

Urban Flooding and Adaptation to Sea Level Rise in Miami Beach

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When It Rains, It Pours: A Socio-environmental Approach to Understanding Urban Coastal Flooding by [Albright, E.A., E. Eisenhauer, M.A. Kenney, and A.E. Sutton-Grier](#) is licensed under a [Creative Commons Attribution-Non Commercial-Share Alike 4.0 International License](#).



(Photo by Emily Eisenhauer, October 28, 2012)

"Where did all this water come from? I've lived here for seven years and never seen it like this!" said Ruth Jones, a long-time resident and business owner in Miami Beach, Florida. Jones was describing the conditions in Miami Beach October 28, 2012 as Hurricane Sandy moved along the East Coast of the U.S. wreaking havoc on many coastal communities.

Miami Beach was lucky to be spared from a direct blow from Hurricane Sandy, which hit hardest in the northeastern U.S. causing billions of dollars in damage and taking the lives of 285 people.

But Miami Beach did experience large storm surge that caused significant urban flooding in parts of the city that usually don't flood. "I missed two days of class because I couldn't leave my

house. My car was broken and I was driving my scooter, but I couldn't leave my house on my scooter or walking," said university student, Amanda Smith. Many residents of Miami Beach found themselves trapped in their residences and unable to leave due to the heavy flooding.

Although the two feet of flooding that Miami Beach experienced due to storm surge from Hurricane Sandy was due to extreme weather, it has brought more attention to the impacts of climate change and sea level rise. The regional Climate Change Compact, an agreement among four southeastern counties in Florida to work together on planning and policy for climate change, has issued projections for up to two feet of sea level rise for the region by 2060. Already sea level has risen about six inches over the last century, and the City of Miami Beach has been developing a new storm water master plan.

The flooding and talk about climate change have caused some people to start thinking differently about the choice to invest in a home than they had before. Sarah Murdoch, a teacher who is currently renting an apartment on Miami Beach, doesn't have a car and appreciates the walkable urban environment. She loves going to the beach and has been thinking about buying a place in Miami Beach but is concerned that the increased flooding is going to make it a much less welcoming place to live in the future. "I like Miami Beach a lot... but again, in ten years are the infrastructure problems going to be so significant that it becomes a much harder place to live?"

This event served as a warning about the impacts of climate change and the need to adapt to climate change, particularly sea level rise. But adaptation options may be expensive and may change the culture of Miami Beach. Margaret Brown, a city official in Miami Beach says that it is possible to fix the flooding problems but that it all comes down to how much money the city and residents are willing to invest. "To me it's a matter of dollars and cents. There is a solution, it's a willingness to implement the solution, an engineering solution, and the cost of it. We've got to raise the sea walls... and you've got to expand your outfalls, and you got to figure out how you're going to create retention wells." She says the threat to the economy is so great that the community really has to make these investments. But these investments may make it difficult for some residents to continue to afford to live in Miami Beach, particularly the elderly and the many low-wage workers in the city's hotels and restaurants. The City voted to raise water and sewer fees to pay for the projects, although officials are sensitive to the concerns of many elderly residents who have lived for decades in their homes and find it difficult to pay increased fees.

At the same time, environmental groups are concerned about focusing only on hard infrastructure solutions like seawalls. "These built structures damage sensitive coastal habitats like beaches and seagrasses. It is important to consider the adaptation options we have to invest in natural defenses such as building more dunes, mangroves, and coral reefs. These ecosystems help control waves and storm surge while also providing amazing recreational and tourism opportunities to support the local economy," says Jill Peterson, head of the Save the Biscayne Bay Coalition. She is concerned that decisions will be made rapidly to build a lot of new seawalls or dykes without considering the trade-offs and the negative impacts these structures will have on the natural environment that everyone comes to Miami Beach to enjoy.

Yet another concern is that more construction will interrupt life in Miami Beach. Many residents don't want to see more construction; they just want to be able to go about their daily lives in peace. However, if Miami Beach does nothing, the flooding is likely only going to get worse. No matter whether Miami Beach is considering built or natural climate adaptation solutions or a

combination of both, the cost estimates to protect Miami Beach are increasing over time as sea level continues to rise

Clearly there are no easy answers. Thus, coastal residents, both here and in other communities around the world, may be faced with difficult questions such as “How much adaptation do we need and what is the right kind? How do we preserve our history and culture? What are the economic trade-offs? What are the impacts on our environment?”

Note: Most quotes used in this case study are based on actual interview responses with residents in Miami Beach, based on research by Emily Eisenhauer. However, names are fictional and some details were added or changed in the writing of this case study.

Activity 2 Student Handout: Negotiation Information for Students (this header can be removed)

MEMORANDUM

TO: Flood Task Force Member

FROM: Philippe Levine, Mayor of Miami Beach

DATE: March 13, 2015

The City of Miami Beach thanks you for agreeing to serve on the Miami Beach Flood Management Task Force. The Task Force will convene for 2 hours on Friday, March 27th, to develop a draft flood management plan for Miami Beach. This draft plan should outline: (1) central goals of the plan; (2) feasible flood management options; (3) a summary of the state of the science and plan for additional study (if necessary); (4) points of agreement and disagreement across the stakeholders. The draft plan that the Task Force develops will be introduced to the City Council in April. The City Council looks forward to your input into the development of a flood management plan.

I have selected six individuals to represent a diversity of constituents across our community to serve on this task force. These individuals include:

1. Miami Beach City Manager who will facilitate the negotiation
2. Representative of the Environmental Coalition of Miami & the Beaches (ecomb)
3. A Miami Beach citizen experiencing localized flooding in neighborhood
4. A Miami Beach Real Estate developer and climate change denier¹
5. Professor Peter Harlen, Florida International University²
6. A representative from Florida's Department of Environmental Protection³

In preparation for next week's negotiation, each stakeholder should read the background material (student handout). Prior to the negotiation each stakeholder should outline: (1) their key objectives, interests and favored management options regarding flood management in Miami Beach; (2) beliefs about the science of flooding, including causes, severity and future predictions of flooding; (3) any scientific data or analysis that has been collected produced by the stakeholder on flooding in Miami Beach (or elsewhere).

¹ Washington Post. 2014. Miami's Climate Catch-22: Building Waterfront Condos to Pay for Protection Against the Rising Sea. <http://www.washingtonpost.com/news/storyline/wp/2014/12/22/miamis-climate-catch-22-building-luxury-condos-to-pay-for-protection-against-the-rising-sea/> (accessed March 2015).

² McKie, Robin. 2014. Miami, the great world city, is drowning while the powers that be look away, The Guardian. <http://www.theguardian.com/world/2014/jul/11/miami-drowning-climate-change-deniers-sea-levels-rising> (accessed March 2015).

³ Korten, Tristram. 2015. In Florida, Officials Ban Term 'Climate Change'. <http://www.miamiherald.com/news/state/florida/article12983720.html> (accessed March 2015)

The agenda for the meeting on March 27th is as follows:

1. Introductions (10 minutes)
2. Develop ground rules for discussion (10 minutes)
3. Discuss flooding in Miami Beach (20 minutes)
 - a. Current extent of problem (severity, spatial extent)
 - b. Predicted/Future flooding in Miami Beach
4. Discuss interests, goals, objectives of flood management plan (20 minutes)
5. Break (10 minutes)
6. Generate and discuss potential management options (30 minutes)
7. Assess science of flooding, need for more data, additional studies (20 minutes)
8. Synthesis of discussion (30 minutes)
 - a. Develop draft flooding management plan
 - b. Discuss the need for additional studies
 - c. Assess whether all stakeholders at the table support draft plan

Activity 3: Example Group Decisional Memo Student Handout

Final Decisional Memo Assignment

You are part of a stakeholder steering committee in Miami Beach, FL, tasked with developing a flood management set of options for the Miami Beach City Council to consider as they develop their flood management plan for managing flood risks in the Miami Beach, FL area south of Rte 112 and the Julia Tuttle Causeway. Remember that these flood management plans are typically looking 30 years into the future since infrastructure investments typically last for 30-50 years. You will work together as a committee (i.e., the whole class together) to write a decisional recommendation memo with a minimum of three options for the City Council to consider. This is a follow up to the negotiation exercise we did in class on XX date.

For each option please discuss scientific risks or uncertainty in what is known about flooding as well as likely impacts to people, property, and/or ecosystems for both without a plan as well as for the options recommended. Also, include any other information that may affect parts of Miami Beach that stakeholders are likely to care about such as cultural or historical landscape features that may be impacted. The description of each option should include a discussion of pros and cons of that option for different stakeholder communities and should make clear if there are elements of the option that may be a “tough sell” for particular stakeholders and why. In discussing the pros and cons of each option, make sure they relate to the flood management goals of the city. There will be trade-offs between the different options you put forward between the anticipated level of storm protection as well as the expected impacts to ecosystem services. Be clear about these trade-offs when you describe each option in your memo. There is unlikely to be one option that is going to please everyone, so it is critical that the scientific facts be distinct from the stakeholder values.

You are not responsible on this committee for figuring out how much each option costs in specific detail. But you should be able to provide a rough estimate of whether each option costs quite a bit or is reasonably inexpensive to implement to help inform the decision making process. It will be up to the City Council to determine how best to fund the option they select.

Once you have laid out at least three options, as a group, you need to decide which of the one or two options you will recommend the City Council adopt. You must justify why you are recommending your chosen option(s) over other approaches. It is okay if all the elements of the recommendation wouldn't be desirable to all the stakeholders, but you must discuss why this option is better than other selections and the elements that would be unacceptable to a specific, identified stakeholder community.

This memo has no page limits or specific formatting requirements, but it must be written as a policy memo⁴. Figures and images are encouraged and scientific statements must be supported with citations. This memo is due XXX date.

⁴ We worked on writing policy memos as part of the class in which we implemented this case study. Each instructor should choose the most appropriate format for how s/he wants to receive this assignment. A memo may not be appropriate in a class that has not focused on helping students learn to write policy memos. A more traditional report may be more appropriate.