ENHANCING CLIMATE RESILIENCE AND ECONOMIC DEVELOPMENT IN SOUTHEAST FLORIDA

C2ES CLIMATE INNOVATION 2050

by

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In southeastern Florida, Miami, and the surrounding region are considered "ground zero" for climate impacts in the continental United States, experiencing the first and worst impacts of climate change so far. Without both strong climate resilience measures to prepare for these impacts and climate mitigation efforts to reduce their severity in the long run, rising sea levels, increasingly frequent and severe storms, extreme heat, and coastal erosion threaten major damage and disruption to communities, businesses, and property. The region, which is no stranger to extreme weather, has a demonstrated history of successfully learning from past disasters and rebuilding in a more resilient way. The region also has tremendous prospects for economic growth thanks to thriving tourism and real estate industries, and growth as a global hub for cleantech innovation. Continuing to attract diverse private sector investment can boost local economic resilience, while conversely, developing a climate resilient community can help make the region more attractive for companies to invest. Harmonized policies at the local, state, and federal level are needed to support better local resilience planning, build resilient infrastructure, and raise local corporate climate ambition. This brief summarizes key takeaways from our regional roundtable held virtually in Florida in June 2022, and offers recommendations for policymakers and companies to enhance resilience and economic development in southeast Florida.

INTRODUCTION

REGIONAL ROUNDTABLES

Achieving net-zero emissions will require large-scale change across all sectors of the economy, and efforts to accelerate this transition are intensifying. Yet these changes—and climate change itself—have already begun to profoundly alter social, economic, and political realities in communities across the country. To chart a pathway to sustainable, long-term prosperity, communi-

ties must be able to leverage their unique strengths and capitalize on emerging economic opportunities, while addressing barriers that are often poorly understood outside of their communities. As companies make significant commitments and investments in low-carbon technologies and the facilities and workers who will produce them, policymakers have sought to identify approaches that can benefit communities and businesses alike. Doing this well requires engaging directly with communities to understand not only their unique challenges, but, perhaps more importantly, the future they want to chart for themselves.

Our June 2022 roundtable brought together more than 50 stakeholders representing business, policymakers, nongovernment organizations, and the community to explore opportunities to enhance climate resilience and economic development in southeast Florida. This roundtable was our first one focused on resilience and builds upon a growing body of C2ES work exploring the interplay between economic competitiveness and local climate resilience.[1] This brief includes key takeaways from the event and a series of C2ES recommendations meant to align climate and economic objectives in the region. These recommendations are based on the roundtable discussion itself, as well as consultations with stakeholders before and after the event.

WHY SOUTHEAST FLORIDA?

Southeast Florida—including Broward, Miami-Dade, Monroe, and Palm Beach counties—is on the front lines of climate change-related impacts to the United States. Already, the region is experiencing catastrophic climate impacts like more frequent and severe extreme weather, sea level rise, extreme heat, and tidal flooding. Since 1950, sea levels on coastal Southeast Florida have risen 8 inches, with an additional 6 inches of sea level rise projected in the next 15 years alone—demonstrating an accelerated pace of change.[2] Rising sea levels contribute already to significant occurrences of tidal, or "sunny day," flooding, when high tides coincide with lunar cycles to produce tides 1.8 to 3.9 feet above the daily average high tide, causing streets to flood even when the weather is clear.[3] Additionally, the annual number of days with a heat index at or above 105 degrees F is projected to increase from seven per year in 2022 to 60–88 days per year by midcentury.[4]

The economic impacts of these forecasted climate risks are significant. By 2070, $53.6 billion in regional property value is expected to be exposed to daily tidal inundation, demonstrating the magnitude of the economic risks of not bolstering local resilience.[5] The region must invest in resilience to prevent some of this damage, and doing so early can and lead to significant long-term cost savings. Indeed, according to the National Institute of Building Sciences, for every dollar invested in resilience, $2–6 are avoided in damages.[6]

The effects of these climate impacts on people and communities in the region are not distributed evenly, however. Often, lower-income neighborhoods, neighborhoods with greater proportions of racially marginalized residents, and neighborhoods with large immigrant communities—particularly immigrant communities speaking languages other than English and Spanish—experience the worst of the impacts while having the least access to essential services.[7] Examples of these services include information about how to prepare for and respond to extreme weather disasters, as well as how to stay safe in extreme heat scenarios; access to cooling centers and emergency shelters; and support for weatherizing and weather-proofing homes. There is an urgent need to invest in local resilience, including investing in local equity and justice, in southeast Florida. Additionally, there is a tremendous opportunity for climate-related industries to boost local economic development.

Southeast Florida is not only home to a thriving real estate market and agricultural sector, it is also known nationally as a positive startup environment.[8] As necessity breeds invention, southeast Florida presents an opportunity for job growth specifically relating to climate resilience—for example, in resilience consulting work like risk analysis, planning, and engineering, or in green infrastructure installation and management—and could serve as a test-bed for solutions. In addition to resilience opportunities, roundtable participants were optimistic that the region is poised to become a hub for innovation in climate mitigation technologies and "cleantech."

FRAMING THE DISCUSSION

Climate resilience is the ability to anticipate, prepare for, and respond to hazardous events, trends, or disturbances related to climate change. Improving climate resilience involves assessing how climate change will create new—or alter current—climate-related risks, and taking steps to adapt to better cope with these risks.[9]

This roundtable joins a previous body of work C2ES has produced linking climate resilience and economic

development, including our 2020 report, The Resilience Factor: A Competitive Edge for Climate-Ready Cities. Among other key findings, this report highlights that enhancing climate resilience can both help cities avoid future losses and minimize damages while also opening the door to new economic opportunities and gains. Further, it calls for economic development planning processes to consider growing climate impacts, including through engaging communities and the private sector. In particular, the report identifies the need for cross-departmental coordination within cities to give leaders a more complete understanding of climate risks and potential benefits of resilience actions.[10] C2ES carried this research forward with our subsequent 2022 report, The Climate Resilience-Economy Nexus: Advancing Common Goals, which explores projects to identify areas where economic development and climate resilience can achieve common goals.[11]

These findings are exemplified in southeast Florida, and in particular in Miami-Dade County, where leadership on climate resilience can be a model for other municipalities or regions within the state. In 2021, the county appointed a Chief Heat Officer—the first in the nation—and the Miami-Dade County Office of Resilience has integrated planning for climate impacts with economic development and community engagement initiatives.[12] Additionally, the Southeast Florida Regional Climate Change Compact—a regional collaboration between Broward, Miami-Dade, Monroe, and Palm Beach counties—presents a forum for inter-county collaboration on climate mitigation and resilience.[13]

At the state level, the state's leadership on climate resilience is in glaring contrast to its lack of action on mitigation. Support for climate change-related initiatives is limited to resilience activities, with little support for climate mitigation policy or funding. In 2019, in the state's first major climate resilience action, Governor Ron DeSantis created the position of Chief Resilience Officer to prepare Florida for the environmental, physical, and economic impacts of sea level rise.[14] Most recently, in 2021, Florida Senate Bill 1954 created the Resilient Florida Program, which created grants for projects to enhance the resilience of inland waterways, coastlines, and shores, as well as resources for communities to access vulnerability assessments and adaptation planning.[15] To date, state and local governments have invested more than $1.2 billion in resilience funding, mostly channeling federal funds from the American Rescue Plan Act.[16] The Florida Department of Environmental Protection has also been tasked with developing a statewide flood vulnerability and sea level rise data set by July 1, 2023, with an assessment following by July 1, 2024.[17]

Yet on the climate mitigation side, investments and policy action have largely been driven by local leaders, with little support—and often direct opposition—from the state government. The state's most recent—and only—climate action plan was released in 2008, and has not been updated since.[18] In 2021, the legislature passed a law prohibiting municipalities, counties, and other local governments from "restricting or prohibiting the types of fuel sources of energy production used, delivered, converted, or supplied" within their jurisdictions, a measure that limits local governments' abilities to meet their climate mitigation goals.[19] Local governments can take meaningful steps toward mitigation, but coordinated and well-funded state-level support is necessary

BOX 1: Local resilience investment in practice

A recent example of successful local resilience investment can be seen in the community of Babcock Ranch near Fort Myers, Florida, which sustained little damage from the recent Hurricane Ian, even as the Category 4 storm destroyed many surrounding homes and businesses were. Homes in this community are designed to anticipate the worst projected impacts of extreme weather and flooding, including underground power lines, flood-preventing retaining ponds, onsite solar generation, and other infrastructure-hardening measures. [45]

The community is intentionally located 30 miles inland and built almost 30 feet above sea level; its structures are designed to withstand winds of up to 145 miles per hour. Following Hurricane Ian, which left devastation across the surrounding communities, residents reported that, not only did their homes sustain minimal damage, but they retained power and their community was able to assist with recovery efforts in the surrounding area.[46]

to meet the challenge at the pace and scale necessary to avoid the worst impacts of climate change.

In order to truly prepare for and be resilient to the current and future impacts of climate change, Florida's state government, municipalities, private sector, and communities have a lot of work to do. However, the region has a demonstrated history of not only recovering from catastrophic weather events like major hurricanes, but doing so by responding with innovative preventative measures based on lessons learned to ensure assets and communities are prepared to weather the next storm. Over the past several decades, the state and its communities have invested in grid-hardening measures, including initiatives to move power lines underground, and programs to restore the Everglades, a key natural resource and a crucial provider of ecosystem services in the region.

In this way, the region may stand as an example to other regions around the country. Where other areas in the United States are only now beginning to invest in building up resilience capacity, southeast Florida has been developing its capacity and can share lessons learned from the past decade. That said, with the pace and scale of impending climate impacts, southeast Florida still has a long road ahead to developing its own climate resilience, and must act with the appropriate urgency.

OUR CONVERSATION

The roundtable discussion, which took place virtually over two days in June 2022, welcomed more than 50 stakeholders to explore themes relating to opportunities for investments in resilience to support a thriving economy, and for economic development initiatives to bolster community resilience. Attendees expressed a shared belief in the economic opportunity of investing in both climate resilience and mitigation, and highlighted the need for proactive investment in local climate resilience measures from both the public and private sectors. At the same time, many attendees stressed the need for collaboration among local, regional, state, federal, and private sector actors to coordinate and accelerate these investments in resilience. Given the urgency of climate change, they highlighted the need for a whole-of-government approach to proactively plan for the coming impacts of climate change and invest now to bolster the region's resilience. Participants also emphasized the tension between balancing the need for data and information that is applicable and accessible across multiple regions against the unique needs of individual communities that must be addressed at the local level.

This brief summarizes key takeaways from the roundtable and—building on insights from the event and dozens of conversations with stakeholders—provides recommendations developed by C2ES for local, state, and federal policymakers to align climate resilience and economic development objectives in southeast Florida.

KEY RECOMMENDATIONS

C2ES has identified a series of policy recommendations to bolster local climate resilience and grow the local economy, in service of aligning climate resilience and economic development objectives, including through expanding access to data and information, building resilient infrastructure, developing partnerships and collaboration, and setting regulatory and corporate ambition.

Collect and Disseminate Data and Information

- Federal and state agencies should fund the collection and dissemination of neighborhood-level data on projected climate impacts such as extreme heat, flooding, and sea level rise.
- Corporations should share downscaled data relating to physical climate impacts with local small businesses and NGOs, when they collect it. Federal agencies should offer grants or other incentives to support companies in sharing this information.
- Federal, state, and local investments in infrastructure should make funding contingent on the integration of future conditions—including projected climate impacts—into planning to facilitate resilient infrastructure construction.
- The state government should facilitate regional coordination among local governments or local NGOs in partnership with local governments to identify opportunities for synergy in local zoning ordinances, particularly with regards to mitigation and resilience-related provisions. Detailed information, including key differentiations between neighboring ordinances, should be made accessible to developers.
- FEMA and NOAA should collaborate to offer locally-specific data and safety materials on climate impacts like extreme heat to employers and workers. Local governments should supplement these materials with outreach and communications strategies designed to target local populations most effectively, taking into account linguistic and cultural nuance.

Incorporate Equity

- Resilience measures focused on protecting individuals should specifically focus on meeting the needs of the most vulnerable communities on the front lines of climate impacts: majority-Black and/or Hispanic populations, LGBTQIA+, elderly, disabled, low-income, or immigrant communities.
- State and local governments should incorporate education on climate-related human health impacts into public education programs and offer resources on outdoor safety in extreme heat, natural disaster preparedness, best practices for home energy resilience, and local government resources for enhancing resilience.
- Rating agencies should provide clearer guidance on how resilience planning and investments—or lack thereof—affect bond rating assessments.

Build Resilient Infrastructure

- The state—or, when impossible, local governments—should convene local government and other public and private sector partners in applications for economic development grants to build cohesive business and government support and increase competitiveness of grant applications.
- Where funding is limited, decisionmakers should prioritize infrastructure investments that support both mitigation and resilience goals, and when possible, should co-locate emissions reducing infrastructure with livability improvements.
- Both "green" and "gray" infrastructure is needed to support making South Florida more resilient to the impacts of climate change; Proposals to develop infrastructure to protect local assets from sea level rise, extreme weather, and other climate impacts should employ both forms of infrastructure where applicable.

Build an Ecosystem of Climate Innovation

- Companies should incorporate incentives that produce climate mitigation and resilience benefits into employee benefits to both attract new workers and support existing workers' communities.
- The state should update building codes to set stringent energy efficiency targets for large buildings and commercial facilities and require resilient development.
- Local utilities and the state should pursue policies and programs to enable significant build-out of carbon-free electricity generation within the state.

KEY TAKEAWAYS AND POLICY RECOMMENDATIONS

DATA AND INFORMATION

Accessing downscaled data

A major issue area identified by participants was the collection of, dissemination of, and access to data and information to provide local planners and communities with useful, local data relating to climate risks. One significant and early impact of climate change is the rapid increase in frequency and duration of extreme heat. In southeast Florida, in particular, extreme heat is augmented by the tropical climate and extreme humidity, making conventional metrics of heat based on temperature alone insufficient to measure the impact to the human body. Heat indices, taking into account the dew point or humidity metrics, are much more useful.[20] In Miami-Dade County in particular, participants highlighted disparities in tree canopy that can significantly impact the urban heat island effect, meaning that although neighborhoods may be located in close proximity, some may be several degrees warmer than their neighbors due to reduced tree canopy.[21]

To reflect this, participants highlighted the need for downscaled (i.e., hyperlocal) data to develop key metrics of climate impacts and community resilience, such as extreme heat indices at a neighborhood level. Some stakeholders suggested that the National Oceanic and Atmospheric Administration (NOAA) could be a vehicle for supporting municipalities' collection and dissemination of extreme heat data at the neighborhood level, which would take into account disparities in tree cover and other factors. This could build upon resources from federal agencies including:

- NOAA's updated Billion Dollar Disasters mapping tool, adding census tract data, historic and future

risks, and the social vulnerability index to map risk and vulnerability to historic weather hazards[22]

- The U.S. Global Change Research Program's Climate Explorer and Climate-related hazards in real time tools[23]
- FEMA's National Risk Index for Natural Hazards.[24]

In some locations, data on a wide range of climate-related risks are already being collected or analyzed by private sector actors, especially those large corporations that are responsible for reporting their climate-related financial risks to shareholders, or that voluntarily disclose risks following guidance from the Task Force on Climate-related Financial Disclosures (TCFD).[25] This information includes detailed assessments of risks to a facility and the surrounding area presented by impacts such as sea level rise, flooding, extreme weather, extreme heat, and coastal erosion.[26] However, some participants noted that these private sector actors do not make this data widely available to relevant stakeholders—particularly municipal leaders, small businesses, and nonprofit organizations. These stakeholders often lack the financial resources to collect this data on their own and could be the most effective actors in using it to prepare the community for the projected impacts and potential risks.

As an example, participants suggested that companies performing risk assessments on large facilities could share relevant climate impact information with smaller businesses located within the footprint of the risk assessment. Doing so would support resilience efforts among smaller businesses, thus bolstering community resilience, which in turn can benefit the large facility's resilience and risk mitigation initiatives. That said, large companies may be reticent to share this data with other companies due to concerns over competitiveness or to the costs of disseminating this data. In addition, some companies may have concerns over protections of customer data or proprietary information, which may require companies to take extra steps to protect sensitive information, adding to cost or staff burden. However, interim data collection to map local or regional climate risks could be shared without needing to demonstrate the specific risk to the company's assets and vulnerabilities.

As C2ES has highlighted in previous research, community resilience hinges on the ability of small businesses and local service providers to return to operations quickly after a disaster.[27] However, small businesses often lack both the capacity and resources to develop their own risk mitigation and resilience strategies, leaving them vulnerable to climate-related disasters. In contrast, large corporations often have more stringent reporting requirements on their physical and climate-related risks, and therefore are more prepared to anticipate and respond to climate-related impacts.

RECOMMENDATIONS

- Federal and state agencies should fund the collection and dissemination of neighborhood-level data on projected climate impacts including but not limited to extreme heat, flooding, and sea level rise.
- Corporations should share downscaled data relating to physical climate impacts with local small businesses and NGOs when they collect it. Federal agencies should offer grants or other incentives to support companies in sharing this information.

Physical risk, updating cost-benefit analysis, and equity

Throughout the roundtable, participants highlighted the need for resilience planning and investment decisions to better consider the ever-changing conditions under climate change and the associated socioeconomic externalities. One challenge is integrating the continuous and accelerating pace of climate change into local physical risk assessments. To illustrate, participants raised the example of tropical storm Alex, which hit the region just days before the roundtable, and tested the area's flood-related infrastructure planning efforts. The neighbor-

BOX 2: Sharing neighborhood-level climate impact data

An example of private sector data sharing is AT&T's Climate Change Analysis Tool (CCAT), developed in 2019 to assess how climate change will impact its network and operations up to 30 years in the future. The tool uses data from AT&T's internal data collection alongside regional climate modeling from the Department of Energy's Argonne National Laboratory to provide insight at the neighborhood level across the country. The company has made the data underlying its CCAT publicly available and supports community utilization, as seen in its 2020 Climate Resiliency Community Challenge.[47]

hood of Little Havana bore the brunt of the flooding from the storm, despite—as participants pointed out—the fact that its flood infrastructure had been expected to prevent flooding in conditions through 2035.[28] They suggested that, had the projections used to model the future flooding scenarios included accurate projections of accelerating sea level rise, this infrastructure could have been designed to be more effective at preventing damage.

Participants also highlighted the need to better demonstrate how climate change affects socioeconomic factors like equity, public health, and livability. They emphasized the need for equity to be integrated into resilience planning and investment, particularly in the communities of southeast Florida where economic, racial, and other intersecting social disparities are pronounced.

Miami is home to a large immigrant community—immigrants make up 54.7 percent of the total population of Miami-Dade County.[29] Educational materials and outreach around disaster preparedness and residential resilience measures must therefore be developed and disseminated in a variety of languages and take into account a variety of cultural norms and sensitivities in order to be effective. For example, different cultures may have widely varying norms around modesty and clothing or gender segregation, which emergency workers must be cognizant of when making a rescue effort.

One useful resource planners can utilize is the U.S. Department of Health and Human Services' Office of Minority Health (OMH) Diversity Preparedness Tool. This tool advises community leaders to explore culturally-specific beliefs and customs regarding disasters and emergencies, preferred channels of communication (whether social networks, ethnic media, or places of worship, for example), and information-seeking behaviors when designing disaster preparedness programs.[30]

Additionally, with greatly varying wealth and income levels across neighborhoods, resilience efforts must be developed to maximize benefits to the overall community rather than focusing only on the highest return on investment. Resilience investments in areas with lower property values may yield smaller monetary returns than comparable investments in areas with higher property values, leading to underinvestment in the resilience of more vulnerable communities, and an overemphasis on areas with the highest property values. For example, a 2021 Urban Institute study raised concerns that a U.S. Army Corps of Engineers (ACORE) coastal mangrove planting project—which was intended to bolster communities' resilience to flood risks—was sited in an area with higher economic values rather than socially vulnerable populations. The study also elevated residents' concerns that the ACORE project prioritized the built environment over equitable social impacts.[31]

One vehicle to standardize resilient infrastructure in new and upgraded construction is local zoning ordinances and building codes. As these are often regulated at the local level to best reflect local conditions, coordination is needed at the regional or state level to communicate best practices across municipalities and with developers operating across jurisdictions. Roundtable participants called for policymakers and regulators to establish rules that would not only require the integration of climate adaptation and resilience considerations into all new development, but also include clear accountability for developers.

RECOMMENDATIONS

- Federal, state, and local investments in infrastructure should make funding contingent on the integration of future conditions—including projected climate impacts—into planning to facilitate resilient infrastructure construction.
- The state government should facilitate regional coordination among local governments—or local NGOs in partnership with local governments—to identify opportunities for synergy in local zoning ordinances, particularly with regards to mitigation and resilience-related provisions. Detailed information, including key differentiations between neighboring ordinances, should be made accessible to developers.

Community and business education on the health and safety risks of climate impacts

Participants highlighted the need for direct and hyperlocal engagement with communities and local businesses. Some participants pointed to the need to overcome misinformation and opposition to climate action, particularly in disaster preparedness and long-term infrastructure planning. The politicization of climate change in local media, by community leaders, and in community spaces can also limit access to reliable information on the risks of climate change while delaying preparedness and plans for response.

Extreme heat can have significant health and productivity risks, and as mentioned earlier, can be exacerbated

by humidity to the extent that guidance developed for other communities with lower levels of humidity will not be sufficient for the southeast Florida region. In addition to its immediate risks to outdoor workers and people engaging in outdoor recreation, chronic exposure to extreme heat has been linked to a variety of negative health impacts and can even be more dangerous than exposure to a single extreme heat event.[32] Workers in the agriculture and construction industries, both significant contributors to the region's economic productivity, are most affected by extreme heat and therefore the most in need of up-to-date education on extreme heat management strategies and protections for workers to prevent exposure.

Miami-Dade County led a broad extreme heat awareness and education campaign in 2022, declaring its first "Heat Season" and flooding its existing communication channels with information about extreme heat.[33] Moving forward, this kind of outreach campaign must be replicated and extended to better target different risk groups and local audiences. Similarly, while the county has strong communications channels in place for sharing emergency preparedness education ahead of extreme weather events like hurricanes and tropical storms, other climate-related impacts like tidal flooding must also be addressed.

One avenue for developing this guidance would be for the state of Florida to develop a State Plan approved by the U.S. Department of Labor's Occupational Safety and Health Administration (OSHA). State Plans are workplace safety and health programs operated by the states but approved and monitored by the agency for effectiveness in protecting workers and preventing work-related injuries, illnesses, and deaths.[34] Currently, 22 states have OSHA-approved state plans, but none include express guidance for climate-related extreme heat protection. Florida could lead the nation by integrating protections into its plan that take into account the local conditions and climate impacts on extreme heat, particularly relating to the impact of excessive humidity on heat indices.

RECOMMENDATIONS

- FEMA and NOAA should collaborate to offer locally-specific data and safety materials on climate impacts like extreme heat to employers and workers. Local governments should supplement these materials with outreach and communications strategies designed to target local populations most effectively, taking into account linguistic and cultural nuance.
- Resilience measures focused on protecting individuals should specifically focus on meeting the needs of the most vulnerable communities on the front lines of climate impacts: majority-Black and/or Hispanic populations, LGBTQIA+, elderly, disabled, low-income, or immigrant communities.
- State and local governments should incorporate education on climate-related human health impacts into public education programs and offer resources on outdoor safety in extreme heat, natural disaster preparedness, best practices for home energy resilience, and local government resources for enhancing resilience.

Financial risk and municipal bond ratings

Two recent C2ES publications, The Resilience Factor: A Competitive Edge for Climate-Ready Cities and Climate-Related Financial Risks and Opportunities: A Primer for Local Governments, demonstrate that local governments across the country are already facing, and will continue to face increasingly severe, financial impacts from extreme weather disasters and chronic climate-related stressors like sea level rise that drain local budgets and threaten municipal creditworthiness.[35] The reports highlight that without proactive resilience measures and dedicated, sufficient disaster recovery funding, local governments are often forced to redirect funds that had been designated for other needs toward recovering from disasters. At the same time, municipal tax revenues are reduced when disasters destroy property and cause local property values to fall. Those local governments that are not prepared for these disasters often are forced into patterns of long-term borrowing, while at the same time credit ratings agencies may downgrade impacted governments' ratings when factoring in these areas' lack of resilience to the very disasters they are borrowing to recover from. Third-party insurance providers may also raise local governments' liabilities and premiums or change their coverage following increasing climate-damage payouts.

Addressing climate change and investing in resilience becomes more urgent when climate risks contribute to degraded municipal bond ratings. In order to both reduce long-term investment risk and to communicate clear and transparent expectations with municipalities, more transparency is needed for financing institutions, institutions in the insurance and reinsurance industries, and ratings agencies. These entities should qualify how

investments in adaptation strategies and resilient infrastructure can measurably reduce risk in ways that allow the market to respond with confidence and certainty.

Roundtable participants called for better alignment of financial risk ratings with climate-related risks. Doing so would incentivize early planning and implementation of adaptation and resilience measures. At the same time, they also called for greater transparency from financial institutions regarding the extent to which resilience informs ratings.

RECOMMENDATION

- Rating agencies should provide clearer guidance on how resilience planning and investments—or lack thereof—affect bond rating assessments.

BUILDING RESILIENT INFRASTRUCTURE

It is imperative to both harden physical infrastructure against climate impacts while preparing communities' social infrastructure to be more resilient to climate-related shocks. This is especially true given the increasing severity and frequency of climate-related extreme weather events, as well as threats to physical infrastructure from chronic climate impacts like sea level rise and coastal erosion. Throughout the discussion, participants highlighted the co-benefits of investing in resilient physical and social infrastructure for municipalities, companies, and communities. These co-benefits include becoming more attractive in federal grant funding opportunities, attracting and retaining workers, and supporting climate mitigation objectives alongside resilience.

Attracting federal funding

Adaptation planning and construction can have high capital costs, placing a significant financial burden on communities, even those with large and reliable tax bases. For smaller or lower income communities, federal funding for resilient infrastructure, capital improvements, and investments in adaptation is urgently needed to help these communities prepare for the coming impacts of climate change and avoid significant damages from future, climate-fueled disasters. Funding opportunities such as FEMA's Building Resilient Infrastructure and Communities (BRIC) program can support hazard mitigation activities, with a focus on critical infrastructure. Other opportunities can help communities as well, including USDA Wetlands Reserve Program, which supports enhancing wetlands as a buffer to flooding, and the Environmental Protection Agency's Clean Water and Drinking Water State Revolving Funds which supports green infrastructure or building resilience for drinking water infrastructure and stormwater management.[36]

Roundtable participants highlighted that municipalities with a strategy and action plan for climate resilience are more easily able to secure federal funding, largely because they demonstrate that the funded projects are more likely to be durable and resilient. Additionally, participants highlighted increased success in securing funding when municipalities can demonstrate strong public-private partnerships. These partnerships signal to federal grantors that the funded projects are more likely to succeed, as they are integrated better with local private-sector networks and can reduce investment risk through diversification.

RECOMMENDATIONS

- The state—or, when impossible, local governments—should coordinate among local government and other public and private sector partners in applications for economic development grants to build cohesive business and government support and increase competitiveness of grant applications.

Supporting both climate resilience and mitigation

Public investments in resilient infrastructure not only improves the adaptive capacity of at-risk communities, but can also support climate mitigation priorities. In the roundtable, participants raised the example of a recent project collocating accessible transit and affordable housing, which supports reducing emissions from transportation while strengthening the community, improving equity and access, and thus building community resilience. Another example from the transportation sector includes procuring electric school buses to reduce transportation emissions, which can then be utilized to provide backup power to hurricane shelters in an emergency. Investing in measures to simultaneously reduce emissions and improve resilience can save on capital costs and extend funding resources that could otherwise be split between climate-related priorities.

Participants highlighted that both "green" and "gray" infrastructure (i.e., infrastructure using native flora and infrastructure built from human-made materials, respectively) can and should be utilized to support resilience. In the case of green infrastructure, new projects often support both resilience and mitigation objectives, such

as investments in new urban tree canopy or mangroves to protect shorelines. In conversations surrounding prioritization of resilience investments, particularly in southeast Florida, participants highlighted a sense of competition between the types of infrastructure investments. However, they were largely in agreement that the two solutions should complement each other and can be used in tandem to boost effectiveness.

As an example, participants highlighted resilience needs at the Miami International Airport and recommended both building sun-shielding infrastructure over open, outdoor work areas as well as planting trees near buildings to cool them. Both solutions combat climate-related extreme heat and can be most effective when deployed together rather than individually.

Throughout the conversation, participants emphasized that all investments in resilient infrastructure, whether green or gray, must prioritize equity in their distribution and objectives.

In the absence of strong state policy setting minimum standards for resilience and mitigation, policy collaboration is necessary across local jurisdictions, especially on regulatory measures that can have an outsized impact on sustainability. Roundtable participants raised the example of zoning ordinances and building codes establishing these minimum standards for new construction.

RECOMMENDATIONS

- Where funding is limited, decisionmakers should prioritize infrastructure investments that support both mitigation and resilience goals, and when possible, should co-locate emissions reducing infrastructure with livability improvements.
- Both green and gray infrastructure is needed to support making South Florida more resilient to the impacts of climate change; proposals to develop infrastructure to protect local assets from sea level rise, extreme weather, and other climate impacts should employ both forms of infrastructure where applicable.
- The state should update building codes to set stringent energy efficiency targets for large buildings and commercial facilities and require resilient development.
- Local utilities and the state should pursue policies and programs to enable significant build-out of carbon-free electricity generation within the state.

BUILDING AN ECOSYSTEM OF CLIMATE INNOVATION

Southeast Florida is home to a thriving economy, which has seen even more growth in recent years as the pandemic enabled tech workers to work from anywhere.[37] The region, particularly the City of Miami and West Palm Beach, is home to an innovation-centric ecosystem designed to attract and support growing companies.[38]

City of Miami Mayor Francis Suarez has worked to market the region as a technology innovation hub, particularly through his support for cryptocurrency. However, as southeast Florida is at risk for severe climate impacts, the business ecosystem is also primed to support innovation in the climate tech field. Both policy and private sector leadership can work together to leverage the existing business ecosystem to develop a high-performing climate technology environment. In such an environment, prospective and existing companies could attract funding, mentorship, connection to others in the industry, and inspiration.

Even among established industries in the region, companies are facing growing pressure from their customers, shareholders, employees, and peers to demonstrate their commitment to ambitious mitigation and resilience strategies. For example, tech giants Microsoft and Google have set sustainability targets, like access to 24/7 carbon-free power and aggressive carbon removal targets, setting the bar for the industry to follow.[39] Globally, shareholder pressure is a major driver of companies' decisions to disclose climate-related risks. In addition, workforce activism is on the rise.[40]

Attracting and retaining workers

Companies are in a unique position to influence local climate resilience, especially when they have a large footprint and better access to data for planning for and responding to climate impacts than small businesses and local leaders in the community. Yet as much as communities can benefit from companies investing in local resilience, companies can also benefit from building a loyal workforce within the local community by—in part—demonstrating a good-faith commitment to building that resilience.

Roundtable participants highlighted how companies demonstrating a commitment to meaningful action on climate mitigation and resilience are more competitive employers and are more successful at retaining talent than their peers. In a time when workers across indus-

tries are highly mobile and shift jobs quickly, attracting and retaining workers is even more important to companies competing for top talent. A recent study found that more than two-thirds of workers in the United States were more likely to choose to work for a company with a "strong environmental agenda," and 34 percent of respondents who changed jobs in 2021 accepted a lower salary to work for a more environmentally sustainable organization.[41] A separate 2021 Gallup poll found 69 percent of workers noted a company's environmental record is a factor in their decision to take a job.[42]

Some companies have offered employee benefits like rebates for electric vehicles or discounted home solar installations that can help employees support mitigation or resilience in their own lives. In 2014, the World Wildlife Fund organized the Solar Community Initiative among Cisco Systems, 3M, Kimberly-Clark, and National Geographic. The initiative offered employees discounted rates to buy or lease home solar systems through Geosteller, coordinating bulk-buying programs to save employees money and reduce emissions.[43] In 2022, Bank of America offered employees a one-time purchase incentive of $4,000 for a new EV.[44]

RECOMMENDATIONS

- Companies should incorporate incentives that produce climate mitigation and resilience benefits into employee benefits to both attract new workers and support existing workers' communities.

Raising climate ambition

Public actors like cities and municipalities can put pressure on local businesses to announce mitigation goals and develop resilience strategies, even when these businesses are headquartered elsewhere but have local operations. Municipalities in southeast Florida should encourage and facilitate businesses in their efforts to assess their climate risks and adopt resilience measures.

At the same time, a state and local policy environment that provides resources to help businesses succeed in achieving their mitigation and resilience goals can make the region more attractive to companies looking to build and expand operations. In the case of businesses with net-zero emissions targets or 100 percent carbon-free power targets, providing access to low-carbon and carbon-free electricity is a fundamental step to enabling development in the region.

FIGURE 1: Corporate Strategies to Advance Community Climate Resilience

These seven strategies represent initiatives that major companies are implementing to support local resilience to climate impacts. They range from projects focused on increasing the resilience of company assets that have benefits for communities, to direct investments in community resilience projects. The strategies represent significant opportunities for major companies to expand on or begin efforts to accelerate community resilience.

Source: An Emerging Blueprint for Companies: Strategies to Advance Local Climate Resilience, Center for Climate and Energy Solutions.

In our 2022 report, An Emerging Blueprint for Companies: Strategies to Advance Local Climate Resilience, C2ES offers seven key strategies for large businesses to support and demonstrate their local-level climate leadership. These strategies include reducing risks of company assets and operations, developing products and services that enable resilience, supporting the resilience of the company's supply chain, supporting community stakeholders in planning for resilience, empowering employees to volunteer to support community resilience, funding community resilience projects through public-private partnerships, and funding community-led resilience initiatives (Figure 1). Companies in southeast Florida that engage in these activities can not only grow their own resilience but also push their private-sector peers, as well as their local governments, to raise ambition and support greater resilience in the region as a whole.

RECOMMENDATIONS

- Municipalities in southeast Florida should encourage and facilitate businesses in their efforts to assess their climate risks and adopt resilience measures.

CONCLUSION

Investing in climate resilience goes hand in hand with smart, long-term economic development. Proactive investments in resilience can support local economic growth and strengthen communities. In southeast Florida, while much progress has been made to date, more work remains ahead to prepare the region for the coming impacts of climate change. This is imperative to protect people and ecosystems from climate-fueled disasters, sea level rise, extreme heat, and other climate impacts, while also reducing risk for public and private investments in local infrastructure and assets. Ensuring these investments focus on equity and on bolstering communities is the best way to create a resilient economy for all residents of southeast Florida.

Other C2ES Resources

Regional Roundtables
https://www.c2es.org/accelerating-the-us-net-zero-transition/regional-roundtables/

What is Climate Resilience and Why Does it Matter?
https://www.c2es.org/wp-content/uploads/2019/04/what-is-climate-resilience.pdf

The Resilience Factor: A Competitive Edge for Climate-Ready Cities
https://www.c2es.org/wp-content/uploads/2020/10/`the-resilience-factor-competitive-edge-for-climate-ready-cities.pdf

The Climate Resilience-Economy Nexus: Advancing Common Goals
https://www.c2es.org/wp-content/uploads/2022/05/the-climate-resilience-economy-nexus-advancing-common-goal.pdf

Climate-Related Financial Risks and Opportunities: A Primer for Local Governments
https://www.c2es.org/wp-content/uploads/2023/01/climate-related-financial-risks-and-opportunities-a-primer-for-local-governments.pdf

An Emerging Blueprint for Companies: Strategies to Advance Local Climate Resilience
https://www.c2es.org/document/an-emerging-blueprint-for-companies-strategies-to-advance-local-climate-resilience/

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ENDNOTES

1 See Center for Climate and Energy Solutions, "Regional Roundtables," https://www.c2es.org/accelerating-the-us-net-zero-transition/regional-roundtables/.

2 SeaLevelRise.org, "Overview: Florida's Sea Level is Rising and It's Costing Over $4 Billion," Accessed December 12, 2022, https://sealevelrise.org/states/florida/.

3 W.V. Sweet et al., *Global and Regional Sea Level Rise Scenarios for the United States: Updated Mean Projections and Extreme Water Level Probabilities Along U.S. Coastlines,* NOAA Technical Report NOS 01 (Silver Spring, MD: National Oceanic and Atmospheric Administration, 2022), https://aambpublicoceanservice.blob.core.windows.net/oceanserviceprod/hazards/sealevelrise/noaa-nos-techrpt01-global-regional-SLR-scenarios-US.pdf.

4 Kristina Dahl et al., *Killer Heat in the United States: Climate Choices and the Future of Dangerously Hot Days* (Cambridge, MA: Union of Concerned Scientists, 2019), https://www.ucsusa.org/resources/killer-heat-united-states-0.

5 Urban Land Institute, *The Business Case for Resilience in Southeast Florida: Regional Economic Benefits of Climate Adaptation* (Washington, D.C.: Urban Land Institute, 2020), https://southeastfloridaclimatecompact.org/wp-content/uploads/2020/10/The-Business-Case-for-Resilience-in-Southeast-Florida_reduced.pdf.

6 Multi-Hazard Mitigation Council, *Natural Hazard Mitigation Saves: 2019 Report* (Washington, D.C.: National Institute of Building Sciences, 2019), https://www.nibs.org/files/pdfs/NIBS_MMC_MitigationSaves_2019.pdf.

7 Susanne Amelie Benz and Jennifer Anne Burney, "Widespread Race and Class Disparities in Surface Urban Heat Extremes Across the United States," *Earth's Future* Vol. 9, Issue 7 (2021), https://agupubs.onlinelibrary.wiley.com/doi/10.1029/2021EF002016; Amy Bailey and Laura Brush, *The Resilience Factor: A Competitive Edge for Climate-Ready Cities* (Arlington, VA: Center for Climate and Energy Solutions, 2020), https://www.c2es.org/wp-content/uploads/2020/10/the-resilience-factor-competitive-edge-for-climate-ready-cities.pdf.

8 Global Entrepreneurship Network, "Miami," *Startup Genome*, accessed December 12, 2022, https://startupgenome.com/ecosystems/miami.

9 Center for Climate and Energy Solutions, *What is Climate Resilience and Why Does it Matter?* (Arlington, VA: C2ES, 2019), https://www.c2es.org/wp-content/uploads/2019/04/what-is-climate-resilience.pdf.

10 Amy Bailey and Laura Brush, *The Resilience Factor: A Competitive Edge for Climate-Ready Cities* (Arlington, VA: Center for Climate and Energy Solutions, 2020), https://www.c2es.org/wp-content/uploads/2020/10/the-resilience-factor-competitive-edge-for-climate-ready-cities.pdf.

11 Laura Brush, *The Climate Resilience-Economy Nexus: Advancing Common Goals* (Arlington, VA: Center for Climate and Energy Solutions, 2022), https://www.c2es.org/wp-content/uploads/2022/05/the-climate-resilience-economy-nexus-advancing-common-goal.pdf.

12 Miami-Dade County, "Chief Heat Officer," Accessed December 12, 2022, https://www.miamidade.gov/global/economy/environment/chief-heat-officer.page.

13 See https://southeastfloridaclimatecompact.org/.

14 State of Florida, "Governor Ron DeSantis Announces Dr. Julia Nesheiwat as Florida's First Chief Resilience Officer," press release, August 1, 2019, https://flgov.com/2019/08/01/governor-ron-desantis-announces-dr-julia-nesheiwat-as-floridas-first-chief-resilience-officer/.

15 Statewide Flooding and Sea Level Resilience, Florida Statues, §§ 380.093, 380.0933, 403.928 (2021) https://www.flsenate.gov/Session/Bill/2021/1954/BillText/er/HTML.

16 Alex Harris, "Florida gets another $404 million for climate change prep. It needs billions more," *Miami Herald*, February 2, 2022, https://wusfnews.wusf.usf.edu/environment/2022-02-02/florida-gets-another-404-million-for-climate-change-prep-it-needs-billions-more.

17 See Florida Department of Environmental Protection, "Resilient Florida Program – Statewide Assessment," Accessed December 12, 2022, https://floridadep.gov/rcp/resilient-florida-program/content/resilient-florida-program-statewide-assessment.

18 Florida Governor's Action Team on Energy & Climate Change, *Florida's Energy and Climate Change Action Plan* (Tallahassee, FL: State of Florida, 2008), https://www.c2es.org/wp-content/uploads/2018/11/FL_2008_Action_Plan.pdf.

19 Preemption over utility service restrictions, Florida Statues, §§ 366.032 (2021) https://flsenate.gov/Laws/Statutes/2021/0366.032.

20 National Oceanic and Atmospheric Administration, "Heat Index," Last Updated November 10, 2022, https://www.noaa.gov/jetstream/global/heat-index.

21 Resilient 305, *Understanding Heat Exposure in Miami-Dade County* (Miami, FL: Miami-Dade County, 2022), https://storymaps.arcgis.com/stories/6f1e91cf8a8e4d5d9bd67525575c042e.

22 See NOAA National Centers for Environmental Information (NCEI), *U.S. Billion-Dollar Weather and Climate Disasters* (Silver Spring, MD: NOAA, 2022), https://www.ncei.noaa.gov/access/billions/.

23 https://crt-climate-explorer.nemac.org/; https://resilience.climate.gov/

24 https://www.fema.gov/flood-maps/products-tools/national-risk-index

25 Verena Radulovic et al., *Emerging Practices in TCFD-Aligned Climate Risk and Opportunity Analysis and Disclosure* (Arlington, VA: Center for Climate and Energy Solutions and WSP, 2022), https://www.c2es.org/wp-content/uploads/2022/03/emerging-practices-in-TCFD-aligned-climate-risk-and-opportunity-analysis-and-disclosure-3.pdf.

26 Verena Radulovic et al., *Emerging Practices in TCFD-Aligned Climate Risk and Opportunity Analysis and Disclosure* (Arlington, VA: Center for Climate and Energy Solutions and WSP, 2022), https://www.c2es.org/wp-content/uploads/2022/03/emerging-practices-in-TCFD-aligned-climate-risk-and-opportunity-analysis-and-disclosure-3.pdf.

27 Amy Bailey and Laura Brush, *An Emerging Blueprint for Companies: Strategies to Advance Local Climate Resilience* (Arlington, VA: Center for Climate and Energy Solutions, 2022), https://www.c2es.org/wp-content/uploads/2022/09/an-emerging-blueprint-for-companies-strategies-to-advance-local-climate-resilience.pdf.

28 Jenny Staletovich, "Weekend flooding spills thousands of gallons of sewage in Miami-Dade," *WUSF*, June 7, 2022, https://wusfnews.wusf.usf.edu/weather/2022-06-07/flooding-spills-thousands-gallons-sewage-miami-dade.

29 New American Economy Research Fund, *New Americans in Miami-Dade County* (Miami, FL: New American Economy Research Fund, 2021), https://research.newamericaneconomy.org/report/new-americans-in-miami-dade-county/.

30 National Consensus Panel on Emergency Preparedness and Cultural Diversity, *Guidance for Integrating Culturally Diverse Communities into Planning for and Responding to Emergencies: A Toolkit* (Washington, D.C.: U.S. Department of Health and Human Services Office of Minority Health, 2011), https://www.aha.org/system/files/content/11/OMHDiversityPreparednesToolkit.pdf.

31 Anne N. Junod et al., *Equitable Investments in Resilience: A Review of Benefit-Cost Analysis in Federal Flood Mitigation Infrastructure* (Washington, D.C.: Urban Institute, 2021), https://www.urban.org/sites/default/files/publication/104302/equitable-investments-in-resilience.pdf.

32 Elspeth Oppermann et al., "Establishing intensifying chronic exposure to extreme heat as a slow onset event with implications for health, wellbeing, productivity, society and economy," *Current Opinion in Environmental Sustainability 2021,* 50:225-235, https://www.sciencedirect.com/science/article/pii/S1877343521000634; See also: American Society of Nephrology, "Statement on Climate Change," April 22, 2022, https://www.asn-online.org/policy/webdocs/22.4.22StatementOnClimateChange.pdf.

33 Miami-Dade County, "Heat Season Campaign," Accessed December 19, 2022, https://www.miamidade.gov/global/economy/environment/heat-season-campaign.page.

34 See United States Department of Labor Occupational Safety and Health Administration, "State Plans," Accessed December 19, 2022, https://www.osha.gov/stateplans/.

35 Amy Bailey and Laura Brush, *The Resilience Factor: A Competitive Edge for Climate-Ready Cities* (Arlington, VA: Center for Climate and Energy Solutions, 2020), https://www.c2es.org/wp-content/uploads/2020/10/the-resilience-factor-competitive-edge-for-climate-ready-cities.pdf; Amy Bailey, *Climate-Related Financial Risks and Opporunities: A Primer for Local Governments* (Arlington, VA: Center for Climate and Energy Solutions, 2023), https://www.c2es.org/wp-content/uploads/2023/01/climate-related-financial-risks-and-opportunities-a-primer-for-local-governments.pdf.

36 Laura Brush and Amy Bailey, *A Federal Policy Action Plan to Accelerate Local Climate Resilience* (Arlington, VA: Center for Climate and Energy Solutions, 2021), https://www.c2es.org/wp-content/uploads/2021/10/a-federal-policy-action-plan-to-accelerate-local-climate-resilience.pdf.

37 Amy Tara Koch, "In Miami, a Pandemic-Fueled Boom," *The New York Times*, July 7, 2022, https://www.nytimes.com/2022/07/07/travel/things-to-do-miami.html.

38 Global Entrepreneurship Network, "Miami," *Startup Genome*, accessed December 12, 2022, https://startupgenome.com/ecosystems/miami.

39 See Microsoft, "Creating a Sustainable Future," Accessed February 3, 2023, https://www.microsoft.com/en-us/corporate-responsibility/sustainability; Google, "Our Commitment to Sustainability," Accessed February 3, 2023, https://sustainability.google/commitments/.

40 Caroline Flammer, Michael W. Toffel, and Kala Viswanathan, "Shareholder Activism and Firms' Voluntary Disclosure of Climate Change Risks," Strategic Management Journal, March 2021, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3468896; Herbert Smith Freehills, *Future of Work: Adapting to the Democratised Workplace* (Sydney, Australia: Herbert Smith Freehills, 2019), https://www.herbertsmithfreehills.com/latest-thinking/the-new-world-of-work-report-warns-of-an-unprecedented-rise-in-workplace-activism-v2.

41 Jane Cheung et al., *Balancing Sustainability and Profitability* (Armonk, NY: IBM Institute for Business Value, 2022), https://www.ibm.com/downloads/cas/5NGR8ZW2.

42 Justin McCarthy, "Environmental Record a Factor for Most U.S. Job Seekers," *Gallup*, April 13, 2021, https://news.gallup.com/poll/346619/environmental-record-factor-job-seekers.aspx.

43 Diane Cardwell, "Home Solar Power Discounts are Worker Perk in New Program," *New York Times,* October 22, 2014, https://www.nytimes.com/2014/10/23/business/solar-energy-discounts-become-employee-perk-in-new-program.html.

44 Reuters Staff, "Bank of America hands out pay hikes, EV perks to U.S. employees," *Reuters,* May 24, 2022, https://www.reuters.com/article/bank-of-america-wages-idUKL3N2XG34S.

45 Scott Neuman, "One Florida community built to weather hurricanes endured Ian with barely a scratch," *WUSF Public Media,* October 6, 2022, https://wusfnews.wusf.usf.edu/weather/2022-10-06/one-florida-community-built-to-weather-hurricanes-endured-ian-with-barely-a-scratch.

46 Babcock Ranch, "A Resilient Community Designed to Weather Any Storm," blog post, October 19, 2022, https://babcockranch.com/a-resilient-community-designed-to-weather-any-storm/.

47 Amy Bailey and Laura Brush, *An Emerging Blueprint for Companies: Strategies to Advance Local Climate Resilience* (Arlington, VA: Center for Climate and Energy Solutions, 2022), https://www.c2es.org/wp-content/uploads/2022/09/an-emerging-blueprint-for-companies-strategies-to-advance-local-climate-resilience.pdf.

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