Monroe County Climate Action Plan

March 2013

Prepared by the Monroe County Climate Change Advisory Committee

ACKNOWLEGEMENTS

Developed and prepared by the *Monroe County Climate Change Advisory Committee* – March, 2013.

This Monroe County Climate Action Plan is the result of true collaboration – this document and its supporting publications are the product of resources from various individuals and agencies. No additional public dollars were dedicated to this effort. The *Monroe County Climate Change Advisory Committee* and support staff came together with purpose and realized the value of sharing resources, expertise and information. Challenges became successes. Many have contributed to the process and this document. The committee members and advisory staff are recognized here.

MEMBERS:

Chris Bergh (2011-2013)
Harry Appel (2011-2013)
Bob Glazer (2012-2013)
Bill Hunter (2011-2013)
Kelly McKinnon (2011-2013)
Sherry Popham (2011)
Joel Reed (2011)
Don Riggs (2011-2013)
Alessandra Score (2011)
Chuck Sherman (2012-2013)
David Tuttle (2011-2013)
Annalise Mannix (2011-2013)
John Forrer (2011-2013)
Tom Genovese (2011-2012)

ADVISORY REPRESENTATIVES:

TJ Patterson, FL Keys Electric Cooperative
Julie Cheon, Florida Keys Aqueduct Authority
Alison Higgins, City of Key West
Vicki Boguszewski, Monroe County Health Department

BOARD OF COUNTY COMMISSIONERS:

Commissioner Sylvia Murphy, Liaison

MONROE COUNTY STAFF:

Alicia Betancourt & Doug Gregory, University of Florida/IFAS Monroe County Extension
Nat Cassel, Assistant County Attorney, Monroe County
Rhonda Haag, Sustainability Program Manager, Monroe County
Michael Roberts, Monroe County Growth Management
Rosa Washington & Colleen Murphy, Monroe County Solid Waste

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I. EXECUTIVE SUMMARY

Welcome to the *Monroe County Community Climate Change Action Plan*. The Monroe County Climate Change Advisory Committee (CCAC), in coordination with advisory Monroe County staff, has developed this document through a collaborative effort over the past two years. This document is a critical milestone of the CCAC, who were charged with the development of climate-related recommendations for the Monroe County Board of Commissioners.

The Committee has united best practices with existing climate science and staff reports to provide the foundation for this Community Climate Action Plan. The Plan calls for concerted action in reducing greenhouse gas emissions and anticipating and adapting to local impacts of a changing climate. The recommendations presented here attempt to accomplish those goals while also serving to protect Monroe County's unique quality of life and economy, guide future investments, and foster livable, sustainable and resilient communities.

The plan provides for steps to move towards resiliency and reduce emissions by exploring alternative policies and practices. It creates a platform for public outreach and public policy development to effectively communicate the steps from risk to resiliency with the general public, voters, elected officials and decision makers in Monroe County, Florida.

The specific recommendations put forth in this plan were developed through a collaborative process involving subject matter experts and stakeholders from public and private sectors, universities and not-for-profit organizations. These stakeholders brought specific subject area knowledge as well as information on successful initiatives already underway locally or in other communities. Many of the recommendations build upon best practices throughout our region. Others delve into new areas which call for the integration of climate change into planning and decision making processes in ways that few local governments have yet implemented.

The overall objective is to integrate climate adaptation and mitigation into existing systems and to develop a plan that can be implemented through existing local organizations. It provides the common integrated framework for a stronger and more resilient Monroe County community starting today, for tomorrow, and into the future.

There are **72 action items** detailed in the plan's **8 goal areas** to be accomplished over the next **5 years,** with annual reports to mark progress. The recommendations will be implemented through several approaches including:

• The development of **policy guiding documents** by local governing bodies;

• The development of **operational guidance documents**;

• The development of **consistent goals and measures** throughout the various governments in the County;

• A coordinated multi-disciplinary **outreach and education** program; and

• Processes for focused and **prioritized investments**.

Every organization in the region has a role to play in making Monroe County a resilient and sustainable community.

II. LOCAL ACTIONS AND POLICIES FOR ADAPTING TO CLIMATE CHANGE VARIABILITY

A. INTRODUCTION

The Florida Keys are on the front lines of climate change impacts such as sea level rise and increased hurricane intensity. While greenhouse gas emissions produced within the Monroe County region constitute only a small percentage of national and global quantities, Monroe County, because of its unique vulnerabilities to sea-level rise and our international presence as a premier tourist destination, has an opportunity to demonstrate leadership on this global issue by implementing the critical policies, practices and investments that will eventually reduce greenhouse gas (GHG) emissions and prepare us for the unavoidable impacts of climate change. We clearly have the most to lose. If sea-level rise is not curtailed by immediate reductions in greenhouse gases, the Florida Keys may eventually become unlivable.

The burning of fossil fuels and deforestation are causing an increase in greenhouse gases in the Earth's atmosphere. There is consensus among climatology scientists that this is driving unprecedented climate change. Post-industrial human activity has cumulatively created an unprecedented negative impact on global climate processes resulting in accelerated changes in climate change patterns that could threaten the future security and stability of sovereign nations and human society. The consequences are dramatic and are already being witnessed through increases in the melting of Arctic sea ice, an expansion of the tropical zone and the rate of sea level rise caused by melting glaciers, the heating (thermal expansion) of the oceans and melting ice sheets in Greenland and Antarctica. In the last 80 years, there has been an average 9-inch sea level rise here in south Florida.

Key West Airport flooding effects solely from high tide in May, 2012

Numerous estimates of future sea-levels have been made on both global and regional scales with regional South Florida planning guidance available from a white paper on sea level rise projections developed by the Sea Level Rise Technical Ad Hoc Working Group of the Southeast Florida Regional Climate Compact entitled *A Unified Sea Level Rise Projection for Southeast Florida* available at (http://southeastfloridaclimatecompact.org/pdf/Sea%20Level%20Rise.pdf). The projection was an integration of similar analyses recently conducted by the US Army Corps of Engineers, the South Florida Water Management District, Miami-Dade Climate Change Task Force Science and Technology Committee, Broward County Climate Change Task Force Science and Technical Subcommittee and Florida Atlantic University.

Planning decisions for future public and private projects and adaptation efforts must recognize the need to address sea-level rise. The current local and regional and sea-level rise projections do not account for future increases in ice-sheet melting. Therefore we should consider current estimates to be conservative

and optimistic. Planning decisions should take into consideration medium to extreme sea level rise predictions.

The long-term costs of having to implement adaptation measures intended to help cope with climate change impacts due to inaction and the subsequent negative consequences to the economy, social structure and environment make it necessary to implement mitigation actions now to avoid or minimize long-term adaptation costs; even though mitigation may be costly in the short-term. We do have a chance now to prevent the worst impacts of climate change. If we act effectively, we should be able to limit both the magnitude of climate change and the severity of its impacts. The two major approaches to addressing the potential negative aspects of climate change are mitigation and adaptation. *Mitigation* involves actions to reduce GHG emissions to reduce the amount and speed of climate change. *Adaptation* involves actions to reduce the impacts of climate change on existing society and the environment. Both mitigation and adaptation strategies are contained within this document.

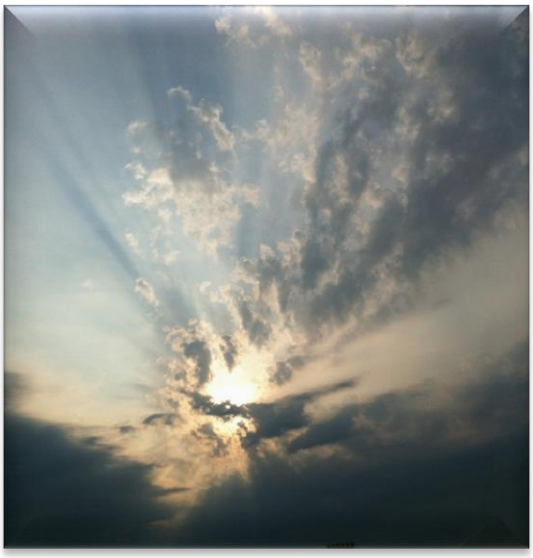
Doug Gregory highlights the effects of extreme high tide in Key West.

Given the overwhelming consensus that anthropogenic or "man-made" greenhouse gas emissions are causing global climate change, Monroe County is joining an increasing number of local governments committed to addressing climate change at the local level. The County recognizes the risk that climate change poses to its constituents, and is acting now to reduce the greenhouse gas (GHG) emissions, or "carbon footprint", of both its government operations and the community at-large through the innovative programs laid out in this Climate Action Plan. Ultimately, local action is needed to *reduce* Monroe County's contribution toward the problem of climate change and *adapt* to its current and future effects. This Climate Action Plan takes advantage of common sense approaches and cutting edge policies that our local government is uniquely positioned to implement – actions that can reduce energy use and waste, create local jobs, improve air quality, preserve our local landscape and history, and in many other ways benefit Monroe County for years to come.

B. THE POLICY CONTEXT OF CLIMATE PLANNING

1. Florida

Since 2006, the State of Florida has responded to growing concerns over the effects of climate change by adopting various legislations and plans to address emissions and sustainability in the public sector.[1]



In 2006, the Florida Legislature passed the *Florida Energy Act* (within Chapter 377, F.S.) which, among other things, created the *Florida Energy Commission* ("FEC"), and provided for renewable energy grants and a solar rebate program. In 2007, Governor Charlie Crist signed a series of executive orders aimed at reducing greenhouse gas emissions and establishing an *Action Team on Energy and Climate Change*. Other legislation was passed in 2007 directing the Florida Building Commission to create a model green building ordinance and in 2008; legislation was passed directing local governments to include GHG reduction strategies into their Comprehensive Plans. Legislation was also passed in 2008 that requires newly constructed government buildings to meet the rating requirements of the U.S. Green Building Council's *Leadership in Energy & Environmental Design* ("LEED") or the Florida Green Building Coalition, or another comparable third party "green" building rating system. This provision was later amended to include the *International Green Construction Code* as an option for government building construction. In 2008, legislation was passed that mandates the Florida Building Code be significantly increased in its energy efficiency requirements, but the State has yet to adopt the International Green Construction Code as a standard for private construction. Finally, in 2010, legislation was passed that provides authority to local governments to create energy financing and retrofitting programs and that revises the state's recycling targets to make them more aggressive.

In the 2007-2009 timeframe, the *Florida Energy and Climate Change Action Plan* was developed (pursuant to Executive Order 07-128). *Phase 1* of the Report includes 35 findings and 30 recommendations. Among the categories covered are power generation, transportation and government recommendations to lower and diversity energy use and diversity energy sources as well as take steps to start planning for climate change impacts. It called for "organizing the state government for Florida's energy future." *Phase 2* of the report detailed 50 separate policy recommendations to reduce GHG emissions and provide a framework for climate change adaptation strategies over the coming years and decades. Finally, in 2008 an important amendment to the Florida Forever legislation made properties subject to sea level rise eligible for state land acquisition funding. Section 259.105 (17)(d), F.S.

In recent 2011 revisions to Florida's Community Planning Act, Chapter 163, F.S. local governments are permitted to establish "*adaptation action areas*" in their comprehensive plans where the community "identifies one or more areas that experience coastal flooding due to extreme high tides and storm surge,

[1] This section taken from: The City of Marathon, *Sustainability and Climate Plan*. May 2012. Pages 26-27. Energy Systems Group and Erin L. Deady, PA.

and that are vulnerable to the related impacts of rising sea levels for the purpose of prioritizing funding for infrastructure needs and adaptation planning." Specifically, the law states:

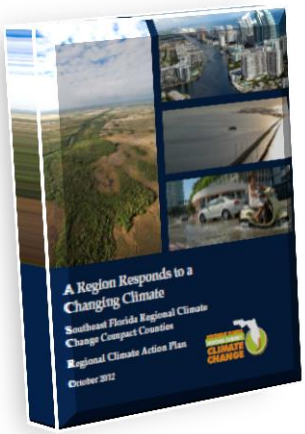
> "*At the option of the local government, develop an adaptation action area designation for those low-lying coastal zones that are experiencing coastal flooding due to extreme high tides and storm surge and are vulnerable to the impacts of rising sea level. Local governments that adopt an adaptation action area may consider policies within the coastal management element to improve resilience to coastal flooding resulting from high-tide events, storm surge, flash floods, storm water runoff, and related impacts of sea level rise. Criteria for the adaptation action area may include, but need not be limited to, areas for which the land elevations are below, at, or near mean higher high water, which have a hydrologic connection to coastal waters, or which are designated as evacuation zones for storm surge*."

Other local governments in Florida and across the country are addressing these issues through various efforts and in their requisite Comprehensive Plans. For instance, Smart Charlotte 2050, Charlotte County's new Comprehensive Plan, (adopted in 2010) addresses climate change and sea level rise in the data and analysis. The Plan states that the County would, "Consider climate change in County decisions particularly along the coast". Sarasota County also includes a discussion of sea level rise and climate change in the data and analysis of its Comprehensive Plan. Several cities, including Punta Gorda and Ft. Myers Beach also address these issues in their Comprehensive Plans, even though there is no state law requiring it.

2. Southeast Florida Regional Climate Change Compact

The *Southeast Florida Regional Climate Change Compact* was signed by Broward, Miami-Dade, Monroe, and Palm Beach Counties in January 2010 to coordinate climate mitigation and adaptation activities across county lines. The Compact represents a new form of regional climate governance designed to allow local governments to set the agenda for adaptation while providing an efficient means for state and federal agencies to engage with technical assistance and support. The Compact calls for the Counties to work cooperatively to:

Team photo from the first Climate Summit held in 2009



1) Develop annual Legislative Programs and jointly advocate for state and federal policies and funding;

2) Dedicate staff time and resources to create a Southeast Florida Regional Climate Action Plan to include mitigation and adaptation strategies; and

3) Meet annually in Regional Climate Summits to mark progress and identify emerging issues. (http://southeastfloridaclimatecompact.org/).

3. Monroe County

Independent of the Southeast Florida Regional Climate Change Compact, Monroe County has also adopted resolutions and policies to advance climate change resiliency. The list of actions contained in **Appendix A** demonstrates the commitment of the Monroe County Board of County Commission in addressing climate change challenges.

C. PURPOSE, SCOPE AND PROCESS

1. Purpose

The purpose of the *Monroe County Community Climate Action Plan (MCAP)* is to outline a course of action for the County government and communities of Monroe County for a coordinated countywide strategy to **minimize climate change impacts** and to **increase the sustainability of the communities within the Florida Keys**. The MCAP is an attempt to mitigate future impacts by reducing community-wide greenhouse gas (GHG) emissions to 20% below 2005 levels by 2020 and to identify local adaptation needs for protection against future sea level rise. The MCAP has been designed to support three primary functions:

1. Provide clear guidance to County staff regarding when and how to implement key provisions of the plan; and
2. Inspire residents and businesses to participate in community efforts to address climate change issues; and
3. Demonstrate Monroe County's commitment to climate change mitigation and adaptation.

The climate action plan seeks to **reduce GHG emissions and adopt mitigation and adaptation strategies** in municipal and community-wide activities. GHG reductions and climate strategies will be achieved in the areas of building and community energy use, waste diversion, water conservation, natural areas, and transportation. The plan contains strategies, objectives, measures, and actions that will direct the County's efforts by creating a clear course of action so that everyone can have a role in creating and achieving climate and sustainability goals, this Climate Action Plan drives and coordinates local efforts toward a reduction in GHG emissions of 20% below 2005 emission levels by 2020.

2. Scope

This Plan covers goals and strategies for GHG emissions resulting from local government and community-wide activities within the County. It addresses the major sources of emissions in Monroe County, Florida and sets forth goals and strategies in 8 focus areas that both the County and community can implement together to achieve greenhouse gas reductions:

- Policy Coordination(P)
- Identify and Monitor Risks and Vulnerabilities (M)
- Education and Business Development (E)
- Natural Systems (N)
- Built Environment (B)
- Water and Waste Water (W)

- Renewable Energy (R)
- Solid Waste and Recycling (S)

The plan also creates a framework for documenting, coordinating, measuring, and adapting efforts moving forward.

3. Process

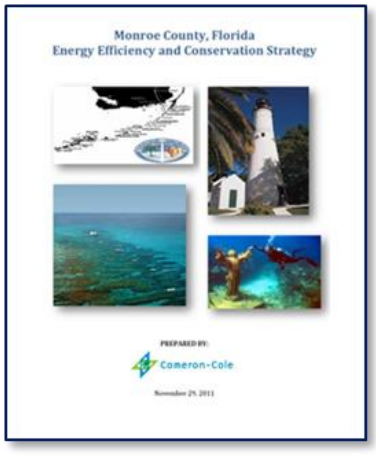
The climate action plan took several years to develop and includes input from County and community advisory groups, local leaders, stakeholders and staff. Following are of the major steps in the development process.

Signatory to the U.S. Mayors Climate Protection Agreement

In 2005, the *U.S. Mayors Climate Protection Agreement* was launched by Seattle Mayor Greg Nickels, and initially was signed by 141 mayors from cities across the country. The Agreement urged cities to take the lead on climate change mitigation, and encouraged state and federal action on this issue. The primary goal set for the signatories of this Agreement was to meet or exceed the Kyoto Protocol goal of a 7% reduction in GHGs from 1990 levels by 2012. Currently, the Mayor's Agreement has 1,054 signatories. (http://www.usmayors.org/climateprotection/agreement.htm)

Counties have also signed on to the Mayor's Agreement, including Monroe County in 2007 (see Resolution 235-2007 at http://fl-monroecounty.civicplus.com/index.aspx?NID=543). Although the County does not have baseline GHG data from 1990, it has set its baseline in 2005, and committed to reduce its GHG emissions 20% below 2005 levels by 2020 (see Resolution No. 067-2010 at http://fl-monroecounty.civicplus.com/index.aspx?NID=543). The Agreement suggests certain actions that signatories can take to reduce their GHG emissions. For example, signatories are encouraged to increase **the use and production of renewable energy** while updating their building codes **and increasing energy efficiency** in public facilities, as well as increase the **average fuel efficiency** of their fleet through the incorporation of alternative fuel vehicles.

Monroe County sought to fulfill its obligations to this Mayor's agreement by increasing awareness of climate change, creating an inventory of GHG emissions, working on near-term reduction efforts, and setting the GHG reduction target. The County has also committed to work with regional partners to develop a comprehensive CAP through participation in the Southeast Regional Climate Compact. Finally, the County developed an **Energy Efficiency Conservation Strategy** which helps the County work toward its goals by focusing efforts on reducing fossil fuel energy use, which contributes to the County's carbon footprint which was adopted in (see Resolution 102-2012 & the Energy Efficiency Conservation Strategy at http://fl-monroecounty.civicplus.com/index.aspx?NID=543).



Membership in ICLEI

In 2008, Monroe County joined ICLEI, Cities for Climate Protection Campaign as a full member. ICLEI is an international association of over 1,220 local governments who have committed to sustainable development and practices (http://www.iclei.org). While Monroe County has already begun to reduce greenhouse gas emissions through a variety of actions, this plan is a critical component of a

comprehensive approach to reducing county emissions. This approach, developed by the *Cities for Climate Protection Campaign* identifies the following 5 milestones to reduce GHG emissions associated with local government operations and the community at large:

Milestone 1: Conduct a **baseline emissions inventory** and forecast

Milestone 2: Adopt an **emissions reduction target** for the forecast year

Milestone 3: Develop a **local climate action plan**

Milestone 4: Implement the climate action plan

Milestone 5: Monitor progress and report results

Monroe County has completed *Milestone 1* by using ICLEI's Clean Air and Climate Protection (CACP) 2009 Software, and established a 2005 baseline of emissions for County owned and/or controlled operations. In 2010, the County achieved *Milestone 2* by approving its GHG emissions reduction target. This plan will achieve *Milestone 3.* Additionally Monroe County coordinated with our regional partners to draft appropriate mitigation and adaptation strategies under the Regional CAP, and the County is already integrating some of these concepts and strategies into our Comprehensive Plan which is currently being updated. Once the CAP has been adopted and implementation has begun, the County is committed to monitoring and verifying its progress. This crucial step will allow the County to adapt its plan to changing conditions and new data as necessary, focusing its efforts and resources in areas that provide the largest GHG reductions.

Formation of Community Advisory Committees

Green Building Code Task Force / Green Initiative Task Force (GITF): In 2008, the county's Green Building Code Task Force was tasked with evaluating and recommending updates to the Monroe County building codes to increase community energy efficiency and overall sustainability. Comprised of 10 commission appointees with representatives from 5 cities, 3 regional utilities, and 1 member of the U.S. Navy, the Task Force was renamed the Green Initiative Task Force (GITF) in 2009 and expanded its role of responsibilities to (1) include the development of the GHG emission reduction target, (2) securing the EECBG Program funding, and (3) drafting the County's Sustainable Vision Statement (see Green Initiative Task Force Sustainable Vision Statement at http://fl-monroecounty.civicplus.com/index.aspx?NID=543)

Teaching green building concepts at the Expo

The *Sustainable Vision Statement* is a qualitative sustainability strategy for the County, outlining areas that need improvement as well as opportunities for strategic development. It serves as the foundation for future planning and was used to aid in the development of the County's Climate Action Plan (MCAP). Covering a broad number of topics related to County and community sustainability, the *Sustainable Vision Statement* suggests actions which guide county operation and provide community guidance on climate change issues.

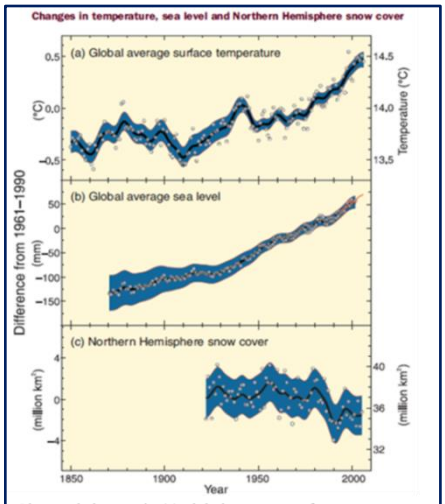
The County also adopted the Florida Green Building Coalition's green commercial building standard for all new construction of County-owned public buildings (see Resolution No. 147-2010 at http://fl-monroecounty.civicplus.com/index.aspx?NID=543). It is important to note that this standard was not required in plans developed prior to the acceptance of this resolution or adoption of a Florida Statute requiring that such standards be implemented.

Following the sunset of the GITF in October 2010, the Climate Change Advisory Committee (CCAC) was established by the Board of County Commissioners (BOCC) in January 2011 as an expansion of the GITF to include representatives from a broader cross-section of the county. The CCAC is an external advisory group that is responsible for providing community input on all County-related climate initiatives, recommending climate change adaptation and mitigation strategies to the BOCC and developing a Community Climate Action Plan.

The minutes, agendas and member list for the CCAC can be found on the county website at (http://fl-monroecounty.civicplus.com/index.aspx?NID=386&ART=1490&ADMIN=1). During 2011 and 2012, the CCAC developed this draft Community Climate Action Plan with recommendations for a coordinated countywide strategy in mitigating the causes, and addressing the local implications of climate change. The Monroe County Community Climate Change Action Plan contains 74 recommended actions to be brought before the Board for approval and implementation in 2013.

III. THE SCIENCE AND DATA

The CCAC determined early in the process that three types of information would be helpful to guide their recommendations. These include 1) a projection of sea level rise that might be anticipated over time in Southeast Florida, 2) a communitywide greenhouse gas inventory to understand the main sources of greenhouse emissions in Monroe County and 3) an analysis of the County's vulnerability to sea level rise should no action be taken to address sea level rise.



Observed changes in (a) global average surface temperature, (b) global average sea level from tide gauge (blue) and satellite (red) data and (c) Northern Hemisphere snow cover for March-April. The shaded areas represent estimated uncertainties.[2]

A. CLIMATE SCIENCE

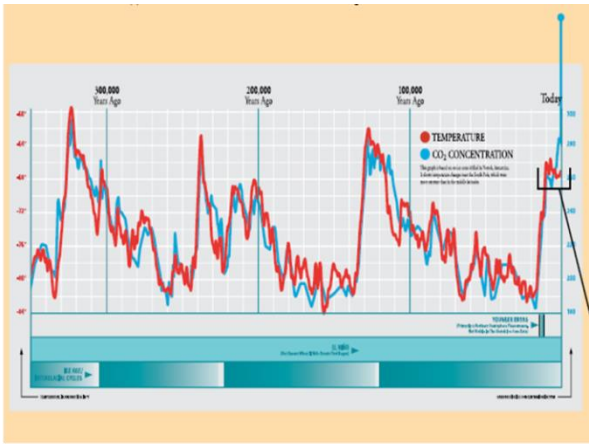
The Intergovernmental Panel on Climate Change (IPCC)'s Fourth Assessment Report affirms that "warming of the climate system is unequivocal, as is now evident from increases in global average air and ocean temperatures, widespread melting of snow and ice and rising global average sea level."[2] The IPCC report also concluded it is *extremely unlikely* that global climate change of the

[2] IPCC, 2007: Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, Pachauri, R.K and Reisinger, A. (eds.)]. IPCC, Geneva, Switzerland, 104 pp.

past 50 years can be explained without external forcing and *very likely* that it is not due to known natural causes alone.

The burning of fossil fuels and deforestation are causing an increase in greenhouse gases in the Earth's atmosphere that is driving **unprecedented climate change**. Post-industrial human activity has cumulatively created a negative impact on global climate resulting in accelerated changes in climate change patterns that could threaten the future security and stability of sovereign nations and human society.[3,4] The consequences are dramatic and are already being witnessed through **increases in the melting of Arctic sea ice[5], an expansion of the tropical zone poleward** [6] and the rate of sea level rise caused by melting glaciers, the heating (thermal expansion) of the oceans and melting ice sheets in Greenland and Antarctica[7]. For instance, in the last 80 years, there has been an average 9" sea level rise in south Florida.[8]

According to most scenarios, continued human emissions of greenhouse gases at current and projected levels will lead to more dramatic and accelerated, potentially even catastrophic, changes in the Earth's natural climate patterns. Given the continued rate of emissions and the atmospheric lifetime of those emissions, global temperatures are expected to rise and climate change is expected to worsen *even if we stopped emitting greenhouse gases immediately* and completely. Specifically, as reported by the Intergovernmental Panel on Climate Change ("IPCC")[9], a warming of about **0.2°F per decade** is expected for the foreseeable future, and even if greenhouse gases had been "kept constant at year 2000 levels, a further warming of about 0.1°F per decade would be expected."



Changes in CO2 (blue) and Temperature (red) for past 350,000 years.

While historic evidence of climate change (global warming), is well understood and documented, the uncertainty about potential future impacts is large. Although it is clear that **human-produced greenhouse gases is causing unprecedented warming of our atmosphere and oceans**, it is more uncertain, what the rate and magnitude of this trend will be into the future - because it is dependent on both complex feedback loops (ice sheet degradation, methane releases from permafrost and the deep ocean and albedo effects) and on how quickly global greenhouse gas emissions are reduced.

[3] Global Business Network. 2007. Impacts of climate change: A system vulnerability approach to consider the potential impacts to 2050 of a mid-level greenhouse gas emissions scenario. Copies available at www.gbn.com/climatechange.

[4] The CNA Corporation. 2007. National security and the threat of climate change. Available from www.securityandclimate.cna.org.

[5] National Snow & Ice Data Center, http://nsidc.org/

[6] Seidel, D.J., Q. Fu, W. J. Randall, T. J. Reichler. 2008. Widening of the tropical belt in a changing climate. Nature Geoscience 1:21-24.

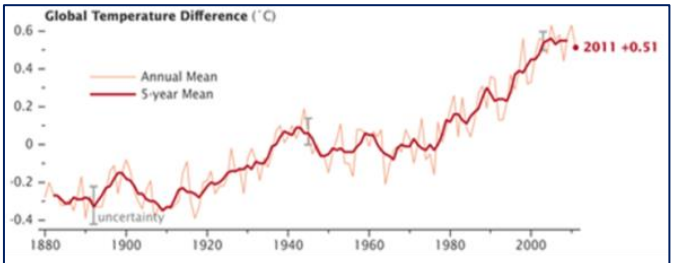
[7] Bindoff, N.L. and others. 2007. Observations: Oceanic climate change and sea level. In Climate change 2007: The physical science basis. Contributions of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Solomon, S. and others (eds.) Cambridge University Press.

[8] Miami-Dade County Climate Change Task Force, Science and Technology Committee. 2008. Statement on sea level in the coming century. 9 pages.

[9] Bindoff, N.L. and others. 2007. Chapter 5. Observations: Oceanic climate change and sea level. In Climate change 2007: The physical science basis. Contributions of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Solomon, S. and others (eds.) Cambridge University Press.

Vermeer and Rahmstorf concluded that emission reductions early in this century will be much more effective in limiting sea-level rise than reductions later on.[10]

The long-term costs of implementing adaptation requirements due to inaction or too little action today and the subsequent negative consequences to the economy and social structure makes it necessary to implement mitigation and adaptation actions now to prevent or minimize these long-term costs; even while recognizing it may be more costly in the short-term. Unusual droughts, Arctic sea ice disappearance, complete melting of the surface of the Greenland ice sheet and glacial discharges from Greenland and Antarctica are unprecedented events that indicate we are already witnessing the initial disruptive effects of climate change.



Annual and 5-year average global atmospheric temperature trend in degrees Celsius.

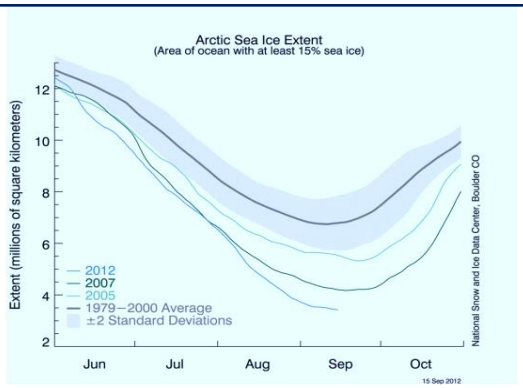
Temperatures & CO2 Increasing Globally

Human induced atmospheric carbon dioxide levels now exceed 390 part per million, greater than any time in the past 350,000 years (Figure 2)[11]. It is noteworthy that temperature and CO2 increase concurrently and that present levels of CO2 will lead to temperatures greater than human civilizations have to date experienced at any time in the past. The time for action to reduce greenhouse gas emissions is now if we want to avoid catastrophic disruptions to the health and well-being of future generations.

Analysis by NASA's Goddard Institute for Space Studies shows that global average surface temperatures in 2010 "tied" 2005 as the warmest on record[12]. The next hottest years, also with very close average temperatures, are 1998, 2002, 2003, 2006, 2007, 2009 and 2011. The period from January 2000 to December 2009 is the warmest decade on record, followed by the 1990's, then the 1980's respectively. These remarkable yearly and decadal trends, based on the Goddard Institute's global average surface temperature analysis, GISTEMP, are tracked from 1880 to 2011 (Figure 3).

Arctic Sea Ice

Increasing summer temperatures are causing substantially above-normal Arctic Sea ice melting[13]. The September 2012 minimum was significantly below the 1979 to 2000 average minimum, representing an area nearly twice the size of the state of Alaska. The 2012 minimum was 18% below 2007 and 49% below the 1979 to 2000 average.



Arctic sea ice extent as of September 17, 2012, along with daily ice extent data for 2007 and 2005, the previous record low years. The gray area around the average line shows the two standard deviation range of the data. From National Snow and Ice Data Center: http://nsidc.org/arcticseaicenews/

[10] Vermeer, M. and S. Rahmstorf. 2009. Global sea level linked to global temperature. PNAS 106(5):21527-21532.

[11] National Academy of Sciences. 2008. Understanding and Responding to Climate Change. http://dels-old.nas.edu/basc/climate-change/basics.shtml.

[12] Goddard Institute for Space Studies, http://www.nasa.gov/topics/earth/features/2011-temps.html

[13] National Snow & Ice Data Center, http://nsidc.org/

The six lowest seasonal minimum Arctic Sea ice extents in the satellite record have all occurred in the last six years (2007 to 2012).

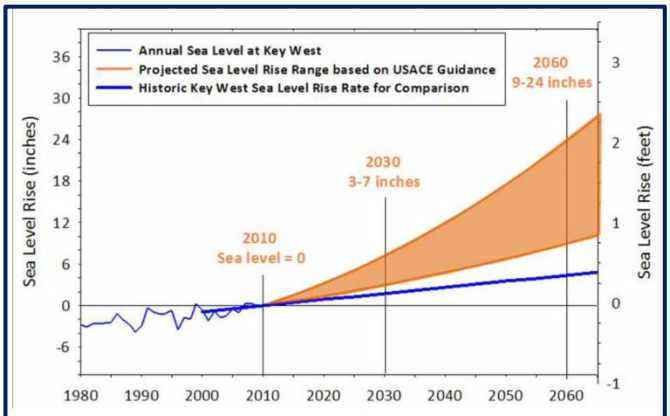
The melting of Arctic Sea ice does not directly contribute to sea level rise but it does cause additional warming of the Arctic Sea because the water absorbs more heat from the sun than does ice. Consequently, as the Arctic Sea adjacent to Greenland warms, it will increase the rate of melting of those glaciers that rest on the seabed, thus accelerating the loss of the Greenland ice sheet that does cause an increase in sea level.

Sea Level Rise Projections

Although floating ice, like Arctic Sea Ice, does not contribute to sea level rise, the melting of land-based glaciers and continental ice sheets (Greenland and Antarctica) do. To date, most of the observed sea level increases has been due to thermal expansion of the existing oceans as ocean temperatures have increased. However, the rate of seal level rise is increasing and is expected to continue due to greater melting of glaciers and ice sheets. Projections of future sea level rise predicted on increased land-based ice melting and on how quickly civilization can curb and reduce CO2 emissions.

Because the impacts of climate change vary geographically, it is important to know what effects are specifically expected for South Florida and the Florida Keys. According to the U.S. Global Change Research Program, the Southeast region of the United States should expect the following impacts from climate change to occur in the coming years[14]:

- Projected **increases in air and water temperatures** will cause heat-related stresses for people, plants, and animals.
- **Decreased water availability** is very likely to affect the region's economy as well as its natural systems.
- Sea-level rise and the likely **increase in hurricane intensity** and associated storm surge will be among the most serious consequences of climate change.
- Ecological thresholds are likely to be crossed throughout the region, causing **major disruptions to ecosystems** and to the benefits they provide to people.
- Quality of life will be affected by increasing **heat stress, water scarcity, severe weather events,** and reduced availability of insurance for at-risk properties. Cities and agriculture face increasing risks from a changing climate.



Unified Southeast Florida Sea Level Rise Projection for Regional Planning Purposes. Projections use historic Key West tidal data and the United States Army Corps of Engineers Guidance (USACE 2009) intermediate and high curves to represent the lower and upper bound for projected sea level rise.

In terms of Florida-specific impacts, the *Florida Energy Commission* (CEC) issued a report in 2006 detailing anticipated changes for the state. The report details specific impacts related to several sectors and finds that "climate change impacts will affect all of the sectors considered in this report: sea level rise, agriculture, snowpack and water supply, forestry, wildfire risk, public health, and electricity demand

[14] Global Climate Change Impacts in the United States, Thomas R. Karl, Jerry M. Melillo, and Thomas C. Peterson, (eds.). Cambridge University Press, 2009. And www.globalchange.gov.

and supply."[15] The report analyzed low, mid, and high emissions scenarios, noting that "all climate models show increases in temperature, with the aggregate of several model runs containing a range of warming from 2000 to 2100 from about +2ºC to about +6ºC (+3.6ºF to about +10.8 ºF). Increases in temperature alone would impact the Florida hydrological cycle, with consequences upon the state's water supply, hydroelectric power supply, agriculture, recreation, and ecosystems." Additionally, "Climate change could produce compounding impacts—for instance, in the South Florida area, heightened sea levels can jeopardize our drinking water supply in periods of prolong droughts and threaten flooding during periods of increased rains."

The Florida Keys are on the front lines of climate change impacts such as sea level rise and increased hurricane intensity. While GHG emissions produced within the Monroe County region constitute only a small percentage of national and global quantities, Monroe County, because of our unique vulnerabilities to sea-level rise and our international presence as a premier tourist destination, has an opportunity to demonstrate leadership on this global issue by implementing the critical policies, practices and investments that will eventually drive reductions of GHG emissions and plan for the impacts of climate change. We clearly have the most to lose. If sea-level rise is not curtailed by immediate reductions in greenhouse gases the Florida Keys will eventually become unlivable.

B. VULNERABILITY ASSESSMENT

While climate change is the most important challenge facing our world and region today, our realization of the problem now represents a significant opportunity for leadership and a change to insure a sustainable future. Thus, this Monroe County Community Climate Action Plan ("MCAP") carries an even stronger message of optimism than a work plan limited only to addressing the worst impacts of climate change. The vision behind this MCAP *is one of a better future for the Monroe County community, economy and environment.*

With a warmer atmosphere and ocean, hurricane frequency in the Atlantic Ocean is expected to decrease but the *intensity* of hurricanes is expected to *increase*[16] as heat is the main driving force for hurricane intensity.

[15] Scenarios of Climate Change in Florida: An Overview. Dan Cayan, Amy Lynd Luers, Michael Hanemann, Guido Franco, Bart Croes, (eds.). <http://www.energy.ca.gov/2005publications/CEC-500-2005-186/CEC-500-2005-186-SF.PDF>.

[16] Knutson, T. R., and others. 2010. Tropical cyclones and climate change. Nature Geoscience 3:157-163.

The "business as usual" scenario was developed by county GIS staff and provided an analysis of vulnerability of major infrastructure at three sea level rise scenarios. A mapping exercise conducted by the Planning Department indicated major areas at risk of tidal flooding due to sea level rise. The mapping showed that 1 foot of sea level rise will substantially affect households, businesses and county infrastructure. There is a greater than 75% certainty the 6.82 percent of developed land would be impacted by a one foot rise in sea level. With a two foot rise, the impact is multiplied 14.19 percent of developed land would be vulnerable. The **three foot scenario shows impacts to 28.58 percent of infrastructure and developed land**. The inundation models show that the cost of inaction would be tremendous. (See Monroe County Inundation Maps at: http://fl-monroecounty.civicplus.com/index.aspx?NID=543).

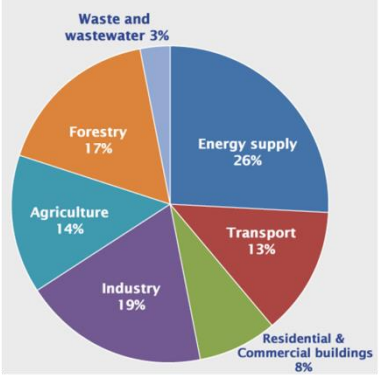
Local impacts related to climate change, especially sea level rise, are already occurring. Critical public infrastructure including beaches, roadways and especially storm water drainage treatment and conveyance systems have already begun to show vulnerabilities to the current rate of rise of sea level, extreme rainfall and seasonal high tides. Coastal communities have begun to seek infrastructure improvements to address mounting drainage concerns. The predicted accelerated rate of sea level rise will further exacerbate the impact of saltwater intrusion on our source of drinking water and on coastal habitats. Climate-related challenges currently exist suggesting action to address these issues is needed today.

C. GREENHOUSE GAS EMISSIONS

Emissions Must be Reduced

The buildup of greenhouse gases in our atmosphere is conceivably even more extraordinary than changes observed thus far regarding temperature, sea level, and snow cover in the Northern hemisphere in that current levels greatly exceed recorded precedent going back much further than the modern temperature record. The latest monthly average atmospheric CO_2 concentration, for December 2010, as measured at Mauna Loa Observatory, Hawaii, was 389.69 parts per million (ppm).[17]

Global Greenhouse Gas Emissions



Societal sector contributions to global emissions from 2004. From http://www.epa.gov/climatechange/ghgemissions/global.html

According to the Director of the Goddard Institute, Dr. James Hansen, "If the warming trend continues, as is expected, if greenhouse gases continue to increase, the 2010 [temperature] record will not stand for long."[18] In response to the problem of climate change, many communities in the United States are taking responsibility for addressing emissions at the local level. Since many of the major sources of greenhouse gas emissions are directly or indirectly controlled through local policies, local governments have a strong role to play in reducing greenhouse gas emissions within their boundaries. Through proactive measures around land use patterns, transportation demand management, energy efficiency, green building, and waste diversion, local governments can dramatically reduce emissions in their communities. In addition, local governments are primarily responsible for the provision of emergency services and the mitigation of natural disaster impacts. While this Plan is designed to reduce overall emissions levels, as

[17] NOAA/ESRL, Dr. Pieter Tans. 2011, 18 Jan. <http://www.esrl.noaa.gov/gmd/ccgg/trends/>.
[18] Goddard Institute for Space Studies, "Research Finds 2010 Tied for Warmest Year on Record," 2011, 18 Jan. <http://www.nasa.gov/topics/earth/features/2010-warmest-year.html>.

the effects of climate change become more common and severe, local government adaptation policies will be fundamental in preserving the welfare of residents and businesses.

Through the completion of a local emissions study, or "greenhouse gas inventory," our County has determined emissions levels for the community as a whole and for Monroe County, Florida government operations. Community-wide emissions represent the sum total of emissions produced within County limits as well as emissions resulting from electricity use within the jurisdiction, even if said electricity is generated elsewhere. In this way, the community-wide figures represent all major emissions for which the community is responsible.

Monroe County Communitywide Greenhouse Gas Inventory

The Monroe County Extension Service staff conducted a communitywide greenhouse gas emissions inventory. This inventory, based on emissions from 2005, 2008 and 2010, served as the basis the Greenhouse Gas reduction recommendations. The use of gasoline and diesel fuel in the Transportation sector accounts for 38% of the County's current emission of greenhouse gas. The Residential sector (28%) and the Commercial sector (21%) represent the bulk of emissions due primarily to the use of electricity. The need for communitywide reductions in these sectors is reflected in the recommendations. A 2011 inventory update will provide for a mechanism to measure progress and improve reduction strategies in the future.

Emissions from the County's municipal operations are embedded within the community-wide totals. For example, emissions from government buildings are included in the "Commercial" sector and emissions from County fleet vehicles are included in the "Transportation" figure above. Government operations are therefore a subset of total community emissions. The outcome for Monroe County Community Emissions include adoption of a 20% reduction of the 2005 baseline equals a target for 1,510,819 MT CO2e in 2020 a reduction of 377,742 MT CO2e.

Year	Residential	Commercial	Industrial	Transportation	Waste	TOTAL
2005	**468,969** (24.83%)	**328,126** (17.37%)	**126,913** (6.72%)	**642,931** (34.04%)	**321,622** (17.04%)	**1,888,561**
2008	**464,437** (29.51%)	**331,037** (21.03%)	**121,353** (7.71%)	**598,315** (38.01%)	**58,835** (3.74%)	**1,573,977**
2010	**442,166** (28.67%)	**330,279** (21.41%)	**119,973** (7.78%)	**593,012** (38.45%)	**56,974** (3.69%)	**1,542,404**
% Change (MT CO2e)	**-5.715%** (26,803)	**0.656% (2,153)**	**-5.468%** (6,940)	**-7.764%** (49,919)	**-82.285%** * (264,648)	**-18.329%** (346,157)

* A good portion of the reduction was realized through the change in waste disposal methods. This change should not be discounted as many communities are looking to reduce emissions through alternatives to landfill waste disposal. Consideration should be given to decrease the target emissions and increase the reduction goal.

County Operations Greenhouse Gas (GHG) Emissions:

Monroe County Municipal Operation GHG inventory and **Energy Efficiency Conservation Strategy** (EECS) has been designed using the following guiding principles:

1) reduce energy consumption associated with County operations and facilities;
2) reduce GHG emissions intrinsic to energy consumption in County operations; and
3) create new demand for green jobs and sustainable industry.

The County will use these guiding principles to assists in meeting the County's stated goals of a municipal **reduction of GHG 20% below 2005 levels by 2020**.

The County selected calendar year 2005 as its baseline, and during that time period, operations consumed 15,968,524 kWh of electricity, 166,692 gallons of gasoline, and 74,132 gallons of diesel. Total energy expenditures in that year were $2,599,255. Data were gathered from utility and fuel bills as well as historical accounting information. As a member of the International Council for Local Environmental Initiatives (ICLEI), the County used this organization's software to enter energy consumption figures and calculate GHG emissions. In 2005, the County emitted 11,853 metric tons of CO_2 equivalents (CO_2e).

To achieve the stated reduction goals, the EECS provides a performance framework to measure energy consumption and emissions, take actions to reduce them, measure the results, and cross-check them against the needed progress toward the 2020 goal. The framework provides **Key Performance Indicators** (KPIs, commonly referred to as 'metrics'), a proposed interim target (10% reduction below 2005 levels by 2015), and the ultimate 20% reduction goal for all KPIs.

Using this framework and baseline levels for KPIs, by 2020 the County will strive to
1) Reduce its electricity consumption from 15,968,524 kWh to 13,808,461 kWh;
2) Reduce its gasoline consumption from 166,692 gallons to 136,537 gallons; and,
3) Reduce its diesel consumption from 74,132 gallons to 59,354 gallons.

These consumption reductions correspond to reductions in GHG emissions of 1919 MT CO_2e, 300 MT CO_2e and 152 MT CO_2e respectively.

County Municipal Sources	**Calendar Year 2005 Metric Tons CO_2e**
Buildings and Facilities	7,421
Streetlights and Traffic Signals	823
Airport Facilities	1,353
Vehicle Fleet (Gasoline)	1,499
Vehicle Fleet (Diesel)	758
Total	**11,853**

This table illustrates Monroe County's Municipal greenhouse gas emissions by source type in metric tons (MT) of CO_2e. Emissions from electricity consumption in County-owned and operated buildings and facilities represents 63% of the total 2005 GHG inventory, with the next largest source type being gasoline-powered fleet vehicles at 13%.

Projected Growth in GHG Emissions

For complete information regarding the emissions inventory and forecast, including methodology and supporting data, please reference the Monroe County, Florida GHG Emissions Inventory Reports (see

Monroe Community Greenhouse Gas Inventory CY2010 at http://fl-monroecounty.civicplus.com/index.aspx?NID=543).

The County has also estimate an emissions forecast based on projections of current data and expected future trends. The emissions forecast is a "Business As Usual" forecast, a scenario estimating future emissions levels if no further local action (i.e. projects within this Climate Action Plan) were to take place. The forecast indicates that for the purposes of this MCAP, Monroe County will experience little or no population growth between 2012 and 2020. (http://keyscompplan.com/system/wp-content/uploads/2011/04/Monroe%20County%20-20Unincorporated%20Population%20Projections%20FINAL%20DCA%20approved%204-5-11.pdf)

Monroe County's Greenhouse Gas Reduction Target

Monroe County has set targets to reduce its emissions to 20 percent below 2005 levels by 2020. The combination of measures that Monroe County has already implemented, is currently planned, and is presented through this Climate Action Plan is designed to achieve this target. Reductions rely on the best information currently available pertaining to population forecasts, future changes to building codes, and vehicle fuel efficiency standards among other information.

Shown in the picture to the left is the county courthouse located in Key West. It was one of four building in the "Jackson Square" complex to receive energy upgrades as a result of a federal grant through the State's Energy Office, to help reduce greenhouse gas emissions and energy costs.

IV. RECOMMENDATIONS OF THE CLIMATE ACTION PLAN

The summary table below identifies the focus areas within the Monroe County Climate Action Plan, the number of strategies within each focus area, and the contribution of each focus area toward the GHG reduction goal. Each focus area has a dedicated section within this document where specific actions (both new and those already employed) are described**.**

While the Monroe County local government cannot address climate change by itself, government policies and practices can dramatically reduce greenhouse gas emissions from a range of sources and help prepare Monroe County for the anticipated impacts of climate change. In addition, Monroe County will assist residents and businesses in their endeavors to reduce emissions through programs explained in this Plan. By working together, Monroe County can not only do its part toward achieving a stable climate - we can reap the benefits of healthier air, lower costs for utilities and services, improved transportation and accessibility, a more vibrant local economy, and many other positive side effects of reducing our carbon footprint.

Monroe County Climate Action Plan Summary Table – Focus Areas

Focus Area	Description	Number of Distinct Strategies
Policy Coordination	Policies and actions that include leadership and long term planning to address climate adaptation and mitigation needs.	10
Identify and Monitor Risks and Vulnerabilities	Actions to identify and monitor the most vulnerable areas and facilities that will be affected by sea level rise in Monroe County.	7
Education and Business Development	Actions that will Increase awareness of change impacts and promote local business development response.	6
Natural Systems	Policies and actions to identify vulnerable natural landscapes and Increase resilience through implementation of strategies.	7
Built Environment	Policies and strategies to promote sustainable practices and efficiency, develop adaptation measures, and reduce GHG emissions.	15
Water and Wastewater	Policies and programs to reduce water demands protect supply and address wastewater treatment needs.	12
Renewable Energy	Policies and strategies to promote local renewable energy uses and development.	5
Solid Waste and Recycling	Policies and programs to reduce waste generation and, promote recycling.	12

A. CLIMATE CHANGE ADVISORY COMMITTEE TOP 6 RANKED RECOMMENDATIONS

The committee took on the task of ranking the recommendations into three categories:

- **High** --Critical project, will not meet Task Force mission without it
- **Medium** --Important project with significant outcomes, worthy of consideration and resources
- **Low** --Important but mitigation and/or adaptation outcomes may not merit implementation with current resources; implement if resources allow.

The CCAC reviewed and approved 72 recommendations which were deemed critical and important to the meet the challenges of climate change. These recommendations represent a cross-section of natural, urban, local and regional interests reflective of the diversity of the County, its collaborative nature and regional focus.

Listed below are the **top 6 recommendations** that the Climate Change Advisory Committee recommends as priority items. Some type of action has already been taken on several of the total 72 ranked actions.

TOP 6 RECOMMENDATIONS

Action P-2.1: **Revise Monroe County Comprehensive Plan** to address strategic planning related to climate change mitigation and adaptation needs.

Action P-1.1: Develop an **implementation strategy** for the Monroe County Community Climate Action Plan.

Action P-2.3: Create policies for future development to **incorporate sea level rise inundation vulnerabilities** for the life expectancy of the infrastructure.

Action M-2.2: Use improved inundation mapping to **identify the sections of roadways, critical structures and natural areas t**hat will be affected by sea level rise projections.

Action P-1.3: Provide **advocacy and leadership** for adoption of climate change policies and legislation with local, state, and federal entities.

Action P-2.4: Incorporate "**Adaptation Action Area**" designation into local comprehensive plans and regional planning documents to identify those areas deemed most vulnerable to sea level rise and other climate change impacts.

B. BENEFITS OF CLIMATE PROTECTION MEASURES

In addition to addressing climate change, measures taken to reduce greenhouse gas emissions have other important benefits. The most obvious of these is the potential for significant cost savings. In 2008, **Monroe County spent over $3,107,000 on energy to power buildings and fuel its vehicle fleet**. Many of the measures in this plan "pay for themselves" quickly by reducing direct costs, such as fuel or energy used, and also indirect costs such as maintenance. For instance, a "right-sized" vehicle fleet is less expensive to purchase and fuel, while also being less costly to maintain.

A key strategic side benefit of climate change mitigation activities is **enhanced energy security** through reduction in total demand. Climate protection measures can also **spur business and job growth** during the design, manufacture, and installation of energy efficient technologies. Climate change mitigation activities, particularly those related to transportation, help to clean the air by reducing vehicle emissions. Finally, mitigation activities help to engender a greater degree of choice for Monroe County residents. For instance, more transit options combined with transit-oriented development practices make for a more vibrant, livable community.

In light of the compositional changes already made to Earth's atmosphere, we have already set the planet on a course for some degree of climate change. Many of the actions identified here to mitigate GHG emissions will also help government, businesses, and residents to adapt to a changing climate. For example, extreme and prolonged heat waves can put considerable strain on the reliability of energy delivery in peak periods; possibly leading to service disruption during times when cooling is most needed. By **increasing efficiency** across Monroe County, such **service disruptions are less likely** and the County will be able to better cope with those situations. Additional measures aimed solely at climate adaptation, such as modifying flood protection and heat emergency response programs will also be addressed in this Climate Action Plan.

In addition to this Community Climate Action Plan, Monroe County is also addressing climate and energy issues through inclusion of a *Climate and Energy Element* in its Comprehensive Plan that is being updated (see http://keyscompplan.com/system/wp-content/uploads/2010/02/16.0-Energy-Conservation-and-Climate2.pdf).

C. FOCUS AREAS

Each of the focus areas within the *Monroe County Community Climate Action Plan* is explored in the following pages. In each focus area, goals with supporting strategies are explored. A G*oal* is an objective, end result, or target that supports a focus area and an *Action* is a means of realizing the objective. Each focus area draws on the actions of both the local government and Monroe County, Florida residents and businesses, although some areas may be largely one or the other.

Focus Area 1: Cross-Cutting Goals & Strategies

Several focus areas are considered cross-cutting strategies because they are integral to successful implementation of the other focus areas. The first three focus areas; Policy Coordination, Identify and Monitor Risks, as well as Education and Business Development are cross-cutting focus areas which will build on the other focus areas. Given the broad reach and embedded nature of the goals for these focus areas, emission reductions were not calculated for these focus areas. Emission calculations are listed for actions in the other focus areas wherever possible.
Efficiency is a critical and common component of this plan. Energy, water and fuel efficiency strategies are woven into all of the focus areas.

Focus Area 2: Government Operations & Community Goals & Strategies

Government operations strategies are specific to the internal operations of Monroe County, Florida. They apply to buildings Monroe County owns or leases, vehicles used to provide services, lighting of roadways, etc. Community strategies require involvement and participation from citizens. Each action is noted as one or both of these.

Focus Area 3: Emissions Reductions

Calculating expected emissions reductions for each goal requires making assumptions about degree of implementation, technology, and individual behavioral changes several years into the future. The uncertainty associated with these assumptions makes it difficult to assign exact reduction totals to each goal or action item. To address this uncertainty and provide a simple but useful reference for reduction potential, a series of symbols and percentage ranges has been devised to represent the emission reductions associated with each goal and its strategies. Specific implementation assumptions and GHG reduction estimates are listed in the Appendix.

Focus Area 4. New and Existing Actions

This Climate Action Plan includes a combination of existing policies and programs as well as new ideas based on best practices from around the country.

V. CLIMATE ACTION PLAN GOALS & ACTION ITEMS

Priority Rankings of Recommended Action Items:

- **High** -- Critical project, will not meet Climate Action Plan mission without it
- **Medium** -- Important project with significant outcomes, worthy of consideration and resources
- **Low** -- Important but mitigation and/or adaptation outcomes may not merit implementation with current resources; implement if resources allow

Planning Horizon:

Each action item has associated implementation actions, indicators to track progress, and timelines. Implementation timelines are broken down into three phases:

- **Short-term:** 2013-2014
- **Mid-term:** 2015-2016
- **Long-term:** 2017-2020

These periods sync with the 2020 target identified and makes the Plan consistent with the State timelines for implementation.

For each action, the County will assign performance targets that will provide guidance on the overall progress toward the goals. Staff will be responsible for communicating these in the Progress Indicator Timelines for each action item.

A. POLICY COORDINATION

The goal is to create collaborative intergovernmental practices and mechanisms in Monroe County that serve as a tool for the County, municipalities and other public and private entities to reduce countywide greenhouse gas emissions to 20% below 2005 by 2020. This can be done by coordinating strategies, programs, and other sustainable initiatives that mitigate the causes and assist in adaptation to the regional consequences of climate change, with special emphasis on intergovernmental coordination of adaptation activities. The Policy Coordination section includes two goals on climate leadership and the Monroe County Comprehensive Plan with 6 and 4 supporting strategic action items, respectively.

Goal P-1: Leadership. Create collaborative community and intergovernmental practices in Monroe County that serve as a tool for the County, municipalities, and other entities to address climate change mitigation and adaptation needs.

P-1.1: Develop an implementation strategy for the Monroe County Community Climate Action Plan.


Photo by R. Haag

Monroe County should assign a working group of employees the task of developing an implementation strategy for the Community Climate Action Plan for adoption by the BOCC. This should include measurable objectives, specific department/personnel assignments and cost estimates.

Priority: High Planning Horizon: Short-term

P-1.2: Provide resources and leadership to the Southeast Florida Climate Change Compact to advance mitigation and adaptation efforts to address the potential negative impacts related to climate variability and change.

Monroe County is the most vulnerable partner within the SE FL Compact with respect to climate change induced sea level increases. Not only is our primary source of drinking water threatened by sea level rise, but our very homes, businesses and infrastructure are also directly at risk. The County should continue to actively support the implementation of a Regional Collaborative Climate Action Plan with the neighboring counties through the Southeast Florida Regional Climate Compact to address the impacts of sea level rise and other related climate change impacts.

Priority: High Planning Horizon: Short-term

P-1.3: Provide advocacy and leadership for adoption of climate change policies and legislation with local, state, and federal entities.


Teaching at the GLEE Energy Expo

Encourage all agencies, utilities and franchisees operating within Monroe County to adopt climate change mitigation plans to minimize greenhouse gas emissions and adaptation plans to minimize potential impacts of sea level rise. Monroe County should collaborate with local municipalities and other public and private entities to coordinate, develop, and implement a suite of planning tools to address climate change mitigation and adaptation strategies.

Monroe County should continue to demonstrate leadership in advocacy for climate change issues and legislation to the National Association of Counties, Florida Association of Counties and the Florida League of Cities, and in Washington, DC and Tallahassee. Support proactive environmental and climate change public policies and standards that support adaptation funding to meet those needs.

An example of such an effort would be to work with local utilities to research incorporation of "smart metering", "smart load management" devices, the potential benefits of solar power as distributed

generators and electric cars as household storage systems. Similarly, the Florida Keys Aqueduct Authority could be encouraged to implement innovative measures for increasing their energy efficiencies and reducing water withdrawals.

Priority: High Planning Horizon: Short-term

P-1.4 Action: Maintain and support a Monroe County Sustainability Office.

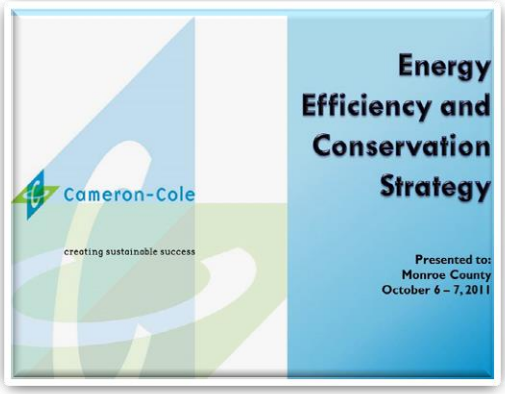
Monroe County should maintain and support a Sustainability Office to provide an identified point of contact for the County's sustainability related issues. Activities of the office should include oversight of energy efficiency and climate change policies, initiatives, and sustainability programs, countywide coordination to local governments, development of climate mitigation and adaptation plans and implementation strategies, and to serve as liaison and support for multi-county climate change strategies and agencies in which Monroe County participates.

The office should identify governmental and community adaptation needs, educate employees; identify sources for future grants; and provide/advise/encourage sustainability actions, best management practices, and energy efficiency for Monroe County government operations and the communities within the County. A mechanism needs to be developed to direct a percentage of the savings from energy efficiency measures and grant monies to fund the Sustainability Office with minimal dependence on ad-valorem taxes.

Priority: High Planning Horizon: Short-term

P-1.5: Provide staff and resources to an inter-departmental task force to 1) address energy efficiencies and adaptation needs for BOCC government operations and 2) development of an implementation strategy for the Monroe County Community Climate Action Plan.

Monroe County should provide support for an active *Energy Reduction Task Force* to effect the target reduction adopted by the BOCC in 2010 of at least a 20% reduction in energy consumption and greenhouse gas emissions below 2005 levels by 2020. This goal is to be accomplished through completion of a Governmental Operations Climate Action Plan for operations under the purview of the BOCC. In addition, Monroe County will need to assign a working group of employees the task of developing an implementation strategy for the Community Climate Action Plan for adoption by the BOCC.



Priority: High Planning Horizon: Short-term

Action P-1.6: Maintain a community BOCC Climate Change Advisory Committee

Monroe County should maintain an advisory committee to assist and advise elected officials and the Office of Sustainability on climate related issues. An advisory committee similar to the existing one is an ideal forum for community coordination in the important area of addressing climate change needs in Monroe County.

Priority: High Planning Horizon: Short-term

Goal P-2: Comprehensive Plan. Integrate climate change planning into Monroe County's Comprehensive Plan and climate change adaptation and mitigation strategies into the Land Development Regulations.

P-2.1: Revise Monroe County's Comprehensive Plan to address strategic planning related to climate change mitigation and adaptation needs.

The Monroe County Comprehensive Plan should include strategies to address the impacts of climate change. Adaptive management principles should be used to continually review and revise climate mitigation and adaptation policies, objectives, and Land Development Regulations. Revisions to the Plan should include:

- Creating a Climate Change Element within the Monroe County Comprehensive Plan which can be a model to other local government efforts.

- Address greenhouse gas reduction and energy conservation strategies that promote compact, bicycle and pedestrian-friendly development; increase public transportation; reduce reliance on automobiles, the construction of energy efficient buildings; and address the potential effects of rising sea levels, and other climate change issues.
- Consider climate change impacts as a factor in determining appropriate levels of development in vulnerable areas.
- Include climate change mitigation and adaptation in all relevant elements of the Comprehensive Plan including; future land use, transportation, infrastructure, coastal management, conservation, recreation and open space, intergovernmental coordination, and capital improvements.

Priority: High Planning Horizon: Short-term

P-2.2: Advance livable communities as identified in the Communi-Keys Master Plan through adoption of LDR policies.

Monroe County should continue to support the livable communities concept which promotes functional, walk-able mixed use development designs and projects by providing flexibility in development review for these projects, revising the zoning and land development codes to allow and encourage these projects, establishing incentives for this type of development, and adopting specific goals in the Monroe County Comprehensive Plan to support and establish sustainable development patterns (www.monroecounty-fl.gov/DocumentView.aspx?DID=173).

Priority: Low Planning Horizon: Long-term

P-2.3: Create policies for future development to incorporate sea level rise inundation vulnerabilities for the life expectancy of the infrastructure.

1. Require one or two feet of freeboard (depending on the life expectancy of the structure) on all structures typically designed to the NFIP 100-year flood elevation. (This also provides significant discount on flood insurance)
2. Require all new commercial buildings to be elevated to NFIP standards plus 1 or 2 feet of freeboard, or elevate flood proofed buildings to a minimum of 2 feet above the road elevation.
3. All new and significantly renovated roads parks, pump stations, filled lots, towers, etc. shall have the grade elevated to above the land's projected sea level for the expected life of the infrastructure.
4. All stormwater infrastructures shall be designed with the assumption that the Mean Lower Low Water datum displayed on nautical charts will be the highest projected sea level during the expected life of the infrastructure and that high tides will be one to two feet greater.
5. All flood proofed buildings shall be designed for buoyancy based on the highest projected sea level during the life expectancy of the structure.
6. All new residential homes and commercial structures shall have 50% of the lot filled to the level of the highest projected sea level for the life expectancy of the structure
7. All new commercial parking lots shall be designed, at a minimum, to the level of the highest projected sea level for the life expectancy of the structure.

Priority: High Planning Horizon: Short-term

P-2.4: Incorporate the "Adaptation Action Area" designation into local comprehensive plans and regional planning documents to identify those areas deemed most vulnerable to sea level rise and other climate change impacts.

"Adaptation action area" or "adaptation area" means a designation in the coastal management element of a local government's comprehensive plan which identifies one or more areas that experience coastal flooding due to extreme high tides and storm surge, and that are vulnerable to the related impacts of rising sea levels for the purpose of prioritizing funding for infrastructure needs and adaptation planning." §163.3164(1), F.S. (2011). Adaptation Action Areas will include the built environment as well as natural areas and be used as a development tool to guide policies and regulations that will serve to reduce future risk and economic losses associated with sea level rise. Adaptation Action Areas will account for both existing and needed infrastructure. Vulnerable natural areas can be protected by directing development to non-vulnerable areas.

A vulnerable beach area on Boca Chica.

Priority: High Planning Horizon: Short-term

B. IDENTIFY AND MONITOR RISKS & VULNERABILITIES

Monroe County should take advantage of all available tools and resources to complete the task of determining where the impacts of climate change will first occur, and what should be done to assure sustainability.

To assist in making planning decisions, actions include a series of mapping, modeling and monitoring measures to identify vulnerable areas and risks. These include improved analysis and mapping capabilities for identifying areas at risk in the County that are vulnerable to sea level rise by utilizing the most recent LiDAR data; encouraging dedicated state and federal funding sources for reoccurring and continued development of local integrated modeling efforts and continuous data gathering; and collaborating with adjacent counties to establish an integrated network of early warning signs that track long-term changes across the Southeast Florida region.

The *Identify and Monitor Risks and Vulnerabilities* section contains three goals related to coordination of technical information, identifying vulnerabilities and monitoring adaptation needs with 2, 2, and 3 supporting strategic action items, respectively.

Goal M-1: Coordinate with peer organizations and assure availability of up-to-date scientific and technical information.

M-1.1: Encourage and participate in long-term regional modeling.

Monroe County should participate in the long-term and regional modeling efforts including: tide gauges; hydrologic, geologic, and groundwater quality and levels; water quality (including temperature); precipitation; and groundwater withdrawals.

Encourage and seek dedicated local, state and federal funding for modeling efforts and data gathering including monitoring of scientific data that improves our knowledge of climate change impacts for Southeast Florida and the down-scaling of global climate models to enable increased awareness of climate change predictions for Monroe County.

SE FL Regional Climate Compact

Priority: High Planning Horizon: Short-term

M-1.2: Seek technical support from state and federal agencies and universities for development of climate change scenarios appropriate for Monroe County.

Monroe County shall engage the support of state and federal agencies (e.g., FDEP, FDOT, SFWMD, NOAA, USGS, FEMA, USFWS, USACE), and universities that can provide technological and logistical

support and work with state, county, and local planning bodies to develop regional scenarios of climate change and analyze potential changes in vulnerability.

Priority: High Planning Horizon: Short-term

Goal M-2: Identify the most vulnerable areas and facilities that will be affected by sea level rise in Monroe County.

M-2.1: Improve inundation mapping and modeling.

Improve current analysis and mapping capabilities to identify areas of the county vulnerable to sea level rise by utilizing the best available LiDAR (Light Detection and Ranging) elevation data, GIS, aerial photography and other appropriate data, including direct observation at spring high tides. Initial analyses should focus on levels of sea level rise projected by the Southeast Florida Regional Climate Change Compact Counties, Technical Working Group report, "*A unified sea level rise projection for South Florida*", April 2011. Those projections included a range of sea level rise of 3-7 inches by 2030 and 9-24 inches by 2060. Similar ranges have been adopted by the USACOE and the SFWMD.

Priority: High Planning Horizon: Short-term

M-2.2: Use improved inundation mapping to identify the sections of roadways, critical structures and natural areas that will be affected by sea level rise projections.

Now that airports, hospitals, schools etc. have been mapped, expand the mapping of potential sea level rise impacts to the natural and built environments. Identify critical elements of our residential and business community infrastructure (natural areas, county roads, community centers, shopping areas, etc.) that will be affected by the increased flooding caused by sea level rise impacts during regular and extreme high tides.

Priority: High Planning Horizon: Short-term

Goal M-3: Create a countywide sea level rise monitoring and adaptation process.

M-3.1: Develop a monitoring program to evaluate and observe climate change impacts and responses on the natural and built environments within Monroe County.

An ongoing monitoring program to document climate change related impacts on the built and natural area is needed to identify best management practices for improving adaptation responses to protect both the natural and built environments. Particular emphasis will be on monitoring the amount and rate of sea level rise, but temperatures, rainfall and drinking water availability are also important. Monroe County

should seek data being collected by other agencies and supplement it, where needed, with in-house monitoring.

Priority: High Planning Horizon: Mid-term

M-3.2: Develop plans with service providers for the delivery of routine and emergency services to areas impacted by each of the current SLR projections.

Maintain a database of critical roads and infrastructure vulnerable to sea level rise according to the various sea level rise projections. To maintain maximum functionality within the communities of Monroe County as sea levels increase, Monroe County needs to provide leadership to the business community in developing strategic plans for the delivery of routine and emergency services.

Priority: Medium Planning Horizon: Mid-term

Marathon City Marina

Action M-3.3: Create a framework to evaluate vulnerabilities and prioritize them for adaptation actions.

Effective adaptation options will be limited, as will the funding necessary to implement them. Some vulnerability will severely impact the residential quality of life and sustainability of business. These should be prioritized and adaptation options should be planned.

Priority: Medium Planning Horizon: Short-term

C. EDUCATION AND BUSINESS DEVELOPMENT

This section contains two goals on education and business and workforce development with three and four supporting strategic action items, respectively. Education is a critical need for addressing climate change mitigation and adaptation because of the ongoing confusion surrounding the issue with regard to its causes, potential impacts and means for ameliorating these potential impacts. Business development efforts are important to help provide the expertise and resources for addressing the challenges of mitigation and adaptation that require adoption of new technologies.

Goal E-1: Increase awareness and understanding of potential climate change impacts as well as mitigation and adaptation needs.

E-1.1: Promote climate change education regarding the potential impacts of climate change and sea level rise on the County's built and natural environments and potential mitigation and adaptation strategies to minimize those impacts.

An active communication and education strategy is needed to help the general public understand the need for mitigation and adaptation responses to climate change. The potential for harm to the built environment and declines in the local environment require rational responses. A first step would be to educate residents and commercial interests on existing rules, ordinances, etc., and promote Florida-Friendly Landscaping (http://www.floridayards.org) along with national and international programs with appropriate non-governmental organizations. Information is needed as well for residents and business owners to learn the potential impacts of sea level rise on the existing built environment and the county's roadways, properties and critical infrastructure.

Priority: High Planning Horizon: Short-term

E-1.2: Develop education programs to highlight the differences between storm surge and SLR and the appropriate hazard mitigation & adaptation techniques for each.

Storm surge and sea level rise are related subjects in that both can and will cause flooding, but they result from different natural phenomena and have relatively different impacts. It is important for people to understand the similarities and differences in developing adaptations to both while recognizing that while sea level rise is a gradual and permanent phenomenon whereas storm surges are infrequent and temporary but extreme events.


Photo by R. Haag

Priority: Medium Planning Horizon: Mid-term

E-1.3: Integrate climate change education into existing curriculum at local schools within Monroe County School District.

Climate change awareness must be integrated into every school's curriculum. The education of students can make a profound impact upon a community. Educating the youth of Monroe County will help to ensure that in the next 50 years the correct practices are put into place to further climate change impacts. The four steps necessary to guarantee the education of Monroe county students include reviewing curriculum, teacher training, curriculum integration, and providing resources. Pre and post evaluation on Survey Monkey will be conducted to measure the climate change education and behavior modifications. To ensure success, this program will be piloted at Sigsbee Charter School and modified based on feedback.

1. **Review Curriculum**: Review existing science curriculum K-7 that addresses the Next Generation Florida Sunshine State Standards.

2. **Teacher Training**: In order to reach out to students, teachers must be invested and educated thoroughly in climate change concepts. Staff and members of the Climate Change Advisory Committee will come speak with teaching staff about climate change and how these lessons can be applied in their classrooms.

3. **Curriculum Integration**: Knowledgeable professionals will meet with teachers to finalize how climate change curriculum can be written and integrated into existing curriculum at each school. Discussion of pertinent materials and guest speakers needed at each school will be critical at these meetings.

4. **Providing Resources**: Teachers will be provided with materials and guest speakers to aid in the full integration of the climate change curriculum into the classrooms.

Priority: Medium Planning Horizon: Mid-term

Goal E-2: <u>Business & Workforce Development</u>. Expand local green workforce and business opportunities through training and business development initiatives.

E-2.1: Develop green workforce capability within the County.

Local tradesmen and contractors need training in green technologies if appropriate construction techniques are to be implemented. Green industries grow the local economy. Therefore, green job training and retraining must be priority issues for the County.

Monroe County should look for technical training opportunities to enhance the local workforce. This enhancement can be accomplished directly through collaboration with the FKCC and the MC School Board to develop green job training. Funding opportunities exist to support curriculum development to train students in energy management and installation of renewable energy systems.

Key West ball field lighting retrofit

Local green workforce enhancement can also be accomplished indirectly by requiring green job skill development for the appropriate county employees in Engineering, Project Management and Public Works, by requiring green credentials and outcomes into solicitation proposals.

Priority: Medium Planning Horizon: Mid-term

E-2.2: Require climate change adaptation training for contractors to learn green building practices and to protect the natural shoreline against sea level rise.

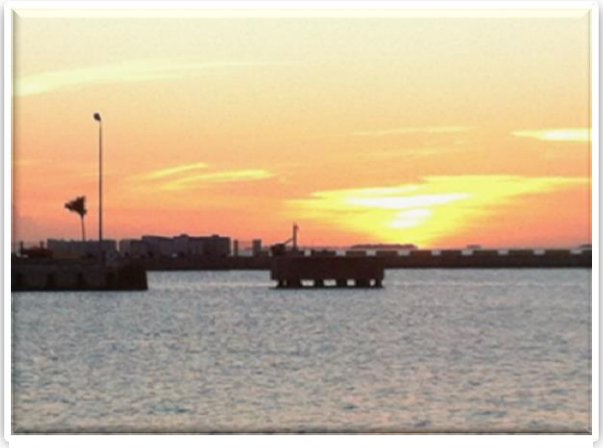
The Monroe County Building Department should consider training requirements for contractors to remain informed of the best management practices for green building practices and protection of private property against sea level rise effect while maximizing protection of the natural shoreline.

Priority: Low Planning Horizon: Short-term

Action E 2.3 Enhance Sustainability of Existing Businesses

Existing businesses should be encouraged when possible to retrofit existing infrastructure and practices to reduce their carbon footprints through a green business certification program. Furthermore, Monroe County should encourage, through policy, sustainable practices with particular sensitivity to and focus on businesses of historical and cultural significance.

Priority: Medium
Planning Horizon: Mid-term



Key West waterfront area

Action E-2.4: Enhance Sustainable Development of New Businesses.

Initiate a sustainable business development effort to encourage growth of new green businesses. This could include evaluation of opportunities to provide incentives for green business development and to create economic and similar other incentives to encourage environmental (green) businesses to relocate to the county. Coordinate and partner with local chambers of commerce to establish "green" initiatives.

Priority: Medium Planning Horizon: Mid-term

D. NATURAL SYSTEMS

One of the largest attractions of Monroe County is the natural system encompassed within its boundaries. For the period 2007-2008, approximately 83% of residents and 92% of visitors participated in recreation-based activities, and these activities contributed $2.109 billion to the local economy. Coincidentally, commercial fishing represented 9% of private sector employment. However, the ecosystems that support recreational and commercial activities are also among the most vulnerable to a changing climate. There is extensive documentation detailing the effects of warming seas on the coral reef ecosystems, and sea level rise on coastal habitats and the plants and animals that they support.

Monroe County should encourage activities designed to 1) better understand the effects of climate change on the Florida Keys ecosystems, 2) to develop adaptation strategies that ensure their sustainability, and 3) to support restoration programs for those systems already impacted. To achieve these goals, partnerships with other governmental and non-governmental organizations and the private sector are needed to develop holistic strategies that ensure these ecosystems continue to be vibrant and healthy, and provide the services upon which the residents of, and visitors to, Monroe County depend.

The Natural Resource Section contains three goals on vulnerability, adaptation and resilience with 2, 1 and 3 supporting strategic action items, respectively.

Goal N-1: Vulnerability-- Identify vulnerability of natural resources (i.e. natural areas, species, groundwater) to coastal hazards and climate change impacts including storms, sea level rise, drought and rainwater flooding**.**

N-1.1: Coordinate with state, regional and national strategic planning efforts to evaluate the vulnerabilities of the natural environment to climate change impacts.

A Key Deer on Big Pine Key

Monroe County should coordinate with other state, regional and national strategic planning efforts to prepare for climate variability and change. For example, the SE Florida Climate Change Compact's regional Climate Action Plan, the Florida Fish and Wildlife Conservation Commission/Fish and Wildlife Research Institute's species vulnerability assessment, the U.S. Fish and Wildlife Service/Landscape Conservation Cooperative scenario planning, the Florida Keys National Marine Sanctuary management planning, the South Florida Water Management District water supply planning, and the NOAA "Coastal and Marine Spatial Planning" under auspices of the National Ocean Policy.

Priority: Medium Planning Horizon: Mid-term

Action N-1.2: Evaluate and support protections and restoration programs in potential climate change affected natural habitats.

Some habitats and other resources of concern include the Keys' freshwater lenses (i.e., groundwater), freshwater wetlands and pine forests as well as coastal wetlands. Protecting and restoring these wetlands should help reduce saltwater intrusion driven by sea level rise, storm surges and the highest tides of the year. Wetlands also help to retain and filter storm water runoff, reducing potential pollution from the built environment. Restoration may include filling or plugging ditches, installing culverts to allow storm surge to run off, and fire management to create or maintain high frequency, low intensity fire regimes in fire-dependent uplands and wetlands of the lower Keys - which will slow the succession from pine and herbaceous species to broadleaf species dominance.

Chris and Nate Bergh demonstrate that pine rockland forests and associated freshwater wetlands and lenses are at risk from sea level

Priority: High Planning Horizon: Mid-term

Goal N-2 Adaptation. Develop strategies that promote the adaptive capacity of natural systems to changing environmental conditions resulting from climate change.

N-2.1 – Promote and encourage policies that provide adaptive capacity to species and habitats to respond effectively to changing conditions, especially to those that are particularly vulnerable to climate change.

The ability of coastal species and habitats to respond effectively to sea level rise is **dependent upon their ability to migrate inland with rising waters**. This ability may be facilitated by adopting strategies that provide migration corridors. For example, approaches that conserve beach berms and/or discourage shoreline hardening should be considered when appropriate. The Land Development Regulations, Tier System, Habitat Conservation Plan for Big Pine and No Name Key and other rules and regulations do these things and should be retained and improved upon as conditions evolve.

Some species of fish, wildlife and/or plants are particularly sensitive to changing climate in the Florida Keys. For example, loggerhead turtles depend on beaches for nesting and sea level rise predictions suggest that Keys beaches are likely extremely vulnerable to increasing sea level rise. Policies that encourage **conservation and restoration of key habitats** and landscape features should be encouraged to provide opportunities for these species to successfully survive and adapt. The Land Development Regulations, Tier System, Habitat Conservation Plan for Big Pine and No Name Key and other rules and regulations do these things and should be retained and improved upon as conditions evolve.

Priority: Intermediate Planning Horizon: Long-term

Goal N-3: Resilience. Increase the resilience of the natural and urban landscapes to climate change through implementation of mitigation and adaptation strategies.

N-3.1: Identify, protect, restore and enhance sites where 'green infrastructure' (e.g. mangroves, natural beaches, freshwater wetlands, coastal berms, coral reefs), alone or in combination with built infrastructure can increase resilience of the natural and built environments.

A healthy green infrastructure not only increasing resilience to natural systems but it also protects people and the built environment from coastal hazards and climate change impacts including storms, sea level rise, drought and rainwater flooding. In addition, maintain functional green infrastructure provides corridors for migration of shore side habitat inland as sea level rises.

Eroded beach shoreline of Boca Chica.

Priority: High Planning Horizon: Long-term

N-3.2: Ensure that Monroe County Land Authority continues to place a high priority on purchasing natural areas for conservation purposes and support efforts of federal, state, municipal and private interests to purchase natural areas for conservation purposes.

This action item reinforces and helps to put in action the protection of existing green space for maintaining a healthy green infrastructure.

Priority: High Planning Horizon: Short-term

N-3.3: Support the recommendations of the Florida Reef Resilience Program's "Climate Change Action Plan for the Florida Coral Reef System 2010-2015" through participation in recommended management, education and research areas, as appropriate.

Protection of the marine environment surrounding Monroe County is critical to maintaining a productive fishing and tourist economy. The Florida Reef Resilience Program's Climate Action Plan's vision is to achieve: 1) increased resilience to global climate change impacts via active management of local reef impacts; 2) enhanced communications and awareness about climate change impacts on reefs and reef users; and 3) targeted research about those impacts. More detailed information is available at: http://frrp.org/SLR%20documents/FL%20Reef%20Action%20Plan-WEB.pdf

Priority: High Planning Horizon: Short-term

E. BUILT ENVIRONMENT

A section of Old U.S. 1 on Boca Chica

Energy consumed in *residential buildings* accounts for **29.5% of Monroe County's total GHG emissions**. Improving the efficiency of our residential building stock will contribute significantly to achieving the county's greenhouse gas reduction target, while saving residents money on utility bills and reducing the need for new infrastructure. This chapter focuses on opportunities to retrofit existing residential buildings, increase the quality of new construction, and to ensure that future activities in these sectors are compatible with our community's climate protection goals.

Emissions from *transportation* are a common sight to nearly everyone in the Keys. Besides emitting greenhouse gases, transportation fossil fuels also produce a host of criteria air pollutants when combusted, reducing local air quality and affecting our health. Transportation accounts for **38% of Monroe County's total GHG emissions.** This chapter focuses on programs and policies to reduce emissions from transportation and includes design-oriented approaches as well as expansion of alternate modes such as walking, biking, or public transportation to and from the most common destinations in Monroe County, Florida.

Broadly speaking, the *use of fossil fuels for energy* (including electricity, heating, transportation, and other uses) is the single largest contributor to greenhouse gas emissions and climate change. While Florida is a strong leader among US states in terms of implementing low or no carbon energy sources, fossil fuels still supply a considerable share of energy for electricity, heating, transportation, and other energy-producing uses. Emissions from fossil fuel combustion for energy, including transportation, **represent 88.5% of the community's total GHG emissions**. Energy Production is a cross-cutting focus area in that nearly all activities that take place in the community require energy of some sort. While Florida Keys Electric Coop and Keys Energy Services are working hard to increase the percentage of electricity generated through renewable sources, opportunities also exist for citizens and Monroe County, Florida local government to produce small-scale renewable energy or fuels, offsetting the need for fossil fuels. The programs and projects within this focus area are designed to spur local government and community investment in renewable energy sources including those that produce electricity, heat, and mobile fuels.

A *resilient vehicle transportation infrastructure* is a must in Monroe County to maintain our quality of life while adapting to sea level rise. Early identification of areas that require improvements and integrating them into the current planning process will help to sustain our neighborhoods and economy. Early identification of needed improvements also minimizes needed expenditures and enables the County to take advantage of state and federal funds.

The overall vision is to have a *functional mass transportation system and ride sharing program* throughout Monroe County for island to island travel and low-carbon transportation alternatives for travel within each of the island communities. As the shift to alternative fuel vehicles occurs, most cars will include electric engines, either wholly or as a plug-in hybrid. Commuter parking areas with *electric*

charging stations at each island community center will help facilitate a transition to electric vehicles for both "drive down" tourists and residential commuters.

Ground level *commuter parking areas should be raised several feet* equal to or higher than the height of the adjacent US1 highway to protect against SLR, and where possible storm surge. As the shift to electric vehicles occurs these small limited distance vehicles will be less likely to be used for storm evacuation.

As an alternative to removing multiple vehicles per household from a storm's path (burdening evacuation times) we should encouraging the use of one conventional fueled vehicle for the entire family while leaving the commuter vehicle in these relatively safe commuter parking areas.

The more the County is able to encourage mass transit use, the less people will be dependent on cars, which will result in a reduction in CO2 emissions. Economic and energy savings for travelers will occur because dependency on oil for personal transportation will be reduced. The Built Environment section contains four goals, landscape, adaptation, mitigation and transportation with 2, 1, 2, and 6 supporting strategic action items, respectively.

Goal B-1: Landscape. Promote the conservation of native species and sustainable landscape practices.

B-1.1: Promote Florida-Friendly Landscaping principles that encourages native flora and discourages the spread of invasive exotics species (http://www.floridayards.org).

Florida-Friendly Landscaping promotes resilient landscapes that require minimal fertilizer and pesticide applications and is more adaptable to natural rain cycles, thus also minimizing the need for artificial irrigation. Native landscaping is a good mitigation and adaptation practice for landscapes within the built environment.

This action will also increase carbon sequestration and to help reduce energy costs. Review current buffer requirements to encourage a balance of trees, understory, shrubs, and groundcover. Reduce pea-rock and turf grass on rights of way whenever possible and replace with native ground cover, plants, and trees.

The development of strategies to respond to potential increases in undesirable exotic and invasive species is critical. Emphasis on prevention of new invasions through education, early detection of and rapid response to new invasions and control of well-established invasive species populations that have particular impacts on climate change vulnerability (e.g. Australian pines are bad in any natural area but on dunes they promote coastal erosion which can reduce resilience of the dune itself and therefore everything landward of the dune, to waves, storm surges and rising sea levels. The Florida Keys Invasive Exotics Task Force should review their existing policies and activities in context of climate change and sea level rise (http://www.floridainvasives.org/Keys/).

Priority: Low Planning Horizon: Short-term

B-1.2: Encourage creation of new community gardens and produce markets.

Community gardens and produce markets are great ways to encourage healthy eating. Monroe County should adopt policies to encourage community gardens by reducing barriers and cost, and search for opportunities to use public spaces for establishment of community gardens and produce markets.

Priority: Low Planning Horizon: Short-term

Goal B-2: Built Adaptation. Incorporate adaptation to climate change impacts, especially sea level rise and storm surge in building codes, the planning of developments and provision of services, as appropriate.

B-2.1: Develop and implement adaptive planning and zoning policies, regulations and programs to ensure that appropriate land use, construction and redevelopment activities address the potential impacts of sea level rise on Monroe County's infrastructure.

Monroe County will ensure that *new*, *renovated* and *replacement* residential and commercial buildings are designed in a manner which takes into consideration the impacts from global climate change, including rising sea level and storm surge, to assure resilience and sustainability.

Establish an ongoing process to review local and regional zoning and building code requirements implemented by other counties, determine their applicability to Monroe County, and adopt as a local code when appropriate regarding the need for resilience of existing and proposed structures in areas at risk to inundation and climate change.

Priority: Medium Planning Horizon: Mid-term

Goal B-3: Built Mitigation. Identify measures to reduce greenhouse gas emissions through changes in building codes and practices.

B-3.1: Consider Land Development Regulations to increase energy efficiency, promote renewable energy systems, and other green construction practices, as well as storm readiness in excess of existing building codes for new and remodeled residential and commercial structures.

Monroe County typically does not adopt building codes that are more stringent than those enacted by the State of Florida because it is a cumbersome process that must be repeated each time the state building codes are updated. An alternative means for incorporating new green building standards that are applicable to Monroe County is through *land development regulations*. The State of Florida has indicated that while it will adopt the 2012 International Building Codes, it will not be adopting the 2012 *International Green Construction Code* recently developed by the International Code Council. The Florida State Green Building Model Ordinance provides guidance on incentives for green building and adaptation for climate change (www.southern**buildings**.org/resources/pdfs/Model_**Green_Building**_Ord.pdf).

Homeowners, businesses and builders need guidance and assistance in creating homes and offices that minimize the use of non-renewable energy. The creation of near **net-zero buildings** is a goal for county residents that can only be facilitated by appropriate policies and assistance from local governments, their departments, and the local utilities.

Incorporating energy efficient design, construction, maintenance and waste reduction standards through the use of regulation, education and incentives is a goal. The county should encourage greener, more efficient, and more durable construction practices locally by establishing an ongoing process to address local zoning and building code requirements that recommend the following:

1. Encourage builders to construct all new and renovated buildings to meet green building standards to be developed in the green building ordinance;
2. Encourage each municipal building department to have at least one "green" accredited official on staff within a two-year time frame;
3. Encourage licensed personnel in each building department to have continuing education units (CEUs) of emerging energy efficiency and renewable energy technologies with the next two-year cycle;
4. Incorporate RFP specifications that will require accredited individuals on design teams and incorporation of green building practices.

Priority: Medium Planning Horizon: Mid-term

High-tide flooded road on Big Pine Key

B-3.2: Reduce impervious surfaces to reduce storm water runoff.

Impervious surfaces have proven to reduce storm water runoff in the built environment and need to be expanded to reduce pollution to the near shore environment. Ongoing consideration is needed for incorporation of impervious asphalt and concrete in appropriate situations.
Priority: Medium
Planning Horizon: Mid-term

Goal B-4: Transportation. Encourage the use of public transportation, ride sharing, and a shift to fossil fuel efficient and electric commuter vehicles through the provision of the appropriate infrastructure. This goal encourages adaptation – 'to build resilience into our transportation infrastructure,' and a mitigation element 'to reduce the current level of vehicle miles travelled and thus the amount of carbon emissions.

A resilient vehicle transportation infrastructure is a must in the Keys to maintain quality of life while adapting to sea level rise. Early identification of areas that require improvements and integrating them into the current planning process will help to sustain our neighborhoods and economy. This early identification of needed improvements also minimizes needed expenditures and enables the County to take advantage of state and federal funds.

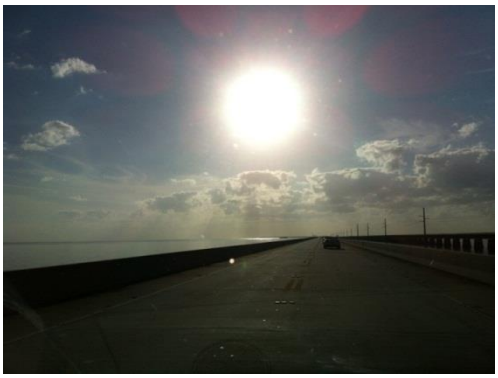
The overall vision includes a functional mass transportation system and ride sharing program throughout the Keys for island to island travel, and low-carbon transportation alternatives for travel within each of the island communities. As the shift to alternative fuel vehicles occurs, most cars will include electric engines, either wholly or as a plug-in hybrid. Commuter parking areas with electric charging stations at each island community center will help facilitate a transition to electric vehicles for both "drive down" tourists and residential commuters.

Ground level commuter parking areas should be raised several feet equal to or higher than the height of the adjacent US1 highway to protect against sea level rise, and where possible storm surge. As the shift to electric vehicles occurs these small limited distance vehicles will less likely be used for storm evacuation.

As an alternative to removing multiple vehicles per household from a storm's path (burdening evacuation times) we should encouraging the use of one conventional fueled vehicle for the entire family while leaving the commuter vehicle in these relatively safe commuter parking areas.

The more the County is able to encourage mass transit use, the less people will be dependent on cars, which will result in a reduction in CO_2 emissions. Economic and energy savings for travelers will occur because dependency on oil for personal transportation will be reduced.

B-4.1: Encourage a functional county wide public transportation system and coordinate transportation-related adaptation policies across jurisdictional boundaries.



7-Mile Bridge south of Marathon

1. Pursue funding opportunities for public mass transit, at the local, state and federal level.

2. Coordinate with the municipalities and the South Florida Regional Transportation Authority to improve the mass transit system functions on a regional level to allow Keys residents effective mass transit within the entire county and to the mainland.

3. Encourage vehicle ride sharing where mass transportation is not practical.

4. Provide the infrastructure and support facilities to encourage and enhance the use of mass transportation and ride sharing.

a) Establishing commuter-parking facilities in each island community.

b) Provide electric charging stations (preferably solar powered) at each of these parking facilities.

c) Raise parking facilities above high water levels.

Priority: High Planning Horizon: Long-term

B-4.2: Enhance bicycle and pedestrian safety, and promote their use to reduce miles driven.

1. Develop a countywide bicycle/pedestrian plan integrated with the *FDEP Overseas Heritage Trail* and the commuter parking areas.

2. Provide more bicycle routes and bike racks throughout the County.
3. Provide bicycle and pedestrian ways for connecting residential areas to recreational areas, commuter parking, schools, shopping areas and employment areas.
4. Promote a bike share program.

Priority: Medium Planning Horizon: Short-term

B-4.3: Promote the infrastructure and encourage use of alternative fuels and alternative fuel vehicles.

Alternative fuels such as biodiesel, propane, and eventually hydrogen can reduce dependence on fossil fuels, but such alternatives need government support or encouragement. Grant funding should be sought to fund evaluation pilot projects. One method of encouraging the needed transition is for the local governmental entities to acquire and use alternative fuels whenever possible. Other possible approaches include:

A Monroe County hybrid car

1. Encouraging the establishment of alternative fueling/charging stations.
2. Working with the MC School Board and FKCC to create and expand training programs.
3. Introducing alternative fueled vehicles when replacing county vehicles. Encourage municipalities to do so as well.

Priority: Medium Planning Horizon: Mid-term

B-4.4: Encourage creation of a Florida Keys Electric Highway.

The installation of fast-charging stations throughout the Florida Keys along U.S. 1 will facilitate the increase use of electric vehicles by both residents and tourists. The creation of a *Florida Keys Electric Highway* would greatly complement the current designations of the Florida Keys Scenic Highway and the Overseas Heritage Trail. Promote electric vehicles or shuttle services for island transportation and provide leadership by purchasing electric vehicles for use in the county fleet. Encourage accessible "plug in" locations for electric vehicles in new development projects or major renovations. Install electric fast-charging stations at all the major county facilities

Priority: Medium Planning Horizon: Mid-term

B-4.5: Develop raised commuter parking at transportation hubs to provide support for increased mass transit usage and to protect parked vehicles from sea level rise and storm surge.

The *Livable CommuniKeys Plans* envision **Community Centers** throughout the Keys where commercial activity will be centralized. The centers lend themselves to bicycling and walkable communities, and provide a focal point for commuter parking. These commuter parking areas should be elevated (with fill) above the projected sea level rise. Where possible, they should also be elevated higher to protect against storm surge. Such elevated areas will provide safe parking for short range commuter vehicles that will not be used for evacuation, thus encouraging the transition to alternative fuel vehicles.

Duvall Street high tide flooding

Elevated commuter parking areas are defined as areas where the parking level is raised to heights equal to or above that of the adjacent U.S.1 roadway and are sufficient in size to provide reasonable access for the nearby community. Multimodal infrastructure (e.g., raised commuter parking) and support facilities (e.g., electric charging stations) are needed to encourage the use of electric vehicles for on-island transportation and the use of mass transportation for island to island transportation. Sites throughout the County along the U.S.1 corridor are needed to provide commuter parking at ground levels equivalent to the adjacent highway to provide protection from anticipated sea levels and the concomitant increases in extreme tides and storm surges.

Priority: High Planning Horizon: Long-term

Action B-4.6: Establish video conferencing facilities to allow residents and employees to participate in advisory and commission meetings without having to drive long distances.

The three primary county meeting facilities (Murray Nelson, Marathon, and Harvey Government Centers), will be equipped and staffed to provide Keys-wide video teleconferencing by the public and county employees during BOCC and other meetings. This action would significantly reduce miles traveled within the county and travel costs for both residents and employees. The time saved would also increase government and business productivity.

Priority: Medium Planning Horizon: Short-term

F. WATER RESOURCES & WASTEWATER

The water and wastewater infrastructure in the Florida Keys are important, but also vulnerable to sea level rise. The well fields which supply water to Keys residents are located on the mainland, and are susceptible to salt water intrusion as sea level increase. Alternative means of providing drinking water to the island chain will be needed. The pipes, pumps and ancillary equipment will need to be hardened against the salt water. In addition, Monroe County has invested years of funding and resources into developing and implementing advanced wastewater systems, many of which may be vulnerable to rising seas.

Water conservation strategies are needed to minimize extraction of potable water from the mainland well fields to help stave off salt water intrusion. *Alternative sources of water* will be needed. Continued and new efforts will be needed to minimize wastewater contamination of our near shore waters. The Water Resources & Wastewater section includes three goals on drinking water, alternate water source and near shore water quality protection with 5, 5, & 2 supporting strategic action items, respectively.

Goal W-1: Drinking Water. Support conservation strategies for protection of water resources.

W-1.1: Advocate for sustained implementation of the Comprehensive Everglades Restoration Plan (CERP) projects that increase the flow of freshwater into lower east coast aquifers and Florida Bay.

CERP projects will increase the resiliency of the local drinking water supply by helping to curtail saltwater intrusion into the Biscayne Aquifer, the primary source of drinking water for the Florida Keys, and will improve the resiliency and quality of the Florida Bay ecosystem. Monroe County should review, in coordination with appropriate agencies, the impacts of climate change and sea level rise on the Everglades and support adaptive management efforts to mitigate impacts.

Priority: High Planning Horizon: Short-term

W-1.2: Support climate change and conservation strategies of FKAA and SFWMD to protect the existing freshwater supply for Monroe County.

Monroe County should support the inclusion of adaptation measures that address impacts from climate change in future updates of the FKAA Water Plan (http://www.fkaa.com/alt_supply_plan.htm), the South Florida Water Management District's Lower East Coast Regional Water Supply Plan (http://www.sfwmd.gov/portal/page/portal/xweb%20-%20release%203%20water%20supply/water%20supply%20planning) and other regional water management activities to ensure that Monroe County's source of potable water supply is conserved and protected.

Priority: High Planning Horizon: Short-term

W-1.3: Provide support to implement water conservation measures.

Monroe County should provide resources to assist local governments, South Florida Water Management District and FKAA in implementing regional water conservation strategies as a water supply demand management tool.

The county should fully promote government and public water-use audits to establish a baseline, and identify efficiency and conservation opportunities using state-of-the-art leak detection technology and other strategies.

Staff should coordinate with the Monroe County Health Department to encourage and facilitate gray water use.

FKAA J. *Robert Dean* Water Treatment Plant in Miami Dade County

Policies should require that new and replacement toilets, showerheads, and other water fixtures purchased by the County be low-flow, consistent with EPA's *WaterSense* (www.epa.gov/WaterSense) or *Energy Star* (www.energystar.gov) programs.

The county shall promote partnerships and consistent conservation policies and reduced per-capita-use goals with all users within the County including homeowner's and condominium associations.

Priority: High Planning Horizon: Short-term

W-1.4: Endorse partnerships with FKAA and all county wastewater utilities to implement energy efficiency measures.

It takes a lot of energy to treat and distribute water. It is important for our wastewater and water systems to reduce energy consumption and greenhouse gas emissions.

Priority: High Planning Horizon: Short-term

W-1.5: Require installation of a rain detection device on all automatic or timer-controlled irrigation systems to cease irrigation during periods of rainfall.

Irrigation of landscape should be curtailed during rainy periods. Rain-detection systems should be installed in any automatic (timer controlled) irrigation system.

Priority: Medium Planning Horizon: Short-term

Goal W-2: Water Quality Protection. Implement measures to protect near shore water quality.

W-2.1: Protect Wastewater Treatment Plants and collection systems from infiltration and inflow.

Monroe County should work in coordination with all utilities and municipalities to maintain infrastructure protection and adaptation through infiltration and inflow program development to prevent loss of groundwater and reduce the need for additional treatment requirements.

Priority: Medium Planning Horizon: Long-term

W-2.2: Complete conversion of wastewater systems in the Keys to Advanced Wastewater Treatment (AWT).

Advanced wastewater treatment is necessary to protect near shore water quality from septic tank and cesspit pollution.

Priority: Medium Planning Horizon: Short-term

Goal W-3: Alternative Water Supply. Encourage the development and expansion of alternative water supply systems (AWS) for the Florida Keys

W-3.1: Evaluate the reclamation and reuse of treated wastewater relative to potential benefits in addressing climate change impacts.

Monroe County should work in coordination with all utilities and municipalities to evaluate current plans for utilization of treated wastewater for reclamation and reuse. Reuse reduces total water withdrawals from the aquifer well fields. Wastewater infrastructure should utilize the most energy efficient technology available and feasible. The County should also evaluate technologies to better utilize wastewater byproducts to produce renewable energy.

Priority: Medium Planning Horizon: Short-term

W-3.2: Encourage the conversion of abandoned septic tanks to non-potable rainwater collection cisterns in accordance with Florida Department of Health procedures.

A very substantial number of stormwater-sequestering containers exist throughout the Florida Keys in the form of soon-to-be-abandoned septic tanks are a valuable resource for reducing overall water consumption at minimal cost. Rainwater harvesting should be fully encouraged to diminish stormwater effects and to increase the supply of secure, widely distributed fresh water.

Priority: Medium Planning Horizon: Short-term

W-3.3 Support legislation and ordinances that encourage rain water harvesting.

Recognition of the potential and encouragement of the practice of rainwater harvesting to supplement non-potable and potable water supply should be encouraged by all levels of government. While decreasing demand through water efficiency and conservation are the primary means to protect the aquifer and reduce the associated energy consumption, harvesting rainwater can and should be fully exploited to increase the supply of water.

Priority: Medium Planning Horizon: Short-term

UF Extension rain barrel education

W-3.4: Work with FKAA to plan for the eventual expansion of the reverse osmosis plant in Florida City to increase the capacity to treat water from the Floridan Aquifer.

As salt water intrusion into the Biscayne Aquifer continues with sea level rise, the need for reverse-osmosis treated water from the Floridan Aquifer will increase and expansion of the existing facility may be the most cost-effective means of maintaining the water supply for Monroe County in the mid-range time frame.

Priority: Medium Planning Horizon: Long-term

W-3.5: Work with FKAA to evaluate the long-range feasibility of developing new or upgrading/expanding existing desalination plants in the Keys.

In the long-term time horizon, advances in sea level rise may require that more of Monroe County's water supply be provided by desalination. Technological improvements may make desalination more cost effective.

Priority: Medium Planning Horizon: Long-term

G. RENEWABLE ENERGY

The Renewable Energy section includes a single goal with 5 supporting strategic action items.

Energy consumed in *commercial* buildings and *industrial* processes account for **21% of Monroe County's total greenhouse** gas emissions. Improving the efficiency of our commercial building stock and reducing the energy intensity of the local industrial sector will contribute significantly to achieving Monroe County, Florida's greenhouse gas reduction target. The use of fossil fuels for energy (including electricity, transportation, and other uses) is the single largest contributor to greenhouse gas emissions and climate change. Emissions from fossil fuel combustion for energy, including transportation, represent 88.5% of the community's total GHG emissions.

A wind farm in Huron County, Michigan

Opportunities exist for citizens and Monroe County government to produce small-scale renewable energy, offsetting the need for fossil fuels. This focus area is limited to energy production exclusively – goals and strategies that focus on end use energy efficiency are included in other focus areas. The programs and projects within this focus area are designed to spur local government and community investment in renewable energy sources including those that produce electricity, and mobile fuels.

<u>Goal R-1:</u> Support the expansion of renewable energy sources and remove the barriers to projects that support sustainability.

Action R-1.1: Support legislation to establish a minimum 20% renewable portfolio standard.

Monroe County should support state legislation which is consistent with the 2008 Florida Energy and Climate Change Action Plan to establish a 20% renewable portfolio standard for 2020. Additionally the County should support a "carve out" of a certain percentage of the Renewable Portfolio Standard for distributive and solar energy as "Renewable Distributive."

Priority: High Planning Horizon: Short-term

Action R- 1.2: Implement a Property Assessed Clean Energy (PACE) or similar program for Monroe County residents and businesses.

In 2010, the State of Florida established the framework for dependent special districts, municipalities and county governments to implement low-interest PACE (Property Assessed Clean Energy) financing programs to advance implementation of renewable energy, energy efficiencies, and hurricane mitigation measures on homes and businesses through HB 7179, amending Chapter 163, F.S. A PACE program in Monroe County would significantly create local jobs, increase property values and reduce greenhouse gas emissions within the county.

Priority: Medium Planning Horizon: Short-term

Action R-1.3: Incentivize solar water heating systems and the installation of electrical generating renewable energy systems on all new construction.

This effort could involve collaborations with utilities or other agencies.

Priority: Medium Planning Horizon: Short-term

A solar water heating panel installed on a home in Big Pine Key.

Action R-1.4: Encourage the electrical utilities, Florida Keys Electric Cooperative and Keys Energy Services, to adopt practices to increase use of renewable energy.

The current fuel source percentages for *Keys Energy Services* electrical output consists of about 50-65% natural gas, 10-25% coal, and 11-13% nuclear with the remainder coming from pooled resources (taken from Florida Municipal Power Agency, *3 Phase Times* newsletter, March 2010). The current fuel source percentages for the *Florida Keys Electric Cooperative* electrical output consists of about 72% natural gas, 21% nuclear, 6% coal, 1% oil, 0.1% solar (T.J. Patterson, personal communication).

The utilities should be encouraged to implement incentive programs to increase the use of renewable energy within the county and minimize the use of fossil fuels, especially coal, as a fuel source. Of all the available fossil fuels used for electrical generations, **coal** emits the most greenhouse gases. The County should recognize and support local utilities which build their own renewable energy facilities such as Florida Keys Electric Cooperative's Simply Solar program (http://www.fkec.com/Green/SimpleSolar.cfm).

Priority: Medium Planning Horizon: Mid-term

Action R-1.5: Encourage local alternative energy studies to evaluate their feasibility in achieving the County's greenhouse gas emissions goals.

Pigeon Key solar panels

Solar energy is well documented as a viable source of renewable energy but national wind studies indicate the wind potential for Monroe County is limited and wave or hydro turbine technologies are still at the research and development stages. A more detailed evaluation of wind potential in Monroe County is needed because many residents believe our proximity to the prevailing ocean breezes may make both onshore and offshore wind energy feasible. Work cooperatively with municipalities and other agencies to develop consistent permitting requirements for renewable energy projects.

Priority: Medium
Planning Horizon: Mid-term

H. SOLID WASTE & RECYCLING

Solid waste management and especially a community's level of recycling have become the measure of local government's commitment to sustainability. Recycling in particular seems to be the most obvious indicator reflecting a sustainable lifestyle. The amount of waste generated by a community is a measure of inefficient use of resources. Many communities are striving to reduce solid waste not only to reduce costs associated with collection, hauling and landfilling but also to reduce our overall dependence on extraction of finite raw materials.

The Solid Waste & Recycling section focusing on various aspects of the community's use and disposal of goods with the overall goal of achieving zero waste by 2025. This section includes three goals with three, five and two action items, respectively.

Strategies to reduce solid waste disposal are an essential piece of reducing the emissions that cause global warming. Recycling, composting, and reducing overall consumption serve to decrease upstream, energy intensive production processes. Monroe County should adopt a goal to achieve Zero Waste by 2025. Zero Waste means that all discarded material is recycled, composted, or reused as waste-to-energy. The County has already increased recycling from 6% to 21% of total solid waste through 2010. With waste to energy credits the County has already reached a cumulative 70-75% level of recycling.

While substantial progress has been made, further reductions in solid waste generation clearly need more effort and may need to include amendments to the County Comprehensive Plan and the renegotiation of the solid waste collection and haul-out contracts.

The *Solid Waste/Recycling Action Plan* should consider adoption of existing programs and criteria, including concepts such as EPA's Waste Hierarchy and their WasteWise Partnership Program: EPA's WasteWise partnership program - http://www.epa.gov/epawaste/partnerships/wastewise/index.htm EPA Waste Hierarchy -- http://www.epa.gov/wastes/nonhaz/municipal/wte/nonhaz.htm. The Action items listed below under this goal are suggested for inclusion in a Solid Waste/Recycling Action Plan.

S-1.1: Revise County solid waste disposal structure to enhance waste diversion.

<u>Goal S-1:</u> Create a Solid Waste/Recycling Action Plan to achieve zero waste by 2025.

Revise the County solid waste disposal rate structure in order to maintain and enhance incentives, outreach programs, and other activities designed to increase recycling and composting. Renegotiate franchise arrangements and haul out contracts, where necessary, to maximize the efforts to reduce solid waste shipments to the mainland.

Priority: High Planning Horizon: Short-term

S-1.2 Adopt progressive, phased in, zero waste programs designed to

be end user friendly for residents and businesses.

Provide support for partnerships with municipal solid waste operation to maximize efficiency. Utilize existing data from successful programs in Florida to guide BOCC/ staff development of a Solid Waste and Recycling Action Plan. Consideration of a variety of source reduction programs need to be assessed not only for both financial and environmental costs and benefits.

Priority: High Planning Horizon: Short-term

S-1.3: Develop and track the Solid Waste Action Plan through key performance indicators.

Track solid waste GHG emissions including waste to energy and waste transport emissions.
Evaluate performance and progress of measures in the County Solid Waste/Recycling Action Plan.
Evaluate reduction achievements in the Comprehensive plan.

Priority: High Planning Horizon: Short-term

S-1.4: Implement ordinances that encourage economic opportunities for recycling/reuse business ventures and reevaluate existing ordinances to remove restrictions that may discourage recycling.

Examples of implementing activities include: 1) Support regional bottle bills and inexpensive disposal options; 2) Incorporate business opportunity measures in the County Solid Waste/Recycling Plan; and 3) Incorporate reduction goals into the Comprehensive plan.

Priority: Medium Planning Horizon: Mid-term

S-1.5: Monroe County should create an action plan to handle storm related solid waste.

The action plan should include means for composting as much debris as possible as well as its use in the waste-to-energy plant.

Priority: Medium Planning Horizon: Mid-term

We are 5 years now from base line of 2005 and are at a 21% recycling rate countywide. (For annual recycling rates in Monroe County and throughout the state visit the FDEP Solid Waste Management in Florida website: http://www.dep.state.fl.us/waste/categories/recycling/SWreportdata/10_data.htm.. To further improve recycling rates, Monroe County should consider the following Action Items, including those which ensure consistency with Monroe County's Comprehensive Plan Solid Waste element (www.monroecounty-fl.gov/DocumentView.aspx?DID=32).

More on the latest statewide recycling information can be found in the following 2010 *75% Recycling Goal Report to the Legislature*: http://www.dep.state.fl.us/waste/quick_topics/publications/shw/recycling/75percent/75_recycling_report.pdf

Goal S-2: Implement specific recycling plans for the residential, business, institutional and construction sectors.

S-2.1: Develop goals, objectives and policies to expand local capacity to process recycled materials and promote development of reuse, recovery, and light manufacturing activities.

Recycling facility in Broward

Expanding local capacity to process and use recycled materials has the potential to reduce the GHG emissions associated with transporting materials elsewhere as well as create local jobs in the waste management sector. The County should adopt goals which expand the types of materials that are collected for local reuse and recycling, in order to increase waste diversion.

Incentive programs need to be designed to decrease the export of waste out of the County, increasing climate change mitigation efforts. Expanding local capacity to process recycled materials has the potential to reduce the GHG emissions associated with transporting materials elsewhere as well as create local jobs in the waste management sector. The County's goal should be to expand the types of materials that are collected for local reuse, in order to increase waste diversion.

Priority: Medium Planning Horizon: Mid-term

S-2.2 Consider a Pay-As-You-Throw residential solid waste program.

A pay-as-you-throw program will encourage residents to recycle and to conduct at-home yard waste and composting to avoid user fees for excessive solid waste or organics. An accompanying educational effort can greatly assist residents adapt to the program. The County can use the composted material in conjunction with construction debris for fill in sea level rise adaptation efforts.

Priority: High Planning Horizon: Mid-term

S-2.3 Evaluate the use of existing transfer stations for a community organics compost program.

Food and yard waste are around 40-45% of our County's waste stream. Monroe County should determine best composting and/or fuel production methods for managing organic waste and evaluate programs for adoption in Monroe County.

Conduct a feasibility study that results in recommendations regarding the design of a rebuilt Transfer Station and material recovery facility as well as recommendations regarding what types of waste processing equipment and material recovery systems to incorporate.

Explore Waste Prevention, Recycling and Composting Option from 30 US Cities: http://www.epa.gov/epawaste/conserve/downloads/recy-com/toc.pdf

Compost Use in Florida (IFAS Contributor) http://www.dep.state.fl.us/waste/quick_topics/publications/documents/compost.pdf

Priority: High Planning Horizon: Short-term

Goal S-3: Expand efforts to eliminate waste at its source.

Recycling in Marathon

S-2.4. Develop a program for mandatory recycling for commercial (i.e. non-residential) businesses, government, agencies, and organizations.

In **2009 only 14%** of commercial units/properties in Monroe County participated in scheduled recycling. http://appprod.dep.state.fl.us/www_rcra/reports/WR/Recycling/2009AnnualReport/AppendixG/Monroe.pdf

In **2010 only 19%** of commercial units/properties participate in scheduled recycling; http://appprod.dep.state.fl.us/www_rcra/reports/WR/Recycling/2010AnnualReport/AppendixB/13B.pdf

Information on waste management for public buildings can be found at: http://www.dep.state.fl.us/waste/categories/hazardous/pages/state.htm.

The following measures should be considered

1. Provide a **range of container sizes and types for all commercial recycling accounts**, priced accordingly to minimize the amount of solid waste generated. Pricing must provide comparisons for equivalent size/type/ collection frequency of recycling containers versus trash collection.

2. Commercial recycling and trash **collection rates to be incorporated into all franchise agreements**.

3. Provide **education about tax credits to businesses for recycling** of all end-of-life products like furniture, appliances, fixtures, electronics to appropriate end of product life handlers and recyclers.

4. **Expand low cost hazardous and electronic waste program** for commercial users with convenient drop off locations and hours.

5. Provide comprehensive **commercial recycling education** opportunities.

Priority: *High* Planning Horizon: Short-term

S-2.5: Develop goals, objectives and policies to increase recycling of recoverable waste from all construction sites throughout Monroe County.

The DEP has best management practices, reports and legislation related to C & D recycling; http://www.dep.state.fl.us/waste/categories/recycling/cd/canddmain.htm

1. Encourage pre-processing of C&D in franchise/license agreements, building permits or ordinances with possible incentives (fee rebates).
2. Incentivize C&D recycling (on-site or off-site), and the use of recycled building materials.
3. Develop a partnership with in-county recycling companies to keep most construction debris in county for use in adaptation efforts to combat sea level rise.

Priority: Medium Planning Horizon: Long-term

3.1: Lobby the State of Florida to allow local communities to regulate retail bags, especially single-use plastic bags, and implement such a program as soon as possible.

Each year millions of discarded plastic shopping bags end up as litter in the environment when improperly disposed. The same properties that have made plastic bags so commercially successful and ubiquitous—namely their low weight and resistance to degradation—have also contributed to their proliferation in the environment.

In May of 2012, the City of Los Angeles became the largest city in the United States to implement a ban on single-use plastic bags. Many other municipalities throughout the US and the World have implemented similar bans. For more information on actions by other US and World entities, see: http://www.dep.state.fl.us/waste/retailbags/pages/list_USA.htm .

In Florida, the Energy, Climate Change, and Economic Security Act of 2008 (House Bill 7135) signed into law by former Governor Crist created Section 403.7033, Florida Statutes. This section requires the Florida Department of Environmental Protection (FDEP) to perform an analysis and submit a report to the Legislature by February 1, 2010 regarding the *necessity* and *efficacy* of both statewide and local regulation of bags used by consumers to carry products from retail establishments. Until such time that the Legislature adopts the recommendations of FDEP, no local or state government may enact any regulation or tax on the use of such retail bags

The FDEP produced a report on the use of retail bags in 2010 and is available on their Retail Bags web page: http://www.dep.state.fl.us/waste/retailbags/default.htm . However, the legislature has not adopted the recommendations of FDEP so the restrictions on local governments to regulate shopping bags remains.

Priority: High Planning Horizon: Mid-term

3.2: Monroe County government should adopt Environmentally Preferable Purchasing (EPP) policies for their internal operations to set a positive example for other government entities and local businesses.

Environmentally Preferable Purchasing (EPP) policies help to reduce costs and mitigates greenhouse gas emissions. Information on development of EPP policies can be found on the US EPA website: http://www.epa.gov/epp/ . Other similar activities the County could encourage through EPP policies include options and opportunities for extending producer responsibility for product waste at the local level.

Priority: Medium Planning Horizon: Long-term

VI. NEXT STEPS

While some of the actions recommended herein are well underway, over the next year Monroe County staff will engage community members, businesses, institutions, and other stakeholders through a Climate Action Planning Task Force to prepare for any prerequisite or additional actions needed to begin Plan implementation.

These prerequisite actions include:

1) Creating citizen advisory groups for programs that require considerable community engagement.

2) Gathering bids for contracted services and equipment.

3) Making necessary changes to local policies or existing programs, including staffing.

Figure 1. Some important groups and sectors to involve in vulnerability assessments and adaptation strategy development.

County staff should develop climate change preparation strategies that are integrated across natural and human systems. Action plan efforts should involve decision makers at all levels in this community-driven process. This work will not replace existing work that has been done on climate change preparations. Rather, it will augment that work and thinking by bringing experts and decision makers from the range of impacted resources together to discuss and plan for responses **in a coordinated and integrated manner**. By making the process compatible with other efforts to characterize and plan for climate change, it will build momentum and provide clarity on scientific projections, local impacts, local and regional vulnerabilities, and innovative and effective adaptation strategies. These strategies will be developed specific to the focal region, but they will also be widely applicable to other coastal communities.

Staff should work across the different sectors of a community by use of a convening organization such as the Monroe County Office of Sustainability, which becomes the local driver of the project. The process is guided and moved to implementation by a committee of interdisciplinary local leaders and experts (elected leaders, county/city water/land use planners, farmers, real estate agents and/or developers, natural resource managers, business leaders, climate scientists, and others). The process is adapted to each community based on local vulnerabilities, economic drivers, climate change impacts, values, and traditions. The primary role is to convene local experts **to identify the likely impacts and develop ecologically-sound solutions** that develop resilience in a collaborative and interdisciplinary manner.

The recommended process includes the following steps or services (in approximate time sequence order, although many steps are overlapping in time):

1. Identification of appropriate convening partner with capacity
2. Relationship building among local experts and decision makers
3. Development of steering committee made up of interdisciplinary experts and leaders
4. Science synthesis specific to the area of interest, in language appropriate for mixed audiences of scientists and non-scientists

5. Communication of science synthesis to local experts and decision makers
6. Gathering of natural resource experts and managers to identify climate change vulnerabilities and develop strategies for increasing resilience
7. Reporting of natural resource output by lead participants
8. Gathering of socioeconomic experts and managers to identify climate change vulnerabilities and develop strategies for increasing resilience
9. Communication of findings in multiple formats and venues
10. Meeting of elected leaders where workshop participants present information on vulnerabilities and adaptation strategies
11. Implementation steps outlined by steering committee and others
12. Final release of adaptation strategies in multiple formats and venues

Table 2. Example of matrix used for **vulnerability assessment across sectors** (resources and populations are examples only – workshop participants will fill in matrix during breakout sessions). Additional information on where/how/when specific local resources are impacted is collected so that targeted adaptation strategies can be developed and mapped, increasing the likelihood of implementation.

Table 2

Resource or population	Likely impact	Exposure	Sensitivity	Adaptive Capacity
Local dam(s)	Increased storm severity and runoff could compromise safety and storage	High exposure to changes in precipitation and runoff	Medium sensitivity – only extreme storms will cause overflow or failure	Low because dam received poor marks on its safety inspections and is upstream of residential development
Barrier island wildlife reserves	Sea level rise, storm surge, and increased hurricane risk could lead to loss of areas for breeding and wintering birds (terns, plovers, etc.)	High due to direct impacts from climate change and loss of mangroves	Some species more sensitive than others	Low because of extensive loss of habitat and disturbance
Agriculture	Loss of water availability due to changes in precipitation and higher temperatures	Medium due to irrigation	Some crops more sensitive than others (cotton)	Farmers with access to new technology and resources have greater adaptive capacity
People with asthma and heart disease – specific populations	Increased ozone formation from higher temperatures will cause more heart attacks, asthma, and demand for health care services	Higher in areas with poor air quality	Some populations more sensitive than others (elderly, young)	People without insurance or those far from health care services have lower adaptive capacity

Outcomes and measurements of success integral to Monroe County:

- An updated county climate action plan based on expert and public input
- Prioritization of climate related projects
- Increased resources made available for adaptation strategies and implementation
- Timely dissemination of outcomes (through reports, presentations, video, etc.)
- Increased decision-maker receptivity to the county's climate action plan

One expected outcome with multiple benefits is **increased consensus for research** supporting ecosystem management, marine sanctuary protection and healthy fisheries. Those in turn create benefits for tourism, commercial fishing, real estate, and other significant aspects of the local economy. The synergy of shared, forward-looking ideas and solutions will build upon existing plans and provide a blueprint for increased resiliency.

VII. APPENDICES

APPENDIX A. – LIST OF MONROE COUNTY ACTIONS & RESOLUTIONS

Independent of the Southeast Florida Regional Climate Change Compact, Monroe County also has adopted resolutions and policies to advance climate change resiliency. The following list of actions demonstrates the commitment of the *Monroe County Board of County Commission* in addressing climate change challenges.

1. U.S. Mayors Agreement on Climate Change - 2007 (Resolution 235-2007)

Resolution of the Board of County Commissioners of Monroe County, Florida endorsing the U.S. Mayors Climate Protection Agreement as amended to reduce global warming pollution; Authorizing full membership in the ICLEI local governments for sustainability and participation in the Cities for Climate Protection Campaign.

2. Establish the Green Building Code Task Force - 2008 (Resolution 177-2008)

A resolution by the Monroe County Board of County Commissioners establishing a Green Building Code Task Force to recommend green standards for new building codes.

3. Establish a sunset date for the Green Building Code Task Force - 2008 (Resolution 345-2008)

A resolution by the Monroe County Board of County Commissioners amending resolution number 177-2008 to change the terms and sunset date of the Green Building Code Task Force to October 1, 2010.

4. Establish the Green Initiative Task Force - 2009 (Resolution 121-2009)

A resolution of the Board of County Commissioners of Monroe County renaming the Green Building Code Task Force to the Green Initiative Task Force; Changing that the recommendations be made to the Board of County Commissioners rather than the Building Department and that the Task Force provide recommendations not on local technical amendments but on green standards for implementation in Monroe County to improve local quality of life and create a more efficient government.

5. Establishment of the Monroe County Employee Green Team – December, 2009

The Monroe County Board of County Commissioners approved the establishment of an Employee Green Team to develop a government operations climate action plan.

6. Southeast Florida Regional Climate Compact - 2010 (Resolution 022-2010)

Resolution of the Board of County Commissioners of Monroe County Florida pledging their commitment to appropriate staff resources and expertise within budget constraints to participate in the regional climate team with Miami-Dade, Palm Beach and Broward counties toward the development of a Southeast Florida Regional Climate Change Action Plan.

7. Energy Efficiency & Conservation Block Grant – 2010

Development and Implementation of a $3.2M grant in partnership with the Cities of Key West, Marathon and Islamorada. Accomplishments included installation of solar water heaters on low-income families, county-wide educational programs, installation of solar powered lighting, greenhouse gas inventory, hybrid vehicles, building retrofits and an energy conservation strategy for Monroe County government operations.

8. Greenhouse Gas Target for County Operations - 2010 (Resolution 067-2010)

Resolution of the Board of County Commissioners of Monroe County Florida adopting a goal for reduction of greenhouse gas emissions to 20% by 2020 as measured from a 2005 baseline inventory.

9. Florida Green Building Coalition Commercial Building Standard - 2010 (Resolution 147- 2010)

Resolution of the Board of County Commissioners of Monroe County, Florida adopting the Florida Green Building Coalition's green commercial building standard for county buildings in addition to the Florida Building Code as the standard to be used for construction of all public buildings from the date of this resolution.

10. Support for Multi-jurisdictional Financing Energy Assessment grant – July 2010

Approval of letter of support to City of Lantana for application to the Environmental Protection Agency for the Climate Showcase Communities Grant to establish a multi-jurisdictional Financing Energy Assessment Program.

11. Climate Change Advisory Committee – January 2011

The Climate Change Advisory Committee was created to include a cross-section of community interests to develop a Community Climate Action Plan.

12, Adoption of the SE Florida Climate Compact's Sea Level Rise Projections – 2011

The Monroe County Board of County Commissioners adopted the Compact's sea level rise projections as guidance for the Climate Change Advisory Committee in their determinations of potential sea level rise impacts.

13. Monroe County Comprehensive Plan – 2013

Monroe County staff is currently developing a Climate and Energy Element for inclusion in the Monroe County Comprehensive Plan.