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**Now or Never: The Urgency of Planning and Adapting to Sea Level Rise in South Florida**

**Introduction**

When you walk through the stylist streets of South Beach, it seems difficult to picture that this modern dream of an alligator filled swampland transformed into the sunshine capital of the United States will eventually be lost beneath sea water. Awareness about climate change and research regarding its implications have brought to the light the high risk that Miami faces as sea levels continue to rise. A 2014 publication by the World Resources Institute expresses the magnitude of the risk by reporting that “Miami has the largest amount of exposed assets and the fourth-largest population vulnerable to sea-level rise in the world” (Tompkins). The estimates of when and how much sea level rise will impact South Florida are varied, but it is clear that the problem is real and particularly vulnerable cities like Miami Beach and St. Augustine are starting to feel the consequences (Dearen). This essay presents evidence to demonstrate that sea level is an issue that should be of concern to the population of Florida and that there is urgency in finding solutions to address it. Our goal is to discuss in depth what local and state governments are doing to protect the population and consequently make an analysis of whether or not what is being done currently is enough to reduce the impacts that sea level rise can potentially have on the residents of south Florida. The investigation presented on this paper shows that although there are programs at the city and county levels to address sea level rise, progress has been slow, and the governments are not doing enough to move towards an efficient adaptation to sea level rise, leaving the future wellbeing of the residents of south Florida uncertain. An important barrier to implementing aggressive sea level rise adaptation initiatives has been the state government, which has widely ignored that sea level rise is an issue of concern. Thus, a solution to this problem starts with increasing state government support to this issue. With state government support and funding, cities and counties in south Florida need to shift their focus to protecting drinking water resources from salt water contamination, modifying infrastructure and joining the global commitment to reduce greenhouse gas emissions. However, we have found that the costs of adaptation are very high and that there are limited resources to alleviate this kind of ´natural disaster´, especially considering that south Florida will not be the only one affected by sea level rise. For this reason, there is a need for local and state government to develop a long-term migration plan simultaneously to the adaptation plans.

**Why Sea Level Rise Matters in South Florida**

First of all, it is crucial to present some of the reasons why sea level rise is an issue of concern to the South Florida. There are a series of factors that contribute Florida’s vulnerability to sea level rise. In the 2013 *Rolling Stone* article by Jeff Goodell, titled “Goodbye Miami”*,* the author explains that the main challenge in South Florida is that it has a remarkable flat topography and that its underlying bedrock is primarily porous limestone where salt water intrusion into the underground drinking water supply can easily occur with rising sea levels. Even before the sea waters move into the streets of the city, the damage caused by salt water intrusion in sewage, drainage and water supply infrastructure will make the city unlivable (Goodell). It is important to emphasize that salt water intrusion is a solvable problem. Desalination technologies are widely used around the world, especially in places that have limited access to fresh water, such as the cases of Israel and Singapore. However, desalination is expensive, and relying on these technologies would increase the costs of living in south Florida (International Public Radio). We will see later how the costs of adaptation are the biggest burden that the majority of the adaptation solutions to this problem bring.

South Florida’s sewage system is also severely threatened by sea level rise. In an interview with Phillip Stoddard, FIU biology professor and current mayor of the South Miami, we learned that South Miami residents are already experiencing this. Professor Stoddard specified that in a government conducted study they found that the water table is getting uncomfortably close to the sewage drain fields. This means that when the groundwater reaches the level of the sceptic system, material from the toilet cannot go into sceptic tanks because they are full; instead it goes into the bathtubs in people’s homes. The problem has become increasingly worrisome as flooding conditions have become more frequent, and this has led the local government to start a plan to rebuild the septic systems.

In addition to the risk to the drinking water supply and the sewage systems, sea level rise is a threat to Florida’s economy. According to an NRDC report “Florida's 800 miles of beaches are the number one attraction behind a $47 billion tourist industry. Miami Beach alone brings in $2 billion in revenue. And coastal cities would face costly measures to avoid inundation” (Coifman). Coastal properties and beaches are clearly threatened by sea level rise, making South Florida’s tourism based economy very fragile to the increasing pressures of this issue. Even more pressing and also highly impactful to the livelihood of people is how just the threat of sea level rise can influence insurance rates across the state. After hurricane Andrew, most large insurance companies stopped offering property coverage in the state, leaving Florida with few regional insurers to guarantee hurricane and flood coverage to home owners. In addition, The National Flood Insurance Program is currently more than $20 billion in debt, and although the federal government has made reforms to protect people living in flood zones, places like south Florida that are almost entirely flood zones will face costs that can be in the hundreds of billions (Goodell) . This insurance crisis is likely to lead to a financial catastrophe, as Goodell graciously described it: “As insurance rates climb, fewer people are able to afford homes. Housing prices fall, which slows development, which decreases the tax base, which makes cities and towns even less able to afford the infrastructure upgrades necessary to adapt to rising seas.” This demonstrates that it is necessary for south Florida to start adaptation plans now in order to minimize the negative health and economic consequences that the population will have to face if the problem is not targeted promptly.

When it comes to the impacts of sea level rise, we do not only need to talk about the potential consequences but also about the urgency of the problem. We have seen how the residents of some cities like Miami Beach and South Miami are already experiencing some of the impacts of rising sea levels. In regards to the magnitude and the timeline of seal level rise there is a broad range of estimates. In an interview with Han Wanless, head of the Geological Sciences department of the University of Miami, he gives us more insight into what scientists are estimating about the future of Miami. Wanless mentioned that published estimates about the expected rise in sea levels by the end of the century range from three feet according to the Intergovernmental Panel on Climate Change, to six and a half feet according to the National Oceanic and Atmospheric Association. Wanless, however, mentions that those are rather conservative estimates and that the majority of the geologists agree on a ten to thirty foot rise by the end of the century (qtd. in Kolbert). If we translate the more conservative estimates into impacts on the city, we can expect roads, infrastructure and the economy to suffer irreparable damages unless the city undergoes effective adaptation. With the geologists’ estimates, the image of the sunshine capital of the United States transformed into the new Atlantis becomes more real than ever.

**The Role of Local and State Government**

Local governments have been the most active in starting adaptation plans in cities and counties. As we learned in the previous section, the local government of South Miami is designing a plan to rebuild the sewage system. Miami Beach is also a clear of example of current sea level rise adaptation investment. The city of Miami Beach experiences flooding twice a year during the king tide in October and later in spring. Damage done to storm water drainage systems as a cause of sea water infiltration has led the city to begin a five hundred million dollar five-year plan to prepare for the consequences of climate change (Nesmith). Local governments in St. Augustine are also attempting to invest in adaptation plans. In an article by Jason Dearen concerning local sea level rise threats he explains that “St. Augustine is one of many chronically flooded communities along Florida’s 1,200-mile coastline, and officials in these diverse places share a common concern: They’re afraid their buildings and economies will be further inundated by rising seas in just a couple of decades”. St. Augustine authorities are particularly concerned with addressing damages to historic sites that could dramatically hurt the local economy.

 Although some local governments are launching sea-level rise coping strategies, what is problematic is that the state government has supported none of these initiatives. The government under Rick Scott has widely ignored this threat and has failed to acknowledge that this is a slow moving emergency. Governor Rick Scott is “ skeptical of man-made climate change and has put aside the task of preparing for sea level rise” (Dearen). This skepticism is slowing down any attempt by all levels of governments to coordinate sea-level rise adaptation plans. The reluctance of Scott’s government to address sea level rise has reached extreme levels. Under his government Florida’s environmental agencies have been downsized and made less effective. More worrisome and even cynical is the fact that Scott’s government issued an order to ban the use of the term ‘climate change’ by state government employees (Korten). Lack of government support has been evident in all south Florida municipalities that are attempting to deal with sea level rise. In the case of South Miami, Professor Stoddard mentioned that Governor Scott has vetoed the city’s sewage reconstruction plan twice. Without state government support the costs of adaptation become too high for local governments, given that public infrastructure is usually funded with the help of the state government (Stoddard). Communities like St. Augustine, Miami Beach and South Miami can only do so much alone. If one city builds a sea wall it might divert water to a neighbor. When it comes to adapting and rebuilding infrastructure local governments have neither the money nor the technology to make it happen by themselves (Dearen). It is clear that a coordinated statewide plan is necessary to prepare all affected communities and reduce the impacts that sea level rise can have on the population.

In addition, it is important to not glorify local governments. Although we have found local city and county governments to be the most active in addressing sea level rise, action has only happened in a few places. In the cases of South Miami, Miami Beach and St. Augustine we can see that local governments have taken action as a response to issues that are already affecting the population. This seems to be the trend; unless there are immediate problems, local governments don’t seem to be doing much either. A clear example of this issue is the city of Doral. In our interview, professor Stoddard made special emphasis on how Doral is essential for the economy of south Florida. Trade is a big part of the economy of South Florida and the warehouses located in Doral are necessary for trade processes to persist. Professor Stoddard mentioned that Doral is one of the lowest cities in the county (around 4ft elevation) and that nobody in office is talking about elevating the district to protect not only residents but most importantly these warehouses that are such an essential part of the economy. From his conversations with local officers, professor Stoddard believes that nothing will be done in Doral until the sea water starts flowing into the warehouses. This delay in action is the major threat we face. Without state government support and with local governments that are only willing to deal with immediate problems, sea levels will catch at us at our backyards off guard and unprepared.

**Where Do We Go From Here?**

From the previous sections of this essay we have come to an understanding of the great impact that sea level rise will have on the population of south Florida and the lack of government planning around the issue. Since this issue has such a widespread impact on the economy, water supply, infrastructure and other aspects that affect the well being of the residents of the region, it is clear that governmental action and planning is an essential part of a solution. The main argument to support planning and adaptation is that it will reduce the costs. Preparing for a ‘natural disaster’ now is more cost effective than waiting for something to happen and paying for all the losses. In a Miami-Dade Sea Level Rise Task Force report prepared by Harvey et al. we learned that estimated loses for Southeast Florida under different sea level scenarios range from $17 billion (8.5% of GDP in 2008) to $33 billion (10% of GDP in 2030). This report suggested cost-effective ways to reduce losses, and found that “approximately $30 billion of the total expected loss in 2050 could be avoided if a comprehensive plan for adaptation were implemented. It was explained to the Task Force that adaptation policies implemented now will significantly lower the insurance costs to the County and its residents in the future, and in some cases avoid or postpone wholesale abandonment due to non-insurability or the high cost of premiums” (Harvey et al.). Taking this last piece of information into account, we can address a possible opposing view to this proposed solution. The idea of increased government spending for a particular issue like sea level rise is usually equated with an increase in taxes. This is true depending on the costs of implementing the plan, and given the high costs of adapting infrastructure, government planning for sea level rise could potentially lead to higher taxes. However, as we see in the previous quote from the report, increased planning also means that residents of the region will have to pay less in insurance in the future and will have less risk of having to abandon their properties. This means that in the long term government planning, even if it brings higher taxes, will reduce the costs of sea level rise to the residents of south Florida.

Another fact that proves that government led adaptation is the best solution is that other locations affected by sea level rise around the world are investing in adaptation. We will take the case of the Netherlands as an example. The Climate Change Post issued a report of the progress of the Netherlands. In the report we find that “The Netherlands is opting for sand replenishment as a way of enabling the coastal foundation zone to grow concurrently with the rise in sea levels. Where possible, this is to take place by distributing and transferring sand naturally along the coast. In addition, the Cabinet is opting for a cohesive approach to area development that allows for a balanced development of nature, economy and accessibility in the existing coastal areas.” The investments and strategies of the Netherlands’ government are estimated to reduce the impacts of climate change in the region from $39.9 billion euros to $1.1 billion euros in the 21st century, at a cost of $1.5 billion Euros (Coastal Flood Risk in the Netherlands). From this evidence, it is clear that if we aim to reduce the impacts and costs of sea level rise on the population, intensive planning and strategy implementation must take place.

Although investment in adaptation is necessary to reduce the costs and impacts of sea level rise, it is important to acknowledge that south Florida in 50 or 100 years will look very different from the south Florida of today. Professor Stoddard pointed out in our interview that flooding will reduce the amount of land that is currently available for living, and that as a result the region will only be able to support a small percentage of the current population. He also mentioned that living in south Florida will become increasingly more expensive, mainly due to the high costs of adaptation, including the costs of sustaining a place that depends on desalinization for drinking water, and that needs infrastructure to connect a patchwork of islands. Higher living costs will in turn reduce the amount of people that can afford living in the region. From this point of view, it is evident that a short-term adaptation plan needs to be paired with a long-term migration plan. Although this solution might seem more extreme, it is more realistic under the highest levels of predicted sea level rise by the end of the century, and therefore must also be considered.

**Conclusion**

Without any doubts we can say that sea level rise is part of the present and future of South Florida. Cities like St. Augustine, Miami Beach and South Miami are already experiencing damages to infrastructure and flooding caused by the rising seas. Geologists estimate that by the end of the century there will be approximately a 10-30 ft. rise in the sea level. What this means for the population of South Florida is dependence on desalination for drinking water, rising insurance costs, damages to public infrastructure, reduced areas for living and drastic changes in the way people live today. The costs of not planning for a natural phenomenon of the magnitude of sea level rise in South Florida are very high and therefore we have concluded that there is an imminent need for a government led, statewide adaptation plan. The high costs of adaptation and the reduction of landmass that is predicted leads us to suggest that the government should also focus on a long-term migration plan.

We have seen planning and investment to address sea level rise in some local governments. However, we also saw evidence that proved that unless there is cohesive statewide planning, local governments can’t really do much to implement effective sea level rise adaptation and migration strategies. Taking this into account, the first step to a solution to the lack of sea level rise planning in south Florida is state government action. The residents of south Florida need to actively work to elect a governor that recognizes that climate change is real and that sea level rise is threatening the future of Florida. This level of awareness and desire to act should be present at all levels of government everywhere in the state. Therefore, social and political activism should take place in counties, cities and municipalities to make sure that adaptation happens fast, coherently and that it addresses the different impacts that each location faces.

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