty Walsh has called climate change "a top priority."[40] He has gone so far as to say that fighting its effects is "non-negotiable" regardless of the price tag.[41] With Boston City Council support, Walsh has launched several programs such as Greenovate Boston, which seeks to make Boston more environmentally sustainable in the future.[42] He also organized an international summit of mayors to discuss climate change solutions in June 2018.[43]

Walsh has, nevertheless, faced some pushback from local environmental groups for not doing enough to increase green energy use in the city, for Boston's rising emissions of greenhouse gases, for planning more than 70 million square feet of buildings that will be powered by fracked gas, for not requiring builders to honor a climate resiliency checklist, and for encouraging development in historic floodplain areas such as Widett Circle.[44]

The Boston area's representatives in Congress are similarly outspoken on climate change issues, especially its two senators. U.S. Sen. Edward Markey (D-MA) introduced the so-called "Green New Deal" legislation in the Senate.[45] Meanwhile, his Bay State colleague and current presidential aspirant, U.S. Sen. Elizabeth Warren (D-MA), has said that "climate change is a threat to our national security."[46]

The state's Republican governor, Charlie Baker, even testified before Congress in February 2019 on the perils of climate change, demanding federal action.[47]

Development Initiatives

Upon entering office early in 2014, Mayor Walsh unveiled his Greenovate Boston 2014 Climate Action Plan Update, which revised initiatives from previous years, including an Executive Order from 2007. Boston has since added other initiatives, such as Go Boston 2030, Imagine Boston 2030, and the Energy Positive (E+) Green Building Program.[48]

Go Boston 2030 and E+ address Boston's sustainable policy goals towards transportation and building practices, respectively, while Greenovate Boston and Imagine Boston 2030 are broader and more multifaceted in scope.

Imagine Boston 2030 is much more than a climate change initiative, but environmental sustainability forms a core tenet of its goal of making Boston a sustainable city for the 21st century.[49] Imagine Boston 2030 is largely the successor to the city's 1965/1975 General Plan for the City of Boston. It addresses many of the same issues (i.e., housing, land use, economy, transportation), but with the notable addition of requiring responsibility for climate and environmental concerns.[50]

In our bond study, we found that Boston mentioned "sea level rise" in just one of its many recent bond issues—General Obligation Bonds 2018 Series A—in which it notes "The Boston Planning and Development Agency also asks all large, new developments to plan for at least 40 inches of sea level rise as part of the Climate Change Preparedness and Resilience Checklist under the Article 80 review process. This level of protection is consistent with Climate Ready Boston sea level rise projections through the end of the century."[51] Note that the city merely "asks," it does not require.

The other major component of Boston's development initiatives is Go Boston 2030, the city's expansive transportation plan. Go Boston 2030 seeks to make other modes of transportation, such as biking, more attractive to Bostonians, largely by reducing the number of cars in the city. In early 2017, this initiative proposed to halve car traffic in the city by 2030 and to increase carpooling by half, public transit use by one-third, biking fourfold, and to double the walking in that time frame.[52]

Yet Boston continues to approve the expansion and construction of old and new garages, totaling thousands of spaces, in key parts of the city, occasionally with public subsidies.[53] The Boston Globe even mentions these new parking developments in contrast with the Go Boston 2030 initiative and goes on to add that "Boston's new nerve center on the waterfront relies so heavily on cars."[54] The article also points out that there are calls to handle more vehicle traffic into the Seaport and South Boston areas; this is all in light of Go Boston 2030's proposals that will take up to fifteen years to implement.[55]

Aside from adding more parking to the city, Boston's government is scrambling to build housing for hundreds of thousands of expected new residents by 2030. While some housing will be built within Boston proper, the city is looking to enlist the help of nearby suburbs to shoulder some of the burden.[56] By encouraging small towns to revise their own zoning laws which protect the aesthetic of "quaint downtowns and stately homes," Boston can reduce the need to alter its own zoning laws.[57] "It really would be a tool to help cities and towns spur housing production," said Jenny Raitt, director of planning and community development in Arlington, a town of about 45,000 people that is part of the pro-housing coalition with Boston. The town is contemplating several zoning changes aimed at adding more multifamily housing, she said.[58]

Zoning laws aside, pushing housing to the suburbs will strain already clogged transportation routes into the city, especially when placed in the context of Go Boston 2030's goals for massive reductions in the use of automobile transportation.

Building Permits

We examined several building permits and related documents in depth for Boston development projects. We focus on two specific examples here: an Expanded Project Notification Form (EPNF) for 25 Fid Kennedy Avenue (25 Fid) and another EPNF for 338 Congress Street (338 Congress). Both projects are nestled in the nine-inch, 2030's sea level rise projections for South Boston Waterfront, according to the Climate Ready Boston (CRB) report.[59] Both EPNFs include an appendix that specifically addresses sea level rise.[60] Even with those acknowledgments, the applicants in both cases make clear that precautions are being taken to address severe storms and temporary flooding, rather than longer-term sea level rise.[61]

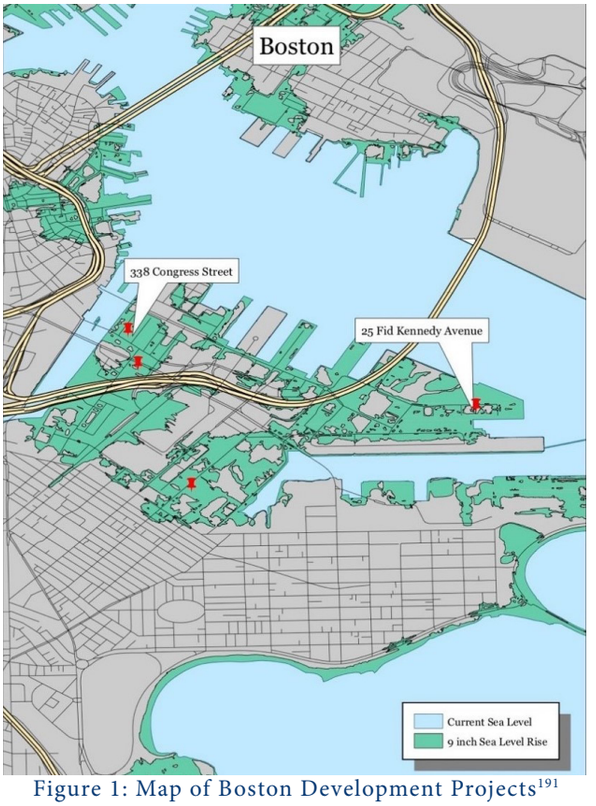


Figure 1: Map of Boston Development Projects[191]

For developers, this is likely a cost-saving measure. But for the city of Boston, it does raise the question: why is the city merely requesting, not requiring, that such preparations be made, especially if the city is assuming as much as nine inches of sea level rise in the next decade?

One possible explanation is that the city is merely allowing the developers to assume that risk. However, if the city wants to minimize the property damage and other costs caused by sea level rise, why grant such

building approvals in the first place? The CRB report, for example, estimates as much as $137 million in annualized losses from just nine inches of sea level rise; that number rises to $455 million and $1.39 billion from longer-term estimated sea level rises of 21 inches or 36 inches, respectively.[62]

These two South Boston projects are examples from one at-risk focus area in Boston. The Climate Ready Boston report points to seven focus areas in Boston that are at risk from sea level rise beginning as soon as the 2030's.[63] Each of these includes neighborhoods with a number of ongoing development projects, although many are not slated to begin construction until after 2020, if a start date is mentioned at all.[64]

Boston only has explicit environmental requirements for projects that fall under Section 80B, Large Project Review, of the Boston Zoning Code[65] (hereafter the Code) but largely pushes the letter of regulation off its plate by requiring these projects to conform to U.S. Green Building Council standards known as Leadership in Energy and Environmental Design (LEED). Commonly called "LEED certification," this is required in Article 37 of the city's code.[66]

In order for these major building projects to be eligible for Boston Green Building Credits, applicants must submit a plan to the Boston Redevelopment Authority that meets several prerequisites. Also, these projects can earn up to four points toward achieving a LEED certification. These four points are listed in Appendix A to Article 37 and are as follows: Modern [Electric] Grid, Historic Preservation, Groundwater Recharge, and Modern Mobility.[67] Section 37-5 requires that, after the applicant submits the completed LEED form to the Boston Redevelopment Authority, the latter must forward a copy of the submission to the Boston Interagency Green Building Committee (IGBC) for review.[68]

The IGBC is a body created in 2007 that consists of at least one, but not more than two, officials from relevant departments (Redevelopment, Environment, Transportation, Inspectional Services, or the Mayor's Office).[69]

A final observation on Boston is how difficult it is to trace how budgeted and awarded funds are used for the city's climate policies. The city's revenue comes from several sources, the largest of which are property taxes followed by local receipts (i.e., excise taxes, fines, fees, etc.), and state aid.[70] Boston's municipal budget is comprised of the following three categories: operating, capital, and external funds.[71] The operating budget addresses day-to-day functions of the municipal government and includes expenditures relating to wages, personnel services, contractual services, supplies and materials, equipment, and other costs. The capital budget is built on rolling five-year plans (e.g., FY2014-2018 or FY2015-2019) and funds municipal projects and programs, including the construction of schools and libraries. The capital budget is funded with issued bonds but also some outside grants.[72] Unless otherwise provided, bond revenue is included in the city's yearly tax levy per the Bond Procedure Act of 1983.[73] The third part of the city budget is external fund expenditures. This refers to programs funded by outside sources, including federal and state grants or awards, and non-governmental grants and

awards.

This is what makes tracking the costs of these programs difficult. The possibility of double counting is very real, given that federal and state grants may go to capital projects or external fund expenditures. However, a yearly audit of Boston's federal money use provides a clearer view into one aspect of Boston's climate funding. While the audit does not clearly label how many dollars go towards "green" policies, if one takes a broad definition of the term the problem is somewhat mitigated. In 2014, for example, Boston received more than $500,000 in federal money for climate or environmental purposes from the Department of the Interior and the Environmental Protection Agency.[74] But in later years that number was less; in 2017, for example, Boston only received $108,852 in federal funds for environmental purposes.[75] When these numbers are placed in the context of the total money Boston received and spent from the federal government in those respective years, the low values are even more surprising: Boston spent over $241 million and $314 million in federal funds for 2014 and 2017, respectively.

One might suspect, therefore, that Boston would spend much more of its own funds on its climate policy. That is true, but only on the surface. A closer look reveals a very different picture: Boston's FY2014 total Environment Department budget was about $3.8 million and more than half of this amount (over $2 million) was for operating purposes. Most of the remaining expenditures were for grants, fellowships, a pollution fund, and the Renew Boston program, which addresses energy audits and conservation. Less than 10 percent of the department budget was set aside for the three capital projects listed and only one of them had an appropriation for FY2014.[76] This was for the Energy Conservation Program, which was included in the FY2014 and FY2015 budgets as an "annual program" focused on a citywide strategy for solar panel installations. It appears that the other two projects, Wind Turbine and Open Space Acquisition, were not fully implemented as indicated by their "to be scheduled" status in the FY2014 and FY2015 budget reports.[77] However, none of the three capital projects were even mentioned in subsequent budget reports (FY2016 to FY2020).[78]

"To be scheduled" is as common a phrase for Boston's environmental projects as "study underway." The Climate Ready Boston report discussed earlier was published in 2016 but as of the FY2020 budget, only $4,280 has been spent on the project to date and its status is listed as "study underway."[79] CRB Phase 2 and the Renew Boston Trust Phase 2 are also said to have "study underway" for their status.[80] CRB Phase 3 and the subordinate CRB Harbor Study are listed as "new project" and "to be scheduled, respectively."[81]

Case Study: Miami

Miami, Florida may be the most mentioned city in the U.S. when it comes to climate change and impending sea level rise. South Florida is often called "ground zero" for climate change.[82] And, Miami

is one of the only major U.S. cities that had its own Sea Level Rise Committee designated for just those matters, though it was later folded in to the city's "Climate Resilience Committee."[83] Miami-Dade County, which encompasses the city of Miami, is part of the Southeast Florida Regional Climate Change Compact.[84] Both its former mayor, Tomás Regalado, and its current one, Francis Suarez, have talked a great deal about these climate threats,[85] Yet, under both Regalado and Suarez, certain actions were taken which are counterintuitive or at least misleading for climate interests.

In late 2017 under Regalado, Miami residents voted for a $400 million "Miami Forever" general obligation bond, the publicity campaign for which was partially funded by a $350,000 dark money investment from a group in New York.[86] The bond was sold to investors as being entirely focused on mitigating damages from sea level rise. Even today, it is the only issue discussed on the bond's dedicated website, except for one brief listing halfway down the page that reveals less than half ($192 million) of the bond's funding is actually designated to mitigate sea level rise.[87]

The balance of the funds will go to affordable housing, public safety, cultural facilities, and things such as renovating parks and playgrounds.

This lack of candor in how bond funding is marketed in the name of climate change has led some critics to question whether Miami is undergoing a sort of "climate gentrification."[88] This refers to a theory that "[C]limate change impacts arguably make some property more or less valuable by virtue of its capacity to accommodate a certain density of human settlement and its associated infrastructure." The implication is that such price volatility "is either a primary or a partial driver of the patterns of urban development that lead to displacement (and sometimes entrenchment) of existing populations consistent with conventional framings of gentrification."[89]

This theory has been advanced by critics who argue that such efforts typically affect racial minority groups who live in certain neighborhoods.[90]

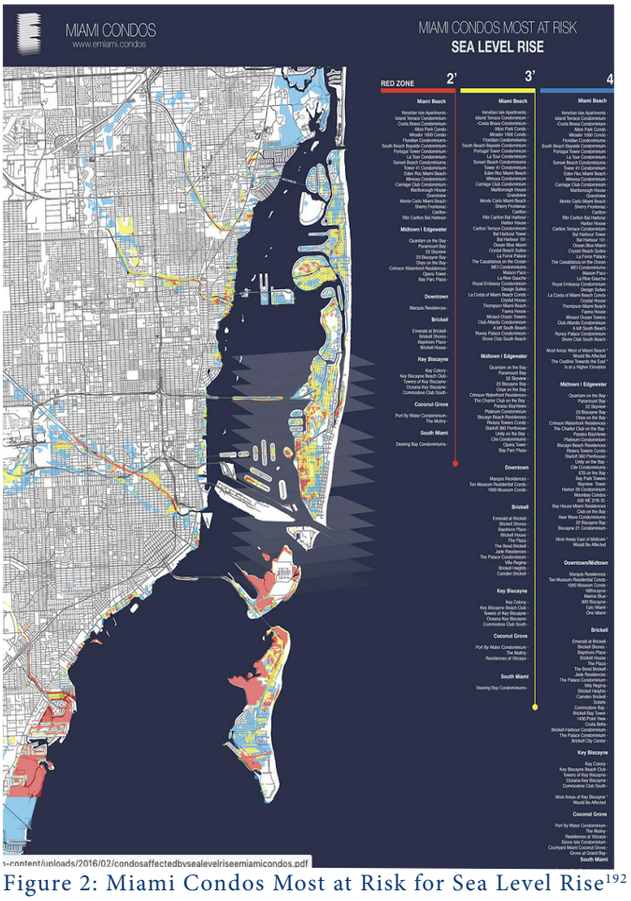


Figure 2: Miami Condos Most at Risk for Sea Level Rise[192]

Despite the city's acknowledged urgency in dealing with encroaching waters due to climate change, there's been no slowdown in oceanfront development. In fact, property values have risen in some places in south Florida, including a 4.7 percent increase in the total value of Miami's housing market, according to a Zillow report published in late 2017.[91] Zillow, a real estate research website, rates the region the fourth most valuable real estate market in the U.S.[92] New condo developments continue to spring up in risky places along Miami's famous South Beach area.[93] A map created with an app developed at Florida International University that tracks the threat of sea level rise provides a list of vulnerable properties by name and risk level.[94]

This is largely because of choices made by private developers, so it may be unsurprising that climate change risks are ignored considering that major developers in both Miami and Miami Beach have been quoted expressing little concern about climate change.[95]

However, it is not just the private sector that is guilty. Examining Miami-Dade County appraisal maps and cross-referencing them with NOAA sea level maps, we identified at least 24 parcels of land marked with government use Department of Revenue codes that were built on between 2010 and the present, despite the risk of being inundated with water at a 3-foot rise in sea level.

Under its current mayor, Suarez, Miami's largest development is under construction. The Miami Worldcenter, in planning since 2011, will be a $2 billion, 27-acre major upscale shopping, living, and commercial mall.[96] Only the first tower has gone up so far, but it seems the building procedures may be less than completely environmentally conscious. When the project broke ground in late 2016, they began by using 100 concrete trucks to make a total of 1,300 trips to pour over 52,000,000 pounds of concrete for the project's foundation.[97] This not only pumps massive amounts of $C0_2$ into the air, but also reduces water-permeable ground surface, which is needed to mitigate flood damage.

This is particularly concerning because the site for the Worldcenter is partially sited within a FEMA flood zone.[98] A property just a few blocks north of the location of the building site was removed because of partial inundation within the same zone. It is worth recalling that these flood projections are based on current sea levels, not accounting for the potentially large rise forecast by some of the mainstream climate science and Miami's own sea level rise committee.[99]

Democrat Philip Levine was mayor of the neighboring City of Miami Beach from 2013-2017. While campaigning for office, Levine was vocal about climate change, running a TV ad showing him paddling through floodwaters with his dog.[100] He promised to focus on following up with the city's $200 million plan to mitigate flooding.[101] He has said more recently on Twitter that climate change posed an "existential threat."[102] Levine even appeared in actor Leonardo DiCaprio's documentary "Before the Flood" that was aired by the National Geographic's cable TV channel in 2016.[103]

Early in his tenure, Levine appointed Scott Robins, an old friend and business partner to be the city's "flooding czar." Robins served as chairman of a three-member group reviewing flood mitigation strategy for Miami Beach. Then, almost immediately following Robins' appointment, after just two meetings, the panel concluded that the city would need to double its spending to avoid catastrophic flood damage in the coming years.[104]

As mayor, Levine famously described his governing style as "just get it done," a phrase that turned out to be disturbingly on the nose. He quickly approved another climate-related project costing $25.5 million to rebuild a seawall, without first securing the proper building permits from the U.S. Army Corps of Engineers.[105] As a result, Miami Beach may have to tear out three chunks of the Indian Creek Drive seawall at a potential cost of about $800,000 because of the neglected permits.[106]

In another case of "just getting it done," Levine declared the city to be in a state of crisis, allowing him to skirt the competitive bidding process for contracting. That decision led to an easily obtained $11 million contract which was spent on building flood water pumps along Alton Road, where Levine still owned real estate.[107]

The city also paid to elevate roads in the Sunset Harbour neighborhood where Scott Robins Companies, in which Levine had disclosed a partnership, owned roughly $20 million in real estate.[108] The two sold that property for $68.75 million in 2018.[109]

In total, close to $40 million in contracts by Miami Beach would be fast-tracked in the name of climate change and, at a minimum, the Alton Road and Sunset Harbour deals directly affected Levine's personal real estate holdings.[110]

Case Study: New Orleans

New Orleans is a unique city in many ways. While other cities sometimes describe themselves as "ground zero" for climate change effects, New Orleans truly deserves the title, as much of the city's land is below sea level.[111] It is protected by levees and subject to frequent, sometimes catastrophic flooding, as occurred during Hurricane Katrina (Katrina) in 2005.

As a late 2018 federal National Climate Assessment report put it, "Louisiana is at exceptional risk from climate change effects through the remainder of the 21st century, including the effects of between 1 and 4 feet of sea level rise, a greater number of intense rainfall days, increasingly warmer temperatures, and exposure to mosquito-borne diseases… The impacts to both infrastructure and human health already are especially high and will continue to be so for New Orleans and other major cities in southeastern states."[112]

The Global Green Community & Climate Action Center predicts that "New Orleans will be the first American city lost to sea level rise unless dramatic measures are taken. It is ground zero for climate change."[113] This group, the American affiliate of Green Cross International, is run by former Soviet Union President Mikhail Gorbachev[114] and counts celebrities including Leonardo DiCaprio, Robert Redford, Jane Goodall, and Norman Lear among its board members and supporters.[115]

The city's political leadership echoes these sentiments. At a recent mayors' conference on climate change, Mayor LaToya Cantrell said that the southeast Louisiana region "loses a football field a day" of land due to climate change.[116] As the city's previous mayor Mitch Landrieu put it in a July 2017 speech that launched his climate change plan, "Along with crime, climate change is an "existential threat" New Orleans must confront.... If you don't worry about this now, in the year 2050, there's a fairly good chance that the land we now work on and live on, outside of the levee system, could deteriorate that dramatically based on the science. It's not something that's going to happen. It's happening now." In the letter to introduce his plan, he added, "It is not enough to plan for how we will adapt to climate change. We must end our contribution to it."[117]

As mayor, Landrieu took several actions. Landrieu signed the Global Covenant of Mayors on Climate & Energy, adding New Orleans to a list of more than 7,400 cities in 119 countries committed to taking climate action. Like New York mayor Bill de Blasio, Landrieu affirmed his city's commitment to the Paris Agreement after President Trump pulled the U.S. out of the deal. "We must not waver. We must work together," Landrieu said. "Time is of the essence in combatting this critical existential threat, and our coastal city is on the front line."[118]

New Orleans has always battled the forces of nature. With more than half the city below sea level, it relies on a huge system of pumps and levees for its survival. Katrina exposed severe failures of these systems, flooding large parts of the city. Some sections of the city remained uninhabited as recently as 2015.[119] After the devastation wrought by Katrina, the state of Louisiana tightened its building codes.[120] In 2017, the city also committed to stronger enforcement of the building codes, which primarily means elevating new buildings and retrofitting others. The state developed a $50 billion "Coastal Master Plan" that includes the following elements:

- Building and Maintaining Land: The plan dedicates nearly $18 billion to marsh creation using dredged material, $5 billion to sediment diversions, and more than $2 billion to other types of restoration projects.
- Reducing Flood Risk: The plan dedicates $19 billion for structural protection and $6 billion for nonstructural risk reduction; these projects will reduce expected annual damage by $8.3 billion by year 50 as compared to Future Without Action and are expected to pay for themselves three times over the course of implementing the plan.

- Promoting Resiliency: The Flood Risk and Resilience Program focuses on proactive investments to make our communities more resilient. It recommends floodproofing more than 1,400 structures, elevating more than 22,400 structures, and the acquisition of approximately 2,400 structures in areas that are most at risk.
- Supporting Ecosystems: The ecosystem benefits provided by the plan will support commercial and recreational fisheries and wildlife coast wide, along with other ecosystem outcomes that benefit our communities.[121]

The flood reduction portion was to address the pumps that failed so tragically during Katrina. Given the city's position below sea level, the pumps are the greatest risk–if they fail again, all the other efforts will be a waste of money.

New Orleans has had a few light tests of these pumps since Katrina and on multiple occasions they have failed spectacularly as recently as 2017.[122] Fortunately, the city has not sustained a direct hit from a hurricane of any size since Katrina, only two glancing blows in 2017—one from the outer bands of Hurricane Harvey, and the other from a more typical sub-tropical rainstorm hit. In both cases, parts of New Orleans flooded due to pump failure.[123]

Finally, in 2018, work was completed on three massive new pump stations and barrier gates, at 17th Street, Orleans Avenue, and London Avenue.[124] These are some of the final pieces of a $14.6 billion reworking of New Orleans's flood and storm defenses.[125] Operation and maintenance of these pumps and water gates has been re-assigned to the Southeast Louisiana Flood Protection Authority after Katrina.[126]

The city's Sewerage and Water Board (S&WB) is also responsible for New Orleans' flood control. The scandal-plagued department[127] has been unable to keep the pumps in working order or even know how many are working and not working. After the 2017 storm flooding, S&WB officials initially said the city's pumps were working at full capacity during the August 5 flooding. Then "it was first revealed that in fact seven were not in operation. Over the next two days, that number was amended three more times, jumping from seven to eight to 14 and finally to 16 pumps not in operation on Aug. 5."[128]

New Orleans has 121 drainage pumps, so this represents a 13 percent failure rate.[129] Making matters still worse, three of the five turbines that supply power to the entire pump system also failed, leaving even the functioning pumps under-powered and operating below full capacity.

Not surprisingly, there was a house-cleaning at the top of the S&WB. Several officials announced their resignation, retirement, or were fired by Mayor Landrieu in the fallout from how the August 5, 2017 flooding was handled:

- S&WB Executive Director Cedric Grant, who had planned to retire at the end of hurricane season.
- Public Works Director Col. Mark Jernigan, who handed in a resignation letter.
- S&WB General Superintendent Joseph Becker, who announced his retirement after Landrieu said he would recommend his termination.
- S&WB Communications Director Lisa Martin, who resigned after Landrieu said he would pursue her termination.[130]

It would be unfair to lay all the blame at recent S&WB leadership. City leaders have underfunded the board for decades and that has not changed despite climate change rhetoric from former Mayor Landrieu or current Mayor Cantrell. Some of the key equipment New Orleans relies on is so antiquated that it requires its own special electricity generating station to operate: "Built more than 100 years ago, the Sewerage and Water Board power plant utilizes a 25-hertz cycle electricity system, which become [sic] obsolete before World War II. Because Entergy supplies a 60-hertz cycle, it's impossible for the Water Board to simply plug-in to the city's power grid. Instead, the Water Board must create its own electricity to power its pumps."[131]

Yet there seems to be no urgency in addressing these issues either. Also, a late 2018 article summarized the city's inability to get funding as follows: "The capital improvement plan typically calls for hundreds of millions in spending each year, but for years it has fallen short of money needed to pay for those projects. This year, for example, officials outlined $370 million in needs but were able to budget only about $221.5 million in spending."[132]

That has led to a backlog of deferred maintenance that officials have blamed for the poor state of the utility's infrastructure."[133] In the summer of 2017, the city had more than 68,000 catch basins to help channel water, for example, but put aside resources to clean only about 3,500 of them. A local report at the time stated the following: "As of July 28, the Department of Public Works had a backlog of 2,500 open service requests for clogged catch basins. Eight months ago, the City Council appropriated $3 million for addressing catch basin problems and other drainage work in the city, but it has yet to begin."[134]

Two years later, after Hurricane Barry gave the city a glancing blow, many city residents awoke "to catch basins full of standing water. Even after Hurricane Barry came and went, some of those storm drains remained clogged."[135] The city's Department of Public Works, which has complained of chronic understaffing, just recently announced plans to hire outside contractors to help with the cleaning of catch basins, drain lines, and ditches citywide.[136]

The city's current mayor, LaToya Cantrell, took office in 2018. Cantrell was previously a community

activist known for organizing resistance to then-Mayor Ray Nagin's plan to turn the Broadmoor neighborhood, one of the lowest-lying areas in the city, into green space. The Nagin administration's intent was to reduce the number of people in the path of rising sea levels or catastrophic storms like Katrina. As an activist, Cantrell led the effort to re-populate those areas and return displaced residents to the same areas they had to evacuate during Katrina.[137]

As mayor, Cantrell has also made the restoration of the Canal Street area a priority. This historic and significant New Orleans street has sections that have fallen into disrepair.[138]

However, given the threat of rising sea levels New Orleans faces and its continuing failure and antiquated nature of the City's water management system, investing in Canal Street (or in many other places) that will be under a significant amount of water since it is already below sea level seems to be a situation of inverted priorities. All that investment and redevelopment could be underwater in the financial sense and literally, not just from rising sea levels or a hurricane but, as recent history shows, even a hard rainstorm.

Case Study: California

With its massive coastline and size, California is home to three of the cities we reviewed in our study—San Francisco, Los Angeles, and San Diego. It is also the political home of several leaders who are very outspoken on climate issues. The state's position on these issues has been largely defined by its former governor Jerry Brown, who has been very outspoken on climate changes throughout his long career:

"Human civilization is on the chopping block—that's a big thought," Brown said in a speech in Germany. "Let's lead the whole world to realize this is not your normal political challenge," he continued. "This is much bigger. This is life itself. It requires courage and imagination."[139]

This sentiment permeates California's current government. Its attorney general, Xavier Becerra, filed a legal brief supporting lawsuits by the City of San Francisco and others, against several petroleum companies.[140] These cities were suing for damage caused to their areas by climate change (as mentioned earlier, New York City filed a similar suit as well). Also, the state's current governor, Gavin Newsom, praised his predecessor, vowing "to build on the momentum that's well underway from Governor Brown's administration."[141]

Like Brown and Newsom, the state's junior senator and presidential hopeful Sen. Kamala Harris (D-CA) also hails from the Bay Area. She previously served as San Francisco and state attorney general before winning retiring Sen. Barbara Boxer's seat in 2016. As a senator, Harris has consistently supported ambitious environmental legislation and recently endorsed the Green New Deal, telling Iowa voters in January 2019, "I support a Green New Deal… Climate change is an existential threat to us, and we have

got to deal with the reality of it."[142]

As mentioned earlier, several cities and counties in California filed massive lawsuits against ExxonMobil, Chevron, and other major oil companies filled with specific claims of damages to the cities of Oakland, San Francisco, and San Mateo caused by the effects of climate change they allege were knowingly caused by these oil companies. Oakland states in its lawsuit that "global warming has caused and continues to cause accelerated sea level rise in San Francisco Bay and the adjacent ocean with severe, and potentially catastrophic, consequences for Oakland." These threats were so real, the city said, that "by 2050, a '100-year flood' in the Oakland vicinity is expected to occur… once every 2.3 years…by 2100…almost once per week." Finally, the lawsuit pleading says, "By 2100, Oakland will have up to "66 inches of sea level rise," which, along with flooding, will imminently threaten Oakland's sewer system and threaten property with a "total replacement cost of between $22 and $38 billion."[143]

Yet in the document disclosing risks to investors in a 2017 bonds offering, Oakland says, "The City is unable to predict when seismic events, fires or other natural events, such as sea rise or other impacts of climate change or flooding from a major storm, could occur, when they may occur, and, if any such events occur, whether they will have a material adverse effect on the business operations or financial condition of the City or the local economy."[144]

In its own lawsuit pleading, San Mateo County claimed "a 93% chance that the County experiences a devastating three-foot flood before the year 2050, and a 50% chance that such a flood occurs before 2030."[145]

Yet, a bond disclosure from 2016 issued in San Mateo was more understated: "The County is unable to predict whether sea level rise or other impacts of climate change or flooding from a major storm will occur, when they may occur, and if any such events occur, whether they will have a material adverse effect on the business operations or financial condition of the County and the local economy."[146]

Similar language was used in the lawsuit pleadings by the County and City of Santa Cruz, Marin County, and the City of Imperial Beach.[147]

California Cities Bond Review

We would expect the entire state government to reflect this deep belief. However, a sample of school district bond issues from its three major metropolitan centers tells a different story. In its bond issue titled "Series 2016 Bonds" and issued in 2017, San Francisco neither reflected this increased risk in its rates nor discussed it in its disclosure statement. The longest maturity bonds of this issue mature in 2037 and were offered at a 4.0 percent rate,[148] below the average rate for at-risk cities in our sample of 100 bonds. Since Harris, Newsom, and Brown all hail from the Bay Area and reflect the region's long-

standing political commitment on these issues, one might have expected a more forthright statement of the threats. Yet, the 223-page official disclosure document that accompanied this bond issue did not mention the phrases “climate change” or “sea level rise” even once.

Our review of Los Angeles bond disclosures showed much of the same. The city’s “Election of 2016 GO Bonds,” issued in 2018, was offered at a slightly higher 5 percent for its longer maturities, but its 221-page disclosure statement made no mention of “sea level rise” or “climate change” to potential investors as a risk factor worth considering.[149]

Farther south, San Diego shows the same pattern. A slightly different school bond with maturities as long as 30 years offered 5 percent interest on its 30-year term. The rate itself is higher than in other cities, but the shorter-term bonds were offered at the same 5 percent and the city did not disclose any increased risk of climate change that was priced into the longer maturities. As we see in other California bond disclosures, neither “climate change” nor “sea level rise” appears even once in the 243-page official disclosure document.[150]

Summing up, while the state’s most well-known political leaders speak tirelessly of the need to confront the inevitable effects of climate change and impending sea level rise in their home state, they do not mention this at all in their legally binding bond disclosure statements.

Case Study: Honolulu

Various projections show Honolulu, Hawaii in the crosshairs of sea level rise.[151] A coastal city situated on a small island, this is not surprising. As a result, climate issues are a significant part of the Honolulu political landscape.

Mayor of Honolulu since 2013, Kirk Caldwell has required “departments and agencies under his jurisdiction to view climate change as an urgent matter and to take action to protect and prepare the city for the physical and economic effects of it.”[152]

In some cases, his view of the situation is more pessimistic than other coastal city mayors. Responding to the 2018 National Climate Assessment report cited in the New Orleans section, the mayor stressed that “coastal erosion threatens major roadways and homes and suggests ‘perhaps we retreat.’ … That we give our beaches a chance to live by eroding, and allowing the sand to stay. But we may have to give up homes. We may even have to give up roads.”[153]

After the local Climate Change Commission presented two earlier reports to the mayor and members of the city council, the mayor said that the information “…confirms that climate change is the defining challenge to humanity —and to O‘ahu—in the 21st century. By issuing this directive, I want to ensure

that every policy and project decision dealing with sea level rise going forward is made in the best interest of the public."[154]

U.S. Rep. Tulsi Gabbard (D-HI), who represents Honolulu and surrounding areas in Congress and is also a candidate for the Democratic presidential nomination, echoed Caldwell's themes in 2017, stressing the need to replace fossil fuels in the next 18 years: "The effects of climate change disproportionately devastate coastal and low-lying communities not only in the United States, but also around the world. Pacific Ocean island communities, like Hawai'i are endangered by rising ocean tides and temperatures and intensifying storms. Together, we must aggressively combat climate change and pass the #OFFAct, to transition the United States off of fossil fuels to a 100% clean energy economy by 2035. We must prioritize the future of people and our planet—and not be swayed by the power of profits or polluters."[155]

Honolulu Bond Disclosure Review

Yet again, however, we do not see the same level of concern reflected in official documents associated with a recent bond issuance. In 2018, Honolulu issued some long-term GO bonds, the longest of which mature in the 2040s, when SLR forecasts become dire. We would expect the associated disclosures to detail the risk and that its coupon rates would reflect it.

Honolulu does detail the risk more than other cities, and the city has taken some action. Its 100-page disclosure statement mentions "climate change" and "sea level rise" in a one-page discussion about establishing a new government office created a year earlier:

> The City and County and the State have taken a number of steps intended to mitigate the negative impacts of climate change; impacts to which the City and County may be particularly vulnerable.
>
> At the November 2016 election the citizens of the City and County approved, by a significant margin, amendments to the City and County's charter to establish an Office of Climate Change, Sustainability and Resiliency (the "Resilience Office"). The amended charter, adopted on June 30, 2017, charges the Resilience Office with, among other things, (i) tracking climate change science and its potential impact on the City and County; (ii) coordinating actions and policies within the City and County to increase community preparedness, protect economic activity, protect the coastal areas and beaches and to develop resilient infrastructure; (iii) developing or coordinating City and County policies and programs to improve the environmental performance of City and County operations and advance environmental priorities; (iv) integrating sustainable and environmental values into City and County plans, programs and policies; (v) coordinating with federal and state

agencies regarding climate change, sustainability and the environment; (vi) convening a climate change commission (the "City and County Climate Commission") consisting of five members with expertise in climate change in Hawaii no less than twice a year; and (vii) providing appropriate advice to the mayor, council and executive departments of the City and County. Under the amended charter, the City and County Climate Commission is charged with gathering the latest science and information on climate change effects in the City and County and providing advice as is deemed appropriate to the executive for climate change and sustainability, the Mayor, City Council, and executive departments of the City and County.

On July 17, 2018 Mayor Caldwell issued a formal directive (the "Climate Change Directive") to all City and County departments and agencies to take action to address, minimize risks from and adapt to the impacts of climate change and sea level rise in response to the Sea Level Rise Guidance and Climate Change Brief, each of which was adopted on June 5, 2018 by the City and County Climate Commission. The City and County Climate Commission compiled the Oahu-specific recommendations based on the State of Hawaii's 2017 Hawaii Sea Level Rise Vulnerability and Adaptation Report ("State Report"), federal research, and additional scientific literature. The State Report found that there is a growing vulnerability to potential coastal flooding, erosion, land loss, and high wave impacts in Hawaii resulting from a potential sea level rise of 3.2 feet by mid-century. The City and County Climate Commission described the impact on Oahu of such sea level rise without action in response and, through its Sea Level Rise Guidance and Climate Change Brief, provided advice and recommendations to the Mayor, City Council and Executive Departments. The Climate Change Directive requires all departments and agencies under the Mayor's jurisdiction to take several actions, including: (i) viewing climate change and the need for mitigation and adaptation as an urgent matter, and taking a proactive approach to reducing greenhouse gas emissions and protecting and preparing the City and County for the physical and economic impacts of climate change; (b) use the Sea Level Rise Guidance and State Report in their planning, programing, and capital improvement decisions to mitigate impacts to infrastructure and critical facilities subject to sea level rise, which may include elevation or relocation of infrastructure and critical facilities, the elevating of surfaces, structures, and utilities, and/or other adaptation measures; (c) propose revisions to shoreline rules and regulations to incorporate sea level rise and conserve a natural, unarmored shoreline wherever possible; and (d) work cooperatively to develop and implement land use policies, hazard mitigation actions, and design and construction standards that mitigate and adapt to the impacts of climate change and sea level rise. The Climate Change Directive strongly encourages independent agencies, city-affiliated entities, and city-related institutions to help advance these efforts and adopt similar initiatives.

> On June 7, 2017 Governor Ige signed Act 32 Session Laws of Hawai'i, 2017 (the "Climate Change Act") into law, which, among other things, renamed the Interagency Climate Adaptation Committee as the Hawaii Climate Change Mitigation and Adaptation Commission (the "State Climate Commission"), clarified and expanded the duties of the State Climate Commission and made Hawai'i the first state to enact legislation implementing parts of the Paris climate accord. The Climate Change Act anticipates that the State Climate Commission will provide direction, facilitation, coordination and planning among state and county agencies, federal agencies, and other partners about climate change mitigation (reduction of greenhouse gases) and climate change resiliency strategies, including, but not limited to, sea level rise adaptation, water and agricultural security, and natural resource conservation. The State Climate Commission is placed under the Department of Land and Natural Resources (DLNR) for administrative purposes and is to be headed jointly by the Chairperson of the Board of Land and Natural Resources and the Director of the Office of Planning (OP), or their designees.
>
> The United States Congress has appropriated $345 million for fiscal year 2019 which will be used to fortify the Ala Wai Canal and the watersheds flowing into it to assist with flood risk mitigation for the Waikiki area of the City and County. There is a local match requirement of approximately $115 million which will be paid by the City and County and/or the State. The specifics regarding the match have not been determined at this time.
>
> In addition to the efforts described above, the Department of Environmental Services is including climate change and sea level rise issues in its planning for new, upgraded, and rehabilitated facilities. At this time the City and County is able to determine if, or to what extent, the Resilience Office, the Climate Commission and the other activities being undertaken will affect the City and County.
>
> At this time the City and County is unable to predict whether, or to what extent, the foregoing measures will insulate it from the adverse impacts of climate change, which could be material.[156]

Compared with most other cities in our study, this is an impressive amount of disclosure. While the disclosure statements do not actually project the anticipated risks to the city, they do detail for potential investors the city's actions thus far. Consistent with this careful disclosure, we could reasonably expect the interest rates offered on Honolulu's long-term bonds to reflect these disclosed risks. Yet, that is where the consistency seems to fail.

Our study found that Honolulu offers its 22- and 25-year general obligation bonds for 5 percent or less,

which is roughly the same interest rate as several no-risk inland cities in our sample.

For example, Chicago, considered a low risk from climate change, offered 20- to 22-year general obligation bonds for 5 percent in a recent issuance. So did Kansas City, Missouri on its 12-year general obligation bonds. Birmingham, Alabama offered the same rate on that city's 30-year bonds.

There are many factors that influence an interest rate, but a general obligation bond is priced taking the city's future ability to repay into account. As we noted earlier, if Honolulu's future ability to repay is jeopardized by sea level rise and its effects on the value of city real estate, or if it would have to divert significant city funds from income-producing activities to mitigate the impact of rising sea levels, that should be clearly reflected in the interest rate, which is the clearest and most objective measure of risk. Yet city leaders, investment experts and the investing public do not seem overly concerned about the risk of sea level rise or its potential long-term effects on Honolulu.

Case Study: Seattle

Washington state has an interesting history on climate and environmental issues. Dixy Lee Ray, who served as the state's first woman governor from 1977-1981, might today be called a climate skeptic. After earning her doctorate in zoology from Stanford University, she was a professor at the University of Washington before entering politics. Following her government service, she wrote a book in 1993 called *Environmental Overkill* that warned of the hypocrisy and scientific fraud she saw in the environmental movement.

Times have changed. The state's current governor, Jay Inslee, who recently ended his bid for the Democratic presidential nomination, called himself the "Climate Candidate" while on the campaign trail.[157] He said, "We are the first generation to feel the sting of climate change, and we are the last generation that can do something about it. As president, I will make fighting climate change our number one priority."[158] His campaign literature stressed, "Governor Jay Inslee knows that defeating climate change is the defining challenge of our time and that it must be the foremost priority for the next president."[159]

Seattle is a city found on many "Greenest Cities in America" lists.[160] However, despite the city's already low emissions per capita score, its mayor Jenny Durkan and Councilman Mike O'Brien (who also serves on the board of directors of the Sierra Club) speak often about lowering emissions even further by reforming the city's transit systems.[161] Mayor Durkan put it plainly at the Climate Solutions breakfast in Seattle on May 8 of this year: "We've got to do everything," she said of mitigating damage to the environment. She signed a city ordinance to require new developments to include electric vehicle charging stations.[162]

At a news conference in September 2018 prompted by the city's winning of an award through former New York City Mayor Michael Bloomberg's "American Cities Climate Challenge," Durkan stressed the need "...to get people out of their cars, out of single occupancy vehicles and into other modes of transportation, transit, biking, walking."[163]

The city's Climate Action Plan released in April 2018 also discusses the burden of passenger transportation on Seattle.[164] It also mentions that for the last 10 years the city has been reducing passenger transportation emissions by only 0.5 percent a year, far below what would meet the plan's stated goals.[165]

Prior to Durkan becoming mayor, Seattle not only planned to build a system of streetcars called the Center City Connector, but also sought to expand a network of protected bike lanes and bike sharing programs that were part of a comprehensive transit initiative called One Center City. However, within three months after Durkan took office, the streetcar program was halted due to runaway costs, and the bike lane project was delayed due to heavy downtown construction. The Center City Connector program has been restarted since then, at least with loans that allow it to resume project design and to revise its total projected costs. Also, it appears that work has resumed on the bike lane project, although it is at least three years behind schedule.[166]

Nevertheless, Durkan mentioned those initiatives in September 2018 when accepting the award that is typically granted for green initiatives in the building and transit sectors, even though the Center City Connector and bike lane projects had already been cancelled or delayed for at least five months before Seattle received the award.[167]

Those initiatives had been approved by voters in a 2015 plan called "Move Seattle."[168] The plan says repeatedly that the city intends to leverage public and private investment for most funding. In postponing them in 2018, Durkan's administration's explanation was that these projects turned out to be more expensive than originally anticipated.[169]

Yet beginning in 2015, the regional transit authority, "Sound Transit," had sold nearly $1 billion worth of green municipal bonds in the largest-ever green bond issuance for the purpose of funding transportation projects like these.[170] GAI's research efforts to learn how those funds were used have so far been unsuccessful.

On top of the bond issue, Seattle received a $75 million grant for the streetcar project in February 2016, funding that may have been secured by overselling the merits of the project in the first place.[171] In 2018, an internal memo from the agency that operates the streetcars stated that the operational costs were 50 percent higher than what the city's transportation department, which operates the streetcar system, had told them.[172] It also appears that local officials projected the project's revenue and ridership to be higher

than was likely.[173] Is the reason for postponing, rather than ending the projects, to hold onto this money and the city's standing with the federal loan dispensaries in the future?[174]

Perhaps Durkan never really expected the streetcar project to work out? One excuse her office gave was that the streetcars purchased by the city were the wrong gauge for the tracks.[175] That excuse was hotly disputed by critics, who noted that both the track and the cars were the standard gauge.[176] Regardless, in 2018 the cost of the delay itself was estimated at $10 to $14 million dollars and "a preliminary review found a budget shortfall of more than $23 million."[177]

Eventually, Seattle brought in external consultant KPMG to sort the matter out.[178] Their report, which was to conclude no later than June 2018, according to the Deputy Mayor, Mike Fong, was delivered in late August. The Mayor's office was set to work alongside the City Attorney's Office in an investigation on the project's management to date.[179]

In lieu of these budgetary shortcomings, Durkan proposed a system of toll stations throughout the city as a means to fund the projects while also cutting traffic congestions, thus lowering emissions.[180] This "congestion pricing" idea was announced days after the streetcar project was suspended and was promptly criticized as an attempt to essentially place a tax on the city's residents, using climate change as an excuse.[181]

For Seattle, and the Pacific Northwest in general, sea level rise is less of an issue due to the rockiness and elevation of the shorelines. In fact, according to the U.S. Global Change Research Program, the northwestern United States may might even experience lower sea levels in years to come, according to one set of projections based on no further melting of polar ice sheets.[182]

That said, Seattle does still play up the threat on the flood hazard management page of their website, acknowledging climate change as a contributor to sea level rise and increased rain fall.[183] The South Park neighborhood is specifically named as being at risk. Most of the developments that were set to happen there had to do with repaving, building a drainage pump station, and shoreline improvement, presumably to help this situation, however that section of the neighborhood association website does not appear to have been updated since prior to the spring of 2013.[184] The city said in August that the pump station project design development phase has been reviewed.[185]

Reviewing the bond issues issued by King County, which comprises Seattle and its immediate suburbs, also shows the discrepancy between what the bonds are offering in terms of risk, and the language in the disclosure statements. In a 2017 general obligation bond issuance with long-term maturities in the late 2030's, King County offered an average coupon rate of 4.81 percent for all the listed maturities (2018 to 2038), and an average coupon rate of 4.2 percent for the maturities from 2034 to 2038.[186] Both figures are higher than the average rate for the no-risk cities in our sample (3.99 percent). Therefore,

these bond rates do not appear to reflect any climate risk at all. Moreover, two of the three evaluating rating agencies gave the bond issuance its highest possible ratings.

A 222-page disclosure statement that accompanied this bond issuance mentions climate issues several times and refers to the city's "Strategic Climate Action Plan."[187] In this case, though, that is no big surprise. These bonds were officially labeled as "Green Bonds."

The bonds were issued for a variety of purposes, including to fund flood mitigation projects. King County's disclosure statement is accompanied by an appendix done by the Center for International Climate and Environmental Research (CICERO) that is offered as a "second opinion" on the bond issues. Between the two documents, "climate change" is mentioned ten times, and "flood" matters are referenced 13 times in the context of resilience and preparation.

It is important to note that CICERO's scope is in evaluating the "greenness" of King County's plans, not their cost-effectiveness. As they note, "CICERO is neither responsible for how the framework or mechanisms are implemented and followed up by the institutions, nor the outcome of investments in eligible projects."[188]

The state, however, did mention it in several of its own general obligation bonds. In a few of the disclosure documents (one of which is a general preface they release each year called the "Annual Disclosure for General Obligation Bonds"), the state says, "Climate change could intensify and increase the frequency of extreme weather events, such as coastal storm surges, drought, wildfires, floods and heat waves, and raise sea levels along the coast. The loss of life and property damage that could result from a major earthquake or other major natural disasters could have a material and adverse impact on the State and its economy and financial condition."[189]

Conclusion

It is no shock that so many city and state leaders who campaign for office on promises to battle the "existential threat" of sea level rise and climate change quietly change their tune when selling bond issues to pay for new and expanded development. But it is true that these disclosure statements are legally binding while campaign promises are not. That these leaders are careful not to highlight these risks in such legal documents certainly suggests that they do not really believe the problem is as pressing as they claim in their stump speeches.

Looking at this question from another perspective, the municipal bond market is a sophisticated place filled with thousands of gimlet-eyed analysts and underwriters who thoroughly evaluate each new municipal issue for their bond-buying customers. In turn, those customers are no less savvy, especially the large institutional investors, at "pricing in" the potential risks and rewards they see in any bond

they purchase. The municipal bond market is prized by investors for its relative safety and security.

Are those investors simply being short-sighted? A recent study done for the financial publication Barron's sought to identify the most potentially vulnerable jurisdictions nationwide, and their bond issuers. The study used statistical data evaluating climate risk in these cities and counties to derive "climate-threat" ratings for various large bond issuers.[190] Their review concluded that bond buyers in today's market are simply ignoring the risks to their investments in many cases, but noted comments from a few investment analysts and ratings agencies that say they are beginning to evaluate such risks as part of their own due diligence.

We have not evaluated the methodology of that study to see how it balanced and weighted the threats posed by singular weather "events" such as hurricanes or floods against longer-term threats predicated on rising sea levels or on higher average temperatures affecting those jurisdictions directly. The goal of our project as investigative reporters was to explore whether the leaders of those jurisdictions are as forthcoming about the risk in their bond documents as they are in their public speeches. And in most cases, the answer is no.

In conducting this bond study and reviewing various individual cases, GAI expected to find higher interest rates for bonds coming from cities and states identified as being at greater economic risk from rising sea levels caused by climate change. And yet, the small variations we did find were statistically insignificant and showed no correlation to the risks prophesied—elsewhere—by city or state politicians.

The clear implication of this is that not only do bond-issuing city and state leaders not credit their own, sometimes dire, rhetoric, but the analysts, underwriters, and institutional buyers discount it as well. It is business as usual for both sellers and buyers, and the bonds are bought and sold as though the threat of sea level rise and catastrophic flooding caused by runaway climate change were not really a consideration.

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