

## SECTOR IN-DEPTH

17 January 2019



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## Local government - US

## Cities' heightened focus on mitigating climate risk is credit positive

Many of the nation's largest cities are accelerating their efforts to mitigate the impact of climate events. Cities' increasing focus on climate risks is a credit positive, particularly as climate change is forecast to increase the frequency and severity of extreme weather events. The risks from climate change include economic disruption, infrastructure damage, insufficient health and public safety services, and population displacement. As cities ramp up their investment, many expect to benefit from having a substantial amount of the costs covered by the federal and state governments. Our conclusions are derived from a survey we recently conducted of the nation's largest cities by debt outstanding (details on page 2).

- » **The pace of planning for climate risk adaptation is quickening.** Though only 57% of survey respondents have developed climate risk action plans to date, that number is on track to reach 82% by the end of 2019. The respondents also report a median estimated time of completion of just three and a half years for climate projects.
- » **Flooding dominates as the primary risk cities are guarding against.** Though drought and extreme heat are key climate risks, flood mitigation efforts account for 60% of reported climate change resilience projects. The focus reflects the estimated trillions of dollars of property in areas vulnerable to flooding.
- » **Climate projects carry a substantial cost relative to outstanding debt, though cities anticipate sharing the burden with federal and state governments.** The 28 cities who responded to the survey identify nearly 240 climate resilience projects launched or planned with a combined cost of \$47 billion. However, cities anticipate bearing only a combined \$21 billion of the total cost with the remainder funded by the federal government, the state or other local sources.
- » **Just over half of survey respondents (54%) plan to issue debt for climate resilience efforts.** The figure will likely rise as cities increasingly identify and plan for the impact of climate risks. The availability of state and federal money will influence the level of issuance.

### Survey on climate risk mitigation efforts

We surveyed the 50 largest Moody's-rated US cities as measured by debt outstanding. We received responses from 28 cities, which have a combined population of 29.5 million, about 10% of the US population (see Exhibit 1). Respondents' ratings range from Aaa to Ba3; the median is a high Aa1 compared with a Aa3 median for all Moody's-rated cities. Together, the respondents have \$118.7 billion in outstanding debt for an average of \$4.2 billion per city, ranging from \$72 billion for New York City (Aa2 stable) to \$645 million for Louisville, Kentucky (Aa1 stable).

The respondents represent a cross section of the largest US cities and are geographically and economically diverse. Collectively, they face a full array of climate events and risks: floods, sea level rise, extreme heat, drought, storms, wildfires and increased demands on electrical systems.

Exhibit 1

#### Survey respondents are among the 50 largest Moody's-rated cities by debt outstanding

City	State	Current seniormost rating	Population (2016 ACS Data)	Net debt outstanding (\$000s)
Austin	TX	Aaa	907,779	\$1,419,238
Boston	MA	Aaa	658,279	\$1,421,746
Charlotte	NC	Aaa	808,834	\$1,377,007
Cleveland	OH	A1	389,165	\$704,855
Columbus	OH	Aaa	837,038	\$1,646,105
Dallas	TX	A1	1,278,433	\$1,804,061
Denver	CO	Aaa	663,303	\$1,387,398
Detroit	MI	Ba3	683,443	\$1,833,414
Honolulu City and County	HI	Aa1	986,999	\$2,821,693
Houston	TX	Aa3	2,240,582	\$2,917,159
Huntsville	AL	Aaa	188,973	\$767,167
Indianapolis	IN	Aaa	835,097	\$1,234,360
Kansas City	MO	Aa2	471,767	\$1,553,051
Louisville	KY	Aa1	759,724	\$645,172
New York City	NY	Aa2	8,461,961	\$72,620,832
Norfolk	VA	Aa2	245,724	\$1,058,395
Oklahoma City	OK	Aaa	620,015	\$853,051
Omaha	NE	Aa2	443,072	\$838,126
Oyster Bay Town	NY	Baa3	297,537	\$756,527
Phoenix	AZ	Aa1	1,555,324	\$2,133,974
San Antonio	TX	Aaa	1,439,358	\$2,430,657
San Diego	CA	Aa2	1,374,812	\$744,515
San Francisco	CA	Aaa	850,282	\$2,836,248
San Jose	CA	Aa1	1,009,363	\$1,006,488
Scottsdale	AZ	Aaa	234,495	\$793,971
Virginia Beach	VA	Aaa	449,733	\$924,395
District of Columbia	DC	Aaa	659,009	\$9,537,740
Worcester	MA	Aa3	183,677	\$724,601

ACS stands for American Community Survey, which is conducted by the US Census Bureau.

Source: Moody's Investors Service

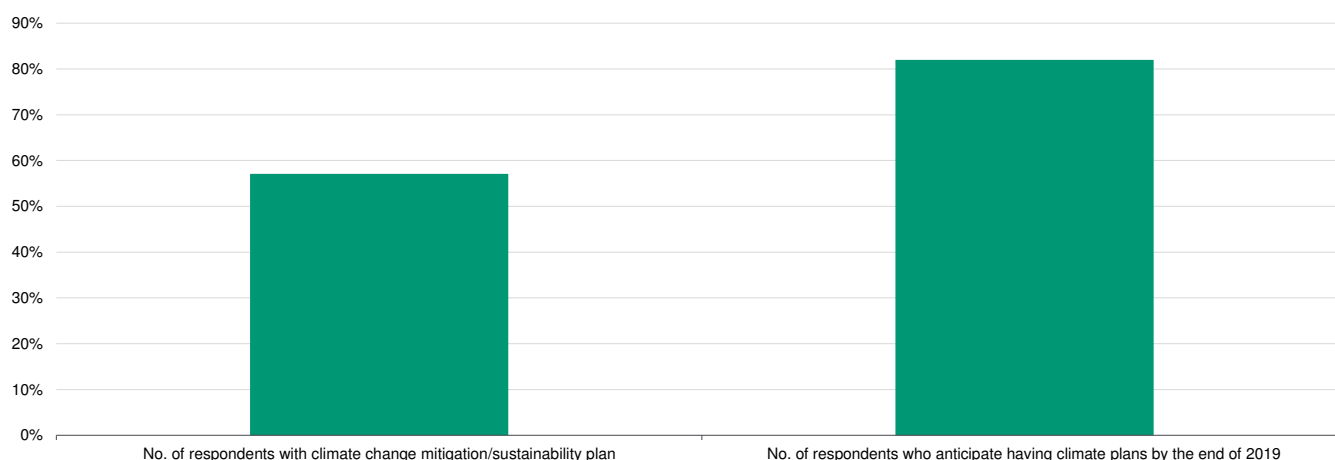
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## Pace of planning for climate change adaptation is quickening

Cities are increasingly adopting climate risk mitigation plans that detail specific projects designed to improve resilience to vulnerabilities. Among the 28 survey respondents, 57% have developed climate risk action plans (see Exhibit 2). However, as an indicator of cities' increasing recognition of the importance of preparedness, more than half of respondents without plans intend to complete one by the end of 2019, which would raise the number of surveyed cities with climate sustainability plans to 82%.

Exhibit 2

### Number of respondents with climate sustainability plans set to reach 82% by end of 2019



Source: Moody's Investors Service

Cities' reported climate sustainability plans are distinct from the hazard mitigation plans developed using guidance from the Federal Emergency Management Agency (FEMA). Approximately 87% of the US population lives in areas covered by a hazard mitigation plan, which is required for eligibility for non-emergency FEMA grants. However, the hazard mitigation plans typically focus on natural disaster recovery rather than long-term sustainability and adaptation to climate change. These plans are also intended to be part of a broader, long-term and comprehensive mitigation plan and may address disaster response for multiple jurisdictions.

These aims are generally in contrast to city-driven climate sustainability plans, which typically identify specific projects, programs and costs to address both short-term climate risk mitigation as well as long-term climate adaptation strategies.

While the rate of climate sustainability plan adoption is increasing, the plans' content varies substantially from city to city. Climate plans do not consistently include project costs, which are often folded into multiple departmental budgets within a city or its enterprises. The interdepartmental nature of climate projects creates a challenge for a central administrator to oversee or track the costs of climate-specific projects.

Besides more cities adopting plans, another indicator of the quickening pace of cities' climate planning is the fairly short estimated time to complete climate projects. The survey respondents provided time frames for 200 climate mitigation projects. The median and average estimated times to completion are three and a half years and seven years, respectively.

Effective climate risk preparation is a credit positive that sheds light on how a city manages infrastructure vulnerabilities, current and future capital costs, mitigation of potential economic impacts and the risk of population loss resulting from climate change. Preparation costs can affect a city's debt profile, balance sheet and economy and can thus present a challenge to cities seeking to balance the benefits of climate planning against the attendant expense.

### Contending with rising seas and flood risk

#### Virginia Beach: Comprehensive sea level rise study will be basis for billions of dollars in resiliency projects

The [City of Virginia Beach](#) (Aaa stable) is located in Virginia's Hampton Roads region and lies at the intersection of various major bodies of water, increasing its vulnerability to sea level rise and flood risk. The city projects sea level rise up to three feet by 2100 and as much as one and a half feet in the next 20 years. In response, it is conducting a Comprehensive Sea Level Rise Study. The study will include an impact assessment and serve as the basis for long-term adaptation strategies. Ultimately, the study will form the foundation for billions of dollars in flood mitigation projects tied to the city's long-term resiliency plan. The city is also incorporating sea level rise and flood mitigation strategies in its Stormwater Master Plan and stormwater management regulations.

Virginia Beach has a history of strong financial management and adherence to policies to maintain satisfactory reserves, liquidity and debt levels despite significant capital plans to mitigate environmental risk primarily associated with flooding.

#### San Francisco's seawall a long-term response to rising sea levels

Located on a peninsula bounded by the Pacific Ocean and the San Francisco Bay, sea level rise is a particular vulnerability for the [City of San Francisco](#) (Aaa stable). The city expects sea level rise of six inches by 2030, 11 inches by 2050 and nearly 36 inches by 2100 relative to 2000 levels (assuming moderate greenhouse gas emissions). Such increases would intensify the potential damaging effects of storm surges and floods.

San Francisco plans to mitigate the threat of sea level rise and seismic activity by building a seawall along the northern waterfront that the city expects will cost an estimated \$5 billion over the next 30 years. The city anticipates that the seawall program will be funded through a combination of federal, state, and local sources including a \$425 million general obligation bond approved by voters in November 2018.

In March 2016, the city released the Sea Level Rise Action Plan to provide a comprehensive sea level rise and coastal flooding risk assessment in addition to outlining priority actions in 2017 through 2018. In 2019, the city will build upon this plan by completing a citywide sea level rise vulnerability and consequences analysis regarding extreme precipitation events. The city's next major steps will include developing a comprehensive adaptation plan followed by implementation and monitoring of plan priorities to reduce the impact of sea level rise and flooding risks.

While San Francisco faces heightened risk of sea level rise and coastal flooding, its strong tax base and economy and adequate reserves and liquidity will boost its ability to meet the costs of climate mitigation projects.

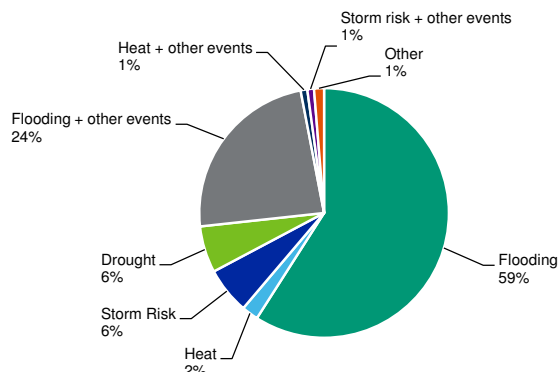
### Flooding dominates as the primary risk cities are guarding against

Though the survey respondents are collectively subject to the full range of climate risks, flooding dominates as the risk most addressed by the respondents. Approximately 60% of the cities' reported climate mitigation or adaptation projects are aimed at managing flood risks alone (see Exhibit 3). Flood mitigation projects grow to an even larger 83% when including projects that mitigate multiple risks, including flooding.

Exhibit 3

**Flood risk mitigation driving city climate resiliency projects**

Percentages of project types from survey respondents



Source: Moody's Investors Service

Drought, storm and heat, either singularly or in tandem with other risks, account for a combined 17% of current or expected climate mitigation projects. Threats to air quality and electrical grids are infrequently identified risks despite the projected increase of heat across the country, which will intensify demands on the nation's electrical systems. Wildfires were also not a key risk identified by cities in our survey despite the recent rash of damaging wildfires in California. This is likely because forest management largely falls outside of the purview of municipalities and large cities generally have low risk of wildfire damage.

The focus on flood risk is not surprising given that the Fourth National Climate Assessment reports that 42% of the US population lives in coastal zone counties accounting for \$8 trillion, or 48%, of the nation's GDP. Storm and flood risk awareness is also heightened by the fact that the five costliest hurricanes in US history have all occurred since 2005, according to the National Hurricane Center.

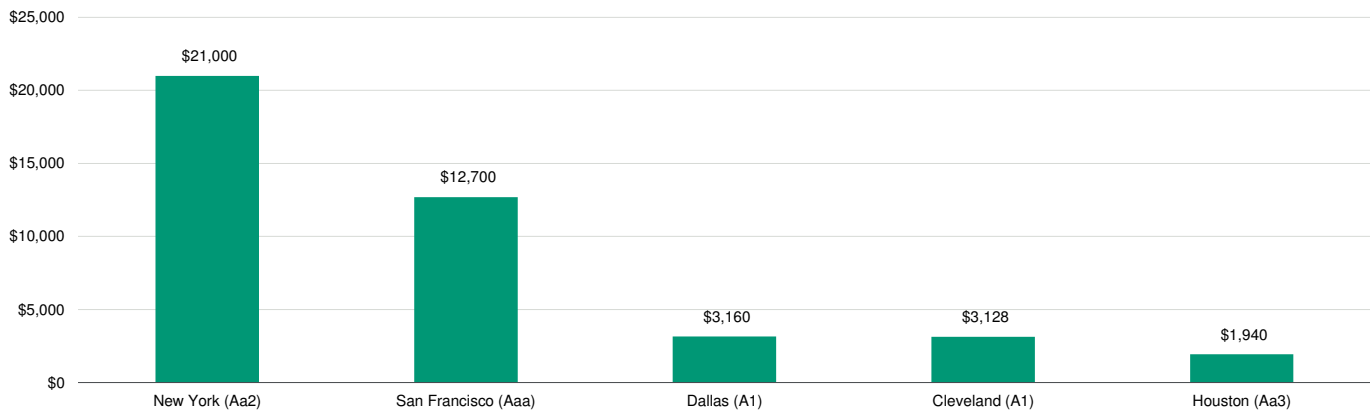
### **Climate projects carry a substantial cost relative to outstanding debt, though cities anticipate sharing the burden with federal and state governments**

While efforts to mitigate climate change risks are generally a credit positive, they carry a substantial cost relative to outstanding debt. The survey respondents reported a combined \$47 billion cost estimate for nearly 240 projects either planned or already in progress, which is equal to 40% of their combined outstanding debt. Much of this cost is driven by the sustainability plan of New York City (see Exhibit 4), which anticipates spending \$21 billion (29% of New York's currently outstanding net direct debt) to strengthen infrastructure against flood risk and improve the city's resilience to increased heat. However, even absent New York City's efforts, the climate change projects of the remaining cities still equal a combined 56% of their outstanding debt, underscoring the relatively large capital costs of improving resilience to climate risks.

Exhibit 4

**Cities with largest investment in climate mitigation projects planned or underway**

Among survey respondents, \$ millions



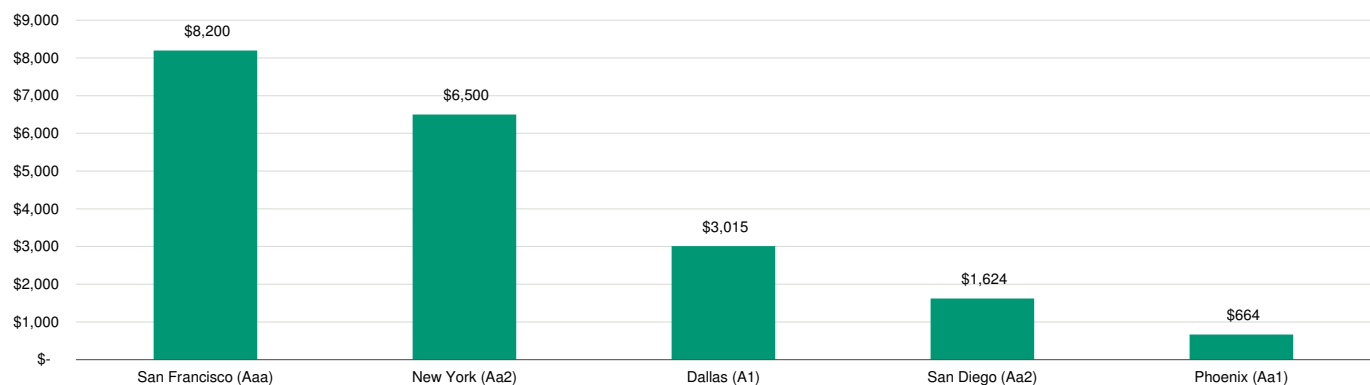
Source: Moody's Investors Service

Despite the substantial cost of climate change plans and projects, survey respondents anticipate bearing only a combined \$21 billion, or 45%, of the total. That amount is only 18% of their combined total debt outstanding. The cities expect the remainder to be funded by the federal or state governments. New York City leads the way in planned federal assistance, projecting it will pay only \$6.5 billion of its climate plan costs (31%) while leveraging federal resources to meet the balance. The bulk of the city's planned federal dollars (\$10.4 billion) would come from FEMA and other federal disaster assistance in the wake of Superstorm Sandy. Despite the federal contributions, New York is still among the leaders in total city investment to climate change projects (see Exhibit 5).

Exhibit 5

**Cities making largest contributions to climate mitigation efforts**

Among survey respondents, \$ millions



Source: Moody's Investors Service

### Mitigating the effects of rising heat in the Sun Belt

#### Phoenix's water and power standby backup systems an effort to mitigate heat and drought risks

The [City of Phoenix](#) (Aa1 negative) is the nation's fifth largest city and is exposed to rising heat and drought effects on its primary water sources, which are the Colorado River, Salt River and Verde River watersheds. In order to address the risks, Phoenix has climate action and water resource plans that primarily include projects for water system power redundancy and water distribution system redundancy. These projects are intended to provide standby power for critical equipment and minimize disruptions to the water distribution system in case of a drought. The projects include new wells to broaden supply, construction of standby power generators for certain water treatment plants, and boosters for distribution. The city anticipates total project costs of approximately \$500 million over five years.

In the last two decades alone, the city has experienced a nine-degree increase in average nighttime temperatures. The city is responding by planning to reduce greenhouse gas emissions by as much as 30% through building, fuel and electrical grid efficiency. The city is also exploring infrastructure investments that include smart grids, which monitor, plan and optimize distributed energy resources as well as smart metering that tracks energy usage in homes. The city anticipates that the use of these technologies will reduce both distribution losses and emissions linked to non-technical energy losses on the grid.

#### San Antonio: Sustainable energy grid aimed at combatting demands of rising heat

The [City of San Antonio's](#) (Aaa stable) sustainability plan projects that the number of hot days (defined as the hottest days or nights during a historical period) will increase by two to three weeks by 2050, resulting in further demands on the city's energy grid. In order to mitigate the effects of greenhouse gas emissions and combat rising heat levels, the city is working with its municipally-owned utility, [CPS Energy](#) (Aa1 stable), to develop a sustainable energy grid. The city is also working with the US Department of Energy and the Sandia National Laboratories to identify metrics and action steps to develop a resilient energy grid. The City is seeking to reduce energy demand by purchasing renewable energy for government operations; exploring renewable energy generation, distribution and battery storage opportunities at critical municipal facilities; and developing and implementing an energy reduction policy for city buildings and operations.

While CPS Energy has moderate exposure to carbon transition risk, the system has a balanced power resource plan to reliably meet customer demand. CPS Energy has a fairly diverse fuel mix for electric generation with renewable power purchase agreements constituting 22% of its electric energy sources as of 2019. To advance the city's sustainability goals, in 2018 CPS Energy announced a Flexible Path strategy that establishes a pathway to 55% of the energy provided to customers coming from renewable energy sources.

### Cities will increasingly issue debt for climate resilience initiatives

With increasing attention paid to climate risk planning and projects, 54% of respondents report plans to issue debt to fund climate initiatives. This signals that a growing number of cities are acknowledging climate change among the array of credit risks they face. Planned debt issuance will likely rise as cities increasingly identify and plan for the impact of climate risks, including a higher frequency of climate shocks. For example, in November 2018, voters in the [City of Miami](#) (Aa2 stable) approved a \$400 million bond issuance with \$192 million earmarked for sea level rise and flood prevention.

Future climate-driven debt issuance by cities will be driven by the availability of additional money to supplement their resources. The federal government has traditionally provided strong support for cities contending with the costs of natural disasters with funds used to strengthen a city's overall resilience to climate change and climate shocks. FEMA and other federal agencies also provide grants to support climate mitigation projects outside of recovery from a natural disaster event. However, if the level of federal aid were to wane, cities would be more reliant upon state funds and their own money to finance substantial project costs and be more likely to turn to debt issuance to finance climate mitigation plans.

## Moody's related publications

### Sector In-Depth

- » [Credit profiles of small, agriculture-reliant sovereigns most susceptible to climate change risk](#), May 15, 2018
- » [Regional & Local Governments — France Higher flooding frequency adversely affects revenue and expenditure](#), April 18, 2018
- » [Regional & Local Governments – Europe Climate change will pose increasing credit challenges for cities](#), December 12, 2017
- » [Small island credit profiles resilient to near-term climate shocks, but climate trends pose longer-term risks](#), December 5, 2017
- » [Evaluating the impact of climate change on US state and local issuers](#), November 28, 2017
- » [Moody's approach to assessing ESG in credit analysis](#), October 25, 2017

### Issuer In-Depth

- » [Despite climate risk and hurricane damage, Florida and Texas maintain strong credit quality](#), February 8, 2018
- » [District of Columbia and New York City: Large East Coast cities step up efforts to confront growing climate risks and reduce potential credit stress](#), September 6, 2018

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REPORT NUMBER

1153779