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Be Prepared: Using Florida's Natural Infrastructure to Combat Climate Change

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Natural infrastructure is not a panacea, but should be considered as a potentially less costly and more beneficial option than traditionally engineered flood or storm mitigation measures.

Introduction

Florida has a diverse and beautiful natural environment, ranging from the Everglades to the beaches of the Florida panhandle. The state is also vulnerable to a variety of extreme weather events, such as flooding and hurricanes, which are projected to become more severe in the coming decades due to climate change. Protecting the state against these events could be a costly undertaking. Various proposals seek to minimize the risks through new infrastructure projects such as sea walls. But in deciding how best to adapt to extreme weather risk, Florida should be sure to consider using the state's "natural infrastructure" to protect itself in a less costly and more sustainable way.

Natural Infrastructure

Natural infrastructure refers to natural features of the environment that can reduce risk from flooding, storms or other extreme weather events. Examples of natural infrastructure include wetlands, marshes, mangroves and coral reefs.

Natural infrastructure can reduce damage from extreme weather in a variety of ways. Wetlands and marshes, for example, can absorb storm surge, preventing or reducing flooding in other areas. A mere 15 feet of marsh can absorb as much as half of the energy of incoming waves.[1] Mangroves can also reduce impacts from storm surges. One study found that 330 feet of mangrove trees "can reduce wave height by 66 percent."[2] Coral reefs can also help dissipate wave energy, reducing the impact of storms.

Natural Infrastructure at Work

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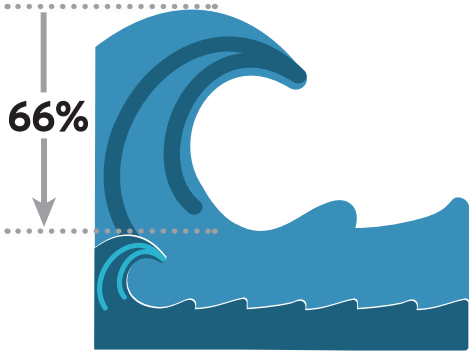

This protection can result in significant damage reductions from extreme weather events. During Hurricane Sandy, the presence of wetlands was estimated to have reduced storm damage by 10 percent, whereas salt marshes reduced property damages in areas further inland by 16 percent.[3] Similarly, a study found that Florida's mangroves had prevented $1.5 billion of flood damage related to Hurricane Irma.[4]

Natural infrastructure can also do a better job weathering the effects of storms and flooding than engineered structures. A study of damage caused by Hurricane Irene in North Carolina found that approximately three-quarters of bulkheads in the central Outer Banks sustained damage requiring repairs, whereas protective wetland areas were unaffected by the storm.[5] Artificial barriers such as sea walls or bulkheads may also need to be built up higher over time to account for additional sea level rise. By contrast, marshes collect sand and sediments from the water over time, causing them to rise along with sea levels.[6]

Natural Infrastructure as an Alternative

Governments are increasingly recognizing that natural infrastructure can be a more cost-effective way of addressing extreme weather risk than traditional engineered projects. The America's Water Infrastructure Act, signed in 2018 by President Donald J. Trump, required the United States Army Corps of Engineers (USACE) to consider natural infrastructure solutions as an option when planning flood projects along the coast. Since that time, USACE has implemented at least eight natural infrastructure-based projects after concluding that these projects would have a higher cost-benefit ratio than any traditional alternative option. Notably, in conducting these cost-benefit analyses, the USACE did not consider any environmental or health benefits derived from the projects and looked only at economic benefits.[7]

A report looking at these eight projects concluded that key factors favoring natural infrastructure projects over traditional artificial alternatives were the additional benefits related to recreation and tourism. In other words, natural infrastructure not only serves a storm-protection purpose, but can also be a source of income for local communities in a way that an engineered project typically cannot. For example, natural infrastructure projects could help promote commercial or recreational fishing or might encourage bird watching by protecting fish and bird habitats.

Options for Protecting and Promoting Natural Infrastructure

While natural infrastructure can be the best option for mitigating extreme weather risk in some instances, Florida cannot simply sit back and take advantage

Natural infrastructure can result in significant damage reductions.

Hurricane Sandy

Salt marshes reduced damage further inland by

16%

Wetlands reduced damage by

10%

Hurricane Irma

Florida's mangroves prevented flood damage totaling

$1.5 billion

Natural Infrastructure: Serving Dual Purposes

Natural infrastructure projects can offer storm protection but can also offer an income source (recreation and tourism) for local communities.

of these solutions without acting. Efforts to protect existing natural resources and to restore or expand natural infrastructure in critical locations will be necessary and will not be free. Natural infrastructure is not a panacea, but should be considered as a potentially less costly and more beneficial option than traditionally engineered flood or storm mitigation measures.

An increasing number of jurisdictions are incorporating natural infrastructure into their storm planning and response process. For instance, after historic flooding in Louisiana in 2016, the state decided to overhaul its flood management system and replaced the multiple, often overlapping agencies and organizations responsible for flood mitigation with a unified approach known as the Louisiana Watershed Initiative (LWI).[8] The LWI also explicitly tries to incorporate natural infrastructure into its planning and mitigation strategies.

Government should also avoid inadvertently degrading existing natural infrastructure. In 1982, President Ronald Reagan signed the Coastal Barrier Resources Act (CBRA), which prevents federal subsidies from being used for development in 3.5 million acres of wetlands, barrier islands and other environmentally sensitive areas in Florida and throughout the United States.[9] The CBRA does not prohibit development in these areas. Instead, the act takes a "first do no harm" approach in not having government encourage or assist in such development. Florida should look to copy this approach by denying state subsidies—including access to the Citizens' flood insurance program—for new development in areas where natural infrastructure is providing damage-protection benefits against extreme weather events.[10]

First Do No Harm

Government should also avoid inadvertently degrading existing natural infrastructure, which receives some protection from the CBRA.

Conclusion

Meeting Florida's future climate challenges will require ingenuity, and the state will need to use every available mechanism to reduce risk at reasonable cost. Taking full advantage of Florida's natural resources must be part of that process. While not appropriate in every case, the state needs to consider natural infrastructure solutions as an option in planning and implementing mitigation projects.

ABOUT THE AUTHORS

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Endnotes

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