RESILIENCE

THE RESILIENCE FACTOR:
A COMPETITIVE EDGE FOR CLIMATE-READY CITIES

by

Amy Bailey
Laura Brush

Center for Climate and Energy Solutions

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EXECUTIVE SUMMARY

Increasingly, U.S. cities and regions are facing costly climate impacts that are having significant effects on local businesses and communities. This report explores how the economic competitiveness of U.S. cities will be impacted as climate impacts worsen – and how enhanced climate resilience could could provide a competitive advantage.

Based on a comprehensive literature review, discussions with city representatives and private-sector experts, and analyses of local resilience and economic development plans, this report examines the links between local climate risks and economic competitiveness. It highlights emerging resilience practices, identifies cross-cutting challenges, and recommends government and private-sector actions to strengthen climate preparedness and competitiveness among U.S. cities. The report focuses on the links between climate resilience and local economic competitiveness in three particular areas: city finances, economic development, and livability.

With respect to city finances, we find that local governments across the country are already facing real, but largely unquantified, financial impacts from weather disasters and chronic climate-related stressors that drain local budgets and put municipal creditworthiness at risk. Climate-related damages to public assets and systems force local governments to re-direct funds that had been designated for other needs towards repair and recovery instead. Municipal revenue streams are also at risk, for example when eroding property values lead to reduced property tax revenues. Local governments that are not adequately protected from these financial risks can be forced to boost long-term borrowing or otherwise adjust their budgets when impacts strike. At the same time, credit rating agencies and investors are starting to factor climate risks into their decision making, so cities ill-prepared for climate change may receive lower credit ratings and encounter higher borrowing costs – just when their need to invest in resilience grows.

A key component of a competitive city is the ability to maintain and attract new businesses through economic development, but climate change can hinder cities' local economies by damaging private-sector assets and real estate, increasing operational costs, hindering worker productivity, and disrupting supply chains, utility systems, and transportation networks. One important aspect of a strong local economy – the commercial real estate industry – is becoming increasingly aware that investments and local markets may be affected by climate impacts and that greater risk management is needed. Further, cities with economies reliant on a single industry or major employer – a situation more common in small communities than large cities – are inherently more vulnerable than diversified economies to extreme weather events or chronic climate-related stressors. Despite the advantage a thriving and diversified economy provides, resilience planning has not typically focused on diversifying the local economy; likewise, economic development planning has not historically addressed climate resilience, or the economic opportunities that may be available in addressing climate risk.

City competitiveness also relies on factors that promote a high quality of life for residents, but climate change is already threatening the livability of U.S. communities. At its core, livability requires a safe place to live, and climate change presents an obvious threat by bringing sea level rise, inland flooding, wildfires, deadly heat waves, catastrophic storms, and more to neighborhoods throughout the country, threatening human life, health, and financial security. In addition, climate change is threatening housing affordability at the same time it is eroding home values – effects that appear contradictory but are often linked. For example, homes that cannot be insured or that face frequent repair costs due to climate-related impacts are both expensive to live in and worth less. Low-income communities and communities of color are disproportionately vulnerable to these and other effects of climate change on city livability.

City and industry experts agree that economic development and climate resilience planning should be more interwoven to ensure economic competitiveness in a climate-changed world. During our interviews with cities across the country, we encountered a variety of existing climate resilience strategies and others that are just emerging that can help cities strengthen their financial position, advance resilient economic development, and improve livability. Key

strategies for local governments include: engaging across city departments, economic agencies, communities, and the private sector; preparing for new expectations around climate-risk disclosure; ensuring greater financial protections; climate-risk mapping vulnerable neighborhoods and assets; updating building and zoning codes; investing in resilient infrastructure; and prioritizing investments in vulnerable and marginalized communities.

Ensuring cities can take necessary action will require concerted efforts across sectors and governments to improve our institutions and their policies, practices, and tools. To help cities avoid economic losses and realize gains through climate resilience, we recommend the following:

Federal and State:

- Establish a cohesive federal and state resilience policy landscape with adequate resources for local governments
- Establish a national resilience clearinghouse to provide federal data and technical assistance to localities
- Establish equity protections and resources to protect communities from negative impacts that arise from financial sector changes and the pandemic-caused economic downturn

Local and Regional:

- Increase collaboration between city departments and agencies
- Enhance protections and investments for low-income and marginalized communities
- Promote regional collaboration to address shared climate risk

Private Sector:

- Support local governments' abilities to assess climate risks and the financial and economic benefits of resilience options
- Increase collaboration with local governments to ensure public and private investments are resilient
- Help local governments assess and adopt cost-effective financial protections to reduce the impacts of climate change on local budgets
- Address the time horizon misalignment and risk ownership problems embedded in public- and private-sector decision-making

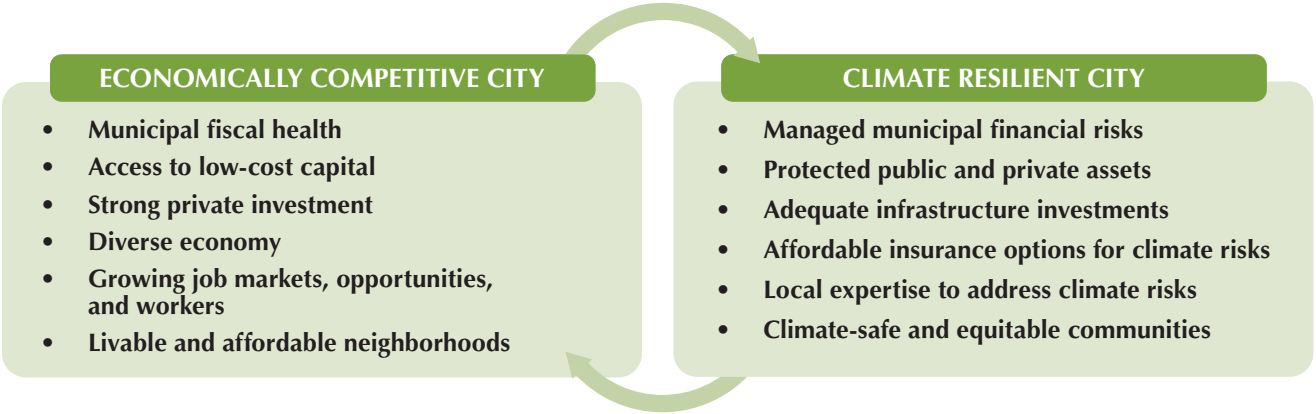
By addressing climate risks and boosting their resilience, cities can improve their ability to protect city finances, attract investors and employers, and improve livability – thereby positioning their local economies to be competitive in a climate-changed world.

I. INTRODUCTION

In an increasingly global economy, the economic competitiveness of cities – their ability to attract capital, businesses, and people – has become more important than ever. U.S. cities are among the most competitive in the world, despite concerns over aging populations and infrastructure, indebtedness, and slow growth. Competitiveness is influenced by a number of factors, including local economic strength, physical capital, financial maturity, institutional character, human capital, global appeal, social and cultural character, environmental characteristics, and natural hazards.[1] Each of these factors can be negatively impacted by climate change. As U.S. cities and regions face climate impacts that can be expensive and affect local businesses and communities, how will this affect their economic competitiveness? Will enhanced climate resilience improve the competitiveness of U.S. cities?

This report aims to broaden understanding of climate risks facing cities and the potential economic benefits of resilience planning, identify policy gaps and needs for government and private-sector action, and highlight paths forward to help facilitate more comprehensive climate preparedness among U.S. cities. We define a climate-resilient city as having adequate protection from climate impacts for residents, infrastructure and public and private assets, managed municipal financial risks, affordable insurance for climate risks for government and the public, local expertise needed to address climate risks, and equitable communities. An economically competitive city, meanwhile, can attract capital, businesses, and people by achieving strong municipal fiscal health with access to low-cost capital, strong private investment, a diverse economy, new job markets and workforce expertise, and livable and affordable neighborhoods. These two working definitions show a close linkage between what makes a city climate resilient and what makes a city economically competitive (see **Figure 1**). For example, an economically competitive city has strong municipal fiscal health, which allows for continued investment in city services, assets, and resilience. In turn, resilience investments help reduce the city's financial risks, which is viewed positively by investors and credit rating agencies, supporting low-cost capital for the city's future growth.

FIGURE 1: Reinforcing Components of Economic Competitiveness and Climate Resilience



The elements that make a city economically competitive and resilient to climate change reinforce each other.

Every community in the United States is projected to experience climate-related hazards such as heavy precipitation events, drought, heat waves, and major storms. A 2019 C2ES-U.S. Conference of Mayors survey of 182 American cities found that 96 percent have already experienced changing weather impacts in just the last five years, with many of them experiencing changes in more than one hazard type.[2]

Extreme weather is already exposing the vulnerability of our communities. Hurricane Harvey, just one of three category 4 hurricanes to make landfall in 2017, "displaced more than 30,000 people and damaged or destroyed more than 200,000 homes and businesses."[3] 2017 and 2018 proved to be California's deadliest and most expensive years for wildfires, with insurance payouts reaching $24 billion over the two years.[4] The November 2018 Camp Fire alone was responsible for killing 85 people, destroying nearly 19,000 structures, triggering more than $12 billion in insurance claims, and driving out a significant portion of the town of Paradise's population.[5] The 2019 floods in the Midwest and South affected nearly 14 million people and caused more damage than any other extreme weather event that year.[6]

Ensuring our communities can thrive in spite of climate hazards like these requires planning for broad material risks. A 2019 report by the global investment management firm BlackRock highlighted some areas of material risk, including: public finances, coastal real estate, insurance, electric utilities, corporate supply chains, mortality rates, and energy expenditures.[7] Despite increasing reports of such climate-related vulnerabilities across the economy, there has been pervasive under-valuing of the risks posed by climate change. U.S. communities have not seen sufficient investment or planning to achieve climate resilience, even though every dollar invested in pre-disaster mitigation yields an average $6 return in the form of avoided damage costs; simply adopting model building codes saves $11 for every $1 spent.[8]

Community climate resilience planning is largely driven by city sustainability, resilience, emergency management, or planning departments, with nonprofit assistance, city support networks, and federal policies playing an influential role. Objectives commonly focus on recovering from hazard impacts and reducing risks to protect residents and avoid future losses. Now, the financial, insurance, real estate, and other sectors are beginning to integrate climate risks into their decision-making to achieve similar objectives, which will have additional ramifications for both city resilience and city competitiveness. For instance:

- Credit rating agencies are requesting information about cities' climate policies and insurance coverage as an input to their credit determinations. S&P Global Ratings and Moody's have both revealed their plans to incorporate climate risks into municipal bond ratings,[9] and their climate considerations are already showing up in some assessments. Further, in a September 2020 report, *Managing Climate Risk in the U.S. Financial System*, an advisory group to the U.S. Commodity Futures Trading Commission recommended that regulators require credit rating agencies to disclose the extent to which their ratings for municipal issuers take into account climate risk.[10]

- In late 2018, 16 of the world's biggest insurers, including IAG, Allianz, and Swiss Re, announced their plans to work with climate scientists and develop analytical tools as part of a U.N. Environment Program pilot to better understand the new and unpredictable weather events resulting from climate change.[11] In the United States, some insurers have pulled out of areas such as wildfire-prone locations in California because of risk exposure. However, insurers are also creating new products to help the public and private sectors reduce financial risk.

- Asset managers, investors, and real estate firms are beginning to make the connection between climate impacts and market value of assets and real estate. For instance, Freddie Mac reported in 2016 that sea level rise and expanding floodplains in the United States could "destroy billions of dollars in property and displace millions of people," with the resulting social and economic impacts "greater in total than those experienced in the housing crisis and Great Recession."[12] Further, BlackRock has found signs that climate-resilient electric utilities trade at a premium over their most vulnerable peers,[13] a sign that resilience can improve the bottom line.

This report explores in more detail how climate resilience and local economic competitiveness are interconnected, focusing in particular on three areas: city finances, economic development, and livability. The report considers what is at stake with respect to these areas and explores how public- and private-sector actors

are addressing climate risks and thinking about new benefits from resilience. The report also provides examples of resilience strategies and practices that cities across the country are implementing to strengthen their financial positions, advance resilient economic development, and improve livability. In addition, the report identifies major cross-cutting challenges and offers recommendations to address these and other obstacles to enhanced resilience and competitiveness.

To explore these issues, The Center for Climate and Energy Solutions (C2ES) conducted a comprehensive literature review and interviewed dozens of U.S. local government representatives and private-sector experts from a variety of industries relevant to city economies. In addition, C2ES researchers analyzed the resilience and economic development plans of the interviewed cities to assess consistencies and gaps. C2ES also facilitated cross-sectoral dialogues at its 2020 Climate Leadership Conference and in a virtual workshop in May 2020. To ensure candor, the interviews and workshop were conducted under Chatham House Rule; any attributions in this report are from publicly available sources. A list of the types of organizations consulted and additional notes on this study's research methodology can be found in **Appendix A**.

II. STRONG CITY FINANCES: PROTECTING BUDGETS AND ATTRACTING CAPITAL

WHAT'S AT STAKE

Climate change presents risks to city finances in several ways, including damage to assets and impacts on budgets. Physical damage to municipal assets from climate impacts (e.g., loss of roads, utilities, buildings, communication networks, and transportation assets) adds to current capital expenses or long-term debt burdens; when cities do not have adequate financial resources to recover, damaged infrastructure goes unrepaired or requires budget reallocation. Population displacement caused by the impacts and damages, meanwhile, can change the labor market, economic base, and demand for public services. All of these effects, in turn, can cause local economic disruption that weakens revenue; lost revenue requires budget cuts, increased taxes and fees, or long-term borrowing.[14]

Many city representatives interviewed view their infrastructure as a strength and as key to their city's efforts to attract people and companies. As explained in the National Climate Assessment (NCA), the infrastructure that serves cities (roads, rail systems, airports, ports, electric and water utilities, etc.) is vulnerable to climate change.[15] Weakened infrastructure and finances, therefore, damage city competitiveness.

Ensuring strong city finances in the face of climate change will require action to mitigate risks to infrastructure, budgets, and creditworthiness, but most cities – especially small and/or under-resourced cities – do not typically have trained staff that can help identify evolving climate risk, develop risk-reduction plans, and/or prepare risk disclosure information. Further, cities of all sizes are struggling to quantify the financial benefits of specific resilience strategies.

These challenges will be exacerbated by the economic impacts of the coronavirus pandemic. Prior to the pandemic, many municipalities were near the top of their municipal debt limits but had amassed strong "rainy day" funds. The crisis has put local governments in a far more challenging position to issue new debt.[16] Small and medium-sized businesses that are the backbone of local economies have been hard hit and are drawing emergency financial support from local governments whose budgets are already stretched by shortfalls in sales and income tax revenues.

RISKS TO CITY BUDGETS

Minor climate events are draining city budgets

While the federal government's disaster relief programs can help cities recover from major climate events, financial support is lacking for recovery from smaller extreme events and chronic climate-related stressors that are draining city budgets. We spoke with cities that have experienced catastrophic extreme weather and others that have not. In both cases, the city representatives provided examples of extreme weather events that did not meet a threshold that activated federal or state disaster aid. These minor extreme weather events brought costs that were handled on an ad-hoc basis and changed the way city budgets were spent – re-directing funds that had been earmarked for other needs towards recovery instead, without the benefit of federal reimbursement. For example, a debilitating snowstorm in one city damaged water and sewer infrastructure, necessitating costly emergency repairs, while a flash flood event in another city resulted in funds previously earmarked for a new fire station to be redirected to landslide remediation. There are many more examples like these, but there is currently no aggregated public record of smaller events or their financial impacts (e.g., recovery needs, accelerated maintenance needs), which obscures the true costs of climate change that municipalities and their residents are absorbing.

Revenue streams at risk – a spotlight on property taxes

Climate impacts, both extreme and chronic, can reduce property values, and any such reduction in the local property tax base has implications for municipal

budgets. Looking at sea level rise alone, researchers have identified that nationally, exposed homes sell for approximately 7 percent less than similar but unexposed homes.[17] Further, 120 communities along U.S. coasts in which 20 percent or more of the local property tax base will be at-risk in 2045, endangering a major source of funding for critical infrastructure and public services.[18] Real estate comparisons by First Street Foundation and Columbia University show that properties dealing with climate hazards are already suffering from eroded property values.[19]

We found from our interviews that local governments generally do not have information on climate risks to property values and thus to municipal tax revenues, a knowledge gap that could have negative consequences for cities across the country. Without knowledge of how properties and neighborhoods are at risk from climate impacts, local governments are less equipped to extrapolate how tax revenue streams are exposed and to take action to protect both property and municipal budgets. It can be tremendously complicated, however, to identify and quantify risks to specific properties from a variety of climate hazards, under different climate scenarios, over various time frames.

Additionally, it can be challenging to calculate the potential economic benefits (i.e., avoided losses and/or realized gains) of risk mitigation measures in a comprehensive cost-benefit analysis, though some cities are beginning to do so. For example, a 2020 Miami Beach study completed by ICF and others found that city investments to elevate roads and install water pumps that minimize sunny day flooding in the public right of way and on private property would increase the property values in and tax revenues from the neighborhood.[20] (See **Featured City: Miami Beach** for more information.)

Inadequate insurance and coordination

Two common ways that cities seek to protect themselves against the financial risks of climate impacts are through reserve funds and insurance – but it is unlikely that city governments have enough financial protection for the asset and revenue risks they face. Many cities rely on reserve (or "rainy day") funds, in part because they can be utilized flexibly to cover any number of potential damages or needs. Such reserve funds, however, may be inadequate to address the scale of the potential damages. They also tie up substantial funds (often in safe, low-yield accounts) that could instead be used for resilience investments that reduce risks ahead of time. As for insurance, traditional indemnity insurance policies do not adequately address all types of local governments' financial risk; they generally only cover damage to physical assets. "Business interruption" indemnity policies can cover lost revenue, but only that which directly results from damage to a specific physical asset. Inadequate financial protection can force cities to boost long-term borrowing or take other measures to adjust their budgets.

Notably, participating city representatives – who were typically sustainability or resilience leads – often did not know how their cities were insured, highlighting a knowledge gap between government agencies and an opportunity for more information-sharing.

RISKS TO CREDITWORTHINESS

Agency and investor interest in climate risk is growing

Two-thirds of state and local infrastructure projects are financed through municipal bonds, the prevailing vehicle for local governments to raise capital.[21] $3.8 trillion of outstanding debt is tied up in the U.S. municipal bond market alone,[22] with municipal bonds representing an important part of investor portfolios.

As noted earlier, climate change presents risks to public sector debt issuers in a number of ways, including economic disruption that weakens revenue, physical damage that adds to current capital expenses or long-term debt burdens, health and safety impacts, and population displacement.[23] In 2019, BlackRock reported that *without* climate action, a growing share of municipal bonds will come from regions facing economic losses from rising average temperatures and related events. BlackRock's modeling shows that within a decade, more than 15 percent of municipal bonds will be issued by metropolitan areas suffering direct and indirect climate-related economic losses of up to one percent of GDP; these losses will escalate and impact more cities as time goes on.[24]

Credit rating agencies are starting to factor these climate risks into their ratings, at times requesting information about cities' climate policies and insurance coverage as an input to their credit determination. At the moment, they focus on issues such as financial health, operations, and risk management capacity and practices to discern cities' adaptive capacity to hazards like sea level rise and heat, as opposed to conducting quantitative climate risk assessments. Moody's, for instance, recently revealed that climate change risks can be captured in its

current framework – which assesses economic strength and diversity, capital asset management, fiscal strength, governance, and other factors – explaining that:

> *climate shocks may weaken economic output and tax base valuation and reduce the issuer's revenue base. Issuers with economies concentrated in sectors exposed to climate risks face higher credit vulnerability. Small economies that can be disproportionately impacted by climate events are at a heightened risk, whereas others may have flexibility to raise taxes/ revenues as needed.*[25]

Similarly, S&P has shared that its municipal assessments see it as a positive when cities have long-term management plans with adequate emergency funds, proper insurance coverage for climate risks, and diversified economies.[26]

In accounting for climate risks, credit rating agencies may lower their ratings of cities ill-prepared for climate change, and investors may increase the cost of borrowing to protect against repayment risks. To put it another way: local governments with increased exposure to climate impacts may find that they have reduced capacity (or perceived capacity) to pay off new or existing debt, thus making the cost of raising necessary capital more expensive at the same time as investment needs for adaptation increase. Cities that can demonstrate resilience strategies and reduced risk can better avoid this situation. (Fundamentally, this credit-rating shift could put low-wealth communities at an even greater disadvantage in the pursuit of building climate resilience, an outcome that policymakers should strive to avoid.)

Already, climate risk analyses have appeared in some final credit assessments, and cities have been rewarded for their resilience planning or flagged for the lack thereof. Examples of such determinations by S&P Global Ratings are provided in **Table 1.**

Interviewees indicated that the long time horizon over which climate risks (which are nonlinear and probabilistic) are typically described presents a challenge to those assessing an issuer's creditworthiness. For instance, a general obligation municipal bond issued for an infrastructure project with a lifetime of 50+ years will typically reach maturity in 10-20 years, whereas the credit analysis focuses most heavily on impacts and creditworthiness just three to five years out. Extreme weather events and chronic impacts can render the infrastructure inadequate or useless if it is not constructed for changing conditions, or if additional risk-reduction measures are not taken. If damages occur within the bond's window of maturity (repayment period), local governments may be saddled with useless debt; if damages happen after the bond is repaid, but before the end of the investment's lifespan, local governments will face continued need for additional investments.

Investment advisors and asset managers are doing their own due diligence and asking about climate risk and sustainability. For instance, Breckinridge Capital, an investor in municipal bonds, asks cities about their sustainability programs because environmental, social, and governance (ESG) factors – an area of interest for many investors – are a central part of their investment considerations. Climate change metrics that consider resilience to impacts and risk-reduction measures are now integrated into the company's assessments.[27]

As data and analytical capabilities improve, rating agencies and investors may shift from a qualitative to a more consistent and transparent data-driven approach, and these assessments may carry more weight. Moody's recent acquisition of a major stake in Four Twenty Seven to better refine assessment of physical risks and S&P Global's expansion of their subsidiary Trucost's offerings in physical risk assessment signal that the rating agencies will incorporate more refined quantitative analyses of physical climate risk into future assessments of municipal governments.

Lack of clarity on disclosure of municipal climate risks

The financial sector's growing interest in physical climate risks and local climate resilience means cities preparing to issue public debt offerings like municipal bonds need to figure out what types and levels of disclosure will be adequate.

As a general rule, financial disclosures are adequate if they provide investors with material information, meaning "there is a substantial likelihood that a reasonable investor would consider it important in making an investment decision."[28] Omitted information is considered material if its inclusion would significantly alter the set of information available to investors. For now, though, there is no standard formula or guidance for how local governments should disclose their climate risks. Because risk profiles and the capacity to assess and report on them vary so widely among cities and over time, standardized reports from cities are not currently possible.

TABLE 1. Credit Assessments and Climate Risk

CITY	ASSESSMENT DIRECTION	S&P'S RELEVANT REASONING
Norfolk, VA	Upgraded	The higher rating reflects Norfolk's "strong economy," its "very strong management, with strong financial policies and practices," and "very strong budgetary flexibility, strong budgetary performance, as well as very strong liquidity." S&P noted that the City's proactive management of its environmental, social, and governance risks are integrated in Norfolk practices and long-term planning. S&P applauded the City's resiliency efforts to address sustainability, climate change, and sea level risk in its long-term financial and capital planning efforts and its development regulations, while leveraging its strategic location and importance. S&P noted the City has committed to improving the economic power of its residents through several different programs, which over time may bolster economic metrics. S&P highlighted the City's work towards redeveloping the St. Paul's neighborhood and transitioning current low-income housing to mixed-income housing. S&P did note Norfolk's weak, but manageable, debt and contingent liability profile and the slight expansion of the City's debt metrics.[29]
Charles County, MD	Stable (Reaffirmed)	S&P reaffirmed Charles County, Maryland's AAA rating for its general obligation bond, citing the government's "proactive and multipronged approach to climate change" as a sign of strong long-term planning. S&P noted the county's steps to reduce greenhouse gas emissions, development of a resiliency plan for county assets that may be exposed to sea level rise, and climate leadership training for government officials.[30]
Oak Park, MI	Watching	The city is facing litigation for preparedness for a significant rain event in 2014, which, if successful, could change S&P's view of its liquidity.[31]
Rockport, TX	Downgraded	Approximately 80 percent of structures in Aransas County, where Rockport is located, sustained damage from Hurricane Harvey, as did a number of the city's facilities. Officials estimate about 60 percent of residents, or 5,768 people, have been displaced, and management is unsure when, or if, they will return. S&P downgraded Rockland based on its view of potential tax-base deterioration, revenue declines, and uncertainty with regard to its budgetary performance and flexibility following the effects of Harvey.[32]

S&P Global Ratings has incorporated qualitative assessments of climate risks into their municipal credit determinations.

Nevertheless, disclosures that include relatively specific information about a city's prior and future climate impacts, risks, and risk-reduction measures are likely to become more expected, particularly as climate hazard data becomes more readily available. Failure to adequately disclose risks related to climate change may result in municipalities getting lower credit ratings and less investment – and potentially being held liable for misleading investors.[33]

The cities we interviewed fall into two categories with respect to climate risk disclosure: those whose sustainability, resilience, or finance offices have spoken with rating agencies about climate risk and those that have not (yet) heard from rating agencies on this issue. Interestingly, some cities in this latter category have chosen not to wait for requests from rating agencies and are instead proactively sharing information about their sustainability activities, climate risks, and preparedness plans.

Regardless of whether they have already talked with rating agencies or not, the local governments we spoke with all lack clarity on how rating agencies are assessing city climate risks and resilience planning and how consequential this assessment is in agencies' determinations,

adding further confusion to cities' disclosure efforts. It may be too early to know. Although a handful of reviews have not found a clear link between climate risk and the interest rates for bonds issued,[34] it is clear that rating agencies and investors are growing increasingly serious about climate risk issues and are positioned to change the conversation at the city level. The result could be increased awareness and disclosure of potential climate-related risks and additional incentives for local climate resilience strategies to avoid negative outcomes.

PRACTICES TO PROTECT AND STRENGTHEN CITY FINANCES

Key steps that protect city finances and demonstrate to investors strong management of climate risks include:

- **Analyzing benefits of resilience measures to city revenue streams.** Local governments can get ahead of potential risks to future revenue streams by assessing their financial exposure of revenue streams and quantifying the benefits that resilience measures may afford. While we have identified one example of a city assessing the benefits of resilience measures to its property tax revenue, additional revenue streams should be examined as well.
- **Integrating and elevating resilience throughout city government.** Cities are pursuing a number of strategies to integrate resilience throughout government. One well-resourced city placed resilience staff in multiple departments, while another elevated the authority of the resilience director. Other cities are establishing cross-department conversations on resilience.
- **Insuring city assets and revenue streams against climate impacts.** Local governments can use insurance products to reduce climate-related financial risks created by vulnerable assets and revenue streams. Parametric insurance (described in **Box 1**), for example, can protect cities from financial risks that are not covered by indemnity insurance or federal assistance, such as losses in tax or tourism revenue, regardless of the cause of the disruption (e.g., tropical storms or public health crises). Interest in parametric insurance is expected to grow as climate hazards worsen and threaten municipal revenues.[35] There may also be room for new products that help cities finance resilience measures, such as resilience bonds (also described in **Box 1**).

BOX 1. Parametric Insurance and Catastrophe Bonds

A parametric insurance policy establishes an objective measure of a potential event's impact, such as wind speed of a hurricane or flood level at a specific gauge. When the threshold is met or exceeded, the insured receives a pre-determined payout, the size of which is not dependent on actual damages. Parametric payouts can offset any expense associated with the triggering event, covering a protection gap left by indemnity insurance plans and federal assistance. Parametric insurance payouts are released more quickly than federal assistance and indemnity payouts, the latter of which require an often time-intensive claims adjustment process.[36]

Though these advantages have prompted some government interest in parametric insurance policies as a complement to traditional insurance, only a few entities have purchased them. The State of Louisiana, for example, holds a parametric policy for storms with sustained wind speeds of at least 80 miles per hour.[37]

Catastrophe bonds, another type of risk transfer mechanism, are securities that are paid out to the issuing entity if a predetermined disaster threshold is met or exceeded. Catastrophe bonds have traditionally been used by insurance and reinsurance companies but are also used by governments to reduce economic disruption from low-probability, high impact events. In the wake of Hurricane Sandy, New York's Metropolitan Transportation Authority issued a catastrophe bond, stating that as a result of the storm, premiums for it were well below that of traditional indemnity insurance options.[38] Resilience bonds, a type of catastrophe bond conceptualized by RE.Bound in 2015, would offer premium discounts or rebates to issuers upon their completion of an infrastructure project that enhances resilience in the covered location. In effect, the approach could leverage private capital from investors interested in reducing their risk of a lost payout to help finance resilience projects.[39]

- **Disclosing climate risks and risk mitigation steps.** Cities of all sizes, as discovered in interviews, are disclosing this information to credit rating agencies and in bond information – or are beginning to prepare for disclosure. Disclosure efforts are made easier with cross-departmental collaboration.
- **Investing in green and resilient infrastructure to reduce physical risks.** Cities are making investments in resilience, which requires capital. Investors have demonstrated strong demand for green bonds (which can fund resilience projects), and recent years have seen the implementation of new green bonds initiatives, standards, and products.[40] Environmental impact bonds (EIBs), for example, are a promising new financing option for projects that can produce measurable outcomes, as EIBs involve a performance-based repayment structure determined by the quantified benefits of the project.[41] They reduce the risk of green investments by paying public issuers if third-party monitoring shows that a project does not meet expectations, or triggering higher payouts to investors and contractors when results exceed expectations. EIBs provide a financing option for projects that are viewed as new or risky in comparison with more expensive alternatives, or for projects that need to be scaled but face budgetary limitations. In addition, the tool's outcome-based approach can attract impact investors who may be willing to offer lower interest rates for capital, which may also support investments by cities with reduced borrowing capacity.[42] A number of cities, including Washington D.C., Baltimore, Atlanta, and Athens, Ohio, have issued EIBs for resilience and sustainability projects.[43] (See **Featured City: Atlanta** for more information.)
- **Coordinating with state and local agencies and regional entities.** Climate impacts and subsequent impacts on city finances are often felt across jurisdictional boundaries. For example, the 2017 and 2018 California wildfires impacted not only the communities that burned or were evacuated, but also all the communities affected by PG&E's initiation of rolling blackouts as a fire prevention measure. The blackouts impacted the economic competitiveness of cities throughout the region.[44] Similar interdependencies exist at the watershed level with respect to addressing flooding and drought risks. Coordinated action to boost climate resilience, however, can be hard. For example, businesses and governments can fail to do their parts in taking risk reduction measures, and state governments can limit the responses of local governments through preemption. Establishing alignment among a variety of actors is challenging, but failing to address climate risks can put regional economic competitiveness at risk. Greater coordination across stakeholders can help align strategies, leverage funds and planning resources, and accelerate resilience investment.

TABLE 2. Innovative City Practices to Protect and Improve Municipal Assets and Budgets

GOVERNANCE
Analyze climate risks and benefits of resilience measures to city revenue streams (e.g., property tax revenue)
Integrate resilience throughout city government (e.g., place resilience staff in each department, establish cross-department conversation)
Elevate the role/authority of city's resilience lead
POLICY
Disclose climate risks and risk mitigation steps to credit rating agencies and in bond disclosures
Invest in resilient infrastructure (e.g., issue Environmental Impact Bonds to finance innovative resilience measures)
Explore new insurance products such as parametric insurance and financial tools such as catastrophe bonds
COORDINATION
Coordinate with state and local agencies and regional entities to align strategies, leverage funds and planning resources, and accelerate resilience investment

FEATURED CITY: ATLANTA

In 2019, **Atlanta** became the first U.S. municipality to publicly offer an EIB, demonstrating the tool's potential value to cities across the country. The $14 million fully subscribed bond will fund six green infrastructure projects to address repeated flooding and water quality issues in the Proctor Creek watershed. If these projects create at least 6.52 million gallons of new stormwater capture capacity at the end of the sixth year of the bond's ten-year term, investors will collectively receive a $1 million performance payment. The impact investing intermediary firm with which the city partnered to issue the bond estimates that the $14 million in financing will yield approximately $18 million in local economic benefit from reduced flooding and improved water quality.[45]

III. RESILIENT ECONOMIC DEVELOPMENT: PROTECTING AND ATTRACTING BUSINESSES

WHAT'S AT STAKE

A central part of economic competitiveness is the ability to attract and retain businesses for a strong private sector. Climate change is directly and indirectly impacting the private sector and local economies, including through damaged assets, rising operational costs, and disrupted supply chains, utility systems, and transportation networks. Workforce productivity is also emerging as a major concern; a few years ago, the U.S. Environmental Protection Agency projected that more than 1.8 billion labor hours, costing more than $170 billion in wages, will be lost by 2100 due to extreme heat alone.[46] According to the Federal Emergency Management Agency (FEMA), more than 40 percent of businesses never reopen after a natural disaster. Small businesses, which employ nearly half of American workers and are a critical part of local economies, are particularly vulnerable to climate impacts.[47]

Employers, investors, and the financial community are placing greater value on local sustainability and resilience as climate impacts become more apparent. For instance, investment managers report that, in expectation of climate risks being increasingly addressed across the real estate industry over the next five years, they are starting to seek out markets where local governments are prepared for climate change.[48] Similarly, the president and CEO for the Americas at SwissRE, Eric Smith, was recently quoted in *The New York Times* saying that the cities that adapt to climate risks "are going to attract the jobs and factories of the future" – adding that there will be communities that are left behind.[49]

NON-DIVERSIFIED ECONOMIES ARE LESS RESILIENT TO CLIMATE IMPACTS

Although many cities can thrive with economies reliant on a single industry or one major employer, they are inherently more vulnerable to extreme weather events or chronic climate-related stressors. When external shocks strike, non-diversified economies can suffer devastating impacts, whereas diversified local economies can minimize the economic impacts and speed recovery; this is one reason credit rating agencies look favorably on municipalities with diversified private sectors. Small communities typically have less diversified economies and fewer features and municipal services to attract outside investment; diversified local economies may be more common in large cities with more resources.

Our interviews, which included cities of different sizes and various economic profiles, offered some support to the notion that economic diversification can contribute to climate resilience. Representatives of cities with thriving, diversified economies generally reported minimal concern about their ability to address climate impacts.

Small businesses are an important part of a diversified local economy, but they bear a disproportionate risk from climate hazards, particularly in the most vulnerable communities. A recent study found that the federal government's Small Business Administration (SBA) has historically approved disaster loans in communities where Black residents are a majority at nearly half the rate of majority-white communities. This disparity appears to be the result of the SBA's reliance on credit scores when determining loan eligibility, which ultimately favors white communities and prevents financial support from flowing to the communities that need it most.[50] Policies such as this undermine efforts to cultivate resilient local economies.

LACK OF ALIGNMENT BETWEEN ECONOMIC DEVELOPMENT AND RESILIENCE PLANNING

Despite the advantage a diversified economy provides, climate resilience planning has not typically focused on diversifying the local economy; likewise, economic development planning has not historically approached how it could improve climate resilience (e.g., by enticing businesses that are well-suited for future conditions). This results in a disconnect between efforts to attract new employers and investors and efforts to ensure resilience to climate change.

Most city representatives and industry experts we spoke with acknowledged that climate change could threaten certain factors that enhance local economies. In our review of select local adaptation plans, 90 percent link climate change with the economy, often describing potential damages in qualitative form, as opposed to detailed financial or economic risk assessments. Although general business and economic considerations are common in adaptation plans, only 15 percent frame climate resilience as a part of economic competitiveness (see **Appendix B**). This gap surfaced in our interviews as well; for example, city representatives cited public investments in resilient green infrastructure, but they could not say whether those investments drew additional private investment.

Similarly, about half of economic development plans we reviewed mention climate risk, but they do not include significant assessments of climate impact on growth outlooks or potential new gains through resilient development (see **Appendix B**). Our interviews also reflected this finding, with many cities not perceiving that their climate resilience is important to attracting companies (the exceptions were several port cities, which are ready to answer resilience questions from the private sector but also relatively secure in their importance to the regions they serve). In their efforts to draw private investment and employers, most cities continue to highlight traditional attributes such as workforce availability and affordability of land, although community sustainability and environmental attributes are increasingly seen as important amenities for attracting companies.

We found that cities that are positioning climate risks as an opportunity to create new solutions-focused local jobs and expertise are rare. These cities see long-term opportunities to meet emerging needs presented by climate impacts, such as new modeling capabilities, demand for engineering expertise, resilient products, and more. These findings point to an opportunity for cities to gain support for resilience activities by highlighting the potential economic gains they may unlock.

PHYSICAL ASSETS AT RISK – A SPOTLIGHT ON THE COMMERCIAL REAL ESTATE SECTOR

A competitive commercial real estate market can be integral to a thriving local economy, and the real estate industry touches and is affected by most other sectors in a diversified economy. The real estate industry is becoming increasingly aware that potential investments and local markets may be affected by climate impacts. Real estate investors have historically relied on insurance for protection against losses, but that approach may be insufficient to protect against climate impacts. Chronic hazards (e.g., nuisance flooding) that lead to recurrent losses, as well as catastrophic events, can reduce the value of assets, revenue streams, and the profitability of property and business – but insurance does not typically cover lost revenue or declining value. In addition, real estate investors report that any resilience or mitigation investments to reduce risk are not rewarded by insurance providers.[51]

Commercial real estate development activities have also not historically considered climate change, creating risks for investors. Property developers often sell buildings to real estate investment trusts (REITs) or management companies after several years, which minimizes the incentive for developers to include features that may provide protection against longer-term climate impacts and shifts the risk to the future owners. Furthermore, there is no point-of-sale requirement to disclose a building or asset's vulnerability to climate hazards, which puts the onus on the buyer.

To address this risk management gap, real estate investors are developing strategies such as assessing and evaluating climate risk of assets, exploring new insurance products, and pursuing risk mitigation measures for at-risk assets. One important emerging strategy for the real estate industry is closer coordination with local governments to help ensure that investments to protect private assets are complemented by similar risk mitigation in the larger system of critical services.[52] To protect their real estate markets, cities therefore need to be addressing their own climate risks and taking a collaborative approach with private-sector developers.

PRACTICES TO ADVANCE RESILIENT ECONOMIC DEVELOPMENT

Despite the apparent gap in planning practices for climate resilience and economic development, there are opportunities for local governments and economic development agencies to integrate these objectives, with examples emerging across the country. Key steps that promote resilient economic development include:

- **Guiding the private sector towards resilience with local policy.** One approach for cities to promote resilient economic development is to require the private sector to boost resilience, such as by

implementing building ordinances to address climate-related hazards. For example, freeboard mandates require new buildings in floodplains to be constructed above the base flood elevation (i.e., above the height that floodwaters would reach during a flood that has a one percent chance of occurring in any year). This requirement can protect structures from higher-than-expected floodwaters.[53] Cities with freeboard requirements include Annapolis (two feet),[54] Nashville (four feet),[55] and Cedar Falls, Iowa (one foot above the 500-year flood level).[56] Notably, the National Flood Insurance Program's Community Rating System (CRS) incentivizes local governments to adopt regulations like freeboard requirements by offering flood insurance rate discounts to property owners – a policy that can make investments in exposed locations more attractive.

Similarly, several cities now have heat mitigation policies that offer incentives (such as tax abatements or expedited approval processes) for or require that new structures are built with reflective roofs and other "smart surface" features such as reflective pavements and urban tree canopy.[57] These features reduce heat gain, provide insulation for air conditioning, and can yield multiple benefits for cities, businesses, and residents, including improved air quality and public health, reduced stormwater runoff, climate change mitigation, and increased productivity. The benefits can far outweigh the costs of installation and maintenance; a recent study, for instance, found that the net-present value of city-wide adoption of these technologies would be $3.58 billion for Philadelphia and $1.81 billion for Washington, DC. These values increase significantly (to $8.4 billion and $4.9 billion, respectively) when accounting for avoided losses in tourism revenue that could otherwise result from increasingly consistent heat waves that deter visitors.[58]

- **Incorporating resilience into economic development strategies.** While an increasing number of local governments are making investments and adopting policies that incentivize or require employers and developers to incorporate resilience measures, there are additional opportunities to cultivate a resilient and diversified economy. These can include enticing businesses that are well-suited for future conditions, either because of the solutions and expertise they offer or because of their ability to maintain continuous operations in the face of climate impacts. In the Hampton Roads region of Virginia, the non-profit incubator RISE is cultivating private-sector solutions to resilience and has made close collaboration with local governments and federal agencies central to its approach. (See **Featured City: Norfolk, VA** for more about RISE.) New federal resilience requirements for Comprehensive Economic Development Strategies (CEDS) established by the U.S. Economic Development Administration (EDA) could drive more connections between economic development agencies and resilience planning teams (see **Box 2**). One example is the Metro Atlanta Regional CEDS, which includes resilience as a central pillar of its plan and notes the potential impacts that physical and transition risks associated with climate change could have on the local economy.[59]

  We learned through our interviews with city representatives that areas with multiple economic challenges are less able to focus on climate risks due to competing priorities for limited resources. In these locations, resources from state and federal agencies and the private sector to build resilience and support community priorities can play a critical role.

- **Identifying and investing in resilient business districts.** Municipalities are beginning to map the vulnerability of private assets and business districts and invest in infrastructure that protects businesses from recurrent losses resulting from climate impacts. For example, the City of Annapolis's planned investments in underground wet wells and pumps to mitigate nuisance flooding were further supported after a Stanford report found that businesses at the City Dock location (an historic tourist area home to many small businesses) suffered $86,000-$170,000 in lost revenue due to nuisance flooding in 2017, a recurrent issue in the area.[60]

- **Promoting enhanced coordination around resilience.** Local and state entities are increasingly coordinating their resilience planning and investments, an approach that supports the efficient use of public dollars. In addition, public-private coordination around climate risk mitigation can help communities avoid economic losses and could also help companies realize new business opportunities around

BOX 2. New federal guidelines for Comprehensive Economic Development Strategies (CEDS) could facilitate resilient economic development planning

A Comprehensive Economic Development Strategy is a regionally focused planning process for economic development. It is designed to bring together a diverse set of stakeholders to assess the current state of the economy, develop a strategic plan based on shared goals, and create a framework for evaluation.[61] A CEDS helps qualify a region for millions of federal dollars from the Economic Development Administration, so completing a CEDS can be a very lucrative step to enable projects that benefit local economies.[62] (There are currently 380 localities eligible for EDA funding programs such as Public Works and Economic Adjustment Assistance (EAA).)[63]

In 2015, the EDA updated the CEDS content guidelines to require the incorporation of economic resilience,[64] defined as the ability to avoid, withstand, or recover quickly from shocks, which include, among others, natural disasters and the impacts of climate change.[65] The EDA's Economic Resilience Planning Evaluation Tool offers 52 components that can be integrated into plans to increase economic resilience to natural and man-made hazards. The list includes, among many others: maintaining and upgrading infrastructure; identifying education partners to provide skills training after natural disasters to assist and retrain displaced workers; and changing land use patterns to encourage development in more resilient areas.[66]

Although the updated CEDS guidelines do not ensure that post-2015 plans will include climate change impacts per se (and there is no public tracking to confirm), by introducing guidance around hazard mitigation, pre-disaster recovery planning, and climate-ready workforce development, the EDA is encouraging regional economic development planning to consider climate resilience.

Even without strict requirements, localities have used EAA grants to invest in resilience and recovery after a natural disaster. In 2015, the Southwest New Mexico Council of Governments was awarded $250,000 to host trainings for green building and harvesting stormwater, retrofit local government buildings with energy-saving LED lighting and more. The White River Planning and Development District, Inc. in Arkansas was awarded $1.1 million through an EAA program to repair a conference center that was damaged by severe storms and flooding in 2011, and to elevate and rebuild an intersection to mitigate the effects of future flooding.[67]

TABLE 3. Innovative City Practices to Advance Resilient Economic Development

GOVERNANCE
Map vulnerability of private assets and business districts
POLICY
Provide incentives for developers to adopt resilience measures
Include resilience requirements in local building and zoning codes
Include resilience to climate change impacts in Comprehensive Economic Development Strategy (CEDS) documents
Invest in resilient business districts
COORDINATION
Cultivate multi-agency coordination around investment
Encourage and incubate resiliency innovation and entrepreneurship through public-private partnerships
Engage community economic development organizations in city resilience planning efforts

resilience. Chambers of Commerce and other intermediate organizations can be key partners in establishing lines of communication with business owners to help them plan for disruptions, mitigate risks, and access aid when needed.[68] In Boston, the economic development-focused non-profit A Better City acts as a connector between the city's Climate Ready Boston program and the commercial real estate sector, fostering private-sector participation in the design and implementation of city resilience policies and promoting the adoption of climate resilience measures by its members.[69]

FEATURED CITY: NORFOLK, VA

Norfolk, Virginia and other local governments in the Hampton Roads region partnered with the Commonwealth of Virginia to leverage a U.S. Department of Housing and Urban Development (HUD) National Disaster Resilience Competition award. $5.25 million of this grant funds the economic development non-profit RISE, which supports the development of innovative products and approaches for coastal communities facing sea level rise and recurrent flooding. RISE helps business-led teams test solutions that enhance community resilience, create new value, can be demonstrated in the Hampton Roads region, are scalable to other communities, and can be built into financially viable businesses. The model relies heavily on partnerships with local governments like the City of Norfolk and military installations in the Hampton Roads region that can provide important data resources and act as "testbeds" for new ideas. RISE-funded projects have included nature-based shoreline protection, workforce training on green infrastructure installation and maintenance, and flood sensor development for real-time flood level monitoring.[70] In two years, RISE has deployed $3 million dollars to accelerate the development of 20 novel coastal resilience technologies, products, and services – in the process supporting numerous startup companies, creating and retaining nearly 60 jobs, and upskilling more than 90 people.[71]

IV. LIVABLE PLACES: PROTECTING AND ATTRACTING PEOPLE

WHAT'S AT STAKE

City competitiveness relies on factors that promote a high quality of life for residents. Quality of life – often described as livability – is influenced by characteristics such as city attractiveness, housing stock, green space, cultural activities, and a community's equity and social mobility. A city's real and perceived livability can result in material impacts to the local economy by influencing workforce appeal and compensation, productivity, social cohesion, and stability.

Climate change is already threatening the livability of U.S. cities, and that issue is not lost on major employers. For example, one city interviewed has already fielded questions from major companies worried about the ability to attract people to live and work in the city in the future, following a recent devastating climate-related natural disaster.

RESIDENTS IN HARM'S WAY

At its core, livability requires a safe place to live, and climate change presents an obvious threat by bringing sea level rise, inland flooding, wildfires, deadly heat waves, catastrophic storms, and more to neighborhoods throughout the country. At worst, these impacts threaten human life and well-being; at best, they threaten the health and financial security of residents. As noted earlier, in 2016, Freddie Mac reported that sea level rise and expanding floodplains could "destroy billions of dollars in property and displace millions" of Americans, with social and economic impacts "greater in total than those experienced in the housing crisis and Great Recession."[72] A 2018 report by the Union of Concerned Scientists underscored this grim forecast, finding that within 15 years, 147,000 homes and 7000 commercial properties would be at risk of flooding at least 26 times annually under a high sea level rise scenario.[73]

Where the risks are too great and resilience strategies are insufficient, communities have begun pursuing relocation (also called managed retreat) to help move residents out of harm's way. Planned relocation is a very complicated process, and has historically been considered a last-resort measure. More recently, however, some communities devastated by continued losses from frequent flooding have supported relocation. Further, the federal government has recently devoted more resources through FEMA and HUD grant programs to support communities in relocating.[74] For the many other neighborhoods that need not relocate, the effects of climate change on livability can still be severe, including damaged or destroyed property, disrupted work and activities, and impacts on home values.

Existing public policies can perpetuate the existence of occupied homes in high-risk locations. For example, in 21 states, homebuyers are unable to access full information about a property's exposure to flood impacts before a sale is finalized. These states do not require sellers to disclose past flood damages or flood risks, which can present unexpected costs to new homeowners in flood-prone areas.[75]

A new mapping tool from First Street Foundation stands to help address this information gap. Using a climate-adjusted flood risk model, First Street researchers mapped the present and future flood risk of individual properties across the continental United States and identified 14.6 million properties that meet FEMA Special Flood Hazard Area (SFHA) designation criteria – 5.9 million more than are currently categorized as such.[76] This information is only actionable if it reaches decision-makers, and in August 2020, Realtor.com announced that it will integrate the new data as a "Flood Factor" metric for all properties.[77] The First Street-Realtor.com partnership marks an important step towards giving property owners, buyers, policy-makers, and the financial community better information about flood risk. It also provides a model by which risks from other climate-related hazards could be communicated.

A DUAL CHALLENGE: AFFORDABILITY AND HOME VALUES AT RISK

As noted in the previous section on **Resilient Economic Development**, the commercial real estate industry is becoming increasingly affected by and aware of climate risks. Residential real estate is also exposed to climate change impacts, creating challenges for homeowners, homebuyers, and renters. Interestingly, two of the ways that climate change affects livability in this respect are linked and yet seem almost contradictory: climate change is threatening housing affordability at the same time it is eroding home values.

In our interviews, city representatives across the country shared deep concern about housing affordability and how it impacts the livability of their cities. City planning documents mirror this priority; affordability is addressed in 70 percent of the economic development plans we reviewed (see **Appendix B**).

Many city representatives interviewed anticipate that potential direct and indirect impacts from climate change could exacerbate affordable housing challenges. For instance, if climate risk forces planned relocation and abandonment of some neighborhoods and communities, demand for the remaining housing stock in a city (or in other cities, as noted in **Box 3**) could rise dramatically, leading to higher housing prices. Homes and communities that do not relocate could face repeated damage from extreme and chronic climate impacts (e.g., storm surge, nuisance flooding), and residents may not be able to afford continued repairs and rebuilding. Relatedly, homeowners facing increasing climate impacts are subjected to ever-increasing insurance rates; this price path over the long term cannot be clearly outlined

BOX 3. Proximity to Hazards and the Concept of Climate Havens

Through the course of this research, the importance of location was recurrent, particularly with respect to proximity to certain hazards (or lack thereof). The coastal communities we interviewed are more attuned to climate risks than their inland counterparts because the hazards – which include tropical storms, sea level rise, and nuisance flooding – are more apparent. Sea level rise will not strike randomly (as extreme precipitation can), and that makes climate change a long-term planning issue for those communities, not just a potential emergency for which to prepare. In some (but not all) cities whose character and economic value are linked to proximity to the water, climate risks are discussed openly by city officials.[78] Public messages promote the potential advantages that their resilience activities provide.

Some cities appear to face less exposure to climate change, and the term "climate haven" has emerged in recent years to describe them. All else equal, their locations stand to make them increasingly attractive places for residents and businesses seeking to avoid hazards such as rising sea levels, tropical storms, and hurricanes – and sometimes hazards such as wildfires as well. To date, several cities, including Cincinnati, Buffalo, and Duluth, have publicly noted their potential status as climate havens. While somewhat recognizing the competitive edge being a climate haven could provide, the cities we interviewed that could potentially become climate havens continue to promote and rely on the conventional features that make them attractive for new residents and investors, such as affordability and economic development opportunities.

A number of cities have already become "receiving" destinations for populations fleeing major hurricanes, heat, and wildfires. While a large percentage of people eventually return to their home cities after acute events, many stay in the new communities, and local governments must help them find proper long-term housing, schooling, and jobs.

Though receiving cities and those considered climate havens may be less exposed to certain climate hazards, it is important to note that no city is immune to climate impacts, including the potential for disrupted supply chains. The capacities of local systems to adapt are unclear.

to homebuyers at the point of sale, but high insurance rates could price out certain buyers. In California's wildfire-prone communities, insurance companies have already ceased offering homebuyers coverage for high-risk properties and, in many cases, are declining to renew coverage for existing homeowners, forcing homeowners to purchase costly but limited fire insurance coverage through the state.[79] Again, these concerns about housing affordability (this time viewed through a climate-impact lens) are mirrored in city planning documents; affordability is referenced in 60 percent of the adaptation plans we reviewed.

While climate change is threatening housing affordability, it is also putting home values at risk in many cities. These effects are often connected; for example, homes that cannot be insured or that face frequent repair costs are both expensive to live in and worth less. Many homeowners are already experiencing lost real estate values. As previously mentioned, research has found that homes exposed to sea level rise sell for less than similar but unexposed homes. Further, a 2019 analysis of real estate transactions across the East Coast and Gulf Coast states showed that frequent tidal flooding caused by sea level rise has resulted in a $15.9 billion dollar loss in home value appreciation in just the past 12 years.[80] Homes facing wildfire risks have demonstrated a similar trend; a 2009 study found that Southern California home prices dropped 10 percent after one wildfire, and 22 percent after a second.[81] Declining home values are not a livability draw for current and potential residents, and reduced property values also diminish tax revenues that cities depend on to fund community services, further harming livability.

Cities, homebuyers, and home sellers may be in for an even harsher reality if banks begin declining to offer mortgages in some areas due to climate risks, similar to the insurance industry's approach in high-risk areas. The Mortgage Bankers Association has described the potential for banks to limit lending in areas experiencing "unacceptable flood risk" in the next two or three decades.[82] In neighborhoods that are exposed to hazards such as sea level rise and recurrent flooding, banks may begin reducing their own risk and declining to offer 30-year mortgages. New standards from the Financial Accounting Standards Board (FASB) and the Sustainability Accounting Standards Board (SASB) may further drive financial institutions to integrate projections of factors that could impact credit over the lifetime of a loan, including rising insurance premiums, negative impacts on asset values, or rising local real estate taxes. As with the other examples above, where banks decline to offer mortgages due to climate risks, it becomes harder for people to afford to buy homes and, at the same time, the values of other homes in that neighborhood are negatively impacted.[83]

COMMUNITIES AND PEOPLE AT RISK – A SPOTLIGHT ON MARGINALIZED COMMUNITIES

A city should be livable for everyone, including historically marginalized low-income people and communities of color. Every city representative interviewed indicated that the cultural value from demographic diversity contributes to their city's competitive advantage, yet marginalized communities are disproportionately vulnerable to climate impacts. While a number of factors contribute to this vulnerability, housing challenges play a central role and are particularly exacerbated by impacts such as flooding and extreme heat. For example:

- Low-income communities are often more concentrated in flood-prone areas[84] and in many cities have fewer green features like street trees and parks, which can reduce flooding.[85]
- Low-income families are less likely to have flood insurance,[86] leaving them less able to build back after a storm, as was the case in the Houston counties most affected by Hurricane Harvey.[87]
- Funds to "buy out" vulnerable properties are overwhelmingly used by affluent communities and individuals.[88]
- Housing for low- and moderate-income families is typically constructed with lower-quality materials that are less able to withstand extreme weather.[89]
- A growing body of research shows that low-income communities and communities of color in cities are disproportionately exposed to extreme heat, as these populations are more likely to live in "intra-urban heat islands" – areas in cities that have the highest temperatures due to a lack of green features, which provide a cooling effect.[90]
- Adapting to higher temperatures is a challenge for low-income residents, who are more likely to live in energy-inefficient homes and generally have higher energy costs per square foot than the average household.[91]

These disparities inhibit equitable wealth-building and pose the risk of permanently burdening or displacing low-income residents, who in some cities are already being forced out of their communities by climate gentrification (see **Box 4**).

If low-income residents and small businesses owners in these communities are ill-prepared for the financial, physical, and health risks of climate change or are unable to remain in their communities, the local economy and city competitiveness suffer.

PRACTICES TO PROTECT AND IMPROVE LIVABILITY

Key steps to improve city livability in the face of climate change include:

- **Identifying neighborhood vulnerabilities to climate impacts and benefits of resilience measures.** A critical step in developing a city-wide resilience strategy is to understand which neighborhoods are most exposed and vulnerable to climate impacts. In many cities we spoke with, a common strategy is mapping current and future hazards that can help identify high-risk zones that should be prioritized for investment. Detailed analyses of property value and neighborhood-level benefits of resilience measures will likely become increasingly common. In Miami Beach, the City has found that public investments to elevate roads would help protect home values and insurance rates for residents. (see **Featured City: Miami Beach** for more information.)
- **Investing in resilience measures.** A clear way to reduce the impacts of climate change on communities is to boost resilience to those impacts. Cities are using a variety of tools and strategies to do so, including floodplain buyouts and issuing bonds to fund flood mitigation projects. For example, the City of Phoenix is combatting extreme heat by investing in heat reducing technologies. Through its Cool Pavement Pilot Program, the City selected portions of eight neighborhoods and one park to test a cool pavement treatment. The pavement reflects heat from the sun, giving it the potential to reduce nighttime temperatures and mitigate the urban heat island effect.[94]
- **Prioritizing marginalized communities.** Given the disproportionate risks faced by low-income communities and communities of color, resilience planning and projects that focus on equity can better prepare cities for climate change and make them more economically resilient overall. Cities we interviewed reported that equity considerations are integrated throughout their climate adaptation and sustainability plans. This approach aligns with the National Climate Assessment's (NCA) recommendations around building adaptive capacity. According to the NCA, a community's adaptive capacity "is enhanced when resilience efforts build on other environmental and social programs directed at sustainably and equitably addressing human needs."[95] While equity is a central theme of some local governments' plans

BOX 4. Climate Gentrification

Climate gentrification is displacement or entrenchment of existing populations due to climate-driven appreciation or depreciation of property value. This can happen in at least three ways: (1) when investors shift capital to less exposed or more elevated properties; (2) when rising insurance rates, property taxes, home-buying costs, or repair/rebuilding expenses force lower-income residents out of an area; and (3) when local resilience investments attract advantaged households, forcing lower-income residents out.[92]

An example of climate gentrification is occurring in Miami, which is threatened by sea level rise, storm surges, and flooding. Investors are now buying property in the historically Black, low-income neighborhood of Little Haiti, where property values are quickly increasing, in part because the neighborhood is at a higher elevation than many other places in the city. As properties are bought for a low price and renovated, property values rise and are pricing out the low-income residents.[93] Our interviews identified a number of cities that expect in-migration due to climate change to increase demand for housing, drive home prices higher, a scenario that could force existing low-income populations to relocate.

for climate resilience or climate action plans (see **Appendix B**), implementation approaches vary. One common approach that we discovered in our interviews is to prioritize climate-related investments in disadvantaged neighborhoods, such as by focusing energy efficiency and tree planting initiatives in neighborhoods where downscaled maps have shown the urban heat island effect and high energy burdens are a concern. Some local governments are also pursuing broader efforts to redesign city budgeting processes for more equitable resource allocation, while others are seeking to prevent displacement caused by increasing property values that result from new amenities, including investments to address climate vulnerabilities. Many of these efforts are still nascent.

- **Communicating climate risks and resilience efforts to the public.** We found some indications that city governments are increasingly communicating to their communities and major employers. When city representatives were asked whether their cities are communicating climate risks or promoting local resilience activities to residents and potential residents, they explained that they are overwhelmingly focused on messaging to current residents. For instance, the Miami Beach "Rising Above" initiative is an online platform that provides climate change information for residents and businesses and explains how the city is pursuing resilience.[96] This is an important step in empowering residents to understand their own risks, be aware of local resources, and take protective action.
- **Increasing partnerships and addressing financial and climate vulnerabilities holistically.** A number of cities, we uncovered in our interviews, are linking once-separate housing, finance, and resilience efforts to realize efficiencies and align the benefits of different programs for neighborhoods vulnerable to climate impacts. In this way, policies and programs can be designed to help reduce the vulnerability of these communities while also helping them improve their economic well-being. For instance, greater collaboration between climate resilience planners and economic development agencies could promote the equitable distribution of the economic benefits resilience measures create (e.g., heat mitigation initiatives could be run by small businesses in neighborhoods impacted by the hazards). One emerging example can be found in New Orleans, where the City has established a Cooperative Endeavor Agreement with Finance New Orleans (FNO) and the Louisiana Housing Corporation to increase affordable housing in the city. Expected to be the first of its kind in the state, the collaboration empowers FNO to offer tax-exempt bonds and green infrastructure loans for housing that is both affordable and climate resilient.[97]

TABLE 4. Innovative City Practices to Protect and Improve Livability

GOVERNANCE
Understand property- and neighborhood- level climate risks and economic benefits of public investments to inform decision-making (e.g., assess property value benefits)
Map hazards and overlay community and demographic attributes to locate higher-risk zones to direct city resources where they are most needed
POLICY
Communicate climate risks and resilience activities for the public
Institute procedures to ensure equitable resource allocation
Issue bonds for flood mitigation, water quality investments
Offer floodplain buyouts
COORDINATION
Invest in communities through multi-stakeholder partnerships
Address household financial and climate vulnerability holistically by coordinating complementary programs

FEATURED CITY: MIAMI BEACH

Given current and anticipated climate impacts, the **City of Miami Beach** is making significant investments in road elevation and stormwater collection and pumping systems. The City commissioned ICF and others to understand the potential return on these investments; the modeling and technical analysis considered how the measures could impact the city's tax base, flood insurance rates, real estate market, and other factors of economic competitiveness.

The study found that a $2 billion public and private investment in road elevation, home elevation, and storm protection could avoid $1 billion in property damage and reduce insurance rates for property owners. The latter was determined by assessing the insurance benefit of reduced average annual losses (AAL) from storms and flooding, a factor considered by insurance companies when setting premium rates. Elevating public roads and private efforts to reconstruct homes with higher elevations would decrease AAL (for properties in the case study neighborhood) by 7 percent and 17 percent, respectively, resulting in lower flood insurance costs for residents. These investments would also increase property values by over $1 billion, leading to a $6.6 million annual increase in tax revenue to the city.[98]

These calculations show that public and private resilience investments can yield financial benefits. While these mostly accrue to private property owners, the city stands to benefit as well through increased property tax revenue.

V. KEY FINDINGS

As climate change impacts grow ever more apparent and destructive, climate preparedness and perceptions of it are playing an increasingly influential role in the economic competitiveness of cities. Cities that fail to build resilience to climate risks may fall behind. Our research leads to a number of broad conclusions:

Local climate vulnerabilities and risks are becoming more salient to businesses, investors, insurers, and residents, and by addressing these risks, cities can strengthen their finances, attract investors, and improve livability. We encountered a variety of resilience strategies throughout the course of our research that cities are already employing to address climate risks. Many of these practices help strengthen cities' resilience across all three of the major competitiveness dimensions explored here (see **Table 5**).

Cities are already facing real, but largely unquantified, climate-related financial impacts. Major and minor weather disasters and chronic stressors are eroding property values and tax revenue bases, highlighting insurance gaps, accelerating maintenance schedules, presenting unexpected damage costs, and threatening municipal credit ratings and the resulting cost of capital. City leaders lack information on these risks, which are not currently reflected in local budget processes and are not covered by most federal disaster aid or insurance plans. Large cities and those with more resources are better equipped to obtain risk information, but this can be especially challenging for small cities without in-house expertise or resources to hire that expertise.

A lack of cross-departmental coordination prevents city leaders from having a more complete understanding of climate risks and potential benefits of resilience actions. Across cities of all sizes, city finance and economic development officials can lack climate resilience awareness, expertise, and resources. Similarly, city resilience practitioners can lack expertise and resources to connect their work with municipal bond ratings, city budgets, insurance, drivers for economic development, and more. More internal coordination is needed for cities to connect these dots and be able to prioritize potential resilience actions that have benefits for economic competitiveness.

Enhancing climate resilience can help cities avoid future losses by minimizing direct and indirect damages and costs; at the same time, resilience can also open the door to new economic opportunities and gains (see **Table 6**)**.** Potential gains include increased tax revenues, new job markets, increased borrowing capacity, and enhanced livability. Communicating these opportunities can broaden interest in local resilience action.

City and industry experts agree that growing climate impacts need to be considered in economic development planning. Economic development planning processes should prioritize engaging communities and the private sector, as well as neighboring jurisdictions when climate impacts are felt regionally. There are natural linkages between resilience activities and investments and economic development objectives, including promoting resilient housing and wealth-building opportunities in marginalized communities, building resilience measures into new developments, creating economic opportunities out of climate challenges, and promoting amenities provided by local resilience action.

Prioritizing equitable climate action in marginalized communities can enhance livability and support a diverse population, key features emphasized by economic development agencies and local leaders to attract private investment and jobs. Local governments, impacted communities, and private sector partners must take a close look at the systemic challenges that place these communities at greater risk and work together to address them. One place to start is establishing policies and channeling investments towards adequate and resilient affordable housing.

TABLE 5. Resilience strategies and corresponding benefits to competitiveness

	Strong City Finances	Resilient Economic Development	Livable Places
GOVERNANCE			
Analyze climate risks and benefits of resilience measures to property value and city revenue streams	●	●	●
Integrate resilience throughout city government (e.g., place resilience staff in each department, establish cross-department conversations)	●		●
Elevate the role/authority of city's resilience lead	●		●
Map vulnerable community assets and disadvantaged neighborhoods			●
POLICY			
Disclose climate risks and risk mitigation steps to credit rating agencies and in bond disclosures	●		●
Invest in resilient infrastructure (e.g., issue Environmental Impact Bonds, pursue flood mitigation, water quality investments)	●	●	●
Explore new insurance and financial protection strategies	●		
Include climate resilience in CEDS documents	●	●	●
Invest in resilient business districts	●	●	●
Include resilience requirements in local building and zoning codes	●	●	●
Communicate climate risks and resilience activities to the public	●	●	●
Update city budget process to ensure equitable resource allocation			●
Offer floodplain buyouts	●		●
COORDINATION			
Coordinate with local entities to align strategies and leverage resources to accelerate resilience investment	●		
Engage community economic development organizations in city resilience planning efforts		●	●
Encourage and incubate resiliency innovation and entrepreneurship through public-private partnerships	●	●	●
Cultivate cross-agency coordination of public-private investments	●	●	●
Address household financial and climate vulnerability in a holistic manner by coordinating complementary programs	●		●

During the course of our interviews with cities across the country, we encountered a variety of resilience strategies that can provide benefits that help cities strengthen their financial position, advance resilient economic development, and improve livability – features that help cities remain competitive.

TABLE 6. Resilience benefits to cities

Climate resilience can help cities avoid losses such as:	Climate resilience can help cities realize gains such as:
Accelerated repair and maintenance needs for city infrastructure	Increased tax revenues
Asset damages	New job markets and opportunities for workforce expertise
Revenue losses (utility revenues, sales/income/property taxes)	Increased borrowing capacity due to strong credit ratings and investor confidence
Reduced borrowing capacity due to credit downgrades	Improved livability
Increased insurance premiums	
Damaged local businesses and economies	

This research represents an initial exploration of how climate change impacts and resilience bear on economic competitiveness. Here, we have focused primarily on the impact of climate change on city economies. A broader scope of inquiry going forward could include the transition risks and opportunities that exist for cities as the global economy shifts to clean energy, or the implications of physical climate risks for rural economies dependent on vulnerable industries such as agriculture, logging, fishing, outdoor recreation, and tourism. Additional research could consider how major employers integrate local climate risks and resilience into their decision-making or how climate-resilient small businesses and low-income communities contribute to a community's competitiveness.

To ensure cities can be competitive in a climate-changed world, we must address existing challenges and improve current practices to mitigate risks and take advantage of emerging opportunities. Toward those ends, the following section outlines specific recommendations for both policymakers and the private sector.

RECOMMENDATIONS

Proactively enhancing climate resilience can help cities and regions maintain their competitive edges. Ensuring cities and communities can take action will require concerted efforts across sectors and governments to overcome structural challenges and improve institutions, policies, practices, and tools. We have identified the following steps to help cities avoid economic losses and realize gains through climate resilience:

Federal and State Policy

1. Establish a cohesive federal and state policy landscape that removes perverse incentives, protects disadvantaged communities, and establishes sustainable and adequate funding streams for pre-disaster mitigation that do not require extensive local debt. Without state and federal grants, new investments in resilience – even those with high rates of return and that are addressing potentially devastating risks – may now be more challenging to justify because of cities' difficult financial positions resulting from the economic downturn.
2. Establish a national clearinghouse that provides cities and regions with data on all climate hazards, technical assistance for the assessment and prioritization of resilience measures, and tools to quantify the costs of climate change on city budgets (e.g., municipal asset and property damages, lost revenues, diminished property values, increased maintenance costs).
3. Establish protections and additional resources to ensure changes in financial sector practices and that the economic ramifications of the pandemic do not contribute to deepening inequality within and among cities and communities.

Local and Regional Policy

4. Increase collaboration between city departments and agencies – especially between financial offices, economic development agencies, and sustainability/

resilience offices – to share information, coordinate strategies, and prioritize actions that improve resilience and economic competitiveness.

5. Institute better protections and enhance investments to protect homes, ensure housing affordability, and support wealth-building in low-income and marginalized communities. These protections, which should be designed in partnership with impacted communities, could include distributing resilience funds in ways that address historical disparities, amending local zoning codes to facilitate the development of affordable housing in less exposed areas, and increasing incentives for green infrastructure and housing retrofits for low-income homeowners and for developers and owners of multi-family housing.

6. Promote regional collaboration and coordination to address shared climate risk. Multi-jurisdictional collaborations can produce more coordinated and ambitious approaches to addressing shared climate risks when compared to the siloed planning that an individual government may undertake. Successfully mitigating climate risks such as drought, flooding, and wildfire that arise at an ecosystem-level scale requires state governments, regional authorities, and localities to act in a coordinated manner (e.g., aligning local land use decisions with state planning requirements or funding opportunities). Developing these approaches with regional business councils and utilities can ensure greater success.

Private-Sector Leadership and Collaboration

7. Support local decision-makers' ability to assess (a) their cities' specific financial risks from climate impacts and (b) the financial and economic benefits of resilience options. For example, although each of the three major credit rating agencies has issued guidance on incorporation of ESG factors into municipal assessments,[99] our conversations with local governments highlight a continued need for more information and transparency around the expectations and implications for greater climate risk disclosure.

8. Increase collaboration with local governments to integrate resilience in public and private investments. The private sector has a role to play in helping communities be more prepared, from lenders that conduct risk assessments to developers that invest in resilience measures to businesses that provide resilience services. The San Francisco Federal Reserve Board, for example, calls on lenders and businesses to "take a leadership role in preparing vulnerable regions most at risk." The advisory group to the U.S. Commodity Futures Trading Commission underscored this charge in its September 2020 report, calling on the private sector to provide solutions and develop new financial products, services and technologies to catalyze investments and manage climate risks across the economy.[100]

9. Help local governments assess and adopt cost-effective financial protections and insurance approaches, where suitable, to reduce the impacts of climate change on local budgets.

10. Address the time horizon misalignment and risk ownership problems embedded in public- and private-sector decision-making for infrastructure planning and financial markets. These issues perpetuate insufficient climate resilience action and the transfer of hidden risk burdens, for example by establishing industry practices to disclose flood risks before a property is sold.

APPENDIX A: METHODOLOGY

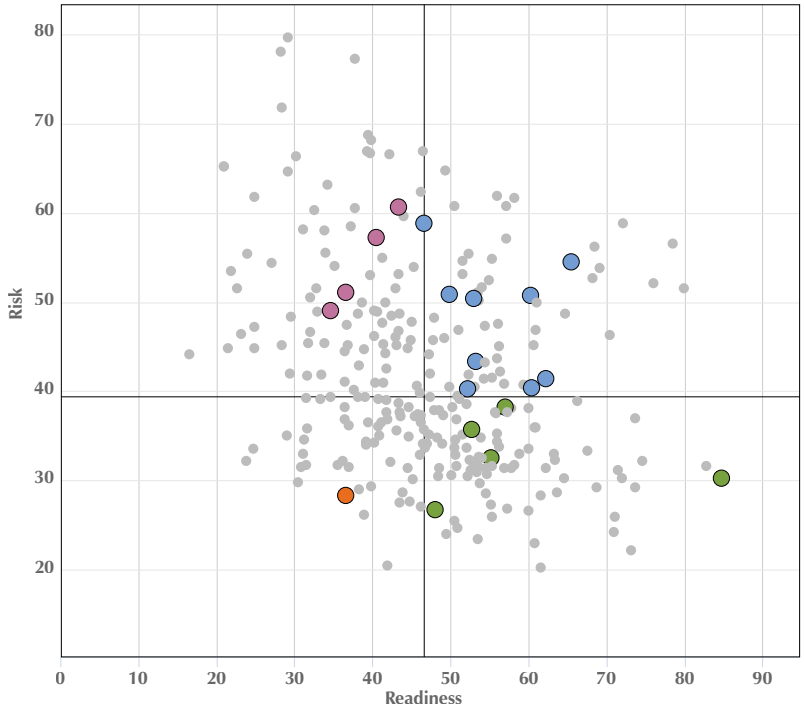
C2ES completed a literature review to survey the existing research and discussions exploring how climate resilience affects factors of local economic competitiveness. This informed the research effort detailed below.

INTERVIEWS

C2ES conducted 38 in-depth phone interviews from May 2019-March 2020. Interviewees included representatives from 20 cities (predominantly sustainability/resilience officers), three regional organizations, two climate consultants, one climate leadership group, and 12 private-sector companies involved in insurance, municipal bond ratings, real estate, and finance. To ensure candor, the interviews were conducted under Chatham House Rule; any attributions in the report are primarily from publicly available sources.

Interviews with city staff were designed to determine: (1) how cities have assessed the risk that climate change poses to their ability to retain and attract businesses, investment, and residents; (2) how this risk is being communicated and addressed across departments; and (3) how cities perceive climate risk and/or action will impact their tax bases, bond ratings, and insurance rates. Cities were selected to represent a broad range of regions, climate impacts, and population sizes. To ensure cities with diverse levels of climate risk and readiness were represented, the ND-Gain Index for each city was mapped when available, as shown in **Figure AA-1** and **Table AA-1**.

FIGURE AA-1. Risk and Readiness of Cities Interviewed or Analyzed vs. U.S. Cities in General



The figure illustrates the climate vulnerability of over 270 cities in the United States, as determined by The Notre Dame Global Adaptation Initiative (ND-Gain).[101] The colored dots show the cities that were selected for our research. The data for Newport, RI and Miami Beach, FL were not available. The axes display a risk and readiness score out of a possible 100 points.

TABLE AA-1. ND-Gain Risk and Readiness of Cities Interviewed or Analyzed

HIGH RISK, LOW READINESS	HIGH RISK, HIGH READINESS	LOW RISK, HIGH READINESS	LOW RISK, LOW READINESS
Buffalo, NY	Baltimore, MD	Ann Arbor, MI	Anchorage, AK
Los Angeles, CA	Cincinnati, OH	Atlanta, GA	
Norfolk, VA	Houston, TX,	Denver, CO	
Sacramento, CA	New Orleans, LA	Orlando, FL	
	New York, NY	Salt Lake City, UT	
	Oakland, CA		
	St. Paul, MN		
	Washington, DC		
	Wilmington, NC		

The Notre Dame Global Adaptation Initiative (ND-Gain) ranks U.S. cities on their vulnerability to climate change using a Risk and Readiness score in their Urban Adaptation Assessment (UAA) database. The Risk ranking considers a city's physical exposure, sensitivity, and adaptive capacity to respond to hazards. The Readiness ranking considers a city's economic, governance, and social readiness to support climate adaptation investment.[102] The cities interviewed for this research represent the full spectrum of risk and readiness as determined by the ranking index.

Additionally, interviews with consultants with experience in municipal resilience were designed to determine if consultants perceived municipal and private-sector entities as considering economic risk, competitiveness, and climate, and if so, the alignments or gaps between the public and private approaches.

Lastly, C2ES conducted interviews with private-sector experts to determine how climate risks and/or local governments' climate preparedness affect investment decisions, municipal bond ratings, real estate, and insurance rates.

ECONOMIC DEVELOPMENT/ADAPTATION PLAN ANALYSIS

To further understand how city planning efforts view the relationship between climate resilience and economic competitiveness, C2ES reviewed the economic development plans of the interviewed cities to evaluate the extent to which they incorporated a resilience lens and reviewed their climate adaptation plans to evaluate the extent to which they incorporated an economic lens (**Tables AB-1**, **AB-2**, and **AB-3** in **Appendix B**). The process involved reviewing the plans for a select list of words associated with climate change or economics and evaluating whether the terms are briefly mentioned or given more substantial consideration. For cities without municipal-level plans, regional plans were used, and a state economic development plan was used for Newport, RI, where neither a city nor regional plan was available. For cities without an adaptation/resilience plan, climate action or equivalent plans were used. In one case, Sacramento, the general plan was analyzed. The most recent full plan at the time of analysis was selected in all cases.

WORKSHOP ON CITY COMPETITIVENESS IN A CHANGING CLIMATE

In May 2020, C2ES partnered with the Science and Climate Action Network (SCAN) to host a workshop titled, "Ensuring Economic Competitiveness in a Changing Climate." The two-day virtual workshop hosted 32 participants representing 12 companies, 6 cities, 1 state, and 6 other organizations, many of which had participated in previous interviews. The agenda focused on how climate risks can impact the economic competitiveness of cities, including real estate, tax bases, and bond ratings. Private-sector experts presented on industry approaches to climate risk and readiness and their impact on city competitiveness, and city leaders shared their efforts to mitigate climate risks and increase resilience. Breakout sessions provided opportunities for participants to discuss key issues and strategies around the role of insurance and bond ratings in adaptation and resilience, as well as the impact of climate change on real estate and tax bases.

APPENDIX B: COMPARISON OF ECONOMIC DEVELOPMENT PLANS AND ADAPTATION PLANS

TABLE AB-1. Plans Reviewed

CITY	ECONOMIC DEVELOPMENT PLAN	ADAPTATION PLAN
Anchorage	Anchorage CEDS DRAFT (2018)	Anchorage Climate Action Plan (2019)
Ann Arbor	CEDS (2010)	City of Ann Arbor Climate Action Plan (2012)
Atlanta	cATLyst: Metro Atlanta Regional Competitiveness Strategy, Chapter 2 (2017)	Resilient Atlanta: Actions to build an equitable future (2017)
Baltimore	Seizing The Momentum, Building A Brighter Future: A Comprehensive Economic Development Strategy for Baltimore 2014. (2014)	Disaster Preparedness and Planning Project (DP3): A combined all hazard mitigation and climate adaptation plan (2018)
Cincinnati	2015-2019 Consolidated Plan and 2015 Action Plan (2015)	Green Cincinnati Plan (2018)
Denver	Jump Start 2017 (2017)	City and County of Denver Climate Adaptation Plan (2014)
Houston	Gulf Coast Economic Development District's 2014 – 2018 Comprehensive Economic Development Strategy (2013)	Resilient Houston Resilience Assessment (2019)
Los Angeles	Year 20 Workforce Development System (WDS) Annual Plan 2nd draft (2019)	Resilient Los Angeles (2018)
Miami Beach	2017-2022 South Florida Comprehensive Economic Development Strategy (2017)	Resilient Greater Miami and the Beaches (2019)
New Orleans	2019 Comprehensive Economic Development Strategy, South Louisiana Economic Development District (2019)	Resilient New Orleans (2015)
New York City	OneNYC: An Inclusive Economy (2019)	OneNYC: A Livable Climate (2019)
Newport	Rhode Island Rising (2014)	Natural Hazard Mitigation Plan 2016 Update (2016)
Norfolk	PlaNorfolk 2030 (2019)	Norfolk Resilience Strategy (2015)
Oakland	City of Oakland Economic Development Strategy 2018-2020 (2017)	Resilient Oakland Playbook (2016)
Orlando	2017 East Central Florida CEDS: Towards a Resilient Region (2017)	Green Works Orlando Community Action Plan (2018)
Sacramento	Sacramento 2035 General Plan: Part 2, citywide goals and policies (2015)	General Plan Appendix B: Climate Action Plan Policies and Programs (2015)
Salt Lake City	Strategic Economic Development Plan Salt Lake City | 2017–2020 (2017)	Climate Positive 2040 (2017)
Saint Paul	2016-2018 Economic Development Strategy (2016)	Saint Paul Climate Action & Resilience Plan (2017)
Washington	D.C's Economic Strategy (2017)	Resilient DC: A Strategy to Thrive in the Face of Change (2019)
Wilmington	Create Wilmington Comprehensive Plan: Policies (2016)	Create Wilmington Comprehensive Plan (2016)

The table shows the names of the plans used for the Economic Development/Adaptation Plan Analysis. The year of publication of each plan is included in parenthesis.

TABLE AB-2. Economic Plan Analysis

CITY	YEAR	CLIMATE (CHANGE)	ADAPT / ADAPTATION	RESILIENCE / RESILIENT	ENVIRONMENT	(EXTREME) WEATHER	FLOOD	SEA LEVEL	DROUGHT	HEAT	FIRE	EQUITY	AFFORDABLE (HOUSING)
Anchorage	2018	■	●	■	■		●				●		■
Ann Arbor	2010												●
Atlanta	2017	●			●			●					■
Baltimore	2014												
Cincinnati	2015												■
Denver	2017												■
Houston	2014		●	●	●		■		●		●		■
Los Angeles	2019	●			●						●		
Miami Beach	2017	■	●	●	■	●	■	●	●				
New Orleans	2013			●			■						■
New York City	2019	■	●	■	●		●						■
Newport	2014	■	■	■	■	■	■	■	●				
Norfolk	2019		■	■	■		■	■	●	●			■
Oakland	2017			●								●	■
Orlando	2017		●	●	●		●	●					●
Sacramento	2015				●								
Salt Lake City	2017											●	■
Saint Paul	2016												
Washington	2017	●			●								■
Wilmington	2016	■	■	■	■		■	■	●	■		●	■

The chart shows the results of the economic plan analysis. The dots illustrate which terms related to climate readiness were included in the document. The tan dots indicate that the term was briefly mentioned in a climate context. The green squares indicate the plan contains a more advanced consideration of how the climate term might relate to economic development.

TABLE AB-3. Adaptation Plan Analysis

CITY	YEAR	ECONOMY / ECONOMIC DEV.	COMPETITIVE	REVITALIZATION	BUSINESS	"PRIVATE / PRIVATE-SECTOR"	PROPERTY VALUE / REAL ESTATE	AFFORDABLE / AFFORDABILITY	EQUITY	MIGRATION / HAVEN
Anchorage	2019		●	●			●		■	
Ann Arbor	2012	●				●				
Atlanta	2017	■		●	■	●		■	■	
Baltimore	2018	●		●		■	■		■	
Cincinnati	2018	■			■			■	■	■
Denver	2014	●	●		●	●	■	●		■
Houston	2019			●	●			●	■	
Los Angeles	2018	■		■	■	■	■	■	■	
Miami Beach	2019	■			●	■	■	●	●	
New Orleans	2015	■		●	■	■		■	■	
New York City	2019	■			●	■	●	●	■	
Newport	2016	■		●		●	■		●	
Norfolk	2015	■	●	■	■	■		■	●	
Oakland	2016	●					●		■	
Orlando	2018	●			●			●	●	■
Sacramento	2015	●		●					●	
Salt Lake City	2017	●								
Saint Paul	2019	●			●	■	●	●	■	
Washington	2019	●			■	●		■	■	
Wilmington	2013	●		●		●	■		●	

The chart shows the results of the adaptation plan analysis. The dots illustrate which terms related to economic development were included in the document. The tan dots indicate that the term was briefly mentioned. The green squares indicate the plan contains a more advanced consideration of how the economic development term might relate to climate readiness.

APPENDIX C: READING LIST

The literature on the various climate impacts and resilience measures that different sectors are considering is quickly growing. C2ES researchers have identified several recent reports that can provide a useful foundation for practitioners who would like to learn more:

- 4th National Climate Assessment
- Climate Bond Guide
- First Street Foundation Flood Factor tool
- Climate Change Disclosure in Municipal Offerings
- Hot Spots 2025: Benchmarking the Future Competitiveness of Cities
- Evaluating the Impact of Climate Change on U.S. State and Local Issuers
- Better Data Can Highlight Climate Exposure: Focus On U.S. Public Finance
- Future-Proofing Real Estate from Climate Risks
- Getting Physical: Scenario Analysis for Assessing Climate-Related Risks
- Underwater: Rising Seas, Chronic Floods, and the Implications for US Coastal Real Estate

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