

Cape Cod: Climate Change Risk Factors and Responses
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Model: Policy Paper
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For purpose of modeling elements and tone of policy-oriented documents

****I have indicated one section I presented in outline form only, for purposes of this model, and where full text resumes****

SUMMARY:

By even the most conservative estimates, Cape Cod, Massachusetts is due to experience dramatic coastal erosion and flooding by 2100 as a result of rising sea levels resulting from climate change. At risk of inundation are not only vast stretches of unique, irreplaceable national seashore and marsh and forest habitats that protect the Cape and mainland but also significant swaths of commercial and residential real estate and key road systems. The state of Massachusetts is also slated to lose a vital, steady source of income in the form of billions of dollars currently derived annually from Cape Cod-based tourism.

A number of coalitions between local, state, and federal organizations and agencies have already initiated projects to investigate avenues for identifying and mitigating climate change-derived coastal disruption along the US's eastern seaboard, including studies of our seven national seashores such as the one on Cape Cod. Additional Cape Cod-based efforts from localized environmental organizations seek to conserve and steward its fragile marsh and forest ecosystems. Still other initiatives exist to pursue a sharp decrease in Cape Cod's carbon footprint to permit the peninsula to contribute directly to the global and national transition to renewable energy and reduction of the same rising temperatures affecting sea level, something particularly marked in the northeastern coastal region of the US (Net Zero, 2017).

However, at present there is only one comprehensive local/national collaborative project specifically dedicated to studying, strategizing, and taking concrete, localized action on climate-change-derived coastal and inland degradation on Cape Cod over the coming decades. Its model recognizes that robust dunes and protected natural lands form the front line of defense during storms and coastal flooding not only for the Cape but for the mainland as well. While still in opening stages of study and assessment, the project clearly outlines upcoming steps involving collaboration with local communities and businesses to forge proactive and preemptive strategies and to then jointly take action.

A well-rounded and self-perpetuating approach to mitigating climate change on Cape Cod over the coming decade would ideally encompass several co-existing projects similar to the singular one today to permit cross-fertilization of data and discoveries, new partnerships, and both cooperative and competitive pursuits of strategies and actions. Such an approach would also

involve continued progress in switching Cape Cod to renewable energy sources, avoiding the repetition of recent objections through clearer and more significant incentives and public outreach on the immediate and long-term benefits.

Particularly with federal support for climate-related studies and initiatives at a significant ebb, it is vital that individual agencies such as NOAA continue to provide competitive grants for study and action plans pertaining to the effects of climate change in the northeastern US coastal region, including Cape Cod. It is equally incumbent upon the current and future state administrations in Massachusetts to proactively involve themselves to a much greater degree in funding for associated studies and trials, coordination and implementation, and ongoing assessments and approval of new projects. At stake is the accelerated loss of a majestic American national seashore and unique coastal habitats that provide protection for mainland coastal regions, billions of dollars of state revenue from visitors seeking the unique landscapes of Cape Cod, and additional billions directed to the repair and rebuilding of roads and property that could instead be allocated for any number of other state-wide purposes.

This paper reviews projections for coastal erosion and inundation on Cape Cod and associated effects through 2100, summarizes existing initiatives to respond to this crisis and to reduce Cape Cod's carbon footprint, and recommends current and future directions in associated policy and management at the local, state, and national levels.

EFFECTS OF CLIMATE CHANGE ON CAPE COD

A. Environmental Projections:

According to a 2012 joint report by the Rocky Mountain Climate Organization and the National Resources Defense Council focusing on threats of climate disruption to the seven Atlantic coast national seashores (Saunders & Easley, 2012), the northeastern coast, including Cape Cod, has already experienced above-average sea level rise compared to the global average and has been designated a sea-level rise "hotspot," with projections indicating this trend will continue. Together with increased global and localized temperatures, this means that Cape Cod will experience stronger and more frequent storms, suffer increased erosion particularly but not only in lower-lying areas, see increased damage to property and road systems, and also be forced to contend with intrusion of rising saltwater into its below-ground freshwater aquifer (Cape Cod Commission, 2017).

B. Evidence

FOR PURPOSES OF MY MODEL, I LIMITED THIS SECTION TO AN OUTLINE OF SOURCES, INFORMATION AND PROJECTIONS THAT WOULD BE USED HERE. FULL TEXT IN PARAGRAPH FORM RESUMES ON PAGE 4 WITH THE "RECOMMENDATIONS" SECTION.

1. Rocky Mountain Climate Organization & National Resources Defense Council: "Atlantic National Seashores in Peril: the Threats of Climate Disruption"

2. US Geological Survey

3. US Global Change Research Program

4. Cape Cod Commission: the "Resilient Cape Cod Project", a NOAA Coastal Resiliency Grant:

i. Projections associated with maximum sea level rise of 6 feet:

a) 21,700 acres (9%) of land is submerged

b) 116 critical facilities impacted

c) 11,720 acres of priority habitat lost

d) Sales of \$1 billion and 8,200 jobs lost, related to loss of 795 businesses

e) 174 miles of roadway submerged, 706 disconnected from the network

ii. Key vulnerabilities on Cape Cod:

a) Environmental damage on the coast and inland including coastal erosion (more leaving than is being replaced; natural transference processes of barrier beaches disrupted)

b) Storm damage to structures and road systems

c) Intrusion of salt water into ground water, shrinking space between salt water and aquifer

EXISTING PROJECTS AND MANAGEMENT PLANS

A. Local and/or Local & National Collaborations:

1. The "Resilient Cape Cod Project," a NOAA Coastal Resiliency Grant

2. Cape Cod Collective for Conservation: brief summary of projects, achievements, plans

3. Woods Hole Sea Grant and Cape Cod Cooperative project: evaluations, projections, recommendations specifically for reducing carbon footprint

5. Cape Cod Wind: achievement in prolonged legal battle, wind farm initiative 4 miles off shore

6. Cape and Islands Net Zero campaign

7. Related - model of Samsø Island Energy Initiative in Denmark utilized by Net Zero

B. National Management:

1. National Park Service: responses and plans in terms of national seashores, including Cape Cod's, and with particular attention to model on Assateague Island – preemptive planning for alternative routes to beaches if roads/bridges are washed out, including a ferry.

RECOMMENDATIONS:

It is imperative to reconcile sometimes diverging natural, economic, and social prerogatives on the Cape to move toward a climate change response that will be mutually beneficial to locals, visitors, and mainland Massachusetts alike and that will ensure continued, evolving protection and conservation in the face of the reality of future coastal disruption. With a forward-thinking set of policies jointly established and maintained at the federal and state levels in conjunction with local environmental organizations, Cape Cod still has the potential to weather the projected increases in temperature and sea level in a manner that optimally preserves vital natural resources, protects and sometimes alters commercial and residential property to accommodate rising waters, and models a zero-point carbon footprint for the world.

Planning a meaningful long-term response to climate-change-driven coastal disruption on Cape Cod encompasses two different but overlapping actions: continuing the types of crucial local/state/national coalitions already underway, as well as both state and national funding, to guarantee the perpetuation of current efforts and smooth rollover to future efforts; and addressing and mitigating climate change itself, especially in the northeastern United States.

Strategies and Actions to Mitigate Effects of Climate Change on Cape Cod:

In the face of reduced overall commitment at the national level in general to promoting and supporting proactive responses to climate change, it is imperative that specific agencies such as NOAA and the National Park Service continue inviting and funding collaborative ventures. In addition, the Massachusetts state legislature must continue to prioritize climate change/sea level-rise research, planning, and strategic responses in cooperation with local and federal environmental organizations whose research is already paving the way for the management of Cape Cod National Seashore and environs over the coming decades.

To date, there is only one collaborative federal/local endeavor, the Resilient Cape Cod Project, exclusively dedicated to assessing, strategizing, and taking preemptive action against effects of climate change on Cape Cod. While this project has already demonstrated promising assessment results, clearly defined plans for working through strategies and developing concrete actions, and an encouraging commitment to involve local communities in these subsequent stages, it would be optimal for more than one such project to operate simultaneously. Parallel projects would permit and inevitably lead to healthy exchange and challenging of tentative conclusions, competition for and improvement of action plans, and ideally, further associations and collaborations from which subsequent projects and action plans might be generated.

1. Key example: Cape Cod Commission's "Resilient Cape Cod Project," in conjunction with NOAA:

The Resilient Cape Cod Project represents the only multi-stage, action-oriented climate change mitigation project currently underway specifically for Cape Cod and represents the type of local/federal scientific and funding collaboration required to forcefully and proactively respond to the effects of climate change on Cape Cod before they become full-blown crises.

The Massachusetts state legislature and NOAA need to foster more such projects and coalitions through dedicated funding and competitive grants at the state and national level, in order to permit multiple avenues of exploration and additional creative cross-fertilization of recommendations and actions. Scientific institutions such as the Woods Hole Oceanographic Institution, a private, nonprofit research and higher education facility, already situated on Cape Cod and already engaged in marine science research contributing to increased understanding of global climate-change-derived oceanic effects are well-placed to begin fostering such efforts.

a) This project's working model (note that each stage represents additional, clearly delineated sub-steps):

1. First stage (underway): study, evaluations, risk assessments
2. Public engagement and socio-economic assessment
3. Development of adaptation strategies, again with public input
4. Actions, with public cooperation

2. Overcome local community and business objections to investment in cleaner sources of energy, as occurred recently in response to the proposed Cape and Islands offshore wind farm, by providing incentives and investments in renewable energy and developing and applying standards for smart energy growth on Cape Cod. Add/enhance local public education opportunities to increase understanding and enthusiasm and overcome reluctance stemming from concern over altering sightlines or landscapes/waterscapes in favor of long-term benefits.

3. Continue fostering new sources of energy through study and development grants (example: *Cape Cod Times*: new tidal-based hydropower testing in Cape Cod Canal)

Strategies at the National/Global Levels (Everything Is Interrelated):

The federal government must reinstitute America's commitment to the Paris Climate Agreement and associated emissions goals. Failure to maintain commitment to these goals costs the US far more in long-term business losses associated with climate-change disruptors than it gains through non-cooperation. A by-product loss already underway is that of vital natural habitats and beautiful national parks. In the case of our national seashores, this occurs

due to erosion, storm surge, and storm damage directly tied to climate-change-induced higher temperatures and elevated sea levels.

FOR PURPOSES OF MY MODEL, I KEPT CLOSING SECTION IN LIST FORM ONLY:

CONCLUSION

BIBLIOGRAPHY

(OPTIONAL) APPENDIX