

Towards a plan for Charlotte County’s Resiliency and Sustainability

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Beaches and Shores Advisory Committee

Notes on what was presented at the June 7, 2018 meeting of the Beaches and Shores Advisory Committee.

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Introduction

What led to this presentation? Its been a combination of events and discussions at our advisory committee meetings and the authors experiences.

Beaches and Shores threads

Since November 2017, our Beaches and Shores advisory committee has developed threads of discussion about sea level rise and climate change in general.

Sea Level Rise and Climate Change Keep Coming up
<ul style="list-style-type: none"> • Our beach re-nourishment plans do not take sea level rise into account • Local media are demanding a plan for dealing with hotter weather and sea level rise • Audubon predicts that, unless we do something to reverse climate change, half the birds in North America may go extinct. • The state requires all counties to take sea level rise into comprehensive plans within three years • Credit agencies warn of downgrading for municipalities that do not prepare for the effects of climate change

It began when we learned that our beach re-nourishment plans do not take sea level rise into account. It is understandable that our 8-year budget for beach re-nourishment is too short a period of time to notice much rise in sea level. On the other hand, we are committing millions of dollars in public resources to this project, without considering the long-term effects of rising seas.

Local media are asking “what’s the plan?” In a November 2017 editorial, the Sun papers took the position that our communities need a written plan for hotter weather and rising seas in our future. ¹

Audubon reported in 2015 that, unless we reverse the trends of global warming, half of bird species and N America are at risk of extinction. ²

Claire Jubb advised us that the state has mandated that counties must include sea level rise in their comprehensive plans by 2021

¹ Editorial Board, 2017. “Warming up and up and up, both locally and globally.” *Charlotte Sun* November 15, p. 16.

² National Audubon Society. 2015. *Audubon’s Birds and Climate Change Report*. National Audubon Society, New York. http://climate.audubon.org/sites/default/files/NAS_EXTBIRD_V1.3_9.2.15%20lb.pdf

Moody's, one of the largest credit rating agencies in the country is warning municipalities to prepare for the effects of climate change or risk being downgraded.³ Writing in *Climate Liability News*, Jennifer Dorroh cites a new study at U Pennsylvania, saying "Many U.S. coastal communities, unprepared for flooding and other effects of global warming-driven sea level rise, are heading toward an imminent downgrade of their credit unless they act quickly."⁴

It seems the time has come to address the issue.

Disclosures

What compels me to get up in front of the committee and talk about sea level rise and global warming? I have lived and worked on the water my whole life. The idea of sea level rise is an emotional and financial threat to my family, our lifestyle, and yes, our real estate.

There is also a national security connection. From my navy career I have ties to Norfolk and other naval base areas threatened by sea level rise. During my time teaching at the [Naval War College](#), it became apparent that climate change is a threat to our national security. This realization provides motivation for me to work on this issue.

I have spent 4 years working with colleagues at [Florida Veterans for Common Sense](#) to create a climate change report. The research for this report provided a good deal of the knowledge and insights presented here.⁵ I serve as FLVCS liaison to the Suncoast Climate Justice Coalition, and in this capacity, I am working with the Sarasota community to adopt a Ready for 100% program. Ready for 100% aims to transition to 100% renewable, zero-emission energy.⁶ This project has helped me learn what sort of elements and strategies can go into a plan for sustainability and resiliency.

I had the opportunity to teach a class this winter at Florida Southwestern College in Punta Gorda: *Preparing for more Irmas – adaptation vs mitigation*. Working on that course helped me deal with the issue of what kinds of actions we can and should be taking in the face of the threat of more severe weather events, more precipitation, higher storm surges, etc.

Finally, I have to admit I have a frugal personality. I have been experimenting with energy efficiency and alternatives to traditional fuels since 1981. So, the idea of using solar power is not new to me. The idea that solar power could help save our coastal communities never occurred to me until long after I had been using it to save money. I feel qualified to speak first hand on how feasible and economically beneficial solar power is, because we have been using it for a long time.

This is where I am coming from.

Purpose

Our advisory committee is responsible for alerting the of action needed to preserve our beaches and shores. With that in mind it is my aim to:

³³ Rott, Nathan. 2017. *Moody's Issues Warning On Climate Change To Cities*. NPR. Dec. 17.

<https://www.npr.org/2017/12/01/567843604/credit-rating-agency-issues-warning-on-climate-change-to-cities>

⁴ Dorroh, Jennifer. 2018 "Credit Downgrades Imminent for Cities Unprepared for Climate Impacts" *Climate Liability News* July 12 <https://www.climateliabilitynews.org/2018/07/12/credit-downgrades-climate-change/>. Miller, John A. 2019 "Credit Downgrade Threat as a Non-regulatory Driver for Flood Risk Mitigation and Sea Level Rise Adaptation." 5-2018 *University of Pennsylvania Scholarly Commons*. https://repository.upenn.edu/cgi/viewcontent.cgi?article=1072&context=mes_capstones

⁵ Darovec, John and William (Coty) Keller. 2018. *Urgency and Action: Drawdown to Reverse Global Warming*. Florida Veterans for Common Sense. <http://ecopapak.org/ecology/What%20to%20Do/FLVCS%20Climate%20Change%20Report.pdf>

⁶ See about Read for 100% at <https://www.sarasotafl.gov/government/city-manager/sustainability/ready-for-100>

- Present information about sea level rise and other dangers of a warming planet, and how that relates to our interest in the conservation and preservation of our beaches and shores, and
- Offer recommendations for courses of action the county could take – what our sustainability and resiliency plan might include.

Sea Level Rise

To get a feeling for the specter of sea level rise, we will examine it from two perspectives. First, we will learn what's happening with our neighbors to the north on Siesta Key. Then we will examine the concept of "Chronic Inundation" and what that means to us in southwest Florida.

Siesta Key demonstration

Siesta Key is a barrier beach, not unlike Manasota Key, Don Pedro Island and Gasparilla Island in Charlotte County.



You need to look at the 3 minute video at <https://www.youtube.com/watch?v=2jdyfKtJOSI> to see first hand the event staged by local community under the guidance of the faculty at Ringling College and [This Spaceship Earth's](#) David Houle and Tim Rummage.

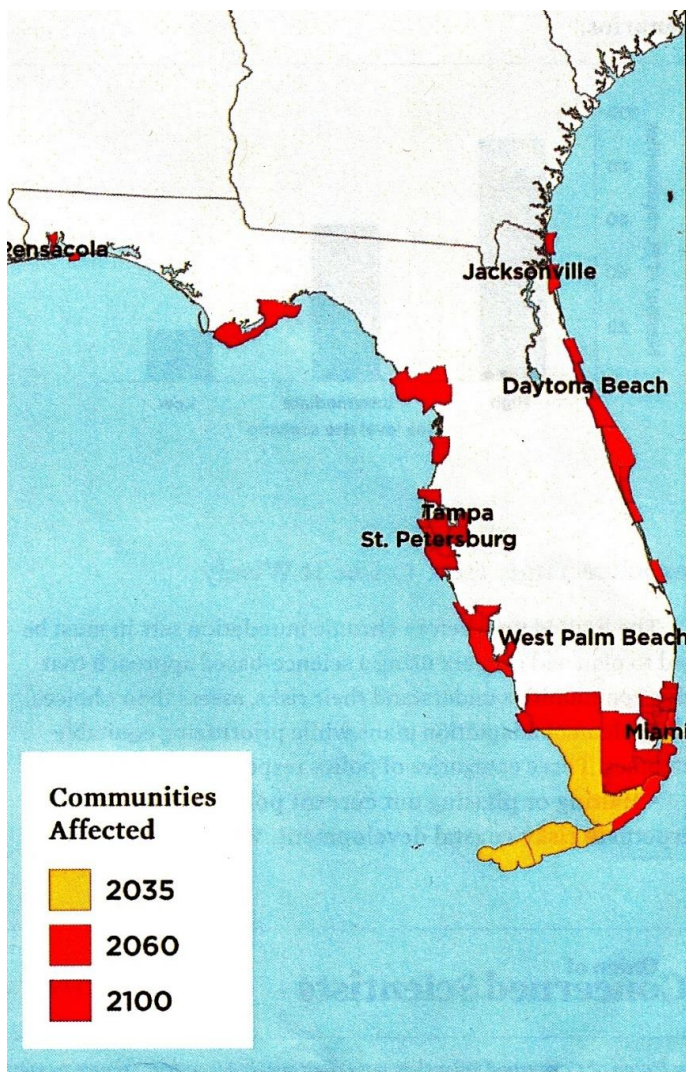
In the video, they use projections by the National Oceanographic and Atmospheric Administration (NOAA), which predicts an 8-inch sea level rise on Siesta Key by 2030, and a 2-foot rise by 2040. You can see how the beach is essentially going to be lost unless something is done.

For us in Charlotte county, its not hard to imagine the high tide line in 2040 being beyond the parking lot at Englewood beach. Perhaps over to the curb at *Lock n Key*.

Chronic Inundation

The Union of Concerned Scientists have created a [series of maps](#) for areas which will be flooded 26 times or more per year—an average of about twice per month—from today through 2100.⁷

By definition, “chronic inundation” happens when 10% of usable land is flooded 26 times/year. You can see in this illustration that parts of our region are forecast to be inundated by 2060.



To get more specific on the impacts for us, we have to think about different scenarios:

- **Moderate (intermediate) sea level rise scenario** is based on carbon emissions continuing to rise until the middle of the century and then decline. This results in a 4-foot global rise in sea level by 2100
- **Higher sea level rise scenario** is based on global carbon emissions rising through the end of the century. The Result is a 6-foot global rise in sea level by 2100.

⁷ Union of Concerned Scientists. 2017. *When Rising Seas Hit Home: Hard Choices Ahead for Hundreds of US Coastal Communities* <https://www.ucsusa.org/global-warming/global-warming-impacts/when-rising-seas-hit-home-chronic-inundation-from-sea-level-rise#.WwwWPPZFw2w>. (Or you can do a browser search for “When Rising Seas Hit Home”)

(The Union for Concerned Scientists also has a 3rd scenario – lower carbon emissions - which will be explained later when we get to mitigation actions)

We examined the projections for Port Charlotte, Boca Grande and Englewood in the two scenarios to see when/if chronic inundation would happen. While Boca Grande is not in Charlotte County, it is the closest beach communities in the data base. It should serve as representative of what our county barrier beaches would experience.

	Moderate (intermediate) sea level rise scenario based on carbon emissions continue to rise until the middle of the century and then decline = 4' global SLR 2100	Higher sea level rise scenario based on global carbon emissions rise through the end of the century=6' global SLR 2100
Port Charlotte	Inundated 2100	2070
Boca Grande	2060	2045
Englewood/Rotunda	2100/2080	2070/2060

For example, Port Charlotte would become inundated by 2100 in the intermediate scenario, or by 2070 under the higher scenario. Englewood will be inundated by 2080 or 2060 depending under the intermediate or higher scenario respectively.

Nearly 500 communities nationwide will become chronically inundated by the end of this century with only **moderate sea level rise**. In this scenario, global carbon emissions continue to rise until the middle of the century and then decline. Ice sheets respond to warming in line with historic trends. By 2100, seas rise by about 4 feet globally.

- Port Charlotte would have 14% of land inundated by 2100
- Boca Grande would have 10% of useable land inundated by 2060, with 42% inundated by 2080
- Englewood proper has 13% of usable land inundated by 2100. The Rotunda area is inundated by 2080.

More than 650 communities nationwide will become chronically flooded by 2100 with **higher sea level rise**.

In this scenario, global carbon emissions rise through the end of the century, ice sheets respond by melting more rapidly, and sea level rises more quickly. By 2100, seas rise by more than 6 feet globally.

- Port Charlotte would have 11% of usable land inundated by 2070.
- Boca Grande – 10% by 2045. 98% usable land will be inundated on average 26 times/year by 2100.
- Englewood 11% inundated by 2070. Rotunda area is inundated by 2060.

For more on the UCS analysis, go to www.ucsusa.org/RisingSeasHitHome for the full report, maps, and data sheets.

The projections from the UCS maps is a bit more abstract than the Sierra Key video- where we can see how far inland the water will rise. But I hope you can see our communities will be affected by sea level rise in the coming decades if we continue to add heat trapping gases to the atmosphere. How much water we see and when depends on how much carbon we emit. Of course, we could really limit sea level rise by achieving a low carbon scenario – we will come back to that in the “mitigation” part of the presentation.

It’s More Than Sea Level Rise

Let’s put aside sea level rise for a moment and address other threats to coastal communities.

A September 2017 article in the *Herald Tribune* told us that hurricane Irma represents the new normal: the strongest storms should get stronger in the coming decades as the ocean temperatures warm; creeping sea level rise will make

storm surges and inundation worse, particularly for low-lying areas; and storms that do form are likely to bring more precipitation with them.⁸

Irma seemed to spark folks in Florida to call for action. As Tom Barwin, Sarasota City Manager said “Perhaps Irma is the kick in the shins we needed to begin a more pro-active response to climate change in Florida... and around the world for that matter.”

In the interest of preserving our beaches and shores, it makes sense to think about how we respond to the threat of sea level rise, increasingly violent storms and unreal amounts of precipitations. We need to consider what kind of actions are available? What are our options?

Action – Adaptation and Mitigation

Let’s consider what kinds of actions a community can take. What are our options? What are other municipalities planning to do? Which choices will give us the best chance to preserve our coastal communities.

Two distinct, non-mutually exclusive paths

Dr. Jane Lubchenco, U.S. Department of Commerce Under Secretary for Oceans and Atmosphere, speaking at a Miami-Dade conference said., “I like to think of mitigation as avoiding the unmanageable, whereas adaptation is managing the unavoidable. We must do both in order to solve the problem of climate change.”⁹

These two terms are used often, and it would help if we defined them. Here is how the dictionary and the UN panel on climate change define these terms.

	Webster’s	IPCC ¹⁰
Adaption	“To adjust to environmental conditions”	“The process of adjusting to actual or expected climate change.”
Mitigation	“To make less harsh or harmful”	“A human intervention to reduce heat-trapping emissions or remove carbon already in the atmosphere”

We might boil it down to this:

- *Adaptation* is acknowledging what is coming, and trying to protect against it
- *Mitigation* has to do with slowing and/or reversing global warming, and therefore reducing the likelihood of severe weather events and catastrophic sea level rise

Adaptation – examples of managing the unavoidable

If you’ve ever visited the Punta Gorda Chamber of Commerce, you may have noticed the fittings for their flood barriers on the entrance way. Flood barriers are a good example of the kinds of adaptations that individuals and businesses can take to try to adjust to actual or expected climate change. They are also an example of how people are profiting from

⁸ Murdock, Zack and Elizabeth Djinis. 2017. “Preparing for more Irmas: Warmer water, sea level rise fuel more dangerous storms.” *Herald Tribune*. September 17.

http://sarasotaheraldtribune.fl.newsmemory.com/clip_article.php?token=4rXXxOHQ6srJpbTC3sbZ4NDRydPInZOmmphe5KpkZWfyNy1ztHhwuiZmnF5wOmP1OCgnoySIKSTo5uad2%252BUUpZWUng%253D%253D

⁹ White House Listening Session, June 23, 2010, Miami-Dade County, Florida – reported in Miami Dade *Greenprint* pg. 70.

¹⁰ United Nations/IPCC, 2014. *Report of the Intergovernmental Panel on Climate Change* (IPCC) <http://www.ipcc-wg2.gov/AR5/>

adaptation. One of our sons designs and manufactures similar flood barriers for residential and business establishments in New York.



Adaptation – managing the unavoidable	
<p>Individual, businesses strategies</p> <ul style="list-style-type: none"> ■ Flood barriers ■ Insurance ■ Storm shutters ■ Elevate ■ Migrate ■ Turn a profit 	<p>Governments strategies</p> <ul style="list-style-type: none"> ■ Dikes ■ Protect assets identified as vulnerable to sea level rise. ■ Oyster reefs, more mangroves ■ Planned retreat

Many of us in Florida have opted for some of these adaptations with flood and wind insurance, perhaps storm shutters to protect against nature’s perils. An expensive adaptation as a hedge against flooding is to elevate your home or business. This can be expensive. I have seen a proposal for \$100,000 to elevate an 1100 sq. foot home worth \$300,000.

Another option is to leave. We know people who have migrated from coastal areas so they don’t have to worry about sea level rise or storm surge.

I mentioned our son – he adapted by creating a business to make money selling coastal protection systems. Profit motive is one reason why adaptation is very popular.

Government strategies for adaptation includes building dikes, not an option in Florida because of our limestone bedrock. The city of Sarasota’s adaptation plan includes protecting the 220 Sarasota city assets identified as vulnerable to sea level rise.¹¹ Punta Gorda’s adaptation plan includes retreat as the high tide mark comes inland.¹² The city also is

¹¹ City of Sarasota 2017 *Climate Adaptation Plan*. <https://www.sarasotafl.gov/home/showdocument?id=2571>

¹² UCS Kate Cell, *When Rising Seas Hit Home* presentation in Sarasota’s Fogertyville Peace Center, January 2018.

adapting with what they call a living shoreline. The idea is to plant mangroves and marsh grasses to stabilize the shoreline, and to use oyster reefs to reduce wave energy.¹³

Miami-Dade county uses a systems approach. For example, in water, sewer, power, transportation, health care, etc. they identify areas of the highest vulnerabilities within each of these systems. Upgrades are programmed as needed during the regular planning cycle.¹⁴

Adaptation gets a lot of attention, in part because there is money to be made. *National Geographic* explains how some are profiting on the threat of rising seas. A proposal for floating islands in the Miami area is an example of a large scale project to profit from people's zeal to adapt.¹⁵

Adaptation is expensive, and increasingly so. The greater the threat the more expensive it is to try to manage it.

Mitigation – concepts and examples for avoiding the unmanageable

At some point, adaptation is going to be too expensive and insufficient. As the Audubon says, no amount of adaptation is going to bring the birds back.¹⁶ While we must take action to protect ourselves, we also need to consider attacking the causes of the problem so we can have a real chance of preserving our beaches and shores in the long run.

To create an effective plan, it is important to make sure we are targeting the right problem and eliminating the causes of that problem.

The problem and its causes.

There is near universal consensus on what the problem is and what causes it. According to the UN panel on climate change, the Union of Concerned Scientists and our own government's November 2017 *Climate Science Special Report*,¹⁷ the problem is too much heat trapping gas in the atmosphere, which results in rising global temperatures.

We have over 400 parts per million (ppm) of greenhouse gases (GHGs) in our atmosphere now and we need to be below 350 ppm if we are to limit global warming to 1.5 degrees Celsius over pre-industrial levels. This limit is the consensus of what we need to achieve a stable climate.

As shown in the Up/Down diagram, there are two causes of the excessive amount of GHG in the atmosphere – too many GHG emissions and not enough photosynthesis to take carbon dioxide out of the atmosphere. Deforestation and poor soil management are reasons why we are not having enough photosynthesis. Let's get into detail on the upside and the downside of the problem.

¹³ City of Punta Gorda Climate Adaptation Plan

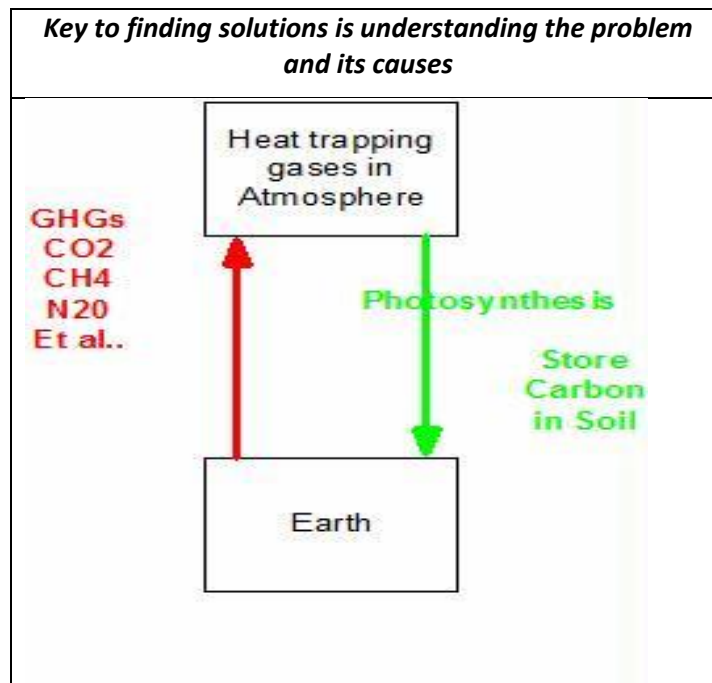
https://www.researchgate.net/publication/281068446_City_of_Punta_Gorda_Adaptation_Plan

¹⁴ Miami-Dade County *Greenprint: Our Design for a Sustainable Future*. <https://www.miamidade.gov/greenprint/pdf/plan.pdf>. Interview with Jim Murley, chief resiliency officer. June 5, 2018.

¹⁵ Laura Parker, "Treading Water," *National Geographic* February 2013 p107-125

¹⁶ Audubon Florida. Five things you can do to combat climate change. <http://fl.audubon.org/news/five-things-you-can-do-combat-climate-change>

¹⁷ Wuebbles, D.J., D.W. Fahey, K.A. Hibbard, D.J. Dokken, B.C. Stewart, and T.K. Maycock (eds.) 2017: *Climate Science Special Report: Fourth National Climate Assessment, Volume I*. U.S. Global Change Research Program, Washington, DC, USA, 470 pp. <https://science2017.globalchange.gov/>



Upside. Carbon dioxide (CO₂) is the major contributor (about 76% of greenhouse gas -GHG- emissions). Methane (CH₄) and Nitrous Oxide (N₂O) emissions are relatively low compared to CO₂, but pound for pound they are more potent as GHGs. Methane (about 16% of GHG emissions) is emitted by Fracking, animal agriculture, and from landfills. While methane does not stay around as long as CO₂, its impact is far more dramatic. Methane is 25 times **more potent as a global warming gas** in the atmosphere. N₂O (a bit over 6% of GHG emissions) comes in part from chemical fertilizers used on crops and in our yards. Each pound of N₂O has a global warming equivalent to roughly 300 pounds of carbon dioxide.¹⁸

So where do the emissions come from? Where do most emissions come from? The carbon footprint of present day power plants is enormous. As two former Environmental Protection Agency (EPA) administrators say:

..these plants emit more carbon dioxide than our cars, planes and homes combined, and it is this greenhouse gas that is the principal culprit behind the alarming warming of our planet.¹⁹

You won't be surprised that when we get to recommendations, electrical power will be a key target area.

Another way to look at emissions is from our own personal footprint. The Union of Concerned Scientists gave us the nice pie chart on the next page, with a comprehensive explanation:

Buildings - including your home, house of worship, workplace - account for about **32%** of emissions.

Transportation - is responsible for **28%** of the average American's emissions

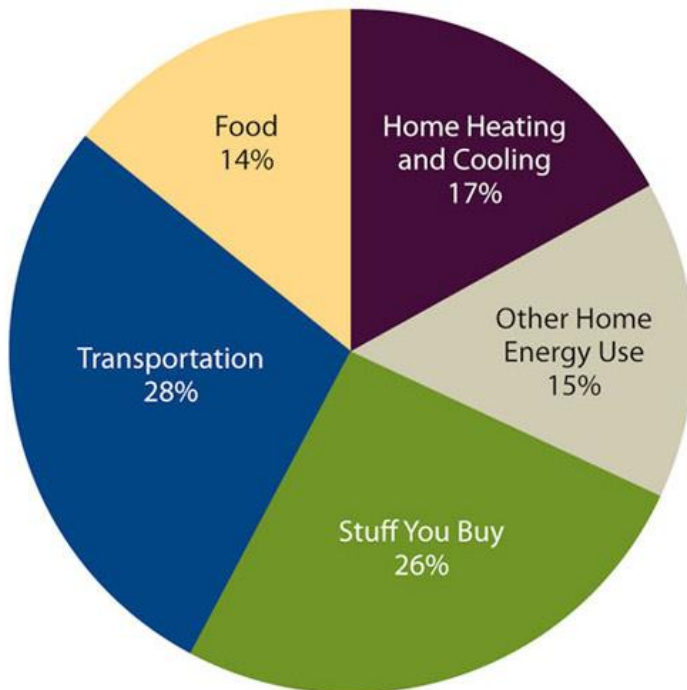
Food -what we eat and what we waste – our diet accounts for **14%** of emissions. A pound of beef is responsible for some 18 times the emissions of a pound of pasta, not to mention the 600 gallons of water it takes to make a hamburger, and that animal agriculture is responsible for most tropical deforestation. The only food that comes close to the emissions intensity of red meat is cheese. Not only does cheese come a methane-producing animal,

¹⁸ ¹⁸ Shulman, Seth, Jeff Deyette, Brenda Ekwurzel, et. al. 2012. *Cooler, Smarter: practical steps for low-carbon living*. The Union of Concerned Scientists. Island Press

¹⁹ William D. Ruckelshaus served Richard Nixon and Ronald Reagan. William K. Reilly ran the EPA for George H.W. Bush.

but the production of each single pound of it generally requires about 10 pounds of milk. An average family of four that cuts their meat intake in half could avoid roughly three tons of emissions annually, nearly half as much as a year's worth of driving. *If you eat meat, chicken and fish are the best choice from a climate standpoint.*

Where the Average American's Carbon Emissions Come From



Food waste accounts for lots of emission because there is so much of it. Most of it winds up in landfills (it is the largest component of municipal solid waste) where it contributes to methane emissions. Plus, it's a waste of money when 1 in 5 bags of groceries that come home wind up in the trash. A double whammy.

What you buy (and don't buy) - 28% of emission fall into this category. They include tangible items like clothes and furniture to services like haircuts and healthcare. About half these emissions are outside our immediate control, the other half are spread across many. Some of the most emissions intensive activities are water use, construction, remodeling and yard care. Fertilizer is a prime contributor of N₂O emissions. Most lawns cause far more emissions than climate friendly natural alternatives. Natural trees and shrubs often sequester carbon better than non-natives. Single use water bottles: 3/4 of them wind up in landfills. Production (not counting transportation) of the bottles puts the equivalent of 2.5 million tons of CO₂ into the atmosphere annually.²⁰

Downside. Deforestation has a four-fold impact. First, by removing trees, carbon in the soil is released into the atmosphere (adding to GHGs). Second, the machinery used to destroy the forests are probably burning some sort of fuel and thereby emitting GHGs. Third, often the dug-up trees are then burned causing more emissions. Finally, we have lost healthy trees and plants who would otherwise be taking CO₂ from *the atmosphere*, using it to produce valuable food for

²⁰ Hamerschlag, Kari 2011. *Meat Eater's Guide to Climate Change and Health*. Environmental Working Group. <http://www.ewg.org/meateatersguide/a-meat-eaters-guide-to-climate-change-health-what-you-eat-matters/>

our ecosystem and storing (sequestering) CO₂ in the soil- keeping it out of the atmosphere - thereby reducing global warming.

We don't have to go to the Amazon or Indonesia to witness similar impacts. The practice of soil tilling causes the release of carbon into the air. Not using cover crops forgoes an opportunity to take carbon from the air and store it in the soil. Our Secretary of Agriculture points out these two examples of how changing simple farming practices (i.e, using no-till and cover crops) can help mitigate the effects of climate change.²¹ We will come back to soil management when we get into the recommendations section.

Given this understanding of the problem (excess heat trapping gases in the atmosphere) and its causes (emissions and deforestation, poor soil management), we can move to solutions. But first let's deal with the possible pitfall of using misleading terms.

"Renewables" and "clean" are misleading terms. Let's just say we strive for Zero Emissions.

An often-heard phrase goes something like, "All we need to do is replace fossil fuels with renewables, and the GHG problem will be solved." Florida Veterans for Commo Sense think this is a dangerous oversimplification that does not take into account the fact we have some sources of energy that are referred to as "renewable" that are burned and hence are contributors to GHG.

"Renewable" energy is produced using the sun, wind, water, etc. or from crops rather than using fossil fuels. But the term "renewable" can be an unnecessary distraction in our quest to reduce GHGs because some renewable fuels are GHG emitters. The biofuels ethanol and biodiesel are examples. Made from corn and soybeans (or other vegetable oils, animal fats, or recycled restaurant grease) respectively, these fuels have been used to replace gasoline and petroleum diesel. While ethanol and biodiesel may produce less GHG, they still emit some.²²

The driving idea behind biofuels is that they can - in theory- offer a carbon neutral fuel source because the emissions caused by burning them are offset by the carbon dioxide taken up by the crops grown to make the fuel in the first place. The UCS points out, however that the farm machinery used to harvest and take crops to market, and the facilities used to produce fertilizers and pesticides emit more GHGs than the corn and soybeans take from the air. Renewable energy in the form of biofuels is not a solution to global warming. Instead it has become part of the problem.²³

Florida Veterans for Common Sense says in its report that we should let the corn and soybeans grow, capture carbon, and then let's eat them instead of burn them. **Non-combustion sources** are what we need to strive for: solar, wind, nuclear, hydro power and geothermal energy.

"Clean" is a relative term with a positive connotation. Advocates of natural gas like to call it a "clean" energy source, implying it is less "dirty" than coal. When we think of natural gas, we should also consider that it is methane, and when leaked (for example at the well, or during transportation in a pipe line) it will be 25 times more potent a GHG as CO₂.

²¹ Biello, David. 2016. U.S. Agriculture Secretary Thinks Farmers Can Help Solve Global Warming. *Scientific American*. <http://www.scientificamerican.com/climate>

²² According to the US Energy Information Agency:

- A gallon of pure gasoline emits 19.64 pounds of CO₂. A gallon of E10 (gasoline with 10% ethanol content) emits 18.95 pounds of CO₂. About 12.73 pounds of CO₂ are produced when a gallon of pure ethanol is combusted.
- 22.28 pounds of CO₂ are emitted when a gallon of petroleum diesel is combusted. B20 is a commonly sold biodiesel fuel, which contains 20% biodiesel and 80% petroleum diesel fuel. Burning a gallon of B20 results in the emission of about 22.06 pounds of CO₂. About 20.77 pounds of CO₂ are produced from burning a gallon of pure biodiesel. <http://www.eia.gov/tools/faqs/faq.cfm?id=307&t=10>

²³ Shulman, Seth, Jeff Deyette, Brenda Ekwurzel, et. al. 2012. *Cooler, Smarter: practical steps for low-carbon living*. The Union of Concerned Scientist. Island Press. p 71, 72.

Natural gas is mined by Fracking, which injects poisonous fluids into the earth. Fracking is also responsible for methane leaks and earthquakes. In our view, Fracked natural gas is not clean by any stretch of the imagination.

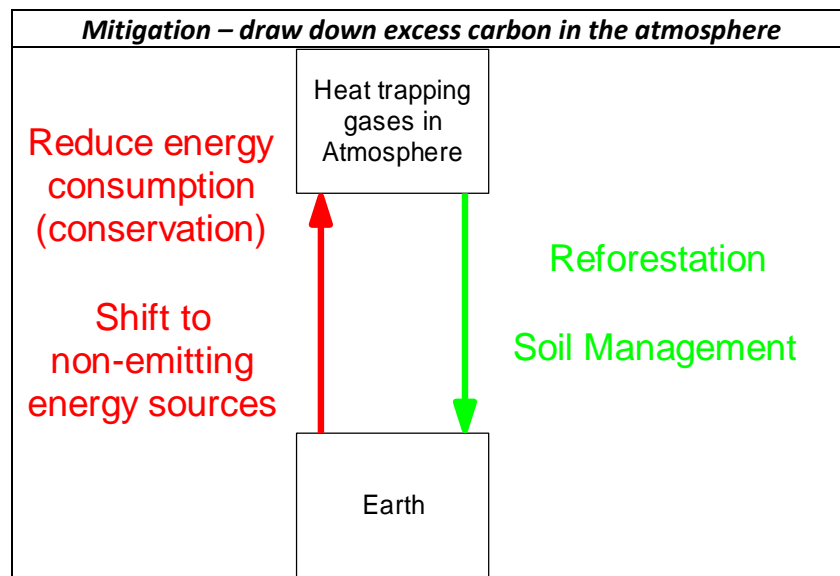
As FLVCS suggests, it would do the county well to delete the terms "renewable" and "clean" from the energy vocabulary.
24

Solutions

Logically, from our definition of the problem (too much carbon in the atmosphere), the solution is to drawdown the amount of GHGs to an acceptable level (something below 350 ppm). Recall that the IPCC defines mitigation as "a human intervention to reduce heat-trapping emissions or remove carbon already in the atmosphere." That's what we need to do to give coastal communities (and indeed all of humanity) hope for a livable world.

How do we put mitigation to work?

We can think of mitigation in terms of a two-pronged approach to deal with the **Upside** and **Downside** of the excess carbon situation.



On the Upside we (1) stop contributing to the problem by eliminating emissions of greenhouse gases. This effort itself has two parts: (a) Conservation (using less energy) and (b) Shifting from combustible to non-combustible (non-GHG emitting) sources of energy.

On the Downside we increasing photosynthesis, the process by which plants remove carbon dioxide (the principle greenhouse gas) from the atmosphere and store it in the soil. This is done thru reforestation and soil management

Local government examples on the Upside

People are already working on solutions like these.

- Miami-Dade county has a target to reduce emissions 80% by 2050. They are also expanding industries that produce non-emitting energy (particularly solar). Miami-Dade is focusing on the generation of electricity, which

²⁴ Darovec, John and William (Coty) Keller. 2018. *Urgency and Action: Drawdown to Reverse Global Warming*. Florida Veterans for Common Sense. <http://ecopapak.org/ecology/What%20to%20Do/FLVCS%20Climate%20Change%20Report.pdf>

is responsible for almost half of the county's emissions. Their strategy is to drastically reduce consumption thru conservation and efficiency and shifting from fossil fuels to solar energy to generate its electricity.²⁵

- The City of Sarasota committed to zero emissions by 2045 and by 2035 for municipal operations. Its called the *Read for 100%* project.

City of Sarasota Resolution (June 2017)
<ul style="list-style-type: none">■ Community target: 100 % renewable, zero emission energy sources by 2045.■ Municipal Operations target: 100 % renewable, zero emission by 2030 (50% by 2024).■ Incorporate into the City's Climate Adaptation Plan and other planning processes■ Work with community stakeholders to devise implementation strategies.■ Be inclusive, promote equity, focus on economic and employment opportunities■ Report to City Commission every two years, beginning in 2018.

The city has been working with all stakeholders to develop the strategies to achieve these objectives. Key components of the plan are:

- Electrical power – this is a three- pronged approach aimed at getting the utility company to transition to non-emitting energy sources and to promote the uses of roof top solar. The third prong is having the utility help with energy conservation.
- Transportation – eliminating carbon emissions in public and private transportation. While the details of the strategies are to be developed, it will likely include adoption of all electric vehicles, with the power coming from solar energy. An important element will be the reduction in the energy consumed by having less miles traveled thru urban redesign.
- Buildings – public and private with a focus on efficiency to reduce energy consumption and shifting to solar power. Building codes will play a big role in the transition.

Direct emission only. The city of Sarasota's strategic planning – at this point in time- only includes action to curtail direct emissions. Direct emissions are what can be measured from electrical plants, vehicles, homes and buildings. Indirect emissions are from what we eat and what we buy. These may be taken into account in the future. But for now, those 40% of total emissions (40% = 14% from our diet and food waste + 26% from what we buy) will not be targeted initially by the Ready for 100% project.²⁶

Local government examples on the Downside

Some local governments have active programs on the **Downside**. Miami-Dade is working on reforestation on two fronts. They have a program that plants trees in urban areas. Miami-Dade is also working to increase carbon storage with mangrove forests in environmentally endangered lands.²⁷ ABC science news reports that mangroves (and other "blue carbon" ecosystems like seagrass meadows and tidal wetlands) can store carbon 40 times faster than regular forest can and hold that carbon in the soil for thousands of years.²⁸

²⁵ Miami-Dade County *Greenprint: Our Design for a Sustainable Future*. <https://www.miamidade.gov/greenprint/pdf/plan.pdf>. Interview with Jim Murley, chief resiliency officer. June 5, 2018

²⁶ To see the latest developments in the city of Sarasota's Ready for 100% program, go to <https://www.sarasotafl.gov/government/city-manager/sustainability/ready-for-100>

²⁷ Miami-Dade County *Greenprint: Our Design for a Sustainable Future*. <https://www.miamidade.gov/greenprint/pdf/plan.pdf>. Interview with Jim Murley, chief resiliency officer. June 5, 2018

²⁸ Joanna Kahn. 2018. "Threatened blue carbon ecosystems store carbon 40 times faster than forests." *ABC Science News*. March 26. <http://www.abc.net.au/news/science/2018-03-26/blue-carbon-mangroves-seagrass-fight-climate->

We have people in our region working actively on the **downside**, but not part of official mitigation programs. We could consider expanding what folks are doing with native landscapes and carbon farming.

Native Plants and elimination of pesticides.

Native trees, shrubs and grasses are able to tolerate natural soils and local rainfall patterns, salt air, etc. Through photosynthesis, they sequester carbon. Replacing lawns that use fertilizers can reduce harmful GHG emissions. Nitrous oxide emissions (including those from fertilizer) are 300 times more potent than carbon dioxide!

Jacques Leslie reminds us that until the advent of synthetics in the late 1800s, fertilizer consisted chiefly of carbon-rich manure or compost. But synthetic fertilizers contain no carbon, and as their use spread along with tillage practices to incorporate them, soil carbon content declined. The process accelerated after World War II, when America's nitrogen-based munition plants were converted into nitrogen-based fertilizer factories. Most agricultural colleges still teach soil fertility chiefly as an exercise in applying inorganic chemical fertilizer, while overlooking soil's biological role (and its carbon content).²⁹

Pesticides and herbicides also damage our eco-systems. Native landscaping practices can extend beyond what you plant and how you feed them.

The disappearance of creepy, crawly, buzzing insects doesn't elicit the kind of emotional response that, say, global warming's threat to polar bears does. Many may be quick to say, "Good riddance!" But we cannot survive in a world without insects, as they are critical for pollinating our food and are themselves a food source for many fish, birds and reptiles. Insects are also nature's scavengers and soil aerators.³⁰

Reducing or eliminating the use of pesticides and herbicides limits the GHGs created in their production. It is also a step towards reversing the rapid decline in insect populations, which threatens our own human well-being.³¹

Charlotte County offers training and guidance on native landscapes thru the Florida Friendly Yards program at our extension office. Charlotte County Extension Service is a partnership between the University of Florida's Institute of Food and Agricultural Sciences (UF/IFAS), the United States Department of Agriculture (USDA), and Charlotte County government, to provide scientific knowledge and expertise to the public.

[change/9564096?utm_source=EHN&utm_campaign=6d87fc605f-RSS_EMAIL_CAMPAIGN&utm_medium=email&utm_term=0_8573f35474-6d87fc605f-99390793#lightbox-content-lightbox-8](https://www.nytimes.com/2017/12/02/opinion/sunday/soil-power-the-dirty-way-to-a-green-planet.html)

²⁹ Leslie, Jacques 2017. "Soil Power! The Dirty Way to a Green Planet" *NY Times*. December 3.

<https://www.nytimes.com/2017/12/02/opinion/sunday/soil-power-the-dirty-way-to-a-green-planet.html>

³⁰ Editorial Board. 2017. "Insect Armageddon" *NY Times* Oct 30.

³¹ Schwägerl, Christian 2016. "What's Causing the Sharp Decline in Insects, and Why It Matters." *Yale Environment 360*. July 16. https://e360.yale.edu/features/insect_numbers_declining_why_it_matters



The extension service could be a ready resource to expand the county's effort to drawdown excess carbon from the atmosphere.

Carbon Farming

Carbon Farming, sometimes referred to as “regenerative agriculture,” is an emerging concept that views agriculture as part of a global solution to avert climate disaster and provide real food security. Carbon Farming includes a set of agricultural practices and crops that sequester carbon in the soil and in aboveground biomass (trees, shrubs, forests). Carbon Farming includes modifications to current cropping systems such as no-till, cover crops, use of organic matter instead of chemical fertilizers and pesticides, the use of perennial crops, and new approaches to animal grazing and agroforestry. Agroforestry (also called farm partitioning) is the intentional integration of trees and shrubs into crop and animal farming systems to create environmental, economic, and social benefits.³²

Carbon farming is nothing new in Charlotte County. [Worden Farm](#) on Bermont road, and other organic farms in our area have been successfully using these principles for decades. As a member of the Worden Farm CSA (community supported agriculture), I have experienced firsthand the positive impact of their operations. They have a small, if not net zero footprint, and they take lots of carbon out of the atmosphere and store it in the soil. This fertile soil holds more moisture and is less susceptible to erosion. They are not only helping the climate, they are protecting our food and water security. Oh, yes their produce is delicious and free of any pesticide residue.

Support for CSAs and carbon farming could go a long way towards mitigation of sea level rise and temperature increase, all the while contributing to our food and water security.

Education and Training

Under consideration in the county of Sarasota is a broad-based program to create a cultural shift in energy and behavioral awareness. It has been recognized that without understanding and support from the whole community, it will be very difficult if not impossible to mitigate on the scale needed to reverse sea level rise and increasing temperatures.

Education and training could involve the whole community including leadership and participation from our colleges, the school district, businesses and non-profit employers. Desired outcomes from such a program would expand beyond energy to what we eat and what we buy.


³² Toensmeier, Eric, 2016. *The Carbon Farming Solution: A Global Toolkit of Perennial Crops and Regenerative Agriculture Practices for Climate Change Mitigation and Food Security*. Chelsea Green Publishing.

Possible outcomes – creating a cultural shift in energy and behavioral awareness³³

- Educate all of our citizens, businesses and government workers on the dangers and risks of our unsustainable uses of energy, food and water systems.
- Make clear to all citizens, businesses and government workers that there are enormous financial, economic and health benefits to be reaped by reducing energy consumption and shifting from fossil fuels to zero emission, renewable energy. There are also important benefits to be gained by altering what we eat and don't eat (food waste).
- Explain how individuals (households and businesses) and groups (neighborhoods, HOAs, condo associations, work teams, government agencies, etc.) can take action to reduce energy consumption, adapt zero-emission energy, improve our health and make money doing so.

Economic and health benefits

Why in the world would the city of Sarasota commit to such a daunting mitigation plan? The short answer is they have everything to gain by doing so. The long answer is that they will create jobs, grow the economy, reap financial returns for families and businesses, and save on both health care costs and damage avoided.

Mitigation – economic and health benefits	
<ul style="list-style-type: none">■ Jobs/Growth■ Families and Businesses■ Utility Companies■ \$ Savings-Health Costs■ \$ Savings from Damage Avoided	

I don't want to undersell climate benefits, but I have to emphasize there is no longer a valid concern about choosing between the environment and the economy. The economy is already booming from the transition to zero emission energy. Solar jobs in the United States have increased at least 20 percent per year for the past four years. The solar industry added \$84 billion to the US GDP in 2016.³⁴ World-wide, solar power is doubling every. That will add up to 100% by 2030.³⁵

The low cost of non-emitting energy makes it the choice for utility companies as well as individual families. In Tucson, the cost of solar energy (including the storage for nights and days the sun is not shining) is already only 4 ½ cents per kwh. Stanford's Tony Seba has studied the cost curves and predicts that by 2020 (not long from now) there will be no cheaper form of energy than solar plus storage. Unsubsidized rooftop solar already costs less than the cost of transmission (7-11 cents/kwh).²⁸ It's no wonder we see FPL building so many solar power plants, and that Florida roof

³³ These outcomes were presented to the Ready for 100% leadership and the county sustainability office by Florida Veterans for Common Sense in July 2018. They are being considered for inclusion in the strategic plan.

³⁴ Solar Jobs Census <https://www.thesolarfoundation.org/solar-jobs-census/>

³⁵ Tony Seba of Stanford University. Speaking to the Colorado Renewable Energy Society June 2017.

<https://www.youtube.com/watch?v=2b3ttqYDwF0&feature=youtu.be>

top solar increased 92 % in 2017.³⁶ I know firsthand how solar can make money for a family. We have earned a return of 9% on our photo electric generator over the past 10 years – that’s a better investment than our IRAs pay.³⁷ Solar is the way to go in the sunshine state to save consumers money, make profits for the utilities, create jobs, and grow the economy. Sarasota’s commitment to zero emission energy make good economic sense, even before we consider the health care saving and damage avoidance.

Less carbon pollution saves lives as well as money. Stanford research estimates that converting to zero emission energy will eliminate about 65,000 premature deaths caused by air pollution in the United States each year and save each person about \$2,600 each year in health costs.³⁸

The damage the world will experience as a result of rising seas, increasingly severe weather and more precipitation will be enormous. A paper published in the journal *Nature* estimates the cost at \$30 trillion by the end of the century. On the other hand, the authors claim, we can avoid those damages if we mitigate well enough to limit global warming to 1.5 degrees Celsius.³⁹

[Recap on mitigation - best chance for coastal communities](#)

Let’s not diminish the importance of adaptation. We must adapt to protect lives and property against what is coming.

Unlike adaptation, which is all cost, mitigation will pay a return on investment if we make wise decisions. And mitigation is the only way to have a chance to avoid the dreary consequences of sea level rise and global warming. Mitigation is our only chance to preserve our beaches and shores.

Of course, we in Charlotte County cannot decide for the rest of the country or the other nations in the world. If others do not mitigate, global temperatures will continue to rise. But, we have nothing to lose by giving it a 100 % mitigation effort. Because even if global temperature continues to rise, we will have made good economic choices that lead to jobs, a growing economy, and return on our investments. We also can be proud to have served as an example of what a community can do to make life better. Our efforts will not have been for naught.

If we really want to preserve our beaches and shores, we have no choice but to mitigate. This means an all-out effort to achieve net zero emissions in electrical power, transportation, building and by what we eat and what we buy. It includes reforestation and soil management.

[Local Government Scorecard](#)

Let’s review what we have learned of the plans in a few Florida municipalities. The experiences and lessons learned by our neighbors in southern Florida can be a valuable resource as Charlotte County develops its plan to deal with rising seas and warming temperature.

³⁶ Andorka, Frank. 2018. “Florida PV Installations Increase 92% In 2017.” *Solar Wake Up*.
<http://www.solarwakeup.com/2018/07/03/florida-92-pv-increase-yoy/>

³⁷ Keller, William (Coty) . 2013. “40,000 pound Carbon Diet: How a middle class American family reduced their carbon footprint by 75% (and made money doing it)” *Current Events*, May/June. Available online at
<http://faculty.sjcnyc.edu/~keller/ecology/40,000%20carbon%20diet.pdf>

³⁸ The Solutions Project. <http://thesolutionsproject.org>.

³⁹ Burke, Marshall and W. Matthew Davis. 2018, “Large potential reduction in economic damages under UN mitigation targets.” *Nature*. V557 pp. 549-553. <https://www.nature.com/articles/s41586-018-0071-9>

Punta Gorda has been a pioneer with the creation of their award-winning climate adaptation plan. City plans focus on protective (living) shorelines to serve as a buffer against storms and a strategy of planned retreat to adapt to sea level rise. ⁴⁰ Punta Gorda’s plan is essentially one of adaptation.

	Adaptation Plans?	Mitigation Plans?
Charlotte County	No	No
City of Punta Gorda	Yes	Not Explicit
City of Sarasota	Yes	Pending on the upside
Miami- Dade County	Yes	Yes – upside and downside
	Miami-Dade is coordinating climate action in a regional compact	

The Punt Gorda plan does not explicitly address mitigation, however part of their living shoreline project is planting mangroves. Mangroves are a great strategy for mitigation on the downside because they take carbon out of the atmosphere 40 times faster than forests do, and store that carbon in the soil for thousands of years.

The city of Sarasota has a comprehensive adaptation plan which identifies properties at risk and the means to protect them from sea level rise and more violent weather events. Sarasota is also in the process of creating a mitigation plan that focuses on the “upside” of the problem. The city has committed to 100% renewable and non-emitting energy.

Miami-Dade County is working actively to adapt and mitigate. Adaptation plans are systems oriented with climate protection upgrades of the most vulnerable areas integrated into regular infrastructure planning cycles. Mitigation plans tackle the upside and downside of the problem. On the upside, the county has goals of reducing emission by 80% before mid-century with a focus on electrical power generation. The strategy is to reduce consumption thru efficiency, as well as shift from fossil fuels to non-emitting energy sources like solar power. On the downside, Miami-Dade works on reforestation in urban areas (tree planting programs) and carbon storage with mangrove forests in environmentally endangered land.

Miami-Dade County is also expanding its plans by collaborating thru a compact with others in the regional. The Regional Climate Action Plan (RCAP) is the Compact's guiding tool for coordinated climate action in Southeast Florida to reduce greenhouse gas emissions and build climate resilience. The RCAP provides a set of recommendations, guidelines for implementation, and shared best practices for local entities to act in-line with the regional agenda. ⁴¹

Other cities and counties in our region have ideas and lessons to share. Orlando and St. Petersburg, for example, have launched ambitious mitigation programs aimed at reducing their carbon footprints to zero while creating jobs and growing their economies. ⁴² We can tap into these sources of information, and perhaps form coalitions like the compact formed on the east coast. ³⁵

⁴⁰ Joanna Kahn. 2018. “Threatened blue carbon ecosystems store carbon 40 times faster than forests.” *ABC Science News*. March 26. http://www.abc.net.au/news/science/2018-03-26/blue-carbon-mangroves-seagrass-fight-climate-change/9564096?utm_source=EHN&utm_campaign=6d87fc605f-RSS_EMAIL_CAMPAIGN&utm_medium=email&utm_term=0_8573f35474-6d87fc605f-99390793#lightbox-content-lightbox-8

⁴¹ Southeast Florida Regional Climate Action Plan 2017. <http://www.southeastfloridaclimatecompact.org/regional-climate-action-plan/>

⁴² EcoWatch. 2017. *Orlando Becomes 40th City to Commit to 100% Renewable Energy*. August 9. <https://www.ecowatch.com/orlando-renewable-energy-2470947578.html>

Recommendations

Given the information presented, it seems logical to develop a county plan to deal with sea level rise, rising temperatures and the other threats that accompany the projected changes in climate.

Here are some recommendations:

A plan for Adaptive Mitigation

We should avoid the temptation to focus exclusively on adaptation (defined as adjusting to actual or expected climate change). Temperatures will continue to rise and the long-term impact of sea level rise and more violent and extreme weather will be too severe to manage by simply adapting. As Florida Audubon says, no amount of adaptation will bring the birds back.⁴³

Without effective mitigation, we have no hope to preserve our beaches and shores in the long term. Mitigation, defined as active intervention to reduce heat-trapping emissions and remove carbon already in the atmosphere, should be the main element, of our county's plan.

This is not to say we should neglect adaptation. We should adopt a strategy of "**adaptive mitigation**"⁴⁴ by drawing down excess carbon in the atmosphere while also helping our residents adapt to a changing climate.

Economic Caveat

The county, and our residents cannot afford to spend money on projects that do not save us money. For this reason it is suggested that mitigation projects be judged on their economic return on investment as well as their ability to drawdown excess carbon in the atmosphere.

Projects should only be pursued if they are projected to pay a positive return on investment.

Consider creating a "Sustainability /Resiliency" function.

Counties and Cities in Florida that are taking the lead with plans to combat sea level rise have offices and/or departments dedicated to sustainability and/or resiliency. Sustainability is often associated with mitigation – creating a harmony with nature that will allow us to sustain our ecosystems over time. Resilience, relates to adaptation—that is, creating and protecting our systems to withstand rising seas, more frequent and severe storms, and other effects of climate change.

If we commit to a comprehensive plan, we need to have a staff, and provide them the resources needed. Perhaps the county should establish a department dedicated to creating, implementing and maintaining our *Adaptive Mitigation* plan. We could have the first *Adaptive Mitigation* department in the country, or we could follow precedent and call it the sustainability/resiliency department.

Comprehensive Plan

One thing I noticed in the research is that many of our neighboring communities have redundant, obsolete and/or conflicting documents to address the problem of a changing climate. It's a confusing bureaucratic mess at times, making it hard for the general public to get a handle on the why and wherefores of government actions. This subject is complex enough without making it hard to follow by adding layers of unkempt paperwork.

⁴³ Florida Audubon 2017, *Five Things you can do to Combat Climate Change*. <http://fl.audubon.org/news/five-things-you-can-do-combat-climate-change>

⁴⁴ The term "adaptive mitigation" is borrowed from Jeffrey Ravens. See "To Curb Climate Change, Cities Need The Right Design" *Forbes Magazine*. Dec 4, 2017. <https://www.forbes.com/sites/realspin/2017/12/04/to-curb-climate-change-cities-need-the-right-design/2/>

The state has mandated that counties include our plans to deal with sea level rise in our Comprehensive Plan by 2021. Instead of creating additional documents, perhaps the county's Comprehensive Plan could be the host document for our *Adaptive Mitigation* plan.

Why create another layer of paperwork by having a special document or sets of documents?

What would the plan contain? While its too early to suggest what means should be employed, we can say what the ends might be. In the next sections, I will outline suggestions for outcomes to pursue.

Specific Outcomes- Adaptation

Adaptation is "the process of adjusting to actual or expected climate change." (UN Panel on Climate Change)

From what we have leaned we know that sea levels will continue to rise. While we do not know precisely how high the tides will rise by certain dates, or what storm surges and damaging winds we will experience, we do have reasonable projections upon which to plan. Let's imagine we live another half century and have a chance to judge the decision we make now.

Fifty years from now, we would like to look back to the 2021 Comprehensive plan and be able to say, it protected assets known to be vulnerable to sea level rise and storm surge. Buildings were elevated and key infrastructure (electrical power distribution, transportation, water and sewer, etc.) were made safe. Living shorelines provided protection from storm surges.

We would also like to say, that the county had a plan to retreat from areas known to be victims of an advancing high tide mark and chronic inundation. Building permits were not issued, and no new communities were created, in these vulnerable areas.

Above all, we would hope to say that the 2021 plan showed bold ad forward-thinking codes, building design and community planning. We insisted on fortifying homes and businesses against rising seas and increasingly violent storms. Communities were approved and designed with new high tide marks, future flooding and dramatic weather in mind.

<i>Adaptation Outcomes</i>
<p><i>Adaptation:</i> "The process of adjusting to actual or expected climate change."</p>
<ul style="list-style-type: none">● Protect assets vulnerable to sea level rise and storm surge-<ul style="list-style-type: none">○ Elevate new construction, require elevation in renovations/re-designs○ Fortify key infrastructures -electrical power distribution, transportation, water and sewer, etc.● Planned retreat in advance of the high tide mark moving inland, and from neighborhoods facing chronic inundation<ul style="list-style-type: none">○ No building permits, no communities planned, in vulnerable areas.● Forward thinking building codes, re-zoning and community planning<ul style="list-style-type: none">○ Elevate 13' above flood plane○ No community development in area expecting chronic inundation
<p>Beaches and shores gain from exploitation of natural defenses such as living shorelines. While we benefit from buffers against rising seas and storm surge, we also benefit by better water quality provided by oysters and mangroves filtering water.</p>

For example, my home in New York, like my home in Port Charlotte is in an 8' flood zone. If I were to the rebuild the NY residence now, it would have to be elevated 13' above flood zone. This code is designed to protect homes from another

super storm Sandy. It seems reasonable to recognize the likelihood of a major storm surge in Port Charlotte, on top of chronic inundation. Therefore, our building codes should be upgraded accordingly.

When we look back in the future, we will be able to say that much of the adaptation work exploited the use of natural defenses to great advantage. Living shorelines of mangroves and oyster beds protected against storm surge while at the same time improved water quality, which is of vital importance to our lifestyle and tourism industries.

Specific Outcomes – Mitigation

Mitigation: is defined as “A human intervention to reduce heat-trapping emissions or remove carbon already in the atmosphere.” (UN Panel on Climate Change)

Imagine our heirs in the middle of the 21st century, looking back at how Charlotte County performed with our 2021 comprehensive plan’s mitigation effort. We want them to say that our actions made the difference in preserving our coastal communities. We want them to be able to say that we took steps to reverse sea level rise and global warming, and did it in ways that helped the economy, created jobs, improved our health and saved us money by preventing damage.

Mitigation Outcomes

Mitigation: “A human intervention to reduce heat-trapping emissions or remove carbon already in the atmosphere”

- **Upside:** Net zero emissions – target date no later than 2050. Reduce energy consumption and transition from emitting energy sources to non-emitting energies
 - Electrical power – reduced consumption in spite of growing population, totally generated by non-emitting sources of energy
 - Transportation – less vehicles, all powered by electricity generated by the sun
 - Buildings – all net zero
 - Shift to plant-based diet
 - Elimination of food waste.

Economic Caveat – priority to projects that pay a return on investment

Building codes and community planning - net zero emissions from individual homes, businesses and communities. Higher density, walker and bike friendly.

- **Downside:** taking carbon from the atmosphere by reforestation, soil management
 - Preserve, expand Mangroves – parks, aquatic preserve, private property, Living Shoreline
 - Native Landscapes - the norm for residence and business properties. No fertilizer.
 - Carbon farming – for all local agriculture.

Beaches and shores will enjoy co-benefits of enhanced water quality by expansion/preservation of mangroves, promoting native landscapes, and carbon farming. The results are not only increased the amount of carbon taken out of the atmosphere, but also less harmful nutrients in the estuary by the elimination/reduction of runoff, fertilizers and pesticide use. Carbon farming results in less erosion and the soil holding more water (and yes, pesticide free produce)

We want our heirs to say that county leaders were wise. They listened and learned. They heeded the suggestion of the UN Panel on Climate Change, the Union of Concerned Scientists and the 2017 *Climate Science Special Report* to achieve

net zero emissions by mid-century. Our heirs will be able to say the county achieved this by a two-pronged approach: 1. reducing the amount of energy we consumed by efficiency measures and conservation and 2. transitioning from combustible fuel sources to non-emitting energy sources, especially solar. We did this in the electrical power, transportation and building sectors. We also achieved it because we managed our diets and eliminate food waste.

Electrical power is a prime target in the plan because it's huge, almost all of it created by combustion, and lower cost zero emission sources of energy are available – this is the sunshine state! Our heirs will be proud to say we ramped up both roof top solar and industrial solar plants. Meanwhile we reduced consumption of energy overall, in spite of a growing population, making the shift to non-emitting more achievable.

Transportation of the future will be transformed in many ways. Our heirs will take pride that we made the transition to all electric vehicles - cars, busses, trucks, water craft. And furthermore, we will be generating the electricity to power our vehicles from zero-emission sources of energy (likely solar). Moreover, our neighborhoods will be transformed to higher density, less suburban and less rural settings where jumping in a car is not an imperative. We will have shown the wisdom of having transportation and community planning going hand in hand.⁴⁵

Our future buildings, newly built and retrofitted will generate more power than they use. Our communities likewise will be net zero and, meanwhile they will be cleaning the surrounding air and water. Our great-grandchildren will be so proud of us.

Knowing that what we eat and waste accounts for almost 15% of heat trapping gasses, the county will take an aggressive approach to help people change their diets and reduce food waste. The result will be drastic reductions in animal products consumed and a community wide shift towards a plant- based diet. Elimination of food waste will reduce energy consumption in general and reduce the emission of methane from our landfills.

Our heirs will be grateful that we did not break the bank with our mitigation plans. They will look back and be thankful the county used sound economic criteria, making choices and establishing priorities based on return on investment. As a result, jobs will have been created, the economy would have soared, and people will have saved money while drawing down the carbon in the atmosphere- a win-win result.

We want our heirs to look back and say that building codes and community planning were really insightful and effective. The outcomes were homes, businesses and whole communities that generated more power than they used. The wisdom of higher density communities recognized that every mile walked or biked is a mile not traveled in a car.

Taking carbon out of the air is an important objective of this plan. Our heirs will say we were so smart, knowing that mangroves store carbon up to 40 times more than forest. Preserving and expanding our mangroves – in the aquatic preserve, our parks and on private property is a vital element of the mitigation plan. The Living Shoreline feature of our Adaptation plan plays a dual role. Planting mangroves on our coastline reduced storm surge and wave energy and removed carbon from the atmosphere at the same time.

Imagine our great grandchildren never knowing the scourge of the fire ants. When we get rid of our lawns, the fire ants often go away too. More important, native landscapes store lots of carbon. They also are responsible for less greenhouse gases because they don't use fertilizers, a culprit in nitrous oxide emission. Therefore, an important outcome of our mitigation plan is having native landscapes as the norm for residential and business properties.

⁴⁵ Crystal ball for the future of transportation in higher density communities has been influenced by *50 Steps Towards Carbon Free Transportation*. <https://environmentamerica.org/reports/ame/50-steps-toward-carbon-free-transportation>. Plus, Casey Studhalter, Urban-scale Sustainability and Affordable Housing at US Green Building Council, speaking to the Citizens' Climate Lobby conference, Washington DC June 2017

Our mitigation plan also includes regenerative agriculture (we call it carbon farming) as an outcome. Instead of farming by tilling (which releases carbon to the air) and using chemical fertilizer, carbon farming focuses on the soil. It uses organic matter instead of chemical fertilizers and pesticides. Carbon farming uses perennial crops, cover crops and animal grazing to fertilize the soil and grass feed the animals. Agroforestry (also called farm partitioning) integrates trees and shrubs into crop and animal areas. The result is a dramatic amount of carbon taken from the atmosphere and stored in the soil. The soil holds more water, and it is less susceptible to erosion. And the food is safer because it has no pesticide residue.

Another concern of the Beaches and Shores committee is water quality. We will enjoy co-benefits of enhanced water quality by expansion/preservation of mangroves, promoting native landscapes, and carbon farming. We benefit from less harmful nutrients in the estuary by the elimination/reduction of runoff, fertilizers and pesticide use. Carbon farming results in less erosion and the soil holding more water (and yes, pesticide free produce).

Managing Change

The mitigation plan presented here is a staggering change from the status quo. Perceptions of change itself can present barriers as significant as the technical and economic challenges. For example, many people will find the idea -of not jumping in a gas car whenever one has the urge to go somewhere - to be unthinkable. We need to overcome this.

Natural fears and anxieties about these kinds of changes must be accounted for, or the plan is likely to fail. Experts in the management of change tell us how we can successfully deal with the inevitable resistance we will encounter:

- Help people understand why the change is necessary - to preserves our coastal communities
- Explain the benefits - for the economy, jobs, health, family buudgets
- Participation by people by affected- as policies and strategies are developed, invite the public to contribute in the decision process. ⁴⁶

Conclusion

The state has mandated that by 2021 each county's comprehensive plan take sea level rise into account. This deadline offers us an opportunity to provide our coastal communities' a good chance to remain livable in the years ahead.

In the interest of preserving our beaches and shores, it is recommended that the county develop and include *Adaptive Mitigation* in our 2021 Comprehensive Plan. Such a plan would draw down excess carbon in the atmosphere while helping our residents adapt to rising seas and the other threats posed by a changing climate.

Adaptive Mitigation includes action to adjust to actual or expected climate change ("adaptation") and actions to reduce heat-trapping emissions and remove carbon from the atmosphere ("mitigation").

It is absolutely essential that we not give into to any temptation to bank on adaption alone. If we only try to adapt, temperatures will continue to rise and the long-term impact of sea level rise and more violent and extreme weather will be too severe to manage. We must mitigate to achieve zero emissions and removal of cargo from the atmosphere, if we are to have a chance to sustain our coastal communities.

Suggestions for organization and strategies are provided in the earlier sections (Recommendations, Managing Change).

⁴⁶ These concepts for managing change come from social psychologist Kurt Lewin's model of change. Details can be found in a book on organizational behavior such as McShane & Von Glinow, *Organizational Behavior* 8th Edition. 2017. McGraw Hill

Recommendation for Commission

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2021 marks the centennial year of the county. Wouldn't be great if our Comprehensive plan for 2021 included *Adaptive Mitigation* to provide the county with the best chance to preserve our beaches and shores through the 21st century.



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