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# INSITUATIONALIZING CLIMATE PREPAREDNESS IN MIAMI-DADE COUNTY, FLORIDA

## BACKGROUND

Miami-Dade County is a diverse, low-lying county of approximately 2.5 million inhabitants<sup>1</sup>, located along the subtropical stretches of southeastern Florida. Covering 5,040 km<sup>2</sup>, the County is a dynamic, economic and culturally diverse coastal community that is bordered by two national parks: Biscayne National Park and Everglades National Park. The County is comprised of 35 municipalities and a large unincorporated area. There are 156 nationalities represented in the County, with approximately fifty percent of the residents being foreign born and over 100 different languages spoken. Within the County, 62% of the population is Hispanic, 18% are non-Hispanic White, and 18% are non-Hispanic Black. Due to this diversity, Miami-Dade County regularly conducts business in three different languages – English, Spanish, and Creole.

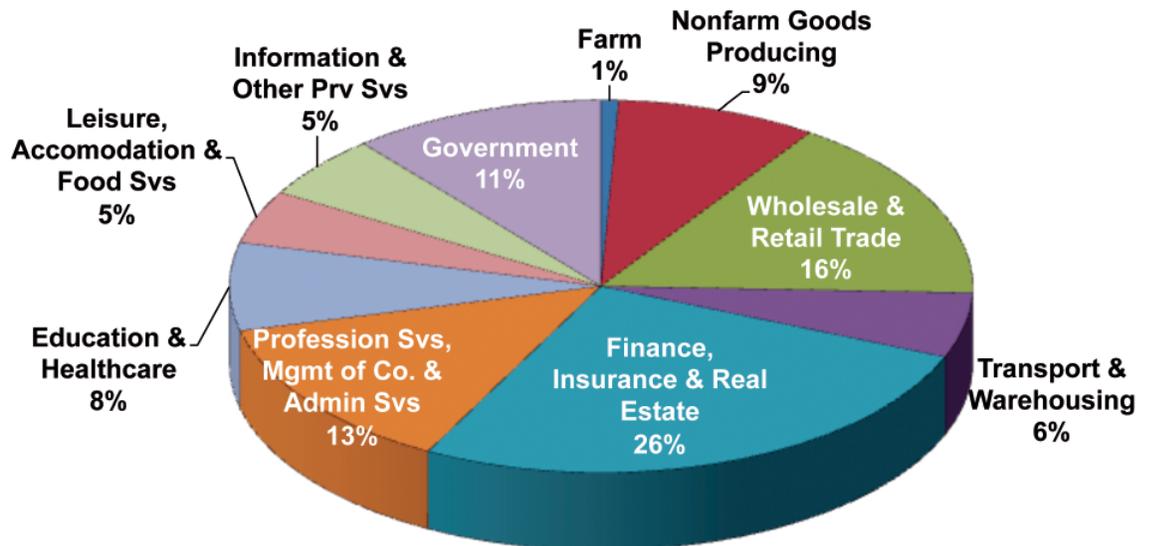


Figure 1: Downtown Miami-Dade County (background) and residential communities (foreground) located adjacent to Biscayne Bay. (Miami-Dade County photograph).

Miami-Dade County has a diverse economy that produces an annual Gross Domestic Product (GDP) of approximately \$111 billion – 90% of which is from the private sector (Figure 2). The largest industries within the private sector are finance, real estate and insurance, accounting for 26% of County-wide GDP. Commerce (which is made up of wholesale, retail, transportation and warehousing services) directly contributes 22% of GDP. Goods producing sectors like manufacturing and construction account for about 10% and Education and Healthcare add another 8%. Hotel, food service, and leisure businesses, a large

Figure 2: Diagram of Miami-Dade County's Gross Domestic Product.

## Composition of Miami-Dade Gross Domestic Product



<sup>1</sup> Miami-Dade County's population is projected to increase to 3.2 million by 2030

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part of the tourism sector, directly account for 5% of GDP, but when things such as air travel, shopping, and the value of the cruise industry are factored in, the economic importance of tourism is much larger than 5%<sup>2</sup>. Government operations contribute roughly 10% to annual GDP. The County government's budget was approximately \$7.8 billion in Fiscal year '09 –'10, comprised of a \$4.7 billion operating budget and a \$3.1 billion capital budget.

Miami-Dade County has a two-tier form of government with the County providing regional services, as well as city-type services, to a large unincorporated area, as well as to some of the thirty-five separate municipalities within the County. These services range from public housing and public utilities to public safety and environmental protection (Figure 3). The County Mayor is elected Countywide and is the administrative head of county government. Mayor Carlos Alvarez, the current County Mayor, appoints all department directors. In addition to a Mayor, the County also has a Board of County Commissioners (BCC), which consists of 13 members elected by the thirteen districts in the County. The Board of County Commissioners is the legislative branch of county government.



Figure 3: Miami-Dade County is a large metropolitan government providing regional services such as transportation, as well as basic city services such as public safety and social services. The County's goal is to integrate sustainability into its entire operations and services.

## A HISTORY OF ENVIRONMENTAL LEADERSHIP

Miami-Dade County has been leading the environmental charge, both domestically and internationally, for over twenty years. Since 1991, the Board of County Commissioners has passed over 100 pieces of sustainability legislation covering climate change, energy and water efficiency, alternative energy and fuels, green buildings, and green jobs. Beginning in 1990, County representatives played an instrumental role at the United Nations World Congress of Local Leaders and aided in the formation of a global organization designed to ensure that the local voice was integrated into international policy making. This organization was created in 1990 as the International Council for Local Environmental Initiatives and is known today as ICLEI-Local Governments for Sustainability (ICLEI).

<sup>2</sup>Dr. Robert Cruz, Miami-Dade County's Chief Economist



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As an inaugural member of ICLEI, Miami-Dade County began participating in the Cities for Climate Protection (CCP) campaign in 1993 and started working to reduce greenhouse gas emissions. Over the course of the next two decades, Miami-Dade County undertook a slew of efforts that have not only solidified their national and international leadership in climate mitigation, but have also established them as a leader in climate adaptation and sustainability. Some notable environmental accomplishments achieved by the County to-date include:

- One of only five local jurisdictions to regulate the sale of stratospheric ozone depleting compounds in 1991
- By 1993, the County had adopted its Urban CO<sub>2</sub> Reduction Plan, which led to a reduction and avoidance of approximately 34 million tons of carbon dioxide (CO<sub>2</sub>) equivalent emissions (roughly equivalent to taking 8.8 coal fired power plants offline for a full year<sup>3</sup>)
- Creation of the Climate Change Advisory Task Force (CCATF) in June of 2006
- Joining the Chicago Climate Exchange (CCX) in 2007 for a fuel-reduction pilot
- Becoming a pilot community in ICLEI USA's Climate Resilient Communities™ adaptation program in 2007
- Creation of an Office of Sustainability in 2007 to streamline environmental, social, and economic efforts
- Establishment of a Sustainable Buildings Ordinance and Program in 2007 to advance sustainable and environmentally responsible planning, design, construction and operation of County buildings
- Committing to the “Cool Counties” goals and objectives, to reduce greenhouse gas emissions by 80% by 2050
- In 2009, Miami-Dade County leapt forward in its implementation efforts with four significant initiatives. These efforts were catapulted forward by the award of \$12.5 million dollars from the federal Energy Efficiency and Conservation Block Grant (EECBG). This has not only facilitated implementation of several energy efficiency and renewable energy projects, but also allowed the County to expand the Office of Sustainability. Concurrently, Miami-Dade County was chosen to pilot ICLEI's Sustainability Planning Toolkit, which initiated the creation of the County's comprehensive sustainability plan, “GreenPrint - Our Design for a Sustainable Future” (GreenPrint). This was also the year the ground-breaking Southeast Regional Climate Change Compact (Compact) was formed, which aligns Miami-Dade County and three other counties in southeastern Florida (Broward, Monroe, and Palm Beach) to regionally collaborate on climate mitigation and adaptation efforts.



Figure 4: Picture of Miami Beach.

<sup>3</sup>EPA Greenhouse Gas Equivalencies Calculator:  
<http://www.epa.gov/cleanenergy/energy-resources/calculator.html#results>

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## A NEED FOR CLIMATE CHANGE ADAPTATION

As a coastal community located at sea level and surrounded by water on three sides, with typical land elevation only three to ten feet above mean high water, Miami-Dade County is acutely aware of the dangers posed by climate change. Climate changes, including sea level rise, increases in temperature, changes in precipitation patterns, and changes in the intensity and/or frequency of extreme events all threaten the health and safety of residents, the integrity of infrastructure, and the vitality of regional ecosystems. In 2007, the Organization for Economic Cooperation and Development (OECD) quantified the vulnerability of various municipalities across the world towards climate change and identified Miami-Dade County as having the highest amount of vulnerable assets exposed to coastal flooding (for the 2070's) with a projected potential cost of approximately \$3.5 trillion<sup>4</sup>.

Moreover, the County's geographical location at the tip of a peninsula, its large, dense population, and the reality that many key economic drivers for the county are weather dependent (e.g. tourism and agriculture), have created a clear impetus to plan for climate change.

To help start with the climate planning process, the County worked with local and regional climate scientists to review regionally specific climate models. These climate models predict an increase in temperature over the next 50 years between 4.5–9 degrees Fahrenheit (depending on the greenhouse gas emissions scenario), with a notable increase in the number of days over 90 degrees<sup>5,6</sup>. The greatest temperature increases are expected during the summer months – which can have significant implications on energy demand, exacerbate heat waves, and lead to greater evapo-transpiration, resulting in an impact on water supply, as well as local agriculture. These increases in temperature could also lead to more heat related illnesses and



Figure 5: Flooding from October 2010 high tide event.

<sup>4</sup>Nicholls, R.J., Hanson, S., Herweijer, C. et al. (2007). Ranking of the world's cities most exposed to coastal flooding today and in the future. OECD Executive Summary Report.

<sup>5</sup>Karl, T.R., Melillo, J.M., and Peterson, T.C. (2009). Global climate change impacts in the United States. Cambridge University Press.

<sup>6</sup>Nakićenović, N. and Swart, R. (2000) Special report on emissions scenarios: A special report of Working Group III of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, UK, and New York.

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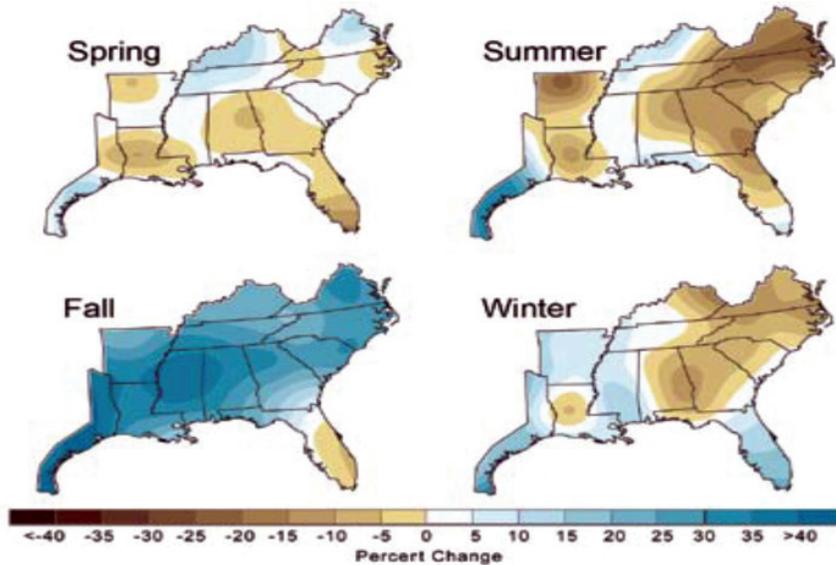


Figure 6: Observed Changes in Precipitation 1901 – 2007. Source: Karl et al., 2009.

deaths, the spread of disease vectors, shifts in agricultural production and growing areas, droughts and excessive crop damage, and affect the viability and habitat of native plant and animal species.

Changes in precipitation are also likely to have significant impacts in the greater Miami–Dade County region. Figure 6 demonstrates that in South Florida, there is generally less precipitation during the fall and spring, and generally more in the summer and winter. The darker the color, the greater the percent change since the early 1900's. In the future Southeast Florida is likely to see up to 20% less rainfall<sup>7</sup>.

Moreover, locally derived data indicates that there has been an increase in heavy downpours in the region and an '09 report by the Florida Oceans and Coastal Council<sup>8</sup> indicates this trend is likely to increase in



Figures 7 and 8: Flooding from June 2009 (left) (photo courtesy of Eric Blake, National Hurricane Center) and low river flow (right)

<sup>7</sup> 2007 report by the IPCC

<sup>8</sup> Florida Oceans and Coastal Council. *The effects of climate change on Florida's ocean and coastal resources. A special report to the Florida Energy and Climate Commission and the people of Florida.* Revised Jun. 2009. Tallahassee, FL., 2009: 34. Print.

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the future. As example, on June 5, 2009, the County experienced a sample downpour in which 9.3 inches of rain fell on South Beach, almost all within a three hour window of time. This inundation of rain resulted in as much as 3 feet of standing water on streets and garages and lead to stalled cars and road closures. However, while the region may experience periods of heavy downpour, these periods are likely to be combined with longer dry spells (or droughts) (Figures 7 and 8). Droughts are of serious concern for Miami-Dade County. From November 2008–April 2009 South Florida experienced the second driest period on record which led to severe to extreme drought conditions and the spread of wildfires (i.e. in Collier County more than 30,000 acres burned during this time frame). Moreover, during this time (December 2008–February 2009), Miami and Fort Lauderdale experienced the driest winter on record, with rainfall amounts of 0.74 and 0.39 inches, respectively.



Figure 9: Beach erosion from coastal storm.

Hurricanes and tropical storms are also important weather patterns Miami-Dade County is taking into consideration. While the science and predictions are still uncertain regarding climate change effects on hurricanes, it is generally thought that the frequency of storms may decrease, but the intensity may increase. For Miami-Dade County this means the possibility of more intensive storms that could cause more widespread damage to infrastructure (buildings, powerlines, water and sewer lines, etc.) and social systems. More intense hurricanes and tropical storms also mean a heightened threat of beach erosion and the degradation of natural habitats. Additionally, more intense tropical storms/hurricanes combined with sea level rise could mean increased migration from nearby island nations, which will bring additional strain on County systems and infrastructure, not to mention creating strain on cultural systems within the community.

Another notable area of climate concern for Miami-Dade County is sea level rise. According to NOAA, the mean increase in sea level trend at the Key West tide gauge was approximately 2.24 millimeters per year from 1913 to 2006, which is roughly equivalent to a change of 0.73 feet in 100 years<sup>9</sup>. Many scientists believe this rate may dramatically increase due to polar ice cap and glacial melt, in addition to thermal expansion resulting from increased ocean temperatures. The resultant sea level rise is expected to exacerbate coastal and inland flooding, as well as erosion, which the region is particularly vulnerable to along the beaches (Figure 9), coastal habitats, and within Everglades National Park. The County currently spends approximately six million dollars annually in beach restoration efforts, which would likely increase as sea level rise increases.

In addition, sea level rise could also lead to increased storm surge damage, population displacement, damage to infrastructure, and the spread of infectious diseases. At-risk infrastructure includes utility infrastructure along the coast such as water treatment plants, electric plants, transportation corridors, and landfills, all of which provide critical municipal services. Furthermore, storm surge inundation and high wind impacts from tropical storms are additional issues of concern for the social, political and natural systems of the County.

<sup>9</sup>United States. Dept. of Commerce. National Oceanic and Atmospheric Association (NOAA). Tides and Currents, Mean Sea Level Trend, 8724580 Key West, Florida. Center for Operational Oceanographic Products and Services, 9 Sep. 2008. Web. 15 Aug. 2010.

< [http://tidesandcurrents.noaa.gov/sltrends/sltrends\\_station.shtml?stnid=8724580](http://tidesandcurrents.noaa.gov/sltrends/sltrends_station.shtml?stnid=8724580) >

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Sea level rise also poses many significant water-related challenges for Miami-Dade County. The substrate in the Southeast Florida region is composed of porous limestone which is extremely transmissive, allowing water to move freely between the pores of underground rock. At present, the County's sole source for drinking water supply is the Biscayne Aquifer, located just a few feet below the ground surface. Because of the porous nature of the substrate, the Aquifer is not only susceptible to contaminants, but is also hydrologically connected to the ocean and therefore susceptible to saltwater intrusion (Figure 10). As sea level rises, hydrostatic pressure will cause the saltwater front to move further inland, threatening contamination of drinking water wells with saltwater.

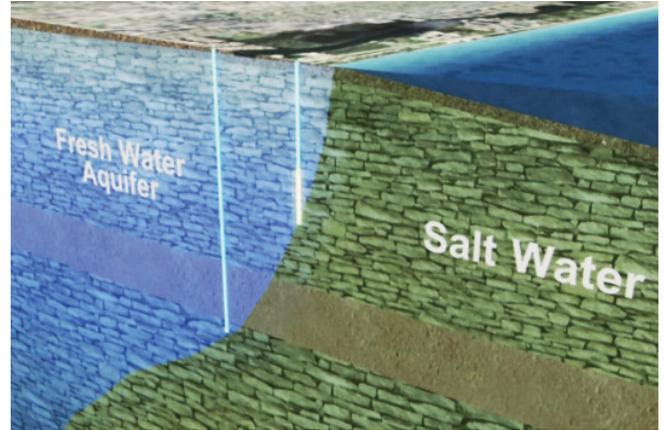


Figure 10: Graphic depiction of interaction of Biscayne Aquifer to surrounding salt water. Image courtesy of South Florida Water Management District.

The local substrate and changes in the water table also pose difficult challenges in regards to protecting the surrounding communities from flooding. As sea level rises, the ground water table will rise closer to the surface, reducing the capacity to absorb stormwater and run-off during heavy rain and storm surge events, as well as progressively compromising the effectiveness of the gravity-driven wastewater and storm water infrastructure. Furthermore, the porous nature of the substrate also precludes traditional methods of constructing barrier walls to stave off rising ocean waters.

While direct impacts from sea level rise and coastal flooding are clear motivators for climate adaptation planning in Miami-Dade County, there are several other issues of concern. One notable example is the agricultural sector, which contributes roughly \$2.5 billion annually<sup>10</sup> to the County's economy, and can be significantly impacted by weather and climate change. Changes in precipitation and temperature patterns, as well as soil salinity from salt water intrusion, can change the type and range of plants and crops that can be grown. Additionally, heavy rain events and freezes can lead to extensive crop damage. For example, the January 2010 extended cold weather and freeze led to over \$280 million in agricultural losses<sup>11</sup>. These climate stressors, combined with increasing pressure from development and population growth could pose significant impacts to the County's agricultural future.

## PREPARING FOR CLIMATE CHANGE WHILE ADVANCING LOCAL SUSTAINABILITY

Recognizing the increased urgency for dealing with climate change, the County created a formal Climate Change Advisory Task Force (Task Force) that has been instrumental in providing guidance and recommendations on both adaptation and mitigation issues to the Miami-Dade Board of County Commissioners. Created in June of 2006 through the adoption of Ordinance 06-113 sponsored by Commissioner Natacha Seijas, the Task Force includes 25 appointed members and



Figure 11: Miami skyline.

<sup>10</sup> Estimated economic impact, for Miami-Dade County, according to the University of Florida Institute of Food and Agricultural Sciences (UF/IFAS)

<sup>11</sup> ibid

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over 150 additional individuals who represent key sectors of the community, such as non-profit organizations, universities, building and architecture firms, national parks representatives, regional and state planning agencies, private sector business, federal partners and community residents.

Seven sub-committees were formed to focus on key areas of concern with the County; each chaired by a member of the Task Force and comprised of participants from the Task Force and the public. The seven committees include:

- Built Environment Adaptation
- Economic, Social, and Health
- Alternative Fuels and Transportation
- Energy and Buildings
- Science Committee
- Intergovernmental Affairs
- Natural Systems Adaptation

Meeting monthly, the Task Force has been a vehicle for community engagement in the County's climate change efforts, ensuring that voices from important community sectors are integrated into long-term

adaptation and mitigations strategies. While the Task Force does not have the authority to make decisions, it does provide critical input and feedback, and helps to facilitate support from the community. To date, fifty-seven recommendations have been forwarded to the Board of County Commissioners and several are already being implemented. Sample activities already underway in the County that have been recommended by the Task Force include:

- The County Manager met with key department directors in the fall of 2008 and began the discussion of how to start incorporating climate change planning into department strategic plans. The County partnered with the National Oceanic and Atmospheric Association (NOAA) in March 2010 to provide an initial introduction and training for climate adaptation to department heads and operational staff to expedite this process.
- Through the Southeast Florida Regional Climate Compact's Regional Vulnerability Assessment Technical Work Group and NOAA, the County and Compact partners have been working with the U.S. Geological Survey (USGS) and the U.S. Army Corps. of Engineers (USACE) to build consensus on climate vulnerability and sea level rise mapping and planning parameters, utilizing regional digital elevation data and models. This information will be used in conjunction with Miami-Dade County's Stormwater Master Plan to identify flood hazard prone areas and create planning maps and tools for use in the comprehensive planning and zoning process.
- County staff has contacted the National Park Service (NPS), U.S. Geological Survey (USGS), Everglades National Park (ENP) and the South Florida Water Management District (SFWMD) to establish a team to work on a Pilot Program to assess the feasibility of using existing monitoring efforts and the information collected during this monitoring as indicators or "vital signs" of climate change.
- The Evaluation and Appraisal Report that will be going to the Board of County Commissioners in January 2011 includes a recommendation for the County to initiate an analysis on climate change and its impacts on the built environment with an eye towards addressing development standards and regulations related to investments in infrastructure, development/redevelopment and public facilities in hazard prone areas.



Figure 12: Everglades National Park.

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- The Evaluation and Appraisal Report that will be going to the Board of County Commissioners in January 2011 also includes a recommendation for the County to establish Climate Change evaluation criteria, to be used to evaluate proposed new development and redevelopment or assess the suitability or proposed use(s), density and/or intensity of use(s), and the level or risk of exposure to climate change impacts, among others.
- County staff has begun working with the Epidemiology, Disease Control and Immunization Services program of the Miami–Dade Health Department to create a working group to track and analyze potential climate change-related health impacts.
- The Office of Sustainability is working with the Museum of Science, Department of Cultural Affairs, and the Library Department to create and fund educational exhibits on climate change and sustainability in the region’s museums.

In addition to providing specific climate mitigation and climate adaptation recommendations, the Task Force is coordinating activities with the Office of Sustainability to help ensure that climate concerns are integrated into the County’s soon-to-be released sustainability plan, GreenPrint. Many of the other Task Force recommendations are being further analyzed, or incorporated as specific initiatives into GreenPrint. This includes the County’s climate action plan, which is an integral component of GreenPrint that will address both mitigation and adaptation planning and actions. The goal of GreenPrint is to carefully analyze and work through the more difficult issues around community sustainability and to enable the County to move forward and plan in a sensible and calculated manner.



Development of GreenPrint is based on a Sustainability Planning Toolkit created by ICLEI in collaboration with New York City. The Plan is being developed to serve as an overarching community-wide sustainability plan to reaffirm, establish and synchronize the County government and community sustainability goals, initiatives, and measures. It will integrate with existing County efforts and additional community plans and will not only make County government operations greener, but will also improve the community’s overall sustainability and quality of life.

In the development of GreenPrint and the climate protection work, the County is adhering to the following guiding principles:

- The County will lead by example;
- The concept of sustainability will guide policy and decision-making;
- Metrics and targets will be used to define goals and measure progress;
- The County will collaborate with local municipalities and neighboring counties to create a sustainability movement among multiple local jurisdictions;
- Partnerships between jurisdictions and between the public and private sector are necessary to achieve sustainability goals;
- Transparency and accountability will guide the County’s sustainability actions;
- Initiatives in the plan will be designed to be aggressive but achievable;
- The County will ensure the benefits of sustainability policies are equitably distributed to all residents; and
- The plan will reflect community demographics and the economy and include key sustainability components addressing both County operations and the community as a whole.

Overall, the goal of the County is to balance and institutionalize sustainability and climate action by building these concepts and strategies into the county’s standard operations and planning processes.



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## BUILDING PARTNERSHIPS

To further support the County’s sustainability, climate change mitigation and climate change adaptation efforts, the County is leveraging support and engagement from numerous levels and organizations. As ex-

ample, efforts to address greenhouse gas emission reductions are being supported by the federal Energy Efficiency and Conservation Block Grant (EECBG) program. Additional resources are being further leveraged on a regional basis through the U.S. Department of Transportation’s Livable Communities Program, which is a collaboration between the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Housing and Urban Development (HUD). Miami–Dade is one partner in a seven-county regional partnership that was recently awarded \$4.25 million by the Livable Communities Program.



Figure 13: Port of Miami.

This partnership was created through the South Florida Regional Planning Council and the Treasure Coast Regional Planning Council, in order to plan, design and implement a multi-jurisdictional regional plan for sustainable development.

As previously mentioned, the County has partnered with the National Oceanic and Atmospheric Administration (NOAA)’s Digital Coasts Initiative, to train County department staff on potential climate change impacts and implications to County operations. As part of this partnership, NOAA will be developing a case study about Miami–Dade County, which will serve as an example for other coastal communities. Furthermore, this partnership led to Miami–Dade being one of only six localities chosen nation-wide to host a public meeting of President Obama’s Interagency Climate Change Adaptation Task Force, allowing the County to play an integral part in forming national climate policy.

In addition, the County is working directly with the U.S. Geological Survey (USGS), to develop an integrated surface-groundwater model to help better understand the interactions between surface and ground water, and the potential effects of sea level rise on these water resources. The ultimate goal is to develop models for the South Florida region that will allow data and different models between the counties to be exchanged. This approach of tackling climate change issues at multiple levels will continue to be a key to the County’s future success.

Moreover, the County was instrumental in the creation of the Southeast Florida Regional Climate Change Compact, a four-county partnership between Broward, Miami–Dade, Monroe, and Palm Beach Counties focused on enhancing regional collaboration around climate mitigation and adaptation. The Compact partners work collaboratively on:

- Developing a joint policy position urging the United States Congress to pass legislation that recognizes the unique vulnerabilities of Southeast Florida to the impacts of climate change and to further a joint position that includes specific recommendations regarding the allocation of federal climate change funding based on vulnerability to climate change impacts.
- Developing additional legislative policy statements relating to climate change and future legislation to be considered by the Congress of the United States representing, in part or in whole, districts within the area covered by the compact.



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- Developing joint position statements on proposed State legislation and energy/climate policies.
- Developing joint position statements that may be considered by the Florida Legislature for transmittal to the Legislative Delegation representing, in part or in whole, districts within the area covered by this compact.
- Development of a Southeast Florida Regional Climate Change Action Plan that, at a minimum, includes the following components:
  - A baseline of greenhouse gas emissions for Southeast Florida;
  - Strategies for coordinated emission reductions throughout the built environment to include the use of energy efficiency, energy conservation, and demand-side renewable energy resources;
  - Strategies for coordinated emission reductions from the transportation sector to include increased reliance on public transit, emerging vehicle technologies, and advanced biofuels;
  - Strategies for coordinated emission reductions resulting from changes in local and regional land use; and
  - Strategies for the coordinated regional preparation for and adaptation to a rapidly changing global environment based upon regional mapping of projected sea-level rise and any resulting amplification of localized impacts of tropical storm events. Such strategies shall incorporate climate preparation concerns for the regional economy, regional infrastructure and built environment, social and cultural needs, and natural systems within the four counties party to the compact.



Figure 14: Flooding at Matheson Hammock from October 2010 high tide event.

As part of the Compact, each County committed appropriate staff resources and expertise, within budget constraints, to participate in the development of a Southeast Florida Regional Climate Change Action Plan.

## CHALLENGES TO ADAPTATION

Throughout Miami-Dade County's adaptation and sustainability process, the County has faced numerous challenges and overcome many obstacles which have resulted in a series of potential stumbling blocks that other communities should be cognizant of during their climate preparedness efforts:

- **Complexity of Issue:** Climate change is a complex issue with multiple impacts that span all agencies/departments, and all sectors of society. This can be an enormous hurdle to overcome and



Figure 15: Crop damage after freeze in January 2010.

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poses difficulty in conveying the need for action. Communities need to acknowledge this complexity but not let it be a barrier to action.

- Scientific Uncertainty and Timeframe:** One significant obstacle to overcome is determining which climate change projections to utilize for planning from the numerous and varied impact projections that currently exist. The extended timeframe of projected impacts (e.g., 2050, 2100), in conjunction with shorter-term decision-making, create a challenging political dichotomy. This is further exacerbated by the reality that some impacts may not be felt until far into the future but require tough decisions to be made today.
- Scale and Complexity of Data:** Vast amounts of data need to be gathered and analyzed in order to guide decision making. In addition, systems, programs, and security mechanisms need to be created to store and manage this data to ensure data accuracy and integrity. Creation of these systems can be a lengthy and resource-intensive process, but is important for tracking changes and success.
- Competing and Immediate Needs:** Miami-Dade County provides all basic services to residents in the County. Climate change impacts will affect most of these services but can also be seen as a separate priority which creates competition between existing, more immediate needs and the need to take action now to prepare for future challenges. Finding ways to integrate climate concerns into existing community concerns can lessen this competition.

- Current Economic and Budget Constraints:** Communities across the U.S. are currently grappling with how to deliver basic services while facing a severe budget shortfall. Miami-Dade County is no different and is struggling with integrating climate adaptation and preparedness activities into operations, while also dealing with the reality that this is likely to create added burdens on already strained budgets.



Figure 16: Damage after coastal storm.

- Land Use Realities:** Can coastal development really be thwarted? In regards to climate change, it's clear that it should, but how can this become a reality? Making tough land-use decisions will require support from federal, state, regional, and local counterparts, which can be challenging to foster, but will be critical for success.
- Turning Science in to Action:** How does a community translate complicated and often 'difficult-to-understand' issues into action? This, along with effective communication, is the key to moving forward and aggressively addressing and acting on climate change.
- Effective Communication:** The most important stepping stone to climate change policy can often be the most challenging obstacle to overcome. Effective communication is pivotal in dealing with any community-wide issue.

## OPPORTUNITIES FROM CHALLENGES

Miami-Dade County has found that obstacles can become opportunities and it is this perspective that has enabled them to address many of the challenges listed above. The cornerstones in making this happen are effective communication, linkages and partnerships. As previously mentioned, the Climate Change Advisory Task Force has played a significant role in engaging and communicating to both the community and decision-makers. Furthermore, collaboration and communication between staff and members of the climate task forces in other southeastern Florida communities has helped lead to the Regional Climate

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Compact that has become so instrumental in drawing national and international attention, as well as additional resources, to the region. Working together on a regional level allows each county to build upon their individual efforts and helps provide validity when addressing these complex and uncertain climate change issues and projections. This in turn facilitates navigation through the politics and tough decisions that often accompany climate change adaptation planning and implementation, and helps turn science into action.

On yet another level, Miami-Dade County is reaching out and engaging the community through partnerships with a local grass roots organization called Dream in Green. Through this program, homeowners are being educated in a language they can understand and given resources to increase their energy efficiency at home and at work. Participants learn



Figure 17: Aerial view of Bayside.

how their simple actions tie in to the overall picture of climate change and how they, as individuals make a difference which can be amplified across the county, the nation, and even the world. As is often the case, saving money is the hook and this hook is even more effective in the current economic times – once again, turning an obstacle into an opportunity.

Linking climate change information and action to existing programs is crucial – climate change cannot be seen as competing against current needs or it will likely fall to the bottom of priorities due to more immediate needs and the inherent lag time of suspected impacts. This is particularly true during the existing tough economic conditions. Rather, climate change information and action must be integrated into local government planning and standard operations as seamlessly as possible. Miami-Dade has found a good opportunity for this with its hazard mitigation and emergency management planning, as well as stormwater master planning. Since many aspects of these programs also address future projected climate change impacts, this is a natural fit that can improve management of existing hazards and reduce the economic burden from both current and future hazards.

## LESSONS LEARNED

Any local government tackling climate change will have a wide array of challenges to overcome. Because of its long history of climate action, Miami-Dade County has had time to gain experience in tackling many obstacles and learned a few lessons along the way that have been instrumental in creating a culture conducive to adaptation planning. One of the most critical, and perhaps evident lessons learned, is the importance of building upon existing successful efforts. Evaluating and assessing what has already been implemented can provide a solid foundation to move forward from and build upon. This can be anything from existing plans or programs, to stakeholders and stakeholder driven efforts. Miami-Dade County has taken important steps and gained critical knowledge in climate change adaptation through implementation of its existing Stormwater Master Plan and Local Hazard Mitigation Strategy. Because the region has experienced numerous hurricanes over the past two decades, the development of these programs has been critical in anticipating, addressing, and recovering from tropical storm events. As the County began adaptation planning, it became apparent that these programs are also a critical component in a successful climate adaptation plan and are serving as an important foundation as Miami-Dade County moves forward.

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Similarly, greenhouse gas (GHG) emissions reduction efforts must continue in earnest as adaptation proceeds. Even if a local government has not been formally implementing a climate mitigation plan, it is likely that they have taken steps to save money by reducing fuel or energy use. These successful efforts, no matter how small, can again form a foundation to build upon. Greenhouse gas mitigation efforts should expand and intensify as part of the adaptation process rather than being replaced by it and it is important to communicate this fact to the decision-makers and the public. This was one of the first points agreed upon by the members of the Climate Change Advisory Task Force when it was formed, and a committee was established specifically to address this issue. Existing emission reduction efforts were reviewed and numerous recommendations were developed to expand and further these efforts, as well as establish new programs. In addition, Miami-Dade County is leveraging existing initiatives and current federal support through the EECBG Program and others previously mentioned, to expand its mitigation efforts.



Figure 18: Forward-pumping stormwater structure. Photo courtesy of South Florida Water Management District.

Stakeholder involvement from the beginning is essential and it must include both internal (decision-makers) and external (community) stakeholders. While this may also seem self-evident, it is a component that is sometimes bypassed because it can often be challenging and time-consuming. Stakeholder involvement is critically important, not only to generate support, but also to keep initiatives on track and provide checks and balances. Decision-makers are obvious key stakeholders and their buy-in is essential. Experience has shown over and over that without their commitment and leadership, progress and success is highly unlikely. Miami-Dade County has been fortunate to have this support and commitment for many years, as exemplified by its leadership in addressing climate change issues since the early 1990's. Despite this long-standing support, staff made sure upper management and decision-makers were educated on the goals and process of developing GreenPrint from the beginning, and have kept them informed and involved throughout its development. To include public stakeholders, Miami-Dade County has utilized its Climate Change Advisory Task Force and the Mayor's Advisory Board to engage various sectors of the community and gain their support. These groups have provided invaluable input into the development of the climate action plan and GreenPrint through their expert knowledge and experience, and have provided a critical community perspective during the process.

Strategies and plans must be flexible to adapt to new opportunities and overlapping goals. Flexibility is important on several levels. First of all, flexibility facilitates effective incorporation of adaptation policies and strategies into existing programs and initiatives. This is integral to leverage current resources and support, as well as build upon successes. Furthermore, a strategic and effective adaptation plan must also reflect

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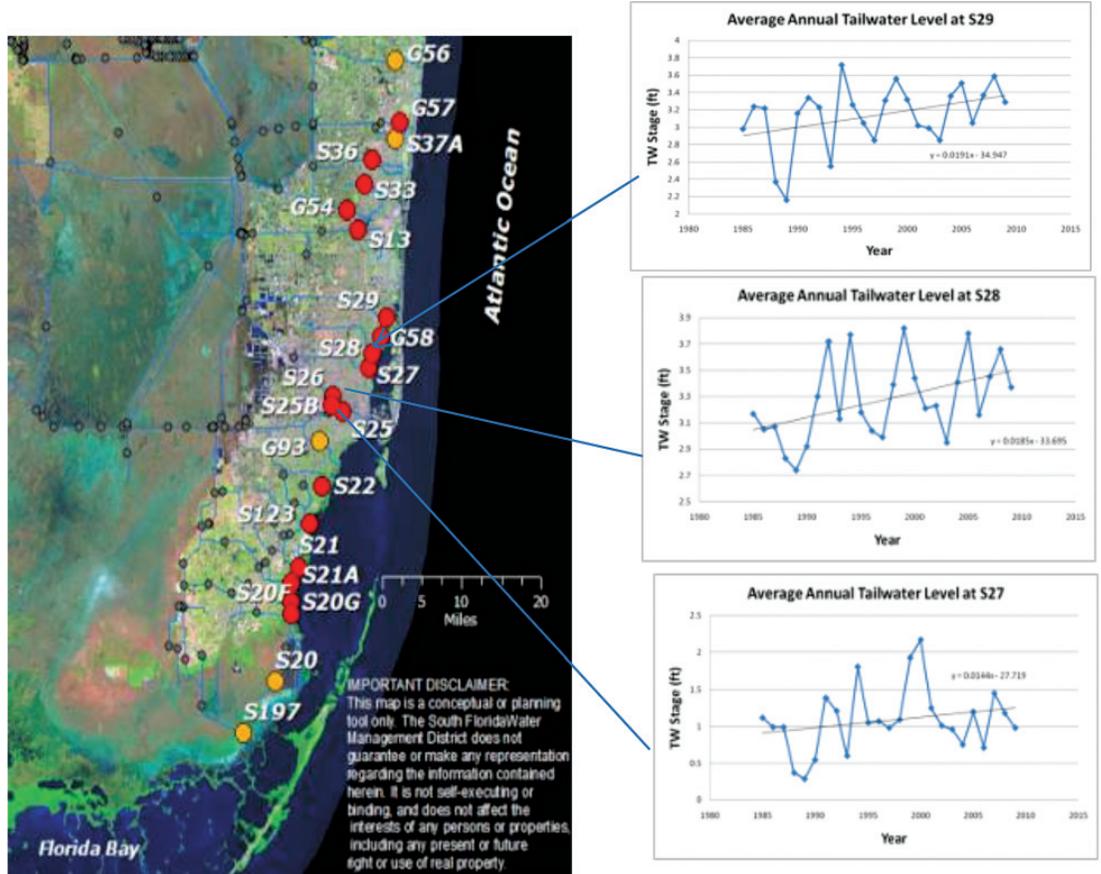


Figure 19: Location of existing coastal structures and the three identified as current priorities for construction of forward pumping stations. Photo courtesy of the South Florida Water Management District.

the latest climate change data and trends, which are constantly changing and being updated. Miami-Dade County will be incorporating new information and data into annual updates of GreenPrint and departments' strategic planning efforts, in order to move forward more effectively and efficiently with building resilience and community sustainability.

Finally, as we see over and over again, local governments can effectively lead in climate adaptation efforts. Rarely has this been more apparent than at this time of strained budgets at all levels of government. Progressive and proactive governments are and should continue to lead the way, rather than waiting for national guidance, resources, and efforts. In this regard, local governments have shown time and time again that they can effectively lead the way when it comes to tackling tough issues – ICLEI members are prime examples and Southeast Florida is leading the way with regional collaboration in the progressive South Florida Regional Climate Compact.

## NEXT STEPS

Miami-Dade County began analyzing and implementing climate mitigation strategies decades before 'climate change' and 'sustainability' became mainstream, and was one of the first local communities to begin actively planning for climate change. Through multiple partnerships and collaborations, the County has established itself as a leader, and has been actively moving forward to make the community more sustainable and more resilient to existing and future projected climate change impacts.

Miami-Dade already has knowledge and skill preparing for certain climate impacts due to their experience of preparing for and recovering from hurricanes. For example, the County already has increased standards

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in building codes to withstand high wind speeds, and has taken measures to improve the overall conveyance of the canal systems for drainage. Moreover, between 2002 and 2006, Miami–Dade County, the State of Florida, and FEMA spent over \$132 million to dredge approximately 120 miles of secondary canals in Miami–Dade County to improve the overall conveyance and drainage capacity of the region. However, more work is needed. The South Florida Water Management District recently conducted a vulnerability analysis of coastal gravity-driven drainage structures in the region and identified three specific structures that have increasing tailwater levels which reduces the discharge capacity (Figure 19). To address this, new forward pumping structures (Figure 18) will be constructed and will be designed with the ability to maintain a certain discharge capacity even with a given amount of sea level rise.

Another key next step for Miami–Dade County is the completion, adoption, and implementation of GreenPrint. As previously mentioned, the County’s climate action plan is an integral component of GreenPrint, and focuses on the first five years for implementation of three specific strategies:

- Track local and regional climate change indicators and trends;
- Develop local and regional climate change scenarios depicting various impacts and time frames; and
- Integrate future climate change impacts into community and government decision-making for capital, operational, and land-use issues – this is the most important and ultimate goal – full integration in decision making.

Slated to be completed in late 2010, GreenPrint will be integral in uniting the County’s environmental, social, and economic concerns into all County operations. As an example, each year in Miami–Dade County, the administration outlines recommended budget priorities for the Board to consider during the budget process. In a memorandum released on January 29, 2010, titled FY2010–11 Recommended Budget Priorities, County Manager George Burgess stated that “a focus on sustainable initiatives must be woven through all of our services and activities.” This institutionalization of climate and sustainability into existing County operations has been one of the most notable areas of success for the County and is something they intend to continue emphasizing.

Regionally, Miami–Dade County will continue to engage with partners of the Southeast Florida Regional Climate Change Compact to develop regional climate planning scenarios. Additionally, the County will continue to collaborate with Compact partners to create the Southeast Florida Regional Climate Change Action Plan, which will be the roadmap for how to reduce greenhouse gas emissions and increase resilience throughout the region.

While Miami–Dade County has repeatedly demonstrated its leadership and commitment to climate mitigation and adaptation, it is clear that significant work still needs to be done. The good news is that Miami–Dade County is determined to minimize risk and build a lasting, climate resilient community.

## RESOURCES

- To learn more about Miami–Dade’s Climate Change Advisory Task Force see: <http://www.miamidade.gov/derm/climatechange/taskforce.asp>.
- To learn more about Miami–Dade’s sustainability, climate, and energy initiatives, see: <http://green.miamidade.gov>
- To learn more about ICLEI’s Climate Resilient Communities program, see: [www.iclei.org/adaptation](http://www.iclei.org/adaptation).

