

# <H1>ROLLING EASEMENTS</H1>

by

<H3>James G. Titus</H3>

June 2011

Titus, J.G. 2011 Rolling Easements. U.S. Environmental Protection Agency.  
Washington, D.C.

# CHAPTER 1

## INTRODUCTION

### 1.1 POSSIBLE RESPONSES TO A RISING SEA

Along almost the entire U.S. coast, sea level is rising<sup>1</sup>—and the rate of that rise is expected to accelerate in the coming decades.<sup>2</sup> Even today, rising sea level is inundating low-lying lands, eroding beaches, exacerbating coastal flooding, and increasing the salinity of estuaries and aquifers.<sup>3</sup>

Over the last several thousand years, shallow-water estuaries have gradually submerged tidal wetlands, which in turn have survived by migrating inland, onto low-lying coastal plains (see Figure 1). Barrier islands and other beach ecosystems have also remained intact by migrating inland. In areas with few if any people, floodplains and tidal ecosystems will probably continue to move inland as sea level rises. In developed areas, however, human activities will complicate—or perhaps prevent—this landward migration.

Communities can respond to sea level rise by any of three or four pathways (See Box 1):<sup>4</sup>

#### 1. Shore Protection

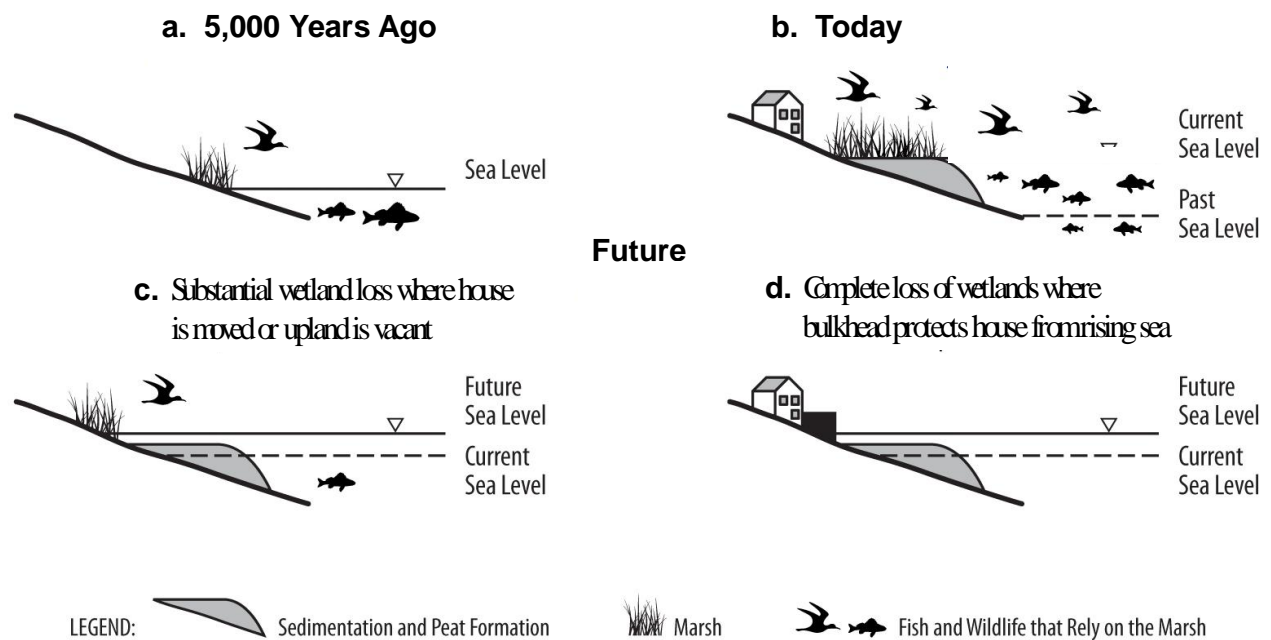
- a. *Shoreline armoring.* Protect land and buildings from erosion and flooding using dikes, seawalls, bulkheads, and other hard structures. Wetlands and beaches are eliminated as they are squeezed between the rising sea and the shoreline armoring.
- b. *Elevation of land surfaces.* Elevate land and buildings as the sea rises. Efforts to protect oceanfront communities usually involve beach nourishment, which elevates the surface of the beach. In theory, the land surfaces of wetlands can also be elevated,

though shore protection projects along wetland shores rarely do so.

2. *Accommodation.* Do not try to prevent tidal inundation, erosion, or flooding. But instead of moving people out of harm's way, develop coping strategies that enable continued human habitation in spite of the increased hazards. Wetlands and beaches migrate inland, though they may be impaired by the presence of homes on pilings.
3. *Retreat.* Allow wetlands, beaches, and other coastal habitats to migrate naturally as the sea encroaches inland; move people out of harm's way; and prevent new construction in vulnerable areas.

Because accommodation would rarely be sustainable,<sup>5</sup> the fundamental question is: Which communities will be *protected* and where will people have to *retreat*?

Beach nourishment is common along developed ocean shores, and shoreline armoring is common along developed estuarine shores. Although retreat often occurs in undeveloped areas, it is uncommon along developed ocean beaches and very rare along developed estuarine shores. Shore protection is common because it generally costs less than what the protected property is worth. But protecting all developed lands from a rising sea would eventually eliminate tidal wetlands, destroy ocean habitat through dredging, expose millions of people to the hazards from living below sea level, and become



**Figure 1. Evolution of a Marsh as Sea Level Rises.** Tidal wetlands are found where the elevation of the land is between high and low tides, with tidal marshes generally above mean sea level and tidal flats below mean sea level. **(a)** When sea level was rising rapidly, tidal wetlands tended to be a narrow fringe along the shore, determined by tide range and the slope of the land, as both the landward and seaward boundaries migrated inland. But vertical accretion through sedimentation and peat formation have enabled wetlands to keep pace with the relatively slow rate of sea level rise during the last several thousand years. As sea level rose, the landward boundary migrated inland as wetlands formed on newly flooded lands; but the seaward boundary of tidal wetlands did not retreat to the same extent, and the area of tidal wetlands increased. **(b)** Today, the area of tidal wetlands—i.e., the land between the high and low tide shorelines—is much greater than the amount of dry land within a similar elevation range above the high tide shoreline. Yet there is a limit to vertical accretion and the rate of sea level rise with which tidal wetlands can keep pace. **(c)** If the sea rises more rapidly, most of the existing tidal wetlands will be lost and the total area of tidal wetlands will decline to the narrow fringe determined by the tide range and slope of the land. **(d)** Finally, in places where developed lands along the shore are protected from tidal inundation, new wetlands may not form inland and almost all tidal wetlands may be lost. Alternatively, **(c)** if the development is subject to a rolling easement, then the people who live along the shore will have to relocate and the wetlands will be able to migrate inland. Because the tidal wetlands support fish and wildlife, loss of tidal wetlands could cause populations of birds and fish to decline or relocate.

## Box 1. Fundamental pathways for responding to sea level rise

As rising sea level threatens coastal lands, people must decide whether to attempt to hold back the sea or allow shores to shift naturally. People can respond to sea level rise through one of four pathways:

**Shoreline armoring.** Protect development with structures such as dikes, seawalls, and bulkheads. This approach maintains existing land use, but can increase the loss of wetlands and beaches. It can also eliminate public access along the shore.



**Elevate.** Raise structures and land surfaces, including beaches and possibly wetlands.



**Accommodate.** Make no additional efforts to prevent tidal inundation, erosion, or flooding. Instead of moving people out of harm's way, develop coping strategies that enable continued human habitation in spite of the increased hazards.



**Retreat.** Allow wetlands and beaches to migrate inland. Avoid building in the most vulnerable areas or remove structures that are already there.

Combinations of these approaches are also possible. Each approach will be more appropriate in some locations than in others. Shore protection costs, property values, the environmental values of habitat, and the feasibility of protecting shores without harming the habitat all differ, depending on the location.



Photo source:  
©James G. Titus,  
used by permission.

economically unsustainable in many areas where it initially seemed successful.<sup>6</sup>

What can society do if individual communities and property owners are inclined to protect more land than would be in society's long-run interest? Logically, there are three ways to limit the portion of our coast eventually subject to shore protection:<sup>7</sup>

1. *Setbacks*. Prevent development of some lands vulnerable to sea level rise, either through regulation or by purchasing land (or development rights) from the current owners.
2. *Rolling easements*. Make no effort to restrict land use but prevent shore protection of some coastal lands either through regulation or by transferring any right to hold back the sea from owners inclined to do so to organizations that would not.
3. *Laissez-faire*. Make no effort to prevent either development or shore protection, but curtail government subsidies for both, and hope that eventually the forces of nature and economics will lead owners to allow their lands to be submerged.

Each way is appropriate in some circumstances.

Landowners tolerate setbacks as long as they can build somewhere on their property. Thus setbacks can be practical where parcels are large or the land is steep enough so that each lot can have a building site high enough to be safe for the next few centuries. But in most places with setbacks, development is only set back by at most a few hundred feet or enough to keep a home out of harm's way for a few decades.<sup>8</sup> In the United States, more than ten thousand square miles of land are within two meters above the sea.<sup>9</sup> The expectation of additional development is reflected in the high prices of undeveloped coastal lands. To prevent development of these lands would impose a great cost either on landowners unable to put their land to its most profitable use, or on governments and private parties who purchase or otherwise pay landowners to refrain from development. Buying most of the nation's

undeveloped coastal lands seems unlikely and economically infeasible.

The laissez-faire approach is based on the assumption that investors are more likely to appropriately manage known risks if they bear all of the burdens of bad decisions and reap all of the rewards of good decisions. This approach can reduce eventual shore protection in places where government subsidies would otherwise fund shore protection or coastal development. The Coastal Barrier Resources Act<sup>10</sup> removed federal subsidies for certain barrier islands,<sup>11</sup> causing some to remain undeveloped and reducing the likelihood of shore protection for several that have been developed without the subsidies.<sup>12</sup> Some ocean beach communities have funded their own shore protection or would do so if federal and state subsidies were unavailable.<sup>13</sup> Other oceanfront communities are unlikely to be protected without public funds; so a laissez-faire approach would reduce the extent of beach nourishment along the ocean. But along estuaries, private landowners generally pay for shore protection. Therefore, laissez-faire is unlikely to provide much vacant land for a gradual upslope migration of wetlands and beaches along estuarine shores. Planners view shore protection as likely for at least 60 percent of the low land along the Atlantic coast if sea level rises three feet in the next century.<sup>14</sup> Many landowners will eventually decide to yield their lands to the sea, as shore protection costs escalate,<sup>15</sup> but only after interim shore protection have blocked the inland migration of wetlands and compromised use of the beach.

## 1.2 ROADMAP

This primer focuses on rolling easements. If it is unrealistic to prevent development of low-lying coastal lands that could eventually be submerged by a rising sea, an alternative is to allow development with the conscious recognition that land will be abandoned if and when the sea rises enough to submerge it. This approach combines the strengths of the other two approaches:



- From now until the land is threatened, valuable coastal land can be put to its highest use, as with the *laissez-faire* approach;
- Once the land is threatened, it will convert to wetland or beach as if it had never been developed.

Rolling easements enable ecosystems to migrate inland and allow society to avoid the costs and hazards from protecting low lands from a rising sea. Like *laissez-faire*, rolling easements are generally based on the assumption that private investors in a free market *could* reasonably manage the risks of sea level rise. But unlike *laissez-faire*, rolling easements are also based on the assumption that to incorporate the risk of sea level rise, the market needs some clearly defined rules about which lands may be protected. Otherwise, uncertainty about future government activities (e.g. subsidizing or regulating shore protection) can overwhelm an investor’s ability to manage the risk of sea level rise.

The following chapters examine many options for ensuring that wetlands, beaches, or barrier islands migrate inland. But the question about which—if any—of these options *should* be adopted is beyond our scope. We merely provide a summary of the tools that could be adopted and their possible rationales, to help encourage a thorough consideration. We have not excluded options merely because they have not been tested or would require existing policies to change. Because modern civilization has not faced a rapid rise in sea level, sometimes the best response may be to do something new. The mention of a given option in this report does not constitute endorsement for implementing the option anywhere, much less in a particular location. Although the federal government could—in theory—adopt a rolling easement policy, this primer focuses on options for state and local government and the private sector.<sup>16</sup>

A rolling easement would generally prohibit shore protection and require removal of pre-existing structures seaward of a specific migrating

shoreline such as the dune vegetation line, mean high water, or the upper boundary of tidal wetlands. This primer uses the term “rolling design boundary” for the shoreline that defines where the restrictions of a particular rolling easement apply. “Submergence” means dry land becoming wetland or open water, whether through actual submergence or shoreline erosion. The term “submerge date” refers to the day the rolling design boundary migrates inland of the main building on a parcel of land subject to a rolling easement.<sup>17</sup>

---

“Submergence” means dry land becoming wetland or open water, whether through actual submergence or shoreline erosion. “Submerge date” refers to the day the rolling design boundary migrates inland of the main building on a parcel of land subject to a rolling easement.

---

The next two chapters look at the purpose of a rolling easement and how it could work. Chapter 2 provides an overall picture for why rolling easements may be appropriate in areas where it is important to allow beaches, wetlands, developed barrier islands, and access along the shore to migrate inland. The chapter also includes a brief overview of the legal boundaries that define private land ownership or public access along the shore. In some cases, legal boundaries migrate as the shoreline changes; so public rights along the shore remain the same, albeit inland. But in other states, the inland boundary of public access is fixed as the shore erodes. Shoreline erosion can leave the only means of (legal) pedestrian access seaward of where ocean waves regularly wash and even break at high tide.

Chapter 3 presents specific ways to put rolling easements into practice. Overall, a rolling easement is a legally enforceable expectation that the shore or human access along the shore can

## *How much of this report should I read?*

This primer examines more than a dozen different legal approaches to rolling easements. It differentiates opportunities for legislatures, regulators, land trusts, developers, and individual landowners. We also consider different shoreline environments (e.g. wetlands, barrier islands) and different objectives (e.g. public access, wetland migration). So most of the possibilities described in this primer might not apply to your situation.

For a general understanding of what a rolling easement can *accomplish*, see Chapters 1, 2, and 6. Sections 3.1 and 3.2 explain what a rolling easement *is*—but they are much more detailed.

If you are considering rolling easements for a particular location, you might start with the particular section in Chapter 2 that addresses your objectives—plus Sections 2.2.1 and 2.2.2, which explain public and private property rights along the shore. Regulatory options are examined in Sections 3.1 and 4.1. Options for landowners, developers, land trusts, and government resource managers are discussed in Sections 3.2, 4.2, and 5.2. Chapter 8 looks at some of the issues a land trust may face managing a rolling easement. Chapters 6 and 9 discuss practical issues that may arise with any type of rolling easement,

If you are considering rolling easements for many locations, it may be best to read the same sections of Chapter 2, 3, and 4 as you would read for a particular location, plus Chapter 7.

migrate inland instead of being squeezed between an advancing sea and a fixed property line or physical structure. The “rolling easement holder” could be the government agency whose regulations prohibit shore protection, or the person, land trust, or government agency who obtains the property rights embodied in a rolling easement.

---

**“The rolling easement holder could be either the government agency whose regulations prohibit shore protection, or the person, land trust, or government agency who obtains the property rights embodied in a rolling easement.”**

---

The term “rolling easement” refers to a broad collection of legal options, many of which do not involve easements. Usually, a rolling easement is either (a) a regulation that prohibits shore protection or (b) a property right to ensure that wetlands, beaches, barrier islands, or access along

the shore moves inland with the natural retreat of the shore. Although the regulatory approach is the more common way to prevent shore protection, the non-regulatory approach may sometimes work better. Private land trusts, government agencies, and (for some approaches) even private citizens can buy (or secure donations of) rolling easements from property owners. An owner who has voluntarily engaged in the creation of the rolling easement is more likely to perceive the arrangement as fair than a landowner subjected to government regulation.

Regulatory rolling easements include:

- Local zoning that restricts shore protection;
- Regulations that prohibit shore protection by state coastal or wetland programs, or require removal of structures standing on the beach or in the wetlands;
- Permit conditions that require public access along the dry beach in return for a building permit; and

- Permit conditions that require public access along the inland side of a new shore protection structure, in return for a permit to build such a structure.

The property rights approach includes:

- Affirmative easements that provide the public with the right to walk along the dry beach even if the beach migrates inland;
- Conservation easements that prevent landowners from erecting shore protection structures or elevating the grades of their land;
- Restrictive covenants in which owners are mutually bound to avoid shore protection and allow access along the shore to migrate inland;
- Future interests that transfer ownership of land whenever the sea rises to a particular level;
- Migrating (ambulatory) property lines, which move as the shore erodes, enabling waterfront parcels to migrate inland so that inherently waterfront activities can continue.
- Legislative or judicial revisions and clarifications regarding the inland migration of public access along the shore and the rights of landowners to hold back the sea; and
- Transferable development rights—especially along migrating barrier islands—that provide those who yield land to the rising sea the right to build on land nearby.

The regulatory and property rights approaches are not mutually exclusive; a land trust could acquire a rolling easement on lands where regulations currently prohibit shore protection, to ensure that future changes in public policy do not put ecosystem migration in jeopardy.

Usually a rolling easement would involve wetlands, beaches, and open water migrating onto areas that are dry land today. In some cases, however, islands and peninsulas could migrate onto areas that are open water today. Thus a comprehensive rolling easement policy may have to manage newly created land, as well as the loss of land.

---

“A rolling easement is a legally enforceable expectation that the shore or human access along the shore can migrate inland instead of being squeezed between an advancing sea and a fixed property line or physical structure. The term refers to a broad collection of legal options, many of which do not involve easements. Usually, a rolling easement would be either (a) a law that prohibits shore protection or (b) a property right to ensure that wetlands, beaches, barrier islands, or access along the shore moves inland with the natural retreat of the shore.”

---

The ability to implement rolling easements depends on state law, which varies considerably, as we see in Chapter 4. In some states, local governments have broad powers, while in other states their authority is limited. In some states, local governments can obtain a conservation easement as a condition for a building permit, or through eminent domain. In other states, local governments can only obtain such an easement from a donor or willing seller. Even if a government has the regulatory authority to prohibit shore protection, doing so might be a “taking of private property,” which would require compensation under the U.S. Constitution. Section 4 does not evaluate the “takings question” in detail, beyond pointing out that the most important question would often be whether coastal property owners have a right to hold back the sea. This question has not been settled in any coastal state. A key reason for government agencies and land trusts to acquire a rolling easement is that doing so would resolve the legal uncertainty about whether a particular landowner has the right to shore protection. Even in states where a rolling easement regulation or statute does take away an



existing property right, the requirements would have a more modest impact on landowners (and hence require less compensation) if they were enacted long before landowners would have otherwise attempted to hold back the sea.

The greatest obstacle to implementing a planned retreat from the coast is that few landowners choose to give up their homes or businesses to a rising sea (see Photos 1 to 4), unless the means of defending their land costs more than their property is worth. Therefore, at first glance, it seems implausible that landowners would agree to eventually allow their lands to become submerged, especially along estuarine shores where holding back the sea is likely to be cost-effective. But as Chapter 5 shows, for the typical parcel of coastal land, a rolling easement would decrease the property value only slightly, because the eventual submergence is so far in the future. Therefore, a relatively modest near-term inducement can lead a reasonable farmer or developer to agree to a rolling easement—especially if the landowner is more skeptical than the land trust about a large rise in sea level and hence views the eventual submergence as a distant possibility. If a rolling easement is part of the permit condition, for example, approval for subdivision of a large parcel of land may be more than an adequate inducement. Cash payments amounting to less than 5 percent of the land’s value may be adequate for farms whose owners have no intention of developing the land.

In a small number of cases, a landowner may actually benefit by donating a rolling easement. A conservation easement sometimes has tax benefits that more than offset its cost to the landowner. But land trusts are not necessarily interested in managing every conservation easement that a landowner might wish to donate. If a rolling easement enticed a land trust to accept a conservation easement that it would otherwise not accept, then the rolling easement could economically benefit the donating landowner.

Chapters 6–9 discuss some of the key considerations for those designing a rolling easement. Chapter 6 examines the restrictions: The “rolling design boundary” can be based on whatever shoreline most closely corresponds to the particular resources the rolling easement is meant to preserve. Along a beach, for example, the rolling design boundary is often the dune vegetation line, which separates the dry sand beach from the dunes. A rolling easement can specify that the public will have access to the beach and that homes encroaching onto the beach as a result of shoreline erosion will be removed within a defined period of time. Chapter 7 looks at ways to identify the lands where a rolling easement would be most useful.

---

**This primer uses the term “rolling design boundary” for the shoreline that defines where the restrictions in a particular rolling easement apply.**

---

The final two chapters discuss some of the issues related to managing a rolling easement once it is created. Chapter 8 examines what the land trust or government agency would have to do between now and sometime in the future when a given parcel of land will be threatened. The chapter focuses on inspection, enforcement, and possible efforts by property owners to have a rolling easement invalidated.

Chapter 9 looks at the endgame: management of the rolling easement from the time when submergence of a parcel becomes imminent until it is finally submerged. The ultimate cost of yielding land and home to the sea can be minimized if the rolling easement leads landowners to gradually alter what they do when the eventual submergence is still a few decades away, and continue to adjust how they use the land and structures as the submerge date approaches (Section 9.1). Whether the owner actually prepares, however, will depend

largely on what the rolling easement holder does (9.2). Because people will not always prepare optimally for the loss of a home to the rising sea, some form of relocation assistance may also be necessary (9.3).

Internal Revenue Service (IRS) regulations require that restrictions from tax-deductible conservation easements apply *in perpetuity*. The restrictions in a rolling easement would also be *in perpetuity*, but unlike the standard conservation easement, the

entire purpose of a rolling easement is to prepare for the day when the easement is no longer relevant. If the landowner complies with the rolling easement, then eventually the land will convert to tidal wetlands, beaches, or open water. This conversion will subject the land to existing wetland protection rules and (in most cases) eventually transfer title of the land from the owner to the state. At that point, the mission of the rolling easement will be accomplished. A rolling easement can set ground rules for this transition.



**Photos 1 to 4. Few landowners choose to give up their homes to a rising sea.** Top left and right: A home on pilings in front of shore protected by a stone revetment (left) and two homes protected by seawalls (right) on land extending into the Gulf of Mexico, along Bluewater Drive north of Surfside, Texas (May 2003). Bottom left: a home on pilings on an eroding beach at Kitty Hawk, North Carolina (October 2002) Bottom right: homes behind a bulkhead whose toe is protected by a stone revetment at North Beach, Maryland (September 2008). Photo source: ©James G Titus, used by permission.

We hope that this exposition does not leave the impression that rolling easements are easy to enact or enforce. A large rise in sea level would eventually require communities to either hold back the sea or move inland. Neither of these options seems feasible today, given what we know about the forces of nature and human nature. Yet those are the only logical possibilities. If some lands must give way to the rising sea, the economic, environmental, and human consequences could be much less if the abandonment occurs according to a plan rather than unexpectedly.

The merits of planning do not guarantee, however, that the plan will be carried out everywhere that lands are subject to a rolling easement. People rarely give up a home voluntarily, even when they have notice.<sup>18</sup> Governments may relax rolling easement regulations instead of preventing shore protection, especially if the public sympathizes more with the waterfront landowners losing their homes than with the environmental resources threatened by shore protection. Courts are often skeptical about previous generations' efforts to use land deed restrictions to limit what people can do today with their land.<sup>19</sup> Even restrictions recorded onto a land deed in return for a fair payment may eventually be overturned by a court, especially if the original purpose of the restrictions no longer

seems to benefit society. Yet some legal agreements and regulations continue to have force for a long time, when succeeding generations continue to find the rules reasonable. The principle that property boundaries move as the shore erodes, for example, is more than 500 years old.<sup>20</sup>

Thus an underlying premise of this report is that some rolling easements will be enforced, some will be modified, and some will be invalidated. Rolling easements would generally involve permanent restrictions. But the overall objective of a rolling easement policy need not be to force future generations to give up homes to a rising sea against their better judgment. It is simply to ensure that they will have the option to retreat or hold back the sea as they see fit in the circumstances they face, instead of having their options limited by the decisions that our generation makes today.

---

If some lands must give way to the rising sea, the economic, environmental, and human consequences could be much less if the abandonment occurs according to a plan rather than unexpectedly.

---



## NOTES AND REFERENCE

<sup>1</sup> See, e.g., NOAA (NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION), SEA LEVEL VARIATIONS OF THE UNITED STATES 1854–1999 (NOAA TECHNICAL REPORT NOS CO-OPS 36, 2001). This report and subsequent updates displayed on NOAA's website. Available at:

<http://tidesandcurrents.noaa.gov/sltrends/sltrends.shtml>.

<sup>2</sup> See, e.g., INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CONTRIBUTION OF WORKING GROUP I TO THE FOURTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE 7 Table SPM.1; *id.* at 13 Table SPM.3, and *id.* at 820 Table 10.7 (2007).

<sup>3</sup> CLIMATE CHANGE SCIENCE PROGRAM, COASTAL SENSITIVITY TO SEA LEVEL RISE: A FOCUS ON THE MID-ATLANTIC REGION 2 (U.S. Environmental Protection Agency 2009) [*hereinafter* CCSP].

<sup>4</sup> INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE: THE IPCC RESPONSE STRATEGIES, 146–149 (1990).

<sup>5</sup> If people were not moved out of harm's way as sea level rises, buildings that are in low-lying areas today would eventually be standing in open water. There is probably a limit to the number of dock homes a given community would tolerate.

<sup>6</sup> See CCSP, *supra* note 3, at 97–103.

<sup>7</sup> See, e.g., James G. Titus, *Rising Seas, Coastal Erosion, and the Takings Clause: How to Save Wetlands and Beaches without Hurting Property Owners*, 57 MD. L. REV. 1281, 1308–1318 (1998) [*hereinafter* MARYLAND LAW REVIEW]. That article used the phrases “deferring action” instead of “laissez-faire” and “preventing development” instead of “setbacks.” See also IPCC, *supra* note 4, at 147 (using the terms “preventing development”, “planned phaseout”, and “no direct government role”).

<sup>8</sup> See notes **Error! Bookmark not defined.–Error! Bookmark not defined.** and accompanying text.

<sup>9</sup> See J.G. Titus, R. Park, S.P. Leatherman, R. Weggel, M. Greene, P. Mausel, M. Treehan, S. Brown, C. Gaunt, & G. Yohe, *Greenhouse Effect and Sea Level Rise: The Cost of Holding Back the Sea*, 19 COASTAL MGMT. 171, 189–92 & Tables 2 and 9 (1991).

<sup>10</sup> 16 U.S.C. §3501 *et seq.*

<sup>11</sup> See, e.g., CCSP, *supra* note 3, at 171.

<sup>12</sup> See, e.g., ENVIRONMENTAL RESEARCH LETTERS, *infra* note 14, Table S3 (projecting that 26 miles of ocean shoreline along developed barrier islands covered by Coastal Barrier Resources Act in Currituck, Hyde, and other counties are less likely to be protected

than similar barrier islands not covered by the act) and *id.* Table S5 (concluding that being covered by the Coastal Barrier Resources Act reduces the likelihood of shore protection from “almost certain” to “likely,” based on interviews with local planners).

<sup>13</sup> See, e.g., NOAA COASTAL SERVICES CENTER, BEACH NOURISHMENT: A GUIDE FOR LOCAL GOVERNMENT OFFICIALS, section on “Federal Cost Participation” (undated), <http://www.csc.noaa.gov/beachnourishment/html/human/socio/shares.htm>, cited April 1, 2011 (discussing sources of beach nourishment funding in Florida which include special taxing districts) and CARTERET COUNTY, NORTH CAROLINA, ADOPTED BUDGET 2011–2012 222 (mentioning Salter Path Special Taxing District for Beach Nourishment).

<sup>14</sup> E.g., J.G. Titus, D.E. Hudgens, D.L. Trescott, M. Craghan, W.H. Nuckols, C.H. Hershner, J.M. Kassakian, C.J. Linn, P.G. Merritt, T.M. McCue, J.F. O'Connell, J. Tanski, & J. Wang, *State and Local Governments Plan for Development of Most Land Vulnerable to Rising Sea Level along the U.S. Atlantic Coast* 4 ENVIRONMENTAL RESEARCH LETTERS 044008 V (2009).

<sup>15</sup> Cf. CCSP, *supra* note 3, at 87, 102, and 149 (questioning the sustainability of shore protection).

<sup>16</sup> Many federal agencies are starting to consider how to adapt to changing climate. WHITE HOUSE COUNCIL ON ENVIRONMENTAL QUALITY, PROGRESS REPORT OF THE INTERAGENCY CLIMATE CHANGE ADAPTATION TASK FORCE (2010). For a brief discussion of federal opportunities to adopt a rolling easement, see James G Titus, [\*Does the U.S. Government Realize that the Sea is Rising? How to Restructure Federal Programs so that Wetland and Beaches Survive\*](#), 30 GOLDEN GATE UNIVERSITY LAW REVIEW, 717, 752–769 (2000).

<sup>17</sup> In the case of future interests in land where the entire parcel transfers at once to the rolling easement holder, “submerge date” means the day the property transfers.

<sup>18</sup> See, e.g., *Severance v. Patterson*, 566 F. 3d 490 (5th Cir. 2009) and *Brannan v. State*, No. 01-08-00179-CV, (Tex. App.–Houston [1st Dist.] Feb. 4, 2010, pet. filed).

<sup>19</sup> Legal scholars generally use the term “dead hand control” when referring to efforts by previous generations to limit what present owners can do. See, e.g., Andrew Dana and Michael Ramsey, *Conservation Easements and the Common Law*, 8 STAN. ENVTL. L. J. 1, 22–24 (1989). The planning literature appears to have no comparable term for similar long-term effects caused by investment decisions. Boston's streets, for example, follow the paths that early settlers used to

---

take cows to pasture or grain to the mill. See D.B. FRADIN, *SAMUEL ADAMS: THE FATHER OF AMERICAN INDEPENDENCE* (1998), and Megan Woolhouse, *Seeing Double in Quest to Map Boston's Roads*, BOSTON GLOBE (March 19, 2008).

<sup>20</sup> See *infra* note **Error! Bookmark not defined..**





