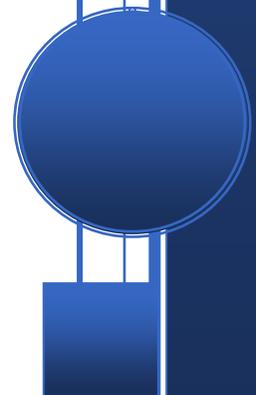


# Second Report and Initial Recommendations

*Presented to  
The Miami-Dade  
Board of County Commissioners  
April 2008*

Miami-Dade County  
Climate Change Advisory Task Force





## MIAMI-DADE COUNTY

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*Mayor*

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*County Manager*

**Robert A. Cuevas Jr.**

*County Attorney*

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## Chairman's Letter

I want to express my sincere appreciation to the Board, the Mayor, and the Manager for the impeccable quality of their appointees to this effort. I am both honored and humbled to be working alongside such a knowledgeable, committed, and distinguished group of individuals.

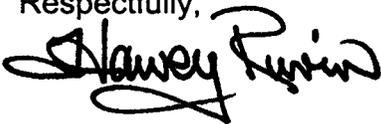
The Climate Change Advisory Task Force's Initial Report (Appendix II) outlines how the Task Force Committees are organized and establishes its work plan. Since July 2007, the Committee members have met regularly in order to share research, listen to expert testimony, and deliberate on recommendations. The Recommendations presented in this report emerged from 48 meetings of the various committees, involving some 175 volunteers and stakeholders, and seven (7) meetings of the full Task Force itself - staff estimates over 5,000 person hours of in-depth presentations and robust discussion.

While resisting an attempt to paraphrase or summarize the specifics to follow (for each recommendation deserves separate focus), I would point out that the Science Committee's Report (Appendix I), which was designed to inform the process, established a clear sense of urgency that permeated the deliberations.

**THE RECOMMENDATIONS COMING FORWARD AT THIS TIME ARE A MERE BEGINNING, WITH MANY TOPICS YET TO BE APPROACHED. BOTH THE RATHER DAUNTING ADAPTATION RESPONSIBILITY AND THE CHALLENGE TO FIND MORE AND MORE WAYS TO REDUCE OUR GREENHOUSE GAS (GHG) EMISSIONS ARE ONGOING TASKS. IN ADDITION, OUR EFFORTS WILL BE LINKING WITH THE FLORIDA ENERGY COMMISSION, GOVERNOR CRIST'S CLIMATE ACTION TEAM, AND NATIONAL AND INTERNATIONAL STAKEHOLDERS.**

We have a critical duty to do everything we can to both manage the unavoidable as well as to help avoid the unimaginable. IMPLEMENTATION of these initial steps, as well as those to follow, may well prove to be the most important legacy the County can leave to the future.

Respectfully,



Harvey Ruvin, Clerk  
Chair, Climate Change Advisory Task Force (CCATF)

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**Appointed Members**

*Clerk Harvey Ruvin, Chairperson*

*Mr. Jim Murley, Vice-Chairperson*

Mr. Leonard Abess, Chairman of the Board, President & Chief Executive Officer, City National Bank

Dr. Adriana Cantillo, Chemist, National Oceanic and Atmospheric Administration (Retired)

Ms. Carolyn Dekle, Executive Director, South Florida Regional Planning Council

Mr. Alan Farago, Executive Director, Everglades Defense Council

Mr. Marcus A. Frankel, President, Frankel Benayoun Architects, Inc.

Mr. Jose Fuentes, South Florida Director, The WREN Group

Dr. Hugh Gladwin, Director, Institute of Public Opinion Research, Florida International University

Ms. Cynthia Guerra, Program Director, Environmentally Endangered Lands, Miami-Dade County Department of Environmental Resources Management

Mr. Dan Kimball, Superintendent, Everglades National Park

Capt. Dan Kipnis, Director At Large, Florida Wildlife Federation

Dr. Stephen Leatherman, Chair Professor and Director, International Hurricane Research Center, Florida International University

Mrs. Nancy Liebman, Former Miami Beach City Commissioner

Mr. Sean McCrackine, Environmental & Land Use Policy Aide, Commissioner Katy Sorenson

Mr. Arsenio Milian, President, Milian, Swain & Associates, Inc.

Mr. Tony Moss, Esquire, Law Office of Tony Moss, Inc.

Mr. Jim Murley, Director, Center for Urban & Environmental Solutions, Florida Atlantic University

Mr. Guillermo Olmedillo, Urban & Regional Planner, OLMEDILLO X 5, Inc.

Dr. Jack Parker, Environmental Studies Department, Florida International University

Mr. Richard Pettigrew, Esq., Former Chair, Governor Chile's Commission on a Sustainable South Florida

Ms. Elizabeth Plater-Zyberk, Principal, Duany Plater-Zyberk & Company, LLC

Dr. Alfredo Ravinet, Research Scientist Asst. Professor, Applied Research Center, Florida International University

Mr. Rafael Rodon, Executive Vice President, Flagler Development

Mr. Manny J. Rodriguez, P.E., Miami Dade Regional Director, Florida Power and Light

Mr. Harvey Ruvin, Clerk of Courts, Miami-Dade County

Dr. Hal Wanless, Professor and Chair, Department of Geological Sciences, University of Miami

*The Miami-Dade County Climate Change Advisory Task Force greatly benefited from professional guidance and early suggestions on organizational structure generously provided by the late Nick Bollman, Senior Research Fellow at the Center for Urban and Environmental Solutions at Florida Atlantic University. Nick was committed to engaging all parts of society in the challenge of addressing climate change. He inspired all of us to see the unlimited opportunities that might come from a united, committed effort by government, business, academia, and not-for-profit organizations.*

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## Initial Recommendations

*These initial recommendations were drafted at the committee level for review by the Miami-Dade Climate Change Advisory Task Force (CCATF). After extensive deliberations and further development, the recommendations were unanimously approved by the full Task Force on March 20, 2008. The items proposed focus on both mitigation activities and adaptation strategies. Mitigation efforts include activities that attempt to slow the process of global climate change by lowering the level of greenhouse gases [GHG] in the atmosphere, such as reducing fossil fuel consumption. Adaptation efforts include proactive steps we can take now to begin the process of making the County more resilient to the impacts that we are likely to experience.*

### **A. Science**

**Initial Statement:** The Science Committee was tasked with providing the Task Force and its Committees with a scientific assessment of the magnitude and timing of expected climate change impacts to Miami-Dade County. This assessment provided the basis for many of the Committees' recommendations. Human-induced global warming is real and has begun. Global warming will result in many types of changes, including changing atmospheric circulation and temperature patterns, changes in rainfall and severe weather, changes in biologic community distribution, increased extinction rates, changes in disease and pest distribution, and changes in sea level. While all these will significantly impact the United States in the coming century, the primary concern for South Florida and Miami-Dade County will be rising sea level. As explained in the attached Statement on Sea Level in the Coming Century (Appendix I), there is a very high likelihood that there will be at least a further 3-5 feet of sea level rise during this century. This rise will most certainly continue at an accelerated rate into the following century. Miami-Dade County will not be able to defend against such a rise and must begin a responsible and serious re-evaluation of all aspects of its present laws and approaches to growth, development, permitting, zoning, infrastructure, waste disposal and pollution, adaptation, and natural area preservation. The following two recommendations are the critical first steps in recognizing the reality of the future and providing a baseline map of elevations from which rational decisions and realistic planning for the future can be made.

#### **Recommendation A.1:**

The CCATF Science Committee's report, Statement on Sea Level in the Coming Century, is provided under Appendix I. The County should use the Science Committee's Statement on Sea Level in the Coming Century to guide future climate change mitigation and adaptation policy.

**Rationale:** *The County must plan for, mitigate, and adapt to climate change even though uncertainty remains in determining which impacts may occur first and the type and severity of the changes. County executive staff and elected leaders need a basic scientific framework to guide them as they begin to formulate policy that properly addresses climate change and associated impacts.*

#### **Recommendation A.2:**

The County should commission detailed maps for all of Miami-Dade County created from calibrated LIDAR (Light Detection and Ranging) surveys (or other elevation survey technology that employs best

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known practices). These maps will show mean high, high water (MHHW) levels for 1- foot through 6-foot rises in sea level. (MHHW level is the spring high tide level which occurs every 14 days around full moon and new moon.) The maps will allow identification of which areas will become flooded in association with different sea levels and will provide a basis for assessing risk to the County's development and infrastructure.

**Rationale:** *Light Detection and Ranging (LIDAR) is a remote sensing system used to collect topographic data. Data are collected with aircraft-mounted lasers capable of recording elevation measurements at a rate of 2,000 to 5,000 pulses per second and have a vertical precision of 15 centimeters (6 inches). After a baseline data set has been created, follow-up flights can be used to detect changes. Calibrated LIDAR maps will detail the elevations of infrastructure and roadway elements throughout the County, determine the susceptibility of coastal, wetland, and artificial fill areas to erosion; define areas of potential pollution and contamination release; determine changing drainage and storm surge risks; assess structural viability of buildings and levees with changing groundwater levels and saline water intrusion; help assess future fresh potable water sources; and define modifications necessary to maintain connectivity of roadways. Note: Some LIDAR mapping has already occurred in the region, undertaken by various entities. These maps need to be assessed for quality and proper calibration.*

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## **B. Greenhouse Gas (GHG) Reduction**

**Initial Statement:** The Greenhouse Gas Reduction Committee is tasked with identifying and promoting ways in which the County can further reduce its Greenhouse Gas (GHG) emissions. This effort was divided into two primary categories – energy conservation and transportation/fuel reduction. While developing recommendations, the GHG Committee took into consideration past and present County “sustainability” initiatives, including policies that facilitate GHG emission reductions. (For more details see the “1993-2006 Long Term Urban CO2 Reduction Plan Report” at:

[http://www.miamidade.gov/derm/library/air\\_quality/CO2\\_Reduction\\_Final\\_Report.pdf](http://www.miamidade.gov/derm/library/air_quality/CO2_Reduction_Final_Report.pdf)

and Miami-Dade County’s recent “Green Government Report” at:

<http://www.miamidade.gov/govaction/matter.asp?matter=070355&file=true&yearFolder=Y2007> .

Due to Miami-Dade County’s recent membership in the Chicago Climate Exchange, the Committee began by focusing on transportation and fuel reduction to develop recommendations related to Miami-Dade County fleet operations. In addition, two recommendations concerning the taxicab industry were included due to a related County Ordinance scheduled for consideration by the Board of County Commissioners in early 2008. The Committee will begin looking into emission reduction opportunities for energy conservation and green buildings in 2008.

While emphasizing efficiency and conservation, the integration of alternative fuels into County fleet operations, namely ethanol and biodiesel, was a major focus of this first set of recommendations. The Committee recognizes that cellulosic ethanol and biodiesel from algae and other more “sustainable” and locally produced crops, while currently unavailable, are preferable as they represent the greatest opportunity for overall greenhouse gas reductions and net environmental benefit. Recommendation B.3 addresses the desire of the Committee to scientifically assess the net environmental benefit of all fuel types. Keeping in mind that the most preferable alternative fuel is a moving target in the rapidly expanding fuel market, however, the recommendations call for the County to consider displacing fossil fuel with alternative fuels at this time, despite sourcing concerns.

### **Recommendation B.1:**

The Climate Change Advisory Task Force recommends that Miami-Dade County ordinances related to the award/allocation of taxicab medallions include a requirement for all new medallions issued after January 1, 2008 to be allocated to hybrid or other vehicles having a combined average fuel efficiency of 28 MPG or higher.

**Rationale:** *The Climate Change Advisory Task Force supports the Consumer Service Department’s (CSD) current efforts to link taxicab medallion issuance to more fuel-efficient vehicles. CSD’s proposed ordinance is expected to be heard by the Board of County Commissioners in April 2008 and establishes an annual lottery of 38 taxicab medallions for a three-year period directed to the South Miami-Dade and underserved taxicab areas. The requirements of this ordinance are in support of one of the major goals of the taxicab reform effort to foster a system of owner-drivers to improve the quality of taxicab services and are designed to align with recent local environmental initiatives.*

*The CCATF would like to encourage the CSD and BCC to strengthen its proposed medallion ordinance to incentivize a higher level of fuel efficiency. About 75 percent of Miami-Dade County’s current fleet of taxicabs is made up of Ford Crown Victoria vehicles, which only get an estimated 17 miles per gallon (mpg) in city traffic. A 2008 Ford Escape hybrid gets 34 mpg and a 2008 Toyota Prius gets 48 mpg (in city traffic). Although a hybrid vehicle may cost more initially, the fuel cost savings and other benefits,*

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*including tax credits and being able to use the High Occupancy Vehicle (HOV) lanes at all times, outweigh the drawbacks. Many new hybrids have been developed in the last few years, and not all of them are fuel-efficient; this is why the recommendation specifies a particular MPG rating.*

*There are several areas in the country with similar taxicab requirements including San Francisco and New York. In addition, on November 9, 2007, the City of Miami Commission approved a resolution urging the County to use hybrid vehicles as part of its taxi fleet. Upon implementation of this ordinance, the County would have the third largest number of hybrid taxicabs in the country.*

### **Recommendation B.2:**

Require that taxicabs being retired in accordance with Miami-Dade County's taxicab retirement schedule be replaced with new hybrid or other vehicles having a combined average fuel efficiency of 28 MPG or higher. Implementation of this recommendation is expected to affect 300 owners each year. The County should develop a financing mechanism to either subsidize the initial purchases or provide a revolving loan fund to assist owners to purchase new hybrids on reasonable terms and at reasonable interest rates. Such an assistance program is urgently needed to alleviate the harsh economic circumstances currently affecting taxicab owners and drivers.

***Rationale:*** *Conversion of the entire taxicab fleet will achieve substantial emissions reductions and save taxicab operators an estimated \$2,500 each year in gasoline costs. These savings can offset part of the cost differential of hybrid purchases. Individual medallion owners are often forced to obtain loans from non-bank sources under onerous terms, including elevated interest rates such as 12%. These costs are passed on to drivers. The recent increase in fuel prices is compounded by the use of older inefficient Ford Crown Victoria vehicles (EPA estimated 17/25 mpg). There is a need to provide individual medallion owners an alternative means of financing these new hybrid purchases. Due to the "pass on" of costs to drivers, many drivers are forced to work very long hours in an effort to realize a marginal profit above operational costs resulting from high costs per-mile-traveled. Miami-Dade County should consider further incentives for conversion to hybrids such as establishing an additional "hybrid-only" lane at the queue at the Miami International Airport. Upgrading our taxicab fleet would also benefit our tourist-dependent economy.*

### **Recommendation B.3:**

It is recommended that Miami-Dade County regularly evaluate greenhouse gas emission reductions and the net environmental benefit of each fuel and vehicle under consideration for purchase and use in internal operations in order to ensure the use of the most efficient vehicles and sustainably-sourced alternative fuels, including those that are locally produced, and adjust investment accordingly. Net environmental benefit shall be determined through the consult of peer-reviewed nationally accepted studies and through the use of evaluation tools, available or to be developed, which will include the analysis of the overall environmental impact of the complete fuel cycle, including land use conversion, feedstock cultivation, raw material extraction, processing, transport, distribution, storage, and combustion. This will be compared to the net environmental impacts of the use of fossil fuels.

***Rationale:*** *While Miami-Dade County is striving to reduce fossil fuel consumption and associated greenhouse gas (GHG) emissions through the use of alternative fuels, it is important to carefully evaluate these alternatives in order to achieve the most GHG emission reductions and net environmental benefits. From an environmental and sustainability perspective, not all alternative fuels are equal. While new federal energy legislation requires at least a 20% net GHG emissions reduction*

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*benefit from corn-based ethanol, the eventual objective must be to achieve much higher benefits such as those anticipated from using sugar cane, cellulosic materials, or algae. Decisions regarding alternative fuels should support Miami-Dade County's overall goal of sustainability.*

### **Recommendation B.4:**

The County's Procurement Management Department should take necessary steps to improve pricing and access to sustainably-sourced alternative fuels and high efficiency vehicles for County operations. This would include forming a joint committee or committees to pursue collective purchasing opportunities and to evaluate the costs and benefits of collective bids. Joint committee(s) could be formed with organizations operating large fleets such as federal, state, local municipal and county governments, airports, large corporations, public school districts, state agencies, universities and large non-profit organizations. GSA, Transit, and other Miami-Dade County departments should participate in collective purchasing committees, as needed, to best meet purchasing needs.

**Rationale:** *The purpose of this recommendation is two-fold:*

- 1. To improve the pricing of and/or access to alternative fuels and high efficiency vehicles for the Miami-Dade County fleet.*
- 2. To encourage the use and improve the accessibility of alternative fuels and high efficiency vehicles throughout the region.*

### **Recommendation B.5:**

The Climate Change Advisory Task Force recommends that as Miami-Dade County fueling facilities are built, modified, or upgraded, they be designed and constructed to accommodate alternative fuels, including, but not limited to, E85 and B100. In addition, the County should consider dispensing E85 at two Miami-Dade County fueling stations within 6 months of it becoming locally available as determined by the process described in Recommendation B.3. It is recommended that Miami-Dade re-evaluate the use of E85 six months after dispensing is initiated to assess local availability, overall net costs and environmental impacts. Furthermore, new vehicles being purchased now and in the future by Miami-Dade County should have the capability of using ethanol and biodiesel, without the need for retrofit.

**Rationale:** *The Climate Change Advisory Task Force supports the County's General Services Administration Department's (a) recent decision to upgrade its fueling equipment at two stations in order to accommodate E85 fuel (in conjunction with required tank replacements that are taking place to comply with EPA 2009 double wall requirements) and (b) future plans to dispense E85 fuel at these two facilities once availability and fuel cost-differential issues are resolved. The CCATF recommendation expands the County's effort by requiring that all fueling facility upgrades incorporate equipment that can accommodate E85, B100, and other alternative fuels. Although only B20 blends are accepted by engine manufacturers at this time, equipment upgrades should be built to accommodate the highest biodiesel blend available, which is B100. In addition, the CCATF recommends that the County begin dispensing E85 fuel at the two upgraded facilities when it becomes locally available.*

*Thirteen percent (940 vehicles) of the Miami-Dade County's light fleet is E85 Flex Fuel compatible. The use of E85 Ethanol in the flex fuel vehicles in the fleet would displace 994,500 gallons of gasoline. There is no firm pricing information available since local vendors don't supply ethanol at this time, but based on an unofficial quote in October 2007 of \$2.49 from a vendor, it is estimated that Miami-Dade County would pay an additional \$790,000 annually for using corn-based E85 transported from the Midwest United States, in the 940 flex fuel vehicles. Other feedstocks for ethanol, such as sugarcane*

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*and cellulosic ethanol are reported to have less adverse environmental impacts than corn-based ethanol. Specifically, cellulosic ethanol, which can be made from the tough, fibrous material found in a variety of materials including herbaceous and woody perennials, wood chips, paper manufacturing sludge, etc. is projected to lower greenhouse gas emissions by 90.9 percent. In addition, cellulosic feedstock can be grown with less fertilizer and water and on poorer quality lands than those currently used to grow crops for conventional ethanol production. While currently there is no commercial production of cellulosic ethanol, there is a general consensus among Committee members familiar with the biofuel industry that cellulosic ethanol will be commercially available in the foreseeable future. In addition to this overall consensus on availability of cellulosic ethanol, Miami-Dade County's Agricultural Manager's Office is working on several local projects to assist in the local production of biofuels. Specifically, the office is assisting local farmers in forming a cooperative to grow and process crops into biofuels, the planting of test crops, and pursuing grants for the production and evaluation of fuel crops.*

### **Recommendation B.6:**

Require the use of sustainably-sourced biodiesel in all County diesel fleet vehicles and equipment (except standby equipment) as determined by the process described in Recommendation B.3, starting with B5 and increasing to B20 in 6 months. The Climate Change Advisory Task Force recommends that a portion of the local option gasoline tax be used to offset the cost difference for biodiesel.

**Rationale:** *Once sustainably-sourced biodiesel is available, this is perhaps the most economical, seamless, and immediately available option for Miami-Dade County to reduce its carbon emissions to meet its Chicago Climate Exchange emission reduction targets. The use of biodiesel, which has experienced a sharp increase in use over the past several years, does not require retrofits of vehicles or changes in fueling infrastructure for blends of up to B20 and is widely reported to provide similar fuel consumption, horsepower, torque, and haulage rates as conventional diesel fuel. Furthermore, there are more than 109 agencies using biodiesel in the southeast region (AL, FL, GA, KY, MS, NC, SC, TN) of the United States alone (<http://www.southeastdiesel.org/Projects%20List/Biodiesel.pdf>). More than thirty (30) of those organizations are county, city, or state vehicle fleets and at least ten (10) are transit bus fleets. A phased-in approach to a B20 blend should address the concerns of providers unfamiliar with handling biodiesel, as well as provide Miami-Dade County the opportunity to monitor and respond to any unexpected impacts of integrating a new fuel, without interruption to the services so essential to its residents.*

*The issue of engine warranty coverage is an important concern always at the forefront of fleet managers' minds. Most major engine companies have stated formally that the use of blends up to B20 will not void their parts and workmanship warranties. This information can be found at [http://www.biodiesel.org/resources/fuelfactsheets/standards\\_and\\_warranties.shtm](http://www.biodiesel.org/resources/fuelfactsheets/standards_and_warranties.shtm) under the "Summary Chart: OEM Biodiesel Statements" link. All diesel engine companies warranty the product they make - engines. Typically, an engine company will define what fuel the engine was designed for and will recommend the use of that fuel to their customers in their owner's manuals. Engine companies do not manufacture fuel or fuel components. Therefore, engine companies do not warranty fuel - whether that fuel is biodiesel or traditional fossil-fuel diesel. Therefore, the most important aspect regarding engine warranties and biodiesel is whether an engine manufacturer will void its parts and workmanship warranty when biodiesel is used, and whether the fuel producer or marketer will stand behind its fuels should problems occur.*

*Finally, it is recommended that Miami-Dade County use a portion of the local option gasoline tax to offset any cost difference for biodiesel. Miami-Dade County's fuel contract price for B20 averaged*

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fourteen (14) cents higher in 2007 than regular (#2) diesel. The prices quoted are provided by the fuel vendors currently under contract with the County. Recently, GSA worked to facilitate future procurement of biofuels by adding additional language to Section 2, Paragraph 2.37 of the Invitation to Bid (ITB) for Gasoline and Diesel fuel. The revised wording of the fuel solicitation allows for the addition of alternative fuels and blends and for the addition of vendors. These changes should result in decreasing the price differential between biodiesel and regular diesel. Biodiesel users have reported minor cost increases, no increase in cost, or actual savings in purchasing biodiesel.

### **Recommendation B.7:**

Require that Miami-Dade County develop a vehicle procurement process, which ensures that vehicles owned by MDC increase their mpg by 5% annually per vehicle class (whenever higher MPG vehicles are available) and that the cost of carbon emissions is included in the life cycle cost analysis process.

**Rationale:** *It is the goal of the Climate Change Advisory Task Force to put forth recommendations that will ultimately result in the reduction of Miami-Dade County's greenhouse gas emissions. One way that these reductions may be undertaken is by increasing the fuel efficiency of the County's fleet vehicles. There are many existing fleet vehicles that do not have the top fuel efficiency ratings in their respective classes. When these vehicles have reached the end of their life cycles/years of service, they must be replaced with a vehicle that has a higher fuel efficiency rating than that of the expiring vehicle. The minimum increase in fuel efficiency must be 5% higher than the most efficient vehicle (within the same vehicle class) purchased in the previous year.*

*This recommendation applies to all Miami-Dade County fleet vehicle classes. Based on information provided by GSA, the Miami-Dade Police Department (MDPD) has 39% of the County's light fleet vehicles, which use 58% of the County's total unleaded gasoline. Therefore, this recommendation shall apply to police department vehicles as well, with implementation starting with non-pursuit police vehicles.*

### **Recommendation B.8:**

The purchase of a hybrid SUV shall be an allowable alternative for Miami-Dade County fleet procurement if that vehicle is determined to be more fuel-efficient than a light truck or other comparable vehicle.

**Rationale:** *Currently, Miami-Dade County is restricted from purchasing SUVs. When this ordinance was passed, there were no hybrid SUVs available. While hybrid SUVs remain less fuel-efficient than other sedan alternatives, there are now several hybrid SUVs on the market with higher fuel efficiencies than the light trucks Miami-Dade County is currently purchasing. If a department justifies the need for a non-sedan vehicle for operational purposes, a hybrid SUV may offer a more fuel-efficient option compared to a light truck.*

### **Recommendation B.9:**

Direct the Office of Sustainability to initiate an energy and fuel conservation incentive and awareness campaign for employees in conjunction with the Miami-Dade County's Resource Conservation Committee, DERM's Pollution Prevention and Environmental Education work groups, and the GSA Department. This campaign should use information from the Chicago Climate Exchange membership, the Climate Change Advisory Task Force (CCATF) Science Committee, and other pertinent sources to

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highlight the environmental, health, and economic benefits of energy conservation and communicate the importance of conserving energy and fuel. The information about energy efficiency and fuel conservation currently provided as part of the Miami-Dade County's New Employee Orientation Program should be expanded to include the campaign components listed above. Funding needs and options shall be identified for the implementation of this recommendation.

**Rationale:** *According to the Alliance to Save Energy, a national leader in energy conservation initiatives, no-cost and low-cost behavioral and operational solutions can reduce energy and fuel consumption by 5-15%. With proper funding and organizational support, a County-wide awareness and incentive campaign will save costs and significantly reduce greenhouse gas emissions generated by the County. This initiative would include trainings for drivers on idling and proper tire inflation and for office workers on energy efficiency and conservation related to lights, computers, and other electronics. It would also include working with facilities, information technology, and fleet managers on operational changes that could improve energy efficiency.*

### **Recommendation B.10:**

The Climate Change Advisory Task Force supports any recommendations put forth as a result of the most recent Miami-Dade County fleet analysis that lead to an increase in fleet fuel efficiency and a reduction in vehicle miles traveled (VMT). The Task Force recommends that the County further strengthen these recommendations by creating incentives to reduce VMT and by not excluding any departments or vehicle types in reduction initiatives. As an example, it is recommended that hybrid sedans be purchased for non-pursuit police vehicles at the time of replacement.

**Rationale:** *See Appendix IV, Miami-Dade County 2007 Review of County Owned Light Vehicles.*

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## **C. Built Environment Adaptation**

**Initial Statement:** The Built Environment Committee's task was to focus on adaptation rather than mitigation strategies. The Committee understands that an appropriate foundation and structure among governmental agencies is necessary before significant mitigation and adaptation investments are made. An early list of the components of the built environment intended to be addressed by mitigation and adaptation actions was set aside in favor of laying the groundwork for the appropriate agencies to identify vulnerabilities and reactive strategies. Thus, topics such as seawalls, raising infrastructure, and private building retrofits among others, although discussed, were not reviewed in any depth. The Committee also discussed mitigation strategies that directly relate to the built environment and that might be good short term regulatory actions; these were documented for future discussions.

### **Recommendation C.1:**

Require all County agencies (and entities that receive County funding for significant infrastructure or built investments) to assess climate change impacts on the agency's/entity's responsibilities. This assessment should be incorporated into their master planning agenda or such a planning process should be initiated if it does not exist. The assessment should include the impact of sea level rise on all public investments and identification of vulnerabilities in order to produce strategies for mitigation and adaptation. These assessments should utilize a 50-year planning horizon.

***Rationale:** It is suggested this mandate utilize a 50 year window for planning (assuming at least 1.5 ft. sea level rise within that time frame and at least 3-5 ft. over 100 years) with interim benchmarks. There is an urgent need to incorporate climate change impacts into all basic planning and permitting. There is also a great need to coordinate action plans among related agencies. For instance, coordination of use and protection of the Biscayne and Floridan Aquifers (by the County's Water and Sewer Department (WASD) and the South Florida Water Management District (SFWMD)) is of critical importance to address the impact of salt water intrusion on the fresh drinking water supply and on vegetation, including agriculture, in the County. The protection of drinking water quality/purity implies increasing the groundwater level to maintain hydrostatic water pressure landside to counter the sea's rise. Higher groundwater changes stormwater drainage functionality and increases inland vulnerability to flooding. The Committee also began initial discussions about how some current capital projects could be impacted by sea level rise and targeted those issues for further discussion and possible future recommendations - for instance, the planning of the new Port Tunnel and how to incorporate the implications of sea level rise projections.*

### **Recommendation C.2: (Note: see also Recommendations D.4 and E.1)**

Use County charter authority to establish minimum criteria and standards related to climate change (including sea level rise), for public investment for all municipalities in Miami-Dade County.

***Rationale:** The County should engage and offer assistance to the municipalities and develop criteria and standards in consultation with them. This effort would encourage each municipality to assess its vulnerabilities and to propose strategies that incorporate climate change into all public investment processes and decisions, including those concerning infrastructure and buildings. Such criteria and standards might include establishing new street grade and building first floor elevation requirements that exceed current County and FEMA standards and would be required for both municipal and county projects.*

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### **Recommendation C.3: (Note: see also Recommendation F.4)**

Expand the mission of the County's Office of Sustainability (OOS), and thus its resources and staffing, to provide a centralized agency for climate change information, monitoring, analysis, and benchmarking. Three activities in particular were identified:

- a.) Establish a base case of information at an identified current or recent past date, to which all ensuing data might be compared;
- b.) Assist in integrating the activities of the various entities including the coordination of data collection so that it can be used across departments/disciplines for analysis and comparison; and determine the appropriate metrics for critical issues;
- c.) Monitor the effects of climate change on Miami-Dade County using the evolving data base, and publish the results for use by elected leaders, public agencies, and the general public.

**Rationale:** *It is understood that a variety of entities and agencies are already collecting and will continue to collect information, but that the OOS would encourage the integration and distribution of this knowledge.*

*The data to be tracked was not fully identified, but might be expected to include population change, emissions levels, salt water intrusion, groundwater levels, vehicle miles per household, total land area of impervious surface, tree canopy, etc.*

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## **D. Natural Systems Adaptation**

**Initial Statement:** Based on the projected impacts of climate change to natural systems in Miami-Dade County, the NSA Committee prepared a Preliminary Draft Report that included recommendations related to the restoration of natural systems; the protection and management of natural, open, and agricultural lands, groundwater, and wildlife and plant species; the development and implementation of monitoring, modeling, and adaptive management approaches; and the establishment of climate change-related partnerships. The main initial recommendations proposed by the NSA Committee are listed below.

### **Recommendation D.1:**

Fully support the Comprehensive Everglades Restoration Plan (CERP), and increase funding and resources for other regional and local habitat restoration and preservation efforts and initiatives.

***Rationale:** Restored ecosystems will be more resilient and better able to adapt to climate change. As such, ecosystem restoration is a crucial component in mitigating and adapting to the effects of climate change in Miami-Dade County. Restoration needs to go beyond the current CERP and include additional degraded habitat and other open space in the County. CERP is expected to provide the proper quantity, quality, timing, and distribution of water to both reduce the potential for saltwater intrusion into the Biscayne Aquifer, the County's principal source of drinking water, as well as provide a healthier natural environment more capable of being resilient to climate change. Additionally, scientific experts have found that the Everglades contains some of the largest stocks of soil organic carbon per area in all of North America and that reductions of these carbon stocks can be minimized by maintaining hydroperiods and implementing an appropriate fire management scheme.*

*Beyond CERP, restoration of additional lands in the County is needed. Remaining undeveloped coastal areas should be restored and preserved. This will allow for habitats to adjust and change with rising sea level and give coastal species the ability to adjust as habitat changes occur. Upland habitat needs to be restored and preserved as well. Fragmentation of upland habitat, such as pine rocklands, creates barriers to species movement. In addition, isolated parcels of these habitats frequently cannot provide all of the necessary components to support plant and animal populations, and are more susceptible to colonization by invasive species. These fragmented areas need to be reconnected.*

### **Recommendation D.2:**

Increase funding and resources for land acquisition and management programs of Miami-Dade County. Investigate new and creative mechanisms to boost funding, such as the creation of a County-administered "carbon credit purchasing" program, as a potential alternative to current development, industry, and government mitigation requirements.

***Rationale:** The retention of natural and open land provides many critical public services such as replenishing drinking water supplies, protecting against saltwater intrusion, contributing to the implementation of regional restoration efforts, conserving native wildlife and habitats, providing recreational space, and sustaining agriculture as a viable industry. Open undeveloped lands, whether currently under some mechanism of protection or not, offer the greatest opportunities to provide for adaptation to the effects of climate change. Different preservation tools must be deployed to offer the greatest amount of protection to existing open lands in public and private ownership. By adopting a*

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*precautionary approach that maximizes the amount of open land retained over time, opportunities to adapt to the effects of climate change are preserved over the long-term.*

### **Recommendation D.3:**

Acquire all undeveloped lands needed for restoration purposes and for mitigation and adaptation to climate change effects. Secure strategic open lands to provide transition zones to accommodate retreat or spatial shifts in natural areas, such as coastal wetlands and freshwater marshes.

**Rationale:** *See Rationale under Recommendation D.2.*

### **Recommendation D.4:** (Note: see also Recommendations C.2. and E.1)

Create a plan to locate infrastructure and development outside coastal or flood hazard prone areas using projections of sea level rise to identify those areas. Describe a transitional zone between the hazard area and the built area to be protected and prohibit incompatible land uses that would convert open lands in the transitional zone. Establish a comprehensive planning and zoning policy, such as development setbacks and limits on density and infrastructure in coastal and transitional zones to consider vulnerability to sea level rise and saltwater intrusion.

**Rationale:** *See Rationale under Recommendation D.2.*

### **Recommendation D.5:**

Encourage the continued funding of the County Agriculture Purchase of Development Rights Program beyond the current funding levels to maintain open lands for aquifer recharge, habitat, and buffers.

**Rationale:** *See Rationale under Recommendation D.2.*

### **Recommendation D.6:**

Provide incentives to study and develop best practices for agricultural management that contribute to carbon sequestration and reduce greenhouse gas emissions.

**Rationale:** *Adaptation to more tolerant tropical crops and crop varieties and migration of more sub-tropical or winter season crops out of the area could mitigate climate change impacts to the agricultural industry in Miami-Dade County. However, compounded with current economic challenges, pest and disease, and a sometimes conflicting regulatory environment, even minor climatic changes would have significant economic and social impacts on local agriculture. That said, agriculture can play a role in helping to mitigate climate change. Currently, Florida forest products and agriculture account for a relatively small percent of the state's overall CO2 emissions; however, these industries represent a great potential to sequester atmospheric CO2. While agriculture is a net producer of greenhouse gases, studies are emerging that show effective management practices such as no tillage or conservation tillage can increase crop yields and stimulate accumulation of soil organic carbon, thereby sequestering CO2 from the atmosphere.*

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**Recommendation D.7:** (Note: see also Recommendation F.2)

Review current stormwater management operations, including the operation of canals and structures, in order to eliminate unnecessary over-drainage and limit the extent of saltwater intrusion into ground and surface water resources. Additionally, require water conservation measures for all users of the Biscayne Aquifer.

**Rationale:** *As sea level rises, there will be a further incursion of brackish water into the Biscayne Aquifer and into freshwater wetland systems. Incursion of brackish water into the Biscayne Aquifer will not only cause a change in habitats from fresh to brackish systems, and potentially cause degradation of habitats through colonization by invasive plant species, it will also endanger the potable water supply of Miami-Dade County. This will be exacerbated by brackish/salt water flowing into canals emptying into coastal waters. In addition, over-drainage of areas via secondary and tertiary canals will reduce the freshwater that is available to recharge the aquifer. Water conservation measures will also need to be part of the strategy. Reduced draws on the Biscayne Aquifer will allow more freshwater head pressure in the aquifer, slowing brackish water intrusion.*

**Recommendation D.8:** (Note: see also Recommendations D.2 and D.3)

Increase funding for County-administered management activities like those programs within Natural Areas Management and Environmentally Endangered Lands. Establish a multi-agency task force to expand County capacity and coordinate conservation activities. Develop a collaborative and integrated approach to conservation involving universities, government agencies, landowners, botanic gardens, zoos, and non-governmental organizations.

**Rationale:** *The natural habitats of Miami-Dade County hold populations of wild plant and animal species that are locally, nationally, and internationally important. As the surviving habitats of the County are increasingly influenced by climate change, we can expect the wild populations of many species to change in both distribution and abundance. Indeed, we can expect that some species will be lost from Miami-Dade County. The projected changes in global temperature will have a number of impacts upon wild species. This will include changes in the ecology of habitats, such as changes in sea level and storm impacts upon coastal strand-line species, the effects of fire on the pine rocklands, and the impact of new invasive species and pathogens on all habitats. Species-specific responses will include changes in behavior in reaction to changing climate. These can include changes in seasonal breeding behavior, changes in migration, and impacts on reproductive success.*

*The importance of Miami-Dade County as habitat for an important range of wild species cannot be underestimated. Miami-Dade County holds important areas of unique Florida habitats such as pine rocklands and tropical hammock, coral reefs, mangrove wetlands, and important areas of a globally unique freshwater wetland ecosystem, the Everglades. Some of these surviving habitat areas are managed by Miami-Dade County (more than 84 natural areas), while others are managed by a wide variety of private owners, non-governmental organizations, and State and Federal agencies.*

**Recommendation D.9:**

Develop a "Vital Signs" monitoring program, following the model of the National Park Service, to serve as a multi-parameter ecosystem monitoring program that will help track climate change effects. Expand current ongoing monitoring efforts, such as those within the Comprehensive Everglades Restoration Plan (CERP), to include specific areas of Miami-Dade County, to provide a better view of how natural areas are changing over time and what forces are responsible. Key parameters may

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include: rate of sea level rise; saltwater intrusion boundary and monitoring wells; landscape-level vegetation patterns; percent coral cover in offshore reef zones; water temperature in reef areas; and occurrence and range of invasive exotic plant and animal species. Dedicate a source of funds to collect information and establish and maintain a long-term data management system.

**Rationale:** *Some of the potential consequences of climate change, such as sea level rise, are predictable, and can be directly monitored and compared to expected outcomes. Other potential responses, such as habitat alteration or loss of species, are less predictable, are poorly understood, or may also be affected by other human causes or natural events. That said, it is also recognized that monitoring everything that seems important is not feasible and that existing local monitoring programs, driven by regulatory requirements and fees, are not designed to address large space and time scales associated with climate change. Therefore, a refined approach, focusing on monitoring a suite of key indicators or “vital signs,” used in conjunction with applied modeling and assessment, is recommended. The effort should build upon or be integrated with regional environmental programs led by State and Federal agencies.*

**Recommendation D.10:** (Note: see also Recommendations D.3, D.8, F.2, and F.3)

Miami-Dade County should establish partnerships, both formal and informal, with other governmental entities, including local, State, and Federal governments; the private sector; non-governmental organizations; and other stakeholders in the County. Partnerships should focus on cooperative efforts to restore existing natural ecosystems; protect natural and open lands; mitigate impacts; and monitor natural systems and indicators of climate change. Partnerships should also be undertaken to effectively practice adaptive management as we increase our understanding over time of the effects of climate change on natural systems in the County and implement management actions to restore and protect natural systems in the County.

**Rationale:** *Partnerships are integral to restoring and protecting natural systems in a time of climate change and to assure the effective implementation of the recommendations of the NSA Committee.*

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## **E. Economic, Social, and Health Adaptation**

**Initial Statement:** A recent study was conducted by a number of international scientists with expertise in climate modeling, risk management, policy and economics. The associated report, *Ranking of the Worlds' Cities Most Exposed to Coastal Flooding Today and in the Future*, by the Organization for Economic Co-operation and Development, lists the metropolitan area of **Miami as the number one most vulnerable worldwide in terms of assets exposed if a 1 in 100 year surge-induced flood event were to happen today and predicts dramatic economic loss estimated at roughly \$416 billion**. Economic losses are estimated to increase to **\$3.5 trillion** by 2070 for this type of catastrophic event. When considering climate change and projected sea level rise, the report lists **Miami as one of the top ten** cities worldwide for population exposure related to coastal flooding for present day conditions. Another study published in November 2007 by Tufts University, *Florida and Climate Change: the Costs of Inaction*, projects **annual costs of inaction totaling \$92 billion** by 2050 and **\$345 billion** by 2100, figures that constitute 2.8 percent and 5.0 percent of the state's projected Gross State Product respectively. These estimates only include economic costs from loss of tourism revenue, increased hurricane damages, at-risk residential real estate, and increased electricity costs and would be even larger if they included other sectors like agriculture, fisheries, insurances, transportation, water systems, and ecosystem damages.

(Webpage URL to the OECD report is <http://www.oecd.org/dataoecd/16/10/39721444.pdf> and the Tufts report can be found via the following webpage URL:

[http://www.ase.tufts.edu/gdae/Pubs/rp/Florida\\_hr.pdf?bcsi\\_scan\\_EAC41357C45D053C=0&bcsi\\_scan\\_filename=Florida\\_hr.pdf](http://www.ase.tufts.edu/gdae/Pubs/rp/Florida_hr.pdf?bcsi_scan_EAC41357C45D053C=0&bcsi_scan_filename=Florida_hr.pdf))

The projected impact of sea level rise and resulting coastal flooding will require all agencies and entities in the County involved in economic development, planning, public health, and water supply to develop a unified and comprehensive response to the challenges of climate change. A key issue is maintaining flexibility in the face of uncertainty about the magnitude of sea level rise. Flexibility conferred by maintaining undeveloped agricultural areas and other open space would be compromised by new development that would require future sea level rise mitigation or would put current and future investments in public infrastructure at risk. Unwisely building in at-risk areas will precipitate extreme financial losses in the event of projected sea level rise.

Developing comprehensive and effective mitigation and adaptation strategies to address climate change will also require the understanding and support of informed citizens, thus requiring the collaboration of media, educational institutions, environmental NGOs, and other groups, to focus on education and two-way communication with the public about choices that have to be made.

### **Recommendation E.1: (Note: see also Recommendations C.2 and D.4)**

The Task Force recommends that the Miami-Dade County Comprehensive Development Master Plan (CDMP) be revised to include a new policy to restrict land uses in areas that would be at risk from sea level rise and associated impacts within the next 50 years as per the CCATF Science Committee's Statement on Sea Level in the Coming Century report and projections. A continuous 50-year planning horizon should be used.

**Rationale:** *Sea level is anticipated to rise at least 1.5 feet over the next 50 years and a total of at least 3-5 feet by the end of the century. It is possible that these estimates could be exceeded. The purpose of the policy will be to maintain land use flexibility to allow for future mitigation measures that may*

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*become necessary. Flexibility will be accomplished by restricting land uses that would require future sea level rise mitigation and/or put at risk current and future investments in public infrastructure. For example, this policy would encourage the retention of agricultural areas that may be prone to sea level rise in the near future. Since these areas are technically undeveloped open space, they could continue to be utilized and remain economically productive until a time that they can no longer be farmed. Maintaining these as agricultural areas pre-empts conversion to development, which would most likely necessitate mitigation or some type of financial assistance for property owners to be re-located, etc. Agricultural areas can also be used to begin locally growing and processing biofuels.*

*This policy would be in addition and complementary to the proposed Coastal High Hazard amendment to the CDMP, which is based on current estimates of hurricane storm surge and is being mandated by the State.*

*Note: Any proposed regulations that have potential impacts on agriculture need to be brought before the BCCs Agricultural Practices Advisory Board, which is an official review body for agricultural regulations.*

### **Recommendation E.2:**

Initiate an additional long-term CCATF advisory board committee composed of representatives from federal, state, and local environmental agencies (including Miami-Dade County DERM, WASD, Cooperative Extension), the Miami-Dade County Department of Health, local colleges and universities, and community leaders to address potential human infectious disease changes and increases that may accompany climate change and to make technical and funding recommendations to the Miami-Dade County Board of County Commissioners. With the goal of disease prevention, the advisory board would advocate for:

- Vector control programs that address mosquitoes, rodents, and other animals and that are adequately maintained and expanded as necessary.
- Chemical and biological monitoring programs within Biscayne Bay's waters and other surface waters to be expanded to detect potential pathogens before they cause illness.
- Adequate funding allocated to the Miami-Dade Water and Sewer Department's (MDWASD) budget to allow for research and planning of alternative water treatment systems that can manage additional pathogens.

**Rationale:** *The Office of Epidemiology and Disease Control of the Miami-Dade County Health Department has the responsibility of doing surveillance and investigation of reportable diseases and conditions as well as investigation of outbreaks. In addition, the office does syndromic surveillance to detect increases in symptoms of diseases and discover outbreaks sooner. However, environmental monitoring may be more effective in detecting potential pathogens before they cause illness. Our recommendations are based on available knowledge of epidemiologic trends and distribution of diseases and their vectors. Sea level rise, an increase in average temperatures, salt water intrusion in fresh water bodies, and decrease in the level of fresh surface water bodies and wells may expand areas hospitable to disease-bearing organisms (vectors of disease), thus increasing the risk of infectious diseases.*

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### **Recommendation E.3: (Note: see also Recommendations F.4, F.5, and F.6)**

The County shall form an interdisciplinary, community-wide working group, including the media and institutions of higher education, which (a) focuses on public education and information regarding climate change and adaptation and (b) assesses public opinion regarding these subjects.

***Rationale:** This working group would focus on increasing public awareness (education), assessing risk and adaptation preferences within the community, and providing comprehensive estimates of mitigation and adaptation costs. Assessing mitigation and adaptation costs, including social and environmental externalities, would provide a more accurate mechanism for comparing proactive proposed policies with the costs of inaction. The working group should actively work toward mainstreaming knowledge regarding climate change, increasing adaptive capacity and climate change resilience, and promoting cognitive and behavioral adaptation changes. It should create dialog (public discussion and participation) within broad social networks to share both problems and solutions and to promote individual and collective empowerment. The group should propose near and long-term alternative courses of action (at the individual and community level) to the business as usual (BAU) scenario, with respect to both GHG mitigation and adaptation strategies. The Commission should make certain that non-regulatory county agencies involved in public education (e.g., the Cooperative Extension) are part of such an advisory board or working group.*

### **Recommendation E.4:**

The Task Force recommends that the County bring together all agencies and entities involved in economic development and planning in order to develop a unified and comprehensive response to the challenges of climate change, housing, economic development, and quality of life

***Rationale:** Expert testimony at the ES&HA Committee meetings has made it clear that even without climate change, the County is facing serious challenges that require better coordination in planning. For example, the current housing market does not provide housing in the price range required for the workforce growth that successful economic development requires, particularly the homeowner housing essential to sustainability of neighborhood quality of life. Another example is water availability and quality, now critical for economic growth, household needs, and environmental sustainability. Planning for challenges like these in the County is now fragmented across different agencies at many levels of government — municipal, county, regional, state, and federal. Climate change will accelerate the need for coordinated planning to meet these challenges as it potentially limits resources like areas for workforce housing expansion and water supply free of saltwater intrusion. Although the County does coordinate planning for hurricane readiness among agencies and municipalities with its Local Mitigation Strategy Working Group, the Task Force has identified a coordination need that will involve agencies and planning in a much more fundamental way.*

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## **F. Intergovernmental Affairs**

**Initial Statement:** A primary focus of the IGA Committee's mission involves working with a broad range of public, private, civic, and non-profit organizations to identify opportunities for collaboration. The Committee has focused its initial efforts on developing strategies that will build support for climate change related initiatives within Miami-Dade County. To that end, the Committee's discussions have focused on how to: (1) engage and partner with the County's municipalities in efforts to mitigate and adapt to climate change; (2) engage local, regional, and state agencies in a discussion about their activities related to climate change; and (3) educate and reach the general public, particularly children and their parents.

### **Recommendation F.1:**

Conduct a survey of Miami-Dade County municipalities to gauge their level of knowledge and engagement in climate change issues, learn about their activities, and begin the creation of an intergovernmental, learning network that allows members to work with each other and the County on adaptation / mitigation issues.

Once the survey has been completed, engage the cities in a dialogue about the survey findings and work of the Climate Change Advisory Task Force. This dialogue could happen in a number of ways including a meeting with the Miami-Dade League of Cities and/or a convening of Miami-Dade municipal and county leaders in a shared discussion of the issues and information exchange.

**Rationale:** *Fifty-five percent of the Miami-Dade County's population, approximately 1.4 million residents, resides within one of the County's 35 municipalities. Any effort to comprehensively address climate change, mitigation, and adaptation in Miami-Dade County will be well served through a collaborative partnership of County and municipal elected leaders and staff. Local governments around the country are leading the way in identifying and implementing strategies that reduce greenhouse gas emissions and create more climate change resilient communities. A partnership of the County and the municipalities will improve efficiency, conserve resources, reduce duplication of effort, and create synergies that will lead to better opportunities and outcomes than would otherwise be possible.*

### **Recommendation F.2: (Note: see also Recommendations D.7, D.10, and F.3)**

Convene local and state agencies and water and sewer utilities around a discussion of climate change and impacts on water quantity, quality, and availability and implications for infrastructure planning and investment.

**Rationale:** *Communication and collaboration at all levels of government will improve efficiency, conserve resources, reduce duplication of effort, and create synergies that will lead to better opportunities and outcomes than would otherwise be possible.*

### **Recommendation F.3: (Note: see also Recommendations D.10, and F.2)**

Convene a broader group of local and state agencies around a discussion of their activities related to climate change. Agencies / groups would include, but not be limited to, DOT 4 & 6, DEP, SFWMD, DCA, Health Planning Agencies, Ecosystem Restoration Task Force, etc. In this conversation we will gain a better understanding if there are issues or concerns that we need to be aware of and identify opportunities for collaboration moving forward.

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**Rationale:** See Rationale under Recommendation F.2.

**Recommendation F.4: (Note: see also Recommendations C.3 and E.3)**

Develop a County internet website with up-to-date information about the work of the Miami-Dade Board of County Commissioners, the CCATF, and municipalities with links to information and best practices related to climate change, adaptation and mitigation efforts by individuals and organizations.

**Rationale:** Miami-Dade County residents are more likely to support County and municipal efforts to reduce greenhouse gas emissions, conserve resources, and adopt adaptation measures if they are provided with balanced information about climate change and the steps they can take to reduce negative impacts on the environment and contribute to positive change. An internet site with up-to-date information about climate change related efforts in Miami-Dade County and beyond will be a resource for residents, elected officials, and a wide range of public, private, nonprofit, and civic partners. Educational efforts which help children understand the world around them, particularly the richness of South Florida's environment and the challenges and opportunities posed by global climate change, will contribute to the creation of a more informed and supportive citizenry, in this generation and beyond.

**Recommendation F.5: (Note: see also Recommendation E.3)**

Work with the region's children's museums and foundations to create and fund educational exhibits on climate change, green technologies, clean cities, etc.

**Rationale:** See Rationale under Recommendation F.4

**Recommendation F.6: (Note: see also Recommendations C.3 and E.3)**

Identify and develop educational materials that can be incorporated into a Miami-Dade Public Schools curriculum on climate change, the environment, and sustainability. The materials should be shared with other educational institutions to facilitate the dissemination of information to Miami-Dade residents.

**Rationale:** See Rationale under Recommendation F.4