Chapter Eight

Energy and Climate Change

I. INTRODUCTION

Over the life of this policy plan, climate change may very well become the defining issue in the Central Florida Region. This challenge is global in nature, but the responses are ultimately local and regional. Finding new ways to conserve energy, to meet future energy needs, lower greenhouse gas emissions, and face the impacts of climate change will be critical to the future success of the Central Florida Region.

Source: libguides.sfsu.edu

Historical records show the average temperature of the Earth has risen by approximately .74 degrees Celsius over the past 100 years and the rate of increase has been considerably more rapid since the 1970s[1]. Warming is expected to continue through the end of this century and will likely accelerate depending on future concentrations of greenhouse gases that accumulate in the atmosphere.

So why is climate change important to the Central Florida region? Only a few degrees of warming can disrupt climate patterns and contribute to rising sea levels. Sea levels have increased approximately eight inches over the last century. Average sea level could rise an additional four feet by the end of the 21st century depending on the

Climate Literacy
(The Essential Principles of Climate Sciences)
March 2009

Presents information to help individuals and communities understand the Earth's climate, impacts of climate change, and approaches to adaptation or mitigation. More information can be found at *www.globalchange.gov*.

[1] Intergovernmental Panel on Climate Change (IPCC)

speed and extent of glacial melting[2]. This change potentially brings with it a long list of regional impacts to ecological systems, agriculture, public health, infrastructure, and commerce.

Communities should really begin to ask the questions:

- How will global and local climate changes affect availability and costs for water, food, energy, and other basic needs?
- How might businesses and employment be altered?
- What new challenges and risks will climate change present to my local community?
- How will sea level rise affect coastal communities?

Adaptation and mitigation action plans can then be properly focused and directed.

II. ASSESSING THE CARBON FOOTPRINT

The term Carbon Footprint refers in general to Green House Gas (GHG) and associated carbon dioxide emissions that a given individual or entity might generate, directly or indirectly. Generally, a local carbon footprint involves energy use emissions from sources such as buildings and transportation, land use change, agriculture, and industrial processes.

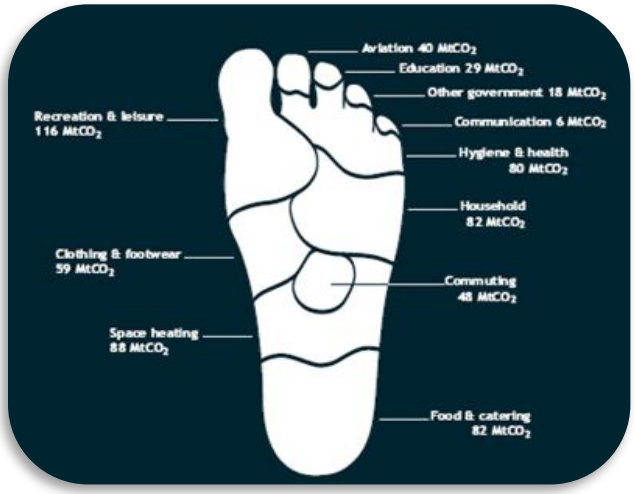


Image Source: leonardo-energy.org

Resulting greenhouse gases are being deposited into the atmosphere at a rate faster than they are able to break down. This, in effect, creates a layered 'blanket' that contains the warmth of the sun. Increasing greenhouse gases contribute to a thicker and less impenetrable 'blanket', and a warmer atmosphere. Many scientists believe current greenhouse gas levels will lead to future warming, but also believe that additional warming could be slowed or stopped if worldwide emissions were drastically reduced. The IPCC report recommends reductions of 50 to 80 percent from 2000 levels by 2050, with emissions falling to near zero by the end of the century.

> ***FYI….***
>
> According to 'America 2050 - An Infrastructure Vision for 21st Century America', domestic electricity production is responsible for 40 percent of U.S. carbon emissions.

Certainly, carbon output will vary by community, but an inventory of carbon emissions could help establish a

[2] Intergovernmental Panel on Climate Change (IPCC)

baseline for a local community. Future emission levels can be projected based on development trends and other information. This then sets the tone for policy and mitigation measures to curb current effects. Communities can only begin to prepare for a new energy and climate future by assessing present emissions.

III. POTENTIAL EFFECTS OF CLIMATE CHANGE

A. Water Availability

The most significant impact of climate change will likely be on regional water availability. Higher average temperatures may increase evaporation and transpiration rates, produce more frequent droughts, and could permanently affect drinking water supplies, water levels in rivers and lakes, and soil moisture conditions. In addition, sea level rise is likely to force salt water further into the regions fresh water supplies.

B. Natural Disasters

Climate change is also likely to result in severe and frequent extreme weather events. Such events are likely to exacerbate the effects of water and air pollution and put public safety at risk. Direct threats to public safety and potential damage to public and private property from wind, flooding, or extreme temperature events are significant risks for communities to assess.

C. Agriculture and Food Security

The combination of changes in water availability and changes in average temperatures are likely to impact agricultural production. Communities should evaluate their food sources and assess the vulnerability of food supplies and potential food price shifts. Price adjustments in distant agricultural production areas may affect communities that rely on remote food sources. Strengthening and diversifying local food systems will help to reduce food security risks associated with climate change.

D. Public Health

The impact of climate change on public health is also of concern especially for those with ailments, such as asthma, that are sensitive to temperature and humidity.

E. Infrastructure

Decreasing groundwater and stream flow levels could alter public and private water supplies, while more frequent and more extreme storm events may overwhelm storm water conveyance and storage systems. This may in turn affect the structural integrity and maintenance costs for roads, bridges, sewer systems, and pipelines. High heat occurrences stress and shorten the service life of paving surfaces and metals, which may also drive up overall infrastructure costs.

F. Natural Resources and Ecological Systems

Plant and animal species and the natural processes of ecological systems have evolved to fit specific climate regimes. Disruptions to certain processes such as flowering and pollination are seasonally timed, and ecological systems are typically sensitive to shifts in such processes and patterns. While some species may adapt by migration, abrupt climate changes may threaten many others. Many ecologists believe that climate change threatens the loss of local species populations, species extinction, and the potential collapse of certain ecosystems.

Climate Change Summit Report
(October 1-3, 2008, Orlando, Florida)
Florida's Wildlife: On The Front Line of Climate Change

Summit Conclusions: This summit identified what climate change may mean for Florida panthers, manatees, gopher tortoises and other species. The Summit ended with a set of suggested actions and a renewed determination to keep Florida at the forefront of conserving fish and wildlife during climate change. See Myfwc.com for additional information.

G. Economy

Businesses and commercial activities have their own particular vulnerabilities to climate change. Tourism and recreation-oriented businesses are likely to be affected and coastal real estate values and coastal economies in general will be increasingly vulnerable to damage from rising sea levels and increased storm surges. Business not directly affected by the impacts of climate change may be indirectly affected by changes in their customer base or in the costs of materials that may be increased by climate change or climate policies.

IV. STRATEGIES FOR REDUCING GREEN HOUSE GAS (GHG) EMISSIONS

A. Building and Site Design Toolkit

Alternative building and site development practices reduce Green House Gas (GHG) emissions.

<u>Reuse and retrofit of existing buildings</u>

The overall energy use embodied in new construction and building materials can be significant. Recent calculations indicate it can take between 25 to 60 years to recover the energy used in demolition and new building construction, as reported by the National Trust for Historic Preservation. Retrofitting existing buildings for energy efficiency can help to offset these impacts. Incorporating product life-cycle design considerations, which include the use of high quality and durable construction materials, can make reuse and renovation of buildings financially feasible versus some current construction techniques that focus on short-term value.

Energy-efficient construction practices

Adapting Land Development Code incentives to promote energy-efficient buildings can be effective when adopted by local governments. This may be done by providing density bonuses for Green buildings meeting certain location criteria or the requirements of Xeriscaping. Additionally, builders and contractors need to be properly trained and gain installation experience with respect to best practices. Likewise, local government building inspectors need to understand how to properly monitor installations, oversee and implement improved permit processes, and coordinate energy efficiency incentive programs. By encouraging building inspectors to become certified in energy efficient building practices, local governments may better assess their energy efficient building stock and can better measure energy reduction methods as well as progress.

Energy-efficient lighting and appliances

Appliance purchases are often consumer decisions, but incentives for incorporating energy efficient appliances in residential, commercial, and industrial projects can be utilized to reduce emissions on a larger scale. (Figure 1. courtesy of newamerica.net).

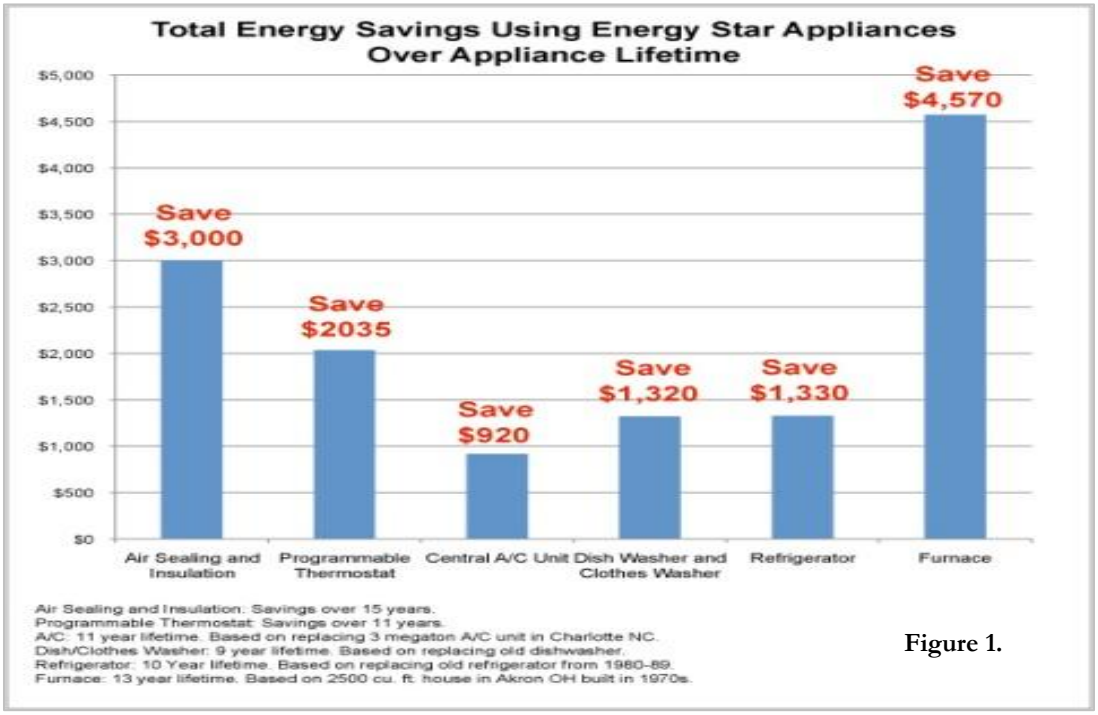


Figure 1.

Promoting "renewable ready" buildings and sites

Promoting "renewable ready" building and sites involves identifying, creating, and preserving opportunities to install site-level renewable energy and efficiency technologies. Neighborhood, community, and regional energy solutions that allow benefits to be shared among users are likely to be the most effective, including site features that support energy efficient transportation choices, such as bicycle and pedestrian accommodations, and well-designed transit stops. Site design should support the inclusion of green spaces, green roofs and the installation of trees as a method to combat increasing temperatures and reduce urban heat island effects.

Parking

It is estimated that there are seven (7) parking spaces for every vehicle in America. Overly aggressive off-street parking standards that anticipate a free parking spot outside every store at peak shopping hours once or twice a year is excessive. There are both immediate and long-term community costs and environmental impacts including heat island effects, stormwater runoff, surface water pollution, construction costs, and maintenance costs. Regulatory approaches that include shared parking and maximum parking requirements should be employed, especially in mixed-use centers where bicycling and walking is encouraged.

Other parking approaches include but are not limited to:

* Use of stabilized permeable surface parking requirements to incorporate drainage swales within the parking area to break up the paved area instead of locating swales only on the perimeter;

* Priority parking for carpools and vanpools;

* Inclusion of charging stations for electric vehicles;

* Inclusion of grade separated and shaded pedestrian paths.

* Reduction of minimum off-street parking standards in corridors served by transit.

B. Natural Resources

Natural resource management can play a role in the conservation and enhancement of undeveloped land and its capacity to remove and store greenhouse gases from the atmosphere – otherwise known as carbon sequestration. According to the U.S. Environmental Protection Agency (EPA), U.S. emissions would be approximately 15 percent higher if it were not for sequestration by forests and grasslands. Additionally, soil management and alternative approaches to livestock feed can greatly reduce methane and nitrous oxide emissions. Strategies for natural resource management should focus on the conservation of ecological areas and corridors to facilitate the ability of wildlife to migrate and to conserve, restore, and expand floodplains and other natural features that will serve to buffer the impacts of climate change. One way to secure long term "ecosystem services" would be for urban areas to make lease payments to selected conservation areas to purify air and water and acts as floodplains.

FYI….

A news report issued February 10, 2009 by the National Audubon Society shows that nearly 60% of the 305 bird species found in North America in winter are shifting their ranges northward by an average of 35 miles. Examples of these changes in Florida can be seen with the Eastern Bluebird and the American Goldfinch. The center of wintering distribution for Eastern Bluebirds moved north by 114.5 miles in the last 40 years. The center of wintering distribution for the American Goldfinch, moved north more than 219 miles in the last 40 years. Warmer winters and food availability at feeders has made it possible for these birds to winter farther north, which may put them at increased risk from unusually cold winters or harsh storms.

C. Educational Programs and Incentives

Well conceived and implemented educational programs and incentives is another strategy that should be employed to address the consequences of climate change. One example of an existing Federal program that could be adopted into local policy is the EPA Pay-As-You-Throw Program. Local and regional governments need to modify their comprehensive plans as directed by HB697. To do so, local and regional governments could engage the public through processes such as those noted in Table 1.

Table 1.

Community Strategy	Description
Visioning and Goal Setting	Gauge the level of awareness and importance of energy and climate change, consider how energy and climate issues can be addressed in the community, and determine how connected it is to other community goals and values
Plan Making	Examine comprehensive plans and other planning documents to see if energy and climate change issues are addressed and integrated
Standards, Policies, and Incentives	Consider how zoning codes, building codes, and other ordinances address energy issues and how these could work to encourage compact development, transit-oriented development, and green building
Public Investment	Evaluate capital improvement programs regarding infrastructure, public buildings, and community facilities to be sure that public investments are made to promote energy efficiency and reduced greenhouse gas emissions
Public Outreach and Education	Engage the public in discussing energy and climate change and provide educational forums for citizens to learn how to make changes in their own lives to improve energy efficiency and reduce carbon emissions
Take Action/Implement	Strategies could include an evaluation of local food systems to reduce security risk; preventing the hardening of unaltered shorelines and natural waterways; developing energy efficient building codes and construction practices; encouraging the use of energy efficient appliances and lighting; promoting the re-use of existing buildings over new construction; promoting vehicle fleet conversions and the use of more efficient vehicles; establishing partnerships that identify regional grant opportunities; participating in or facilitating a regional energy and climate change council; and, encouraging shared parking and maximum parking standards to minimize heat island effects.

EPA Pay-As-You-Throw Program

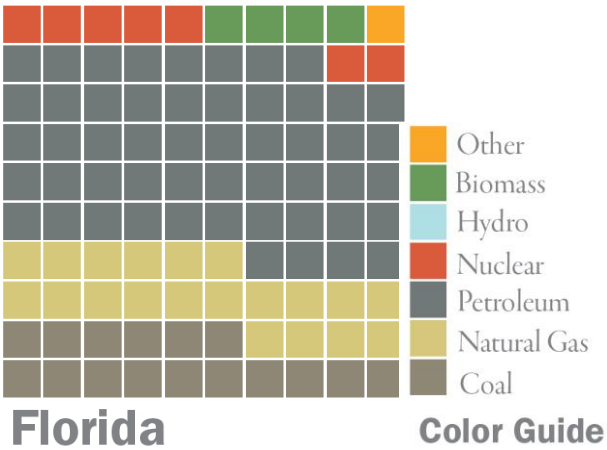
In communities with pay-as-you-throw programs (also known as unit pricing or variable-rate pricing), residents are charged for the collection of municipal solid waste (household trash) based on the amount they throw away minus the amount of material that is recycled. This creates a direct economic incentive to recycle more and to generate less waste. Traditionally, residents pay for waste collection through property taxes or a fixed fee, regardless of how much or how little trash they generate. Pay-As-You-Throw (PAYT) breaks with tradition by treating trash services just like electricity, gas, and other utilities. Households pay a variable rate depending on the amount of service they use. The program ultimately promotes environmental sustainability, economic value and fairness or equity. For more information, go to EPA's Climate Change web site at www.epa.gov/waste/conserve/tools/payt/index.htm.

Energy Efficiency Incentives Likely To Grow

An unprecedented push by the U.S. government to widen rewards for energy-conscious homeowners is underway. An example: Federal Housing Authority (FHA) loans offering 5% larger mortgages to buyers who plan on making renovations.

V. ENERGY RESOURCES - RENEWABLES

The key to effectively reducing carbon output is an assessment of local and regional energy resources. Energy efficiency gains can be achieved most effectively through conservation but also through technology and efficient system design. Driving a more fuel efficient car, carpooling, or building homes closer to employment centers could all help meet the same need of getting to work by using less energy. Likewise, efficiencies can be gained with compact development, where a cluster of buildings share facilities for water heating, space heating, cooling, and electricity. Beyond efficiency, communities can explore options to transition to alternative energy sources. As technology continues to advance, more energy and cost effective technologies are increasingly becoming available. The following is a list of current and emerging energy sources:



Source: *America 2050 – An Infrastructure Vision for 21st Century America*

Table 2.

Image Sources: *Natural Gas Photo from 'flickr.com'; Bioenergy Photo from 'matrixgreatescape.wordpress.com'; Waste-to-Energy Photo from 'oilgae.com' Wind Turbine Photos from 'fif2002.com'; Solar Photos from 'portaec.net' and 'themadpanda.org'; Geothermal Photos from 'liv.ac.uk' and 'cleanenergyclassrooms.ca'; Hydrokinetic Photo from 'ornl.gov' and 'climate.jpl.nasa.gov'*

Energy Sources	
Natural Gas	While natural gas is a non-renewable fossil fuel, the electricity produced from it emits 50 percent less carbon dioxide on average than electricity from coal and approximately 30 percent less than oil-fired power plants (*according to the U.S. Environmental Protection Agency*). Natural gas offers a bona-fide short term or transitional solution to other fossil fuel sources. USA reserves are estimated at 1,836.4 trillion cubic feet according to the "Potential Gas Committee - Potential Supply of Natural Gas in the United States, 2009"
BioEnergy	Bioenergy includes the use of organic matter to produce electricity, heat, or transportation fuels. Such materials include agricultural residues, low-grade timber, woody debris, waste wood, food waste, and energy crops. The cost of electricity from biomass can vary with location and type of feedstock and in some cases it may reduce waste disposal costs.
Waste-to-Energy	Municipal solid waste is composed of a mixture of organic materials, metals, plastics, and other petroleum-derived products. Waste-to-energy applications can lower greenhouse gas emissions and reduce landfill loading and associated methane emissions.
Wind	In wind-prone regions, both small and large-scale wind power installations can be part of a local energy strategy. While the total costs and energy savings of installing wind turbines can vary depending on the location and scale, many regions are finding that energy is becoming cost competitive in comparison to other fossil fuel based energy sources. The American Wind Energy Association estimates that wind could meet 20 percent of U.S. electricity demand by 2030. Wind turbines are often large structures that bring visual and vibration impacts. The proposed development of such structures often becomes political and creative approaches are often necessary to assure their implementation.

Solar

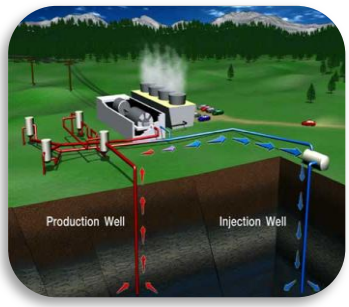
Solar energy is another emerging energy source that is slowly becoming more cost-effective and could also be incorporated into a local strategy. It also has the advantage of being installed in wide variety of places, some of which may be inconspicuous.

Planning April 2009 – "A Run to the Sun" by **Allen Best**

- During the last three years, 37,900 solar-electric systems were installed, compared to 16,000 installations during the previous three-year period. Helping spur this interest are the mandatory renewable energy standards imposed by many states.
- The Solar Energy Industries Association estimates that the existing 4,000 megawatts of installed solar capacity will increase to 28,000 megawatts by 2016, with much of that increase coming on residential rooftops.
- In 1978, both California and Colorado passed laws that barred home owners associations from restricting collector systems. Florida did the same in 2008.

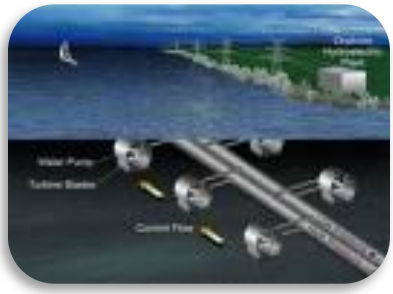
Geothermal

Utilizes hot water found in deep geologic formations to produce energy for heating and cooling. This generally occurs in a more industrial scale operation with the exception of smaller scale geothermal heat exchange systems (ground-source heat pumps). The Country of Iceland utilizes their abundant hot springs to generate electricity and heat for much of the country.



Hydrokinetic

Hydrokinetic energy includes power from hydroelectric dams, but also includes harnessing the power of tides and waves to generate electricity. While this technology is still emerging, a small hydroelectric system that can make use of the ocean or free-flowing rivers to generate electricity may be a feasible local option in many places.



VI. PLANNING FOR CLIMATE CHANGE

The key to effectively reducing carbon output is an assessment of local and regional energy resources. Once quantified, a thoughtful planning exercise can begin to develop adaptation and mitigation policies aimed at reducing the effects of climate change and culminating in a community "climate action plan". The importance of adaptation and mitigation planning is as much a state and federal responsibility as it is a local obligation and many agencies are beginning to plan accordingly. For example:

Orange County facilitated a Climate Change Summit in July of 2007. This effort laid the groundwork for the development of the Orange County Climate Change Plan in September of 2007 and the Orange County Climate Change Implementation in February of 2008. Among the many goals, Orange County has set the following targets based on 2005 greenhouse gas emissions (in Tons Per Year):

- 15% reduction by 2010 = 47,436 TPY less carbon emissions
- 28% reduction by 2015 = 88,548 TPY less carbon emissions
- 40% reduction by 2020 = 126,497 TPY less carbon emissions

Source: http://greencities.com/usa/florida/orlando/2009/government-hosts/orange-county

Orange County in partnership with the University of Central Florida (UCF), commissioned a study to assess Metro Orlando's Assets, Capabilities, and Potential in the clean technology industry. This study resulted in the *Metro Orlando Cleantech, Assets, Capabilities, Presence, and Potential Report* and can be utilized as a tool to promote the development of a clean technology industry in Central Florida.

Additional information can be found at: http://bbr.unl.edu/aubertest/documents/Reduced_Orlando_Cleantech.pdf, or at the Orange County website.

City of Miami Climate Action Plan

Outlines how the city will reduce greenhouse gas emissions to 25% below 2006 levels citywide by 2020 and to 25% below 2007 governmental levels by 2015. The plan emphasizes efforts to improve energy efficiency in existing buildings and their cooling and lighting systems. The plan also looks at energy sources with goals to reduce annual greenhouse gas emissions by 429,000 metric tons by increasing the use of renewable energy and the use of more efficient, local sources of power. Transportation goals include cutting annual emissions by 565,000 metric tons by 2020 through a reduction in vehicle miles traveled, increased fuel efficiency, increased use of alternative transportation, and increased use of alternative-fuel vehicles.

On June 5, 2008, the Green Volusia program was officially adopted by the Volusia County Council as a long-term initiative intended to promote the sustainable use of county resources and educate our citizens. The County Council specifically requested the following three issues be addressed:

1. Measure and reduce the County's carbon footprint
2. Attain a Green Local Government Certification from the Florida Green Building Coalition
3. Bring forward an ordinance encouraging the use of green building practices within the county

Source: http://volusia.org/green/

The National Oceanic and Atmospheric Administration
(NOAA)

While the IPCC is cited throughout this Chapter, it is worthy to note that NOAA has also conducted research on the impacts of climate change in the United States and relevant information can be found at globalchange.gov.

Seminole County also boasts a robust local program and has adopted an Energy Efficiency and Conservation Strategy in 2009, which made the County eligible for a $2 million dollar energy efficiency block grant. Among the projects contained in the Strategy are an Energy Efficiency Loan and Grant Pool, which helps residents and small businesses to retrofit buildings for energy conservation; funds to retrofit County lighting and HVAC systems; funds for public–private partnerships to install renewable energy systems in county facilities; and an upgrade of the County's codes to include energy conservation and efficiency standards such as LEED. This also includes staff training.

In addition to this new effort, the Seminole County Comprehensive Plan has already adopted density and intensity bonuses for its Mixed Development land use category along the US 17-92 Community Redevelopment Area corridor for projects that include green building standards as approved by LEED.

A. Federal Efforts

'Green' funding was put forth by the American Reinvestment and Recovery Act and congressional committees have signaled their intention to work on additional energy and climate bills that will take up cap and trade legislation and the utilization of renewable energy sources.

As the federal surface transportation bill (SAFETEA-LU) nears expiration, the authorization of a new bill is likely to contain new provisions related to climate change and energy efficiency. Additional inclusions are sure to tie in transportation, including funding for reducing vehicle miles traveled and further requirements for incentivizing and/or reducing carbon emissions.

Adaptation Planning for the National Estuary Program

(EPA Whitepaper – May 2009)

There are five critical elements that an adaptation plan should include to earn Climate Ready Estuary (CRE) recognition:

- Assessment of vulnerability to climate change
- Summary of considerations used to set priorities and select actions
- Description of specific adaptation actions for implementation
- Plan for communicating with stakeholders and decision makers
- Plan for monitoring and evaluating results.

DID YOU KNOW...

The 2007 energy bill has begun to address energy infrastructure concerns by advancing research on the 'Smart Grid'. A 'smart grid' would integrate broadband telecommunications technologies and sensing devices that would be installed in homes and appliances, permitting bi-directional communication between the customer and energy supplier. These technologies would allow for real-time monitoring and pricing, and provide for automatic load adjustments on the supplier and consumer ends, which would increase throughput, conserve energy and prevent blackouts.

B. State Efforts

Many U.S. states have developed or are in the process of developing state climate action plans. These plans have typically followed a similar model of reducing emissions through a region based approach. The plans look at any number of sectors but generally address energy supply infrastructure, agriculture, forestry, waste management, transportation, and residential, commercial, and industrial energy use. Greenhouse gas reductions are then typically achieved through regional regulations, incentives, and policies. While these plans are a step in the right direction, many omit any discussion of adaptation measures or the unavoidable damages that climate change may bring to ecosystem health, resource loss, human health impacts, natural disaster impacts, sea-level rise impacts, and air quality impacts. These are important items to address in the future as both providing direction to regional/local governments and in offering political cover for the purpose of implementation.

According to the Florida Department of Environmental Protection, on October 15, 2008, Florida Governor Charlie Crist received the second and final report of the Governor's Action Team on Energy and Climate Change. The Phase 2 report contains 50 separate policy recommendations as well as a separate suite of recommendations as guidance to the Florida Department of Environmental Protection in its development of a regulatory, market-based cap-and-trade emissions limiting program.

DID YOU KNOW...

California is particularly notable for its efforts to address the role of development patterns in energy use and climate change impacts. In 2008, the California legislature passed and signed into law S.B. 375, the first state legislation to address the important connection between energy savings and smarter land use decisions.

Florida has recognized the importance of energy conservation and the direct connection with land use and transportation. Over the past few decades, many groups have worked toward a more energy conscience and transportation efficient future.

C. Local and Regional Efforts

Addressing the impacts of climate change on a regional level allows for the greatest potential to collaborate and reinforce policies and regulations.

VII. DEVELOPMENT FORM AND PATTERNS

The modeling of alternative future development patterns (Chapter 1) demonstrated that location, density, proximity, connectivity, diversity of land uses, and other development concepts are integral to addressing energy and climate issues. Compact development puts people closer to work, reduces vehicle miles traveled, and offers walking and biking options as alternatives to the automobile. Transit Oriented Development (TOD), Transit Ready Development (TRD), and transit-served neighborhoods are development strategies that can help to reduce greenhouse gas emissions. Infill sites for development and redevelopment opportunities along transit-planned corridors should be considered before locating new development in urban fringe and rural areas. Development patterns can also influence the mix of housing and building types and the overall composition of single-family, multi-unit, and multi-story buildings, which can substantially affect the efficiency of water heating, space heating, and cooling systems.

APA – April 2009

According to Peter Park, Denver's Director of Planning, "when it comes to energy, when it comes to the environment, it's not one thing that will save the world." He suggests that much more will be gained by increasing density around transit corridors and stations than by simply restricting development to accommodate solar panels. "We could be much better stewards of the environment by allowing the densities that were traditionally found there, or intensifying densities."

Development form should not be oversimplified. In reality, there are many factors that go into decisions on where people live, with proximity to work only being one of them. Schools are an important factor and parents are often willing to commute long distances to provide quality educational opportunities for their children. Efforts to improve school systems, therefore, may help to make compact urban settings more appealing. Additionally, for dual-income families, it may be difficult to find jobs that are close to one another. It then stands to reason that communities should be sensitive to the corridors between employment centers. Offering quality transit service and a range of housing opportunities in walkable communities provides a quality living environment that serves to reduce vehicle miles traveled.

VIII. INFRASTRUCTURE & UTILITIES

Infrastructure used to convey energy, transportation, water, and wastewater all should be evaluated in light of emerging energy technologies, location constraints, and cost. The distribution of newly desired renewable energy sources may demand new transmission and distribution infrastructure apart from that serving conventional energy sources. An assessment of location and cost-benefit would be necessary in making transitions from fossil-fuel energy sources to renewable energy sources.

One of the principal advantages of generating energy close to where it will be used is the reduction in 'line-loss' averages that are inherently greater when energy is distributed over long distances. Additionally, there is less exposure to climate stresses and hazards.

IX. TRANSPORTATION

According to an 'Urban Land Institute (September 2008)' report, Florida's transportation sector produces about 46 percent of the state's greenhouse gas emissions. Reducing green house gas emissions that result from transportation related activities is of the highest priority if we hope to mitigate the effects of climate change on a regional basis. Below are some strategies that could be employed.

A. Fuel efficient vehicles

Promoting the use of fuel efficient vehicles and fuels is a good way to reduce emissions and communities can take a lead in emerging technologies that promote such things as charging stations and convenient parking spaces for bicycles, scooter, motorcycles, and electric vehicles.

B. Efficient modes of travel

As discussed previously, multimodal networks allow users to access jobs, stores, services, and other everyday needs without necessarily using a car. Transit enhancements, intelligent traffic management systems, and complete streets can contribute to reduced greenhouse gas emissions. Transportation planning models are developing nationally to account for greenhouse gas emissions when analyzing local and regional development scenarios.

Freight traffic volume is tied directly to economic activity, so reducing greenhouse gas emissions associated with freight movement is likely to be more challenging. Shifting freight to more efficient modes (i.e. from trucks to rail to ships) will be important, as will efficiency gains through technology and system management.

C. Travel demand

As previously mentioned, development patterns can play a role in reducing greenhouse gas emissions. New broadband communication technologies, expanded options for telecommuting, and other alternative work arrangements could also serve to reduce travel demand. The "trip not taken" is the most efficient trip of all.

X. ECONOMIC DEVELOPMENT

Energy use represents one of the largest operating costs for many businesses. Providing options for energy efficiency and affordability can be critical to attracting new businesses in an ever-increasing competitive global economy. Some strategies to consider include:

A. Promote renewable energy industries

A broad range of equipment manufacturers, installers, retailers, and consultants will be needed to make the transition to the new energy economy. Attracting these companies in the renewable energy and energy efficiency sector will result from an active market for their products and services. Additionally, sustained industry growth will demand the development and recruitment of an appropriately skilled workforce that is cultivated from technical and university programs that are attune to emerging and best management practices.

FYI…

.According to a recent analysis conducted by the Center for Climate Strategies, implementing a national climate plan involving all US states could result in a cumulative savings of over $535 billion from 2009 to 2020.

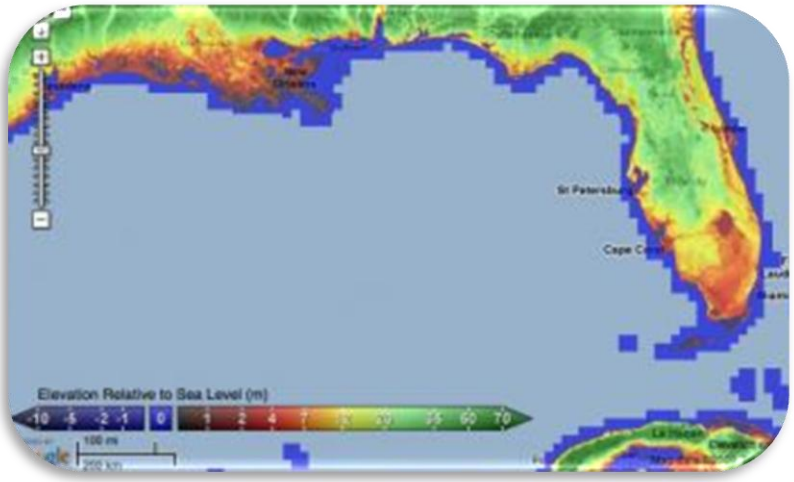
B. Promote lower emission products

Beyond direct energy use, reducing greenhouse gas emissions depend on the availability of goods, materials, and services that have inherently low embedded energy and emissions, or have been produced by companies that have made strides to reduce indirect energy use and emissions. The development and expansion of companies that produce or supply such products should be included in future economic development considerations.

On the opposite end of the spectrum, some businesses are vulnerable to climate change such as farms and food-related businesses or tourism and recreation-based industries. Communities may need to assist these operation where feasible or, in the alternative, plan for their decline.

XI. SEA LEVEL RISE

Sea level rise is threatening coastlines around the world, especially along the Mid-Atlantic and Gulf Coasts, which in the last century rose 5 to 6 inches more than the global average. (Source: EPA Coastal Zones and Sea Level Rise) The majority of Florida's population lives within the low-lying coastal areas that have the potential to be greatly impacted.



Google's "Sea Level Rise Explorer" illustrates vulnerability based on elevation relative to sea level.

The two main contributing factors to sea level rise are melting ice sheets in Antarctica and Greenland and thermal expansion of water. The difficulty in quantifying the effects of these two events has led to

a wide range of possibilities in predicting the pace of sea level rise. The table below indicates the potential for projected sea-level rise in East Central Florida over the next two hundred years.

Figure 2.

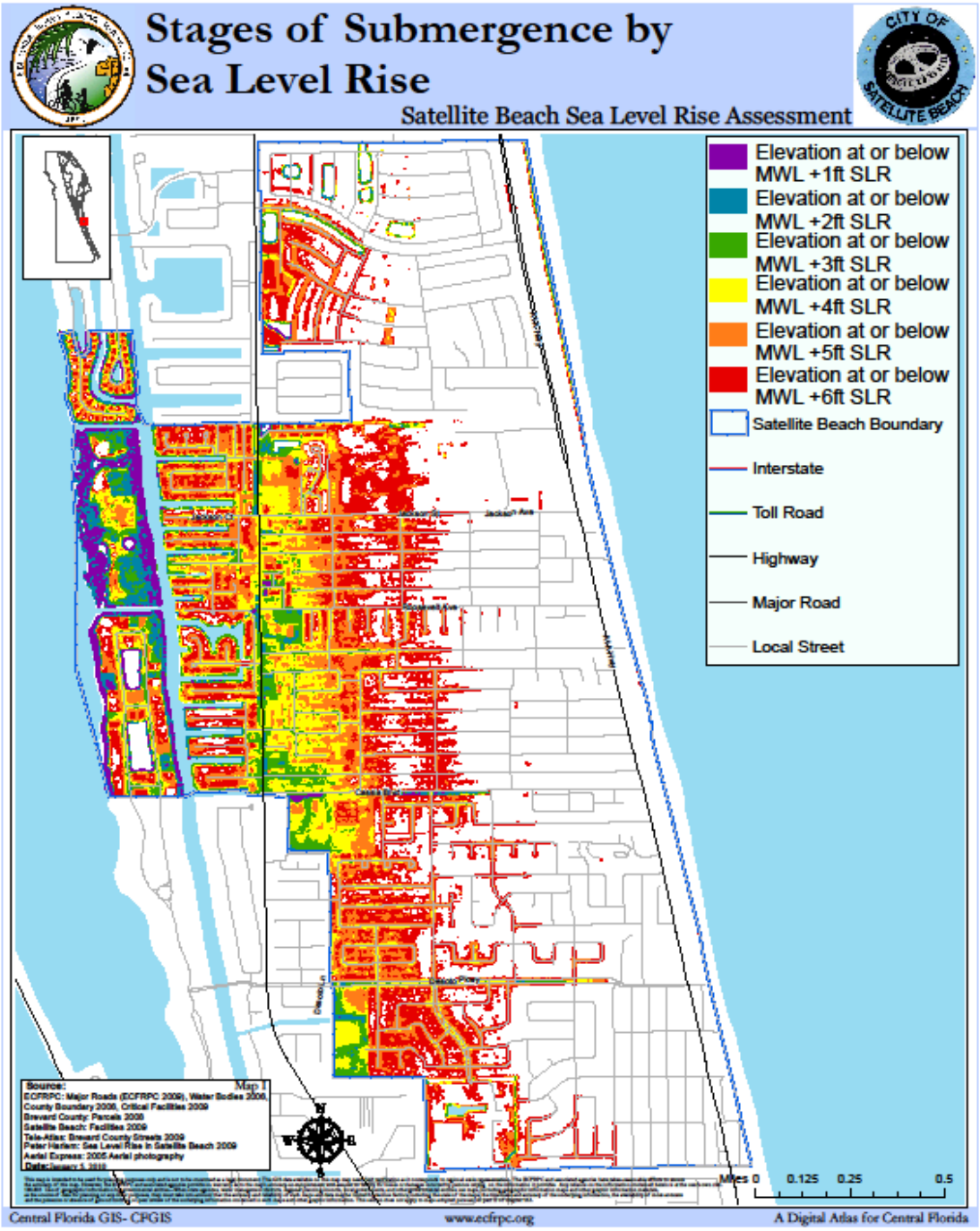


Table 3. Estimated Sea Level Rise For East Central Florida

Sea Level Projection by Year												
Probability (%)	2025		2050		2075		2100		2150		2200	
	cm	inches	cm	inches	cm	inches	cm	inches	cm	inches	cm	inches
90	6.7	2.6	12.2	4.8	18.7	7.4	25.2	9.9	38.2	15.0	51.2	20.2
80	8.7	3.4	16.2	6.4	24.7	9.7	34.2	13.5	51.2	20.2	69.2	27.2
70	10.7	4.2	19.2	7.6	28.7	11.3	40.2	15.8	61.2	24.1	83.2	32.8
60	11.7	4.6	21.2	8.3	32.7	12.9	44.2	17.4	70.2	27.6	97.2	38.3
50	12.7	5.0	23.2	9.1	35.7	14.1	49.2	19.4	78.2	30.8	110.2	43.4
40	13.7	5.4	26.2	10.3	39.7	15.6	54.2	21.3	88.2	34.7	124.2	48.9
30	15.7	6.2	28.2	11.1	42.7	16.8	60.2	23.7	100.2	39.4	144.2	56.8
20	16.7	6.6	31.2	12.3	47.7	18.8	68.2	26.9	115.2	45.4	171.2	67.4
10	19.7	7.8	36.2	14.3	55.7	21.9	79.2	31.2	141.2	55.6	220.2	86.7
5	21.7	8.5	40.2	15.8	61.7	24.3	90.2	35.5	169.2	66.6	277.2	109.1
2.5	24.7	9.7	44.2	17.4	68.7	27.0	102.2	40.2	202.2	79.6	342.2	134.7
1	26.7	10.5	48.2	19.0	75.7	29.8	116.2	45.7	245.2	96.5	448.2	176.5
Mean	12.7	5.0	24.2	9.5	36.7	14.4	51.2	20.2	86.2	33.9	127.2	50.1

Source: EPA Report "The Probability of Sea Level Rise" – September 1995.

According to the Space Coast Climate Change Initiative, rising sea level has the potential to increase beach erosion, cause saltwater intrusion into water supplies, inundate coastal marshes and other important habitat, and expand flood damage to coastal properties and infrastructure. The inundation of coastal habitats necessitates migration; unfortunately, barriers such as sea walls will prevent coastal ecosystems from migrating inland. Additionally, a change in climate could also bring upon more intense weather occurrences, such as increased tropical storms and droughts. (Dr. R.W. Parkinson, SCCI)

Planning – April, 2009

North Carolina has received a $5 million grant from the Federal Emergency Management Agency to study the potential effects of sea level rise. The study complements an ongoing FEMA project focusing on the effect of climate change on the National Flood Insurance Program.

Coastal Home Owners Face Huge Losses from Rising Sea

NY Times via Reuters, September 2, 2009.

"....Powerful storms along China's coast are washing salt onto farmland, severely reducing crop yields and there are fears saltwater may be contaminating vital fresh water aquifers. The first wave of climate change refugees have started leaving their island homes in the South Pacific as storm surges contaminate fresh water supplies and flood coastal crop lands.

….But it's not just high priced beach houses that are at risk from storm surges and rising seas. Parts of Cape Canaveral, home of the Kennedy Space Center and the space shuttle launch pads, and Tampa Bay are considered vulnerable to rising seas.

XII. MANAGED RELOCATION

In addition to the catastrophic environmental implications, coastal communities must plan for managed withdrawal, which is "designed to minimize hazard potential and environmental impacts by removing or diverting development from the most vulnerable coastal areas. "Along *developed* coasts it would consist of the relocation of structures, buyout programs, conservation and rolling easements. Along *undeveloped* coasts the managed withdrawal option is achieved using conservation easements or environmental land acquisition programs." (Dr. R.W. Parkinson, SCCI)

NEWS

NATIONAL ACADEMY OF SCIENCES
NATIONAL ACADEMY OF ENGINEERING
INSTITUTE OF MEDICINE
NATIONAL RESEARCH COUNCIL

FROM THE NATIONAL ACADEMIES

Date: Sept. 1, 2009

For immediate release - increasing residential and employment density could mean reductions in vehicle travel, fuel use, and CO_2 emissions.

WASHINGTON -- Increasing population and employment density in metropolitan areas could reduce vehicle travel, energy use, and CO_2 emissions from less than 1 percent up to 11 percent by 2050 compared to a base case for household vehicle usage, says a new congressionally mandated report from the National Research Council, although committee members disagreed about the plausibility of achieving the higher estimate. Assuming compact development is focused on new and replacement housing -- as converting existing housing to higher densities could be prohibitively difficult -- significant increases in density would result in modest short-term reductions in personal travel, energy use, and CO_2 emissions. However, these reductions will grow over time.

Buildings' contribution to GHG emissions is frequently underestimated, whereas green buildings costs are overestimated. A green building project can be completed with an average of only 2% more upfront costs, resulting in building life cycle savings of 20% of the total construction costs.

XIII. GREEN BUILDING

Why Green Building?

According to the U.S Department of Energy, electricity is by far the most prominent residential source of energy consumption in Florida, ranking third in the United States for total electricity consumption. Since air conditioning is one of the primary consumers of electricity this is expected due to the climate in Florida. Electricity consumption is currently growing faster in Florida than population, indicating a clear increase in per capita consumption. This parallels the rising residential electricity consumption nationwide.

Since buildings are very energy consumptive, contributing a significant amount to greenhouse gas emissions, a strong case is made for green buildings. Reported by the U.S. Green Building Council, buildings account for 72% of electricity consumption in the country, 39% of total energy use, and 38% of all carbon dioxide (CO_2) emissions. However, according to the U.S. Department of Energy, 30% reduction in emissions is possible through energy efficient buildings. Considering this data, increasing energy efficiency in buildings is fundamental in reducing greenhouse gas (GHG) emission and working towards a more sustainable future.

Valencia Community College's new special-events center is vying for gold certification. Features include an underground cistern to collect rainwater, reflective roofing material and crushed-limestone walkways.

(Huntonbrady Architects, August 20, 2009)
Source: Orlando Sentinel

Table 4. Benefits of Green Building

Environmental	Economic	Health and Community
• Reduce greenhouse gas emissions and solid waste • Improve water and air quality • Conserve and protect natural resource	• Decrease operating costs • Reduce operating costs • Increase building value • Improve return on investment • Enhance employee or resident satisfaction • Optimize life-cycle profit of building	• Better overall quality of life • Improve air quality • Enhance thermal and acoustic environments • Reduce impact on local infrastructure

Green Building Practices

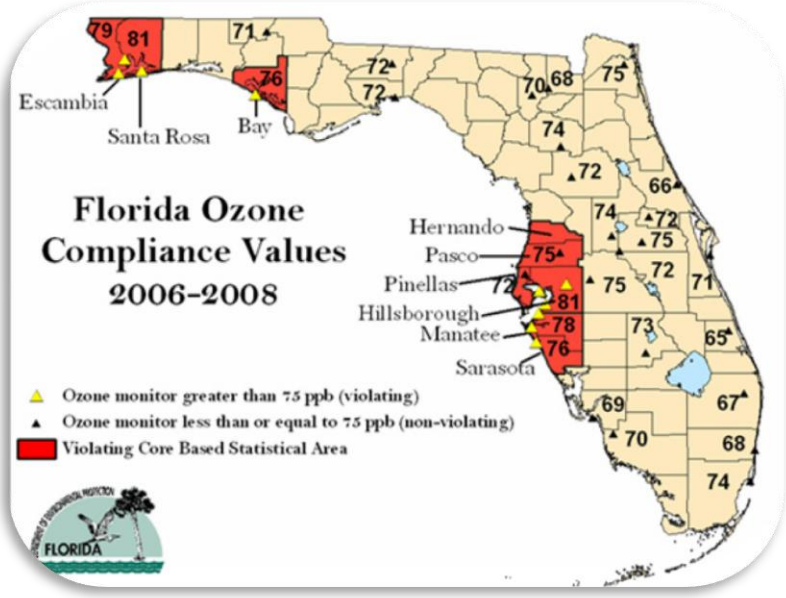
There are a variety of private and non-profit green building certification programs including Leadership in Energy and Environmental Design (LEED), Green Globes, and the Florida Green Building Coalition. The Public-Private Partnership for Advancing Housing Technology maintains a list of national and state Green Building Certification Programs for housing. LEED developed by the U.S. Green Building Council is considered the country's leading authority on the topic. This provides a set of standards and framework to achieve energy efficient, sustainable construction. LEED has various rating systems and rating levels for different types of green buildings. Table 5. below identifies the key areas that LEED examines. The structure of the program can be applied to any building type and stage of a buildings lifecycle.

Table 5. Key Areas that LEED Examines

Key Areas	Practices and Techniques
Sustainable Sites	Sites that minimizes a building's impact on ecosystems and waterways.
Water Efficiency	Efficient appliances, fixtures and fittings inside and water-wise landscaping outside, green roofs, rain gardens, packed gravel or permeable concrete instead of concrete.
Energy & Atmosphere	Energy use monitoring, efficient design and construction, efficient appliances, systems and lighting; the use of renewable and clean sources of energy, generated on-site or off-site; and other innovative strategies.
Materials & Resources	**E**ncourages the selection of sustainably grown, harvested, produced and transported products and materials.
Indoor Environmental Quality	Promotes strategies that can improve indoor air as well as providing access to natural daylight and views and improving acoustics.
Locations & Linkages	Encourage homes being built away from environmentally sensitive places and built in infill, previously developed and other preferable sites.
Awareness & Education	Provide homeowners, tenants and building managers with education and tools to understand their home green and make the most features.
Innovation in Design	Provides bonus points for projects that use new and innovative technologies and strategies to improve a building's performance beyond LEED requirements.
Regional Priority	USGBC's regional councils, chapters and affiliates have identified the environmental concerns that are locally most important for every region of the country, and six LEED credits that address those local priorities were selected for each region.

XIV. AIR POLLUTION

Air quality is an issue that urbanized areas must continue to deal with. Scientific evidence shows that over time, poor air quality due to increased traffic and industrial uses in our cities will have a negative effect on the human population and the surrounding environment. Today, all states have to comply with the Clean Air Act to improve the air quality in our communities. Poor air quality does not recognize political boundaries, so municipalities must work together to improve air standards. The potential for urban area 'ecosystem' payments to rural areas could help to mitigate air pollution.



New Ozone Standard – Florida Department of the Environment

On March 12, 2008, the U.S. Environmental Protection Agency (EPA) changed the National Ambient Air Quality Standard (NAAQS) for the pollutant ozone (O_3), the principle component of smog. The primary (health-protective) standard was changed from 0.08 parts per million (ppm) to 0.075 ppm. Compliance with the standards is based on the three-year average of the annual fourth highest maximum daily 8-hour concentration.

XV. CONCLUSION

Citizens and planners have an important role to play in mitigating the effects of climate change and adapting to its consequences. Taking action in these areas will not only help mitigate the climate change problem, but through various strategies could also help reduce our reliance on non-renewable energy sources, help communities better meet their energy needs, and improve environmental quality. There are many opportunities for our region to start integrating energy and climate issues in planning across issue areas and in different points in the planning process.

CHAPTER 8: ENERGY AND CLIMATE CHANGE	
Goal	Reduce the consumption of energy and prepare the region for the impacts of climate change.
Vulnerability and Assessment	
Policy 8.1	Support research that determines if, when, and where selected coastal communities should be either relocated or protected.
Policy 8.2	Support studies and partnerships with research organizations and universities that explore the impacts of energy use and climate change and develop best management practices.
Policy 8.3	Encourage coastal communities to evaluate their food sources and assess the vulnerability of food supplies to sea level rise.
Policy 8.4	Promote assessments of carbon emissions, local energy resources, and potential impacts and risks associated with climate change.
Adaptation and Planning	
Policy 8.5	Encourage communities to identify coastal land uses and critical facilities that may be impacted by sea level rise.
Policy 8.6	Promote mixed uses in existing communities to reduce vehicle miles traveled and energy use, and thus reduce the region's energy consumption.
Policy 8.7	Encourage land use patterns and multi-modal transportation systems that promote energy efficiency.
Policy 8.8	Encourage interlocal agreements between adjacent government jurisdictions that address energy efficient land use decisions.
Policy 8.9	Promote the development of renewable energy industries and the use of renewable energy sources.
Policy 8.10	Encourage the development of multi-jurisdictional air quality/transportation studies in order to determine the long-term impacts of automobile generated pollution and monitor the efforts made to avoid non-attainment status.
Policy 8.11	Support multi-jurisdictional climate action plans that promote energy efficient development practices and reduce energy consumption throughout the region.

Policy 8.12	Encourage research, development, and implementation of recycling, resource recovery, energy recovery, and other methods of using garbage, sewage, hazardous waste, and other waste.
Policy 8.13	Promote the co-location of new or expanding utilities in existing corridors and rights-of-way.

CHAPTER 8: ENERGY AND CLIMATE CHANGE

Vehicle Miles Traveled by County

Baseline: Vehicle Miles Traveled from 2004-2008

	2004	2005	2006	2007	2008
Brevard	17,400,151	17,460,618	18,009,541	18,144,771	17,893,256
Lake	8,319,741	8,614,899	8,605,081	8,620,150	8,124,673
Orange	32,560,124	34,117,461	34,663,274	36,029,040	35,436,426
Osceola	8,198,137	8,949,500	8,961,895	9,139,112	8,836,800
Seminole	9,793,058	10,167,856	10,211,094	10,325,317	9,866,475
Volusia	15,156,009	15,818,622	15,983,717	15,967,879	15,586,786

Source: *Space Coast TPO, MetroPlan Orlando, Lake Sumter MPO, Volusia TPO*

Non-attainment air quality by county

Baseline: 0.075 ppm

Source: EPA- NAAQS

Number of 'Green' registered projects

Baseline: 31 LEED Registered Projects

Source: USGBC, Green Globes, FGBC

The ECFRPC would like to extend a special thanks to all those who participated in developing this chapter including those listed below:

ENERGY AND CLIMATE CHANGE SOUNDING BOARD (September 22, 2009)	
Amye King	Lake County
Don Fisher	Osceola County
Dori DeBord	Seminole County
Gregory Stubbs	Volusia County
Robin Sobrino	Brevard County
Ginger Adair	Volusia County
Sandy Sanderson	Florida Power and Light
Ken Ksionek	Orlando Utilities Commission
James Welsh	Kissimmee Utility Authority
William Johnson	Progress Energy
Dr. Pierce Jones	University of Florida
Randall Parkinson	RWParkinson Consulting
Dr. Duane DeFreese	Aquafiber Technology
Lori Cunniff	Orange County
Dr. Ross Hinkle	University of Central Florida
Susan Jackson	Volusia County