

Resilience Dialogues for the City of Coral Gables Final Pilot Project Report

Community Context & Process Objectives

The City of Coral Gables occupies just under 13 square miles on the coast of Biscayne Bay south of the City of Miami in Miami-Dade County. The city has 47 miles of coastline and waterways within the city limits. The city's current population of 51,000 people is growing, showing a 9.5% increase early part of this decade. Coral Gables is a relatively affluent community as compared to the other 33 municipalities in Miami-Dade County with median home price for owner-occupied residences at \$621,800. Coral Gables is largely built-out with few significant parcels left undeveloped.

The city is home to the main campus of the University of Miami, a major employer that attracts its workforce and student body from across the county. Further, the city's geographic location between the urban core of Miami and several communities to the south creates major through-traffic within the city during peak travel times in the mornings and evenings. Through the city's sustainability and other planning processes, Coral Gables seeks to promote greater density in its downtown and increased transportation options, both locally within the city and for those traveling through the city from points north and south.

As the home of the University of Miami, the city seeks to leverage its highly-educated and multilingual workforce, its livability and its proximity to the region's many amenities and infrastructure to attract businesses engaged in international financial services, innovation economy sectors and other high wage sectors. The city seeks to protect its high standard of living and the natural/cultural amenities that support it from sea level rise, challenges in storm water management and interior flooding, and other impacts of climate change.

At present, the city staff is very early in thinking about adaptation and has yet to identify specific priorities for action. City staff expressed their hope to use the Resilience Dialogues process to orient themselves for the next steps in assessing vulnerabilities at the city scale to be following by the development of specific adaptation strategies.

Key Questions for Coral Gables

Prior to the beginning of the Dialogue, city staff submitted a list of key questions as follows:

1. What recommendations are there for dealing with the topography and the porous limestone bedrock of South Florida when it comes to dealing with the effects of sea level rise?
2. With regards to future sea level rise estimations, what is the recommended forecast (high, medium, or low) that South Florida communities are encouraged to plan for? In addition, what is the consensus on the timeframe in which South Florida would/could become inhabitable due to effects of sea level rise (flooding, freshwater contamination, etc.)?
3. What is the best climate model that currently exists for South Florida municipalities to use as a guide for planning?

4. What mitigation and adaptation strategies currently exist for South Florida communities to begin implementing?
5. What funding mechanisms, if any, currently exist from the state and federal government (i.e. resilience fund) for municipalities to begin implementing the aforementioned mitigation and adaptation strategies?
6. What public policies are municipalities enacting to help combat the effects of Sea Level Rise?
7. What partners, in addition to those Coral Gables is already working with within the SE Florida Regional Climate Compact, should we be reaching out to for assistance in dealing with sea level rise?
8. What best practices and strategies exist with regards to education/outreach to residents, businesses, employees, and visitors of our community?
9. How are other communities dealing with the demand for new construction/development and capital improvements in the riskiest and most vulnerable areas for sea level rise?
10. How are municipalities, counties, states and the federal government working with insurance companies to provide adequate coverage for high risk areas and planning for the future increased risk?

During the course of the Dialogues, we organized these 10 questions into five primary categories to better organize contributions from participants:

1. Tools and datasets for assessing vulnerabilities within Coral Gables
2. Locally appropriate adaptation strategies and funding mechanisms
3. Partners for assessing vulnerabilities and adaptation strategies
4. Community outreach & engagement
5. Engaging insurers and risk managers

The balance of this final report is organized around these five categories and details the many contributions, resources and suggestions made by participants for convenient access by the Coral Gables team.

Tools and datasets for assessing vulnerabilities within Coral Gables

In response to city questions about which climate models to consider, Kathy noted that:

“Most adaptation professionals don't recommend the use of a single climate model for planning purposes, and if there is a "best fit" model probably someone like Ken Kunkel at NOAA can help. The most important thing to understand in trying to enhance resilience in the region is general trends, some of which are extremely well understood, while others are more dominated by natural climate variability than by long-term climate trends. For example, temperature increases are clearly already underway and expected to continue, and sea level rise is in the same category. Precipitation is less clear on a year to year basis, and more is known about trends in some seasons than others - but this understanding is based on information from a wide range of models and scenarios, not from a single model. So it is good to talk to people in the region who have a broad perspective on model outputs and scenarios rather than pick a single one!”

With respect to sea level rise projections, participants noted general several points:

- Kathy observed generally that: “There has been a lot of work on this topic, in Florida and elsewhere. I would recommend the National Climate Assessment special report on Sea Level Rise Scenarios on the globalchange.gov website. To answer the question more directly, the majority of sea-level rise related damage is associated with extreme events and storm surges, not with normal high tides (though there are damages there as well). So the real question is not which level to prepare for, but how risk averse is the community? To minimize long-term costs in such a vulnerable area, it seems prudent to plan for the worst case scenario, but a series of economic and social/community value tradeoff scenarios should probably be developed that include a range of options, eg how quickly can a planned retreat from the coast be accomplished (along with all of the associated infrastructure) vs. fortifying at least some existing facilities in ways that don't cause a range of maladaptive impacts on surrounding communities and ecosystems.”
- Don noted that “it is important to realize that it is quite possible that the SLR over this century may not be scenario dependent. Our current models of the global climate system underestimate the observed changes in land ice being seen. So I would tend to assume the highest level we gave there for policy considerations, roughly 4 ft, plus one needs to account for projections in the height of the land mass. The changes are expected to increase nonlinearly throughout the century. It would be a mistake to assume a linear change.”
- Adam noted that “this question would be more helpful if broken into two parts. 1) What is the city's risk tolerance (as espoused in official planning documents)? and 2) Given this risk tolerance, what threshold (or thresholds) of sea level rise is most important in terms of the expected damages that the city wishes to avoid? Then the question changes from "what is the most likely amount of sea level rise by year X", to "what is the chance that a sea level rise of Y will occur by year X?" Deciding what that risk tolerance is most likely the most difficult part, since it involves elected and appointed officials making those value judgments that (hopefully) reflect the collective views of the city's residents. I saw in another thread that perhaps some language to this effect had already been added to the comprehensive plan? If so, then you are way ahead of almost every other municipality in the U.S., and it really is a matter of taking Don's advice and picking the best available projections and calculating the probability of exceeding the relevant sea level rise threshold.”

Turning to local resources, Obey noted that “the Unified Sea Level Rise projections available from SE Climate Compact website is the current "standard" for projecting future sea level for planning purposes. Its application at a particular location requires some guidance. The sea level rise curves need to be tied to a local survey datum. NOAA tide gages can help in that.” The Compact’s Unified SLR projections are available [at this link](#).

Regarding saltwater intrusion and the potential impact on groundwater elevations can be simulated using the [county-wide groundwater models](#) developed by US Geological Survey for the Water & Sewer Department of Miami Dade County. This model can be useful for determining both the saltwater intrusion front and the increase water table in the region. The regional water control structures are being reviewed by SFWMD for determining their effectiveness under future sea level rise.

Miami Dade County provided – via DropBox - the original shape files used by the Compact counties that assessed 1, 2 and 3 ft inundation levels against a county-level parcel map. Katie also provided links to the following to address storm surge and salt water intrusion into the Biscayne Aquifer:

- [Miami-Dade Surge & Flood Modeling](#)
- [Chloride Historical Graphs](#)

- [Salt Front Monitoring Program Annual Report](#)

Josh noted that “the NOAA Office for Coastal Management's nationwide sea level rise mapping effort, provided through the [Digital Coast platform](#) provides a web-based mapping viewer for visualizing potential inundation from sea level rise (current MHHW - 6 feet). In addition to the viewer, access is provided to the underlying data sets - both the DEMs and the inundation surfaces. The U.S. Department of Energy recently completed a study in which they applied the inundation data sets to an assessment of coastal energy infrastructure (to include the Miami MSA as a pilot area). The techniques employed could be used to perform a first cut assessment of critical infrastructure vulnerability. More information can be [found here](#).

Locally appropriate adaptation strategies and funding mechanisms

The Dialogue detailed several sources of regionally appropriate adaptation strategies to serve as examples for adaptation planning in Coral Gables

- The [Compact Regional Climate Action Plan](#) contains 110 recommended adaptation & mitigation strategies for implementation by cities & counties in SE FL. Under the [documents page](#) on the Compact website, you'll find several guidance documents developed to support city implementation of some of these strategies. Also note the [Compact's RCAP Database](#) that profiles city-level efforts in implementing these recommendations including links to ordinances and plans.
- Other jurisdictions in SE FL have been focused on setting the policy context for project implementation by amending comp plans to include either a new climate element ([Broward & Monroe](#), for instance) or integrating climate considerations into existing sections in the comp plan (Miami-Dade) - another model to consider is Fort Lauderdale's integration of climate adaptation into their [municipal 2035 Vision document](#) & [municipal strategic plan](#) under separate cover to set the stage for incorporation into the capital budget process. Likewise, Miami-Dade is integrating SLR analysis into its capital budget process as well.

With respect to adaptation funding mechanisms, Russell and Tom offered thoughts:

- Josh noted that a comprehensive set of funding opportunities can be found through the [U.S. Climate Resilience Toolkit](#). Josh noted that an additional resource noted included “is the Economic Development Administration's Comprehensive Economic Development Strategy (CEDS). CEDS was recently updated to include economic resilience as a focus area and is a precondition for several EDA grant programs.”
- Tom noted that much of the burden for adaptation will often fall to local governments. Thus, Florida Sea Grant assembled [a summary](#) of some of the ways that local governments in the state already fund infrastructure. The document's introduction briefly touches on the topic that Teddy is getting at about tax base and potential assessments when it compares policy options that specifically place more of the economic burden of adaptation on the properties most at risk and in need of adaptation infrastructure versus policies that spread the economic burden across all properties regardless of their vulnerability, thus subsidizing the most vulnerable properties.

Partners for assessing vulnerabilities and adaptation strategies

The most obvious partners for Coral Gables include Miami-Dade County and the Regional Climate Compact. Other thoughts offered include:

- Jennifer noted that “One opportunity might include engagement in the south Florida Resilient Redesign Workshops organized by the Compact or participation in the RAND Corp study. Whether the City is the focal area or not, the design concepts that emerge from these collaborations are generally relevant to a broader landscape and the City might be able to position itself as the focus area for a future study of this kind. Collaborations with our academic partners could also be useful as they are frequently looking for study sites for various design challenges. I think a more comprehensive vulnerability assessment would be the first priority as this is what is needed to inform the adaptation strategies. Absent a partnership, there are a number of individuals engaged in consulting who have conducted informative analyses for other local governments, with support in integrating recommendations in the comprehensive planning process. Some such studies have been conducted for municipalities in Monroe County. It might be good to review some of the tools/graphics and study approach used in these assessments to consider if they would be of useful application in the City of Coral Gables.”
- Jennifer also noted that “The USGS has been a great modeling partner in Broward and we have been able to focus on some of the local issues with cost share support provided by cities. For example, Hollywood, Fort Lauderdale, Dania Beach, and Hallandale were all cost share partners in the development of variable density and inundation models developed by Broward County but we worked with municipal partners on how to approach sea level rise scenarios and on the flooding and water supply issues of interest to each city, as well as the integration and testing of adaptation scenarios. We are getting ready to cost share with cities on updated flood maps to incorporate sea level rise. USGS or consulting services could potentially be cost shared similarly by entities in Miami Dade.”

Community outreach & engagement

Dialogue participants noted several resources for city staff:

- Mari noted the City of Baltimore as an example of strong public engagement – here’s a [brief summary](#) of their efforts.
- Josh noted that the NOAA Office for Coastal Management provides the [Coastal Flood Exposure Mapper](#) tool through its [Digital Coast](#) platform. The tool supports users undertaking a community-based approach to assessing coastal hazard risks and vulnerabilities by providing maps that show people, places, and natural resources exposed to coastal flooding. Included with the tool are [tips](#) for using the resultant maps in the community.
- Russell noted that the NOAA Office for Coastal Management provides a 90 minute interactive webinar [Seven Best Practices for Risk Communication](#). The webinar introduces participants to seven best practices, numerous techniques, and examples for how to more effectively communicate about coastal hazards, including climate change hazards. Whether you are just starting, or trying to keep people motivated to better prepare for future hazards, applying risk communication principles can lead to more effective conversations and products.
- Cara suggested the following resources:
 - Check out the [Preparation Frame Guide](#) which summarizing polling around impacts, social science research including risk communication, and examples of engagement efforts in the field, many which are related to coastal impacts and SLR in particular. One item referenced that your group may find useful is UCS & Viewpoint Learnings report on SLR dialogue sessions and their ability to overcome polarization and build trust.
 - There is also [a summary](#) of a project we ran in California using visualizations and community dialogues to engage stakeholders around SLR as part of the county’s adaptation planning process. Marin also created the "Game of Floods" to engage

community members in planning. They started with real maps of the county and used game pieces (i.e. sea walls, levees, etc.) to discuss strategies. They evolved the game into an island because when using the real flood maps, community members became too focused on their street, home, etc. versus the larger community.

- The Ocean Project has been developing research and guidance on how to tie ocean and climate issues together. <http://www.theoceanproject.org>
- Katie flagged an [EcoAmerica publication](#) and the [Yale Climate Communication Project](#) as worthy of review.
- Michael observed that “storm surge is perhaps better understood, and experienced, than general sea level rise, and in many ways less controversial. Also the mitigation strategies for surge differ significantly from those for general sea level rise. Surges will occur sooner than the general rise and we are already seeing the effects. We are familiar with hurricane and other storm surge and those impacts, while not as severe as overall rise, can be devastating. The work on "Big Ike" in Houston is a good model for Miami to consider as it covers general rise and storm driven rise.”
- Sarah noted that “[NCAnet](#) is a network of organizations around the country who produce and use information from the National Climate Assessment. It is a space where science producers and users can come together to share best practices and lessons learned on using science to inform decisions and engage stakeholders. The group has bi-monthly calls hosted by the US Global Change Research Program (USGCRP) National Coordination Office. There are also opportunities to get involved in sub-groups, referred to as "Affinity groups," that address topics such as Communications, Climate Projections, Valuation & Risk Management, etc. This could be a great way to connect with other groups and communities working and dealing with similar issues related to climate change across the US.”

Engaging insurers and risk managers

In response to the question on how are municipalities, counties, states and the federal government are working with insurance companies to provide adequate coverage for high risk areas and planning for the future increased risk, Dialogue participants offered several responses to the Coral Gables team.

Locally within Southeast Florida, Jennifer Jurado and Katie Hagemann noted several related events that city staff may wish to attend:

- The Southeast Florida Regional Climate Compact is hosting an RCAP Implementation Workshop on April 28th focusing on climate risk, insurance and economics. Jennifer noted that “This would be a good workshop for the City's engagement. We will be highlighting the concept of Enterprise Risk Management with conversation being supported by financial advisors and risk managers that service the region. Additionally EigenRisk will be represented with demonstrated use of some of the new open source tools that can be used to support this conversation. Finally, RMS is a modeling tool and company used by many local governments. They too have lent expertise to these conversations by providing local level risk modeling, scenario testing, and full community cost benefit analyses. They may serve as another affordable resource.”
- Katie noted that the Chief Research Officer from RMS would be in Coral Gables for a Nature Conservancy event on March 29th and offered to connect city staff. Further, Katie noted three other events:
 - April 1st Greater Miami Chamber of Commerce event (Hilton in Edgewater)
 - April 8th BOMA sea level rise educational track (Mandarin Oriental on Brickell Key)

- May 3rd-5th FAU's sea level rise summit will have a track on insurance (Ft. Lauderdale Hyatt Regency)

Several participants noted the opportunities afforded by the Community Rating System under the National Flood Insurance Program:

- Katie noted that “we have a CRS users group in Miami-Dade County. They usually meet right after the Local Mitigation Strategy (LMS) meetings held quarterly by emergency management. The point person is [Lourdes Rodriguez](#)”
- Russell noted that “recently [Ocala became FL's first Class 3](#) rated CRS community. Prior to this, many folks in FL felt that they couldn't reach the Class 4 level due to some of the prerequisites to get to the at level. Ocala not only meet the Class 4 level but went on to become one of only a handful of communities nationwide to reach the Class 3 level, I think they are highest rated community east of the Mississippi. There could be some potential to learn from some of the things that Ocala did to move from a Class 8 to a Class 3. It may be possible to get someone from Ocala or from FEMA's CRS Program to attend one of the Miami-Dade County CRS users group meeting.”

A related issue was raised by Russell on FEMA FIRM maps and public understanding of what is and is not conveyed in existing risk maps:

“Many areas have recently received update FEMA FIRM maps and many of the coastal regions within the US are just beginning to get their updated maps. It is important to make sure the public understand that these are the best available maps (updated higher resolution topo data, new storm surge modeling, etc.). However, they are based on historical data (historical rainfall patterns and they don't incorporate climate change effects such as changing rainfall patterns and SLR). These new maps could send the wrong message to a community, especially since in many cases the elevations for the VE Zones (velocity zone where we expect to experience waves has gone down in many cases). This lowering of the VE zone and other changes in the 0.1% chance flood (100 year) which could be the result of better topo data, could be giving homeowners a false sense of security. Especially since we know SLR will impact these areas. I am NOAA's rep on FEMA's Community Rating System Task Force and at our last meeting it was mentioned that Broward County, which has been proactive with Climate Change Adaptation planning, got new FIRM maps recently. The new maps reflected significant changes in the 100 year flood plain. As a result a significant number of properties were no longer in the floodplain. As a result, 75,000 properties dropped their flood insurance policies. This is not something we want to see happen. More than likely all of these properties are within a hurricane storm surge zone and could be flooded. This is what we see in many surge events, hurricane and extra tropical (Katrina, Sandy, etc.) that numerous homes outside of the FEMA floodplain get flooded and they had no flood insurance since it wasn't required. In addition, we are trying to tell the public that we need to be worrying about SLR and the changes in rainfall patterns, but these maps aren't really helping and by the time they get updated again it may be too late.”

With respect to tools, Mari Tye suggested [KatRisk](#) and [Oasis](#) as possible online tools for looking at flooding, tidal surge and risk information.

Coral Gables Dialogue Participants

City of Coral Gables

Matt Anderson
Sustainability Specialist
manderson@coralgables.com

Jorge Acevedo
Utilities Director
jacevedo@coralgables.com

Dialogue Facilitator

Steve Adams
Director of Resilient Cities & Regions
Institute for Sustainable Communities
sadams@iscvt.org

Regional Experts

Katie Hagemann
Sustainability Specialist
Miami-Dade County
hagemk@miamidade.gov

Jennifer Jurado
Director, Division of Environmental Planning &
Community Resilience
Broward County
jjurado@broward.org

Teddy Lhoutellier
Sustainability Manager
University of Miami
teddyl@miami.edu

Jayantha Obeysekera
Chief Modeler
South Florida Water Management District
jobey@sfwmd.gov

Thomas Ruppert
Coastal Planning Specialist
Florida Sea Grant
truppert@ufl.edu

National Experts for Coral Gables

Russell Jackson
Senior Coastal Hazards Specialist
NOAA Office of Coastal Management
russell.jackson@noaa.gov

Kathy Jacobs
Director, Center for Climate Adaptation Science
& Solutions
University of Arizona
jacobsk@email.arizona.edu

Josh Murphy
Senior Spatial Analyst
NOAA Office of Coastal Management
joshua.murphy@noaa.gov

At Large Experts that Contributed

Michael Kleeman
Senior Fellow
University of California, San Diego
mkleeman@ucsd.edu

Cara Pike
Executive Director
ClimateAccess
cara@climateaccess.org

Adam Terando
Research Ecologist
SE Climate Science Center
ajterand@ncsu.edu

Mari Tye
Researcher
National Center for Atmospheric Research
maritye@ucar.edu

Sarah Zerbonne
Adaptation Lead
US Global Change Research Program
szerberonne@usgcrp.gov