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Spring June, 2013

# Thinking Ahead: The Impacts of Sea Level Rise on Coastal Landscape Protections

Chad J McGuire  
Devon Lynch



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# NATURAL RESOURCES & ENVIRONMENT

ABA SECTION OF ENVIRONMENT, ENERGY, AND RESOURCES

VOLUME 27, NUMBER 4, SPRING 2013

## *Landscape Protection*

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- WILDFIRE PREVENTION, EVERGLADES RESTORATION
- HABITAT MANAGEMENT, COASTAL LANDSCAPE PROTECTION

- NATIVE AMERICAN CULTURAL LANDSCAPES
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## FEATURES

- 3 The Importance of Community in Wildfire Prevention and Hazard Mitigation**  
*Meredith Van Horn*
- 7 Jump-Starting Everglades Restoration via Tools for Interim Progress**  
*Jane Graham and Julie Hill-Gabriel*
- 12 Nutrients in the Heartland: Regulatory and Legal Issues Surrounding the Mighty Mississippi**  
*Terry J. Satterlee, Justin D. Smith, and Vanessa D. Dittman*
- 17 Ecology-Based Habitat Management: Letting the Birds Dictate the Planning Unit**  
*Jane E. McBride*
- 23 Taking Care of Native American Cultural Landscapes**  
*Dean B. Suagee and Peter Bungart*
- 28 Thinking Ahead: The Impacts of Sea Level Rise on Coastal Landscape Protections**  
*Chad J. McGuire and Devon Lynch*
- 36 When All You Have Is a Hammer: Scientific Uncertainty and Bay-Delta Policy, 1995 to Present**  
*David Aladjem*
- 40 The RESTORE Act: Legislation That Works for the Gulf Coast**  
*Gerald J. Pels and Julia C. Rinne*

## DEPARTMENTS

- VANTAGE POINT** **INSIDE FRONT COVER**
- THE LEADING EDGE** **2**
- INTERVIEW** **44**
- INSIGHTS**
- Neighborly RCRA Claims** **48**  
*John M. Barkett*
- The New Old Grievances Against ESA Citizen Suits** **50**  
*Madeline June Kass*
- Current Developments in U.S. Food Regulation** **52**  
*Patrick J. Paul*
- Potential Legal Implications of Birds and Buildings** **53**  
*Brooke Wahlberg and Laura Evans*
- In Support of Practical Legal Scholarship** **55**  
*Laurie Ristino*
- West Virginia's Land Stewardship Corporation Act** **57**  
*Gale Lea Rubrecht*
- LITERARY RESOURCES** **60**
- THE BACK PAGE** **64**

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# Thinking Ahead: The Impacts of Sea Level Rise on Coastal Landscape Protections

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Chad J. McGuire and Devon Lynch

Coastal areas are dynamic regions where the landscape is constantly evolving. The ebb and flow of tidal waters provides a steady and recurring sense of change; the intertidal zone between high and low tides varies between exposure and inundation, extending the land-sea interface seaward during low tide and moving it landward during high tide. Beyond the cyclical influences of tidal ranges on coastal areas, other forces aid in creating the dynamic aspects of coastal landscapes. Storm events are often borne in ocean waters and bring their energy to coastal regions, including powerful and sometimes destructive forces that can provide lasting change to the landscape of impacted coastal areas. A more recent phenomenon influencing coastal areas is observed sea level rise.

Mounting evidence is confirming that sea level rise is related to climate change and will continue to occur in the foreseeable future. See U.S. GLOBAL CHANGE RESEARCH PROGRAM, GLOBAL CLIMATE CHANGE IMPACTS IN THE UNITED STATES 18 (2009), available at [www.globalchange.gov/what-we-do/assessment/previous-assessments/global-climate-change-impacts-in-the-us-2009](http://www.globalchange.gov/what-we-do/assessment/previous-assessments/global-climate-change-impacts-in-the-us-2009). The impact of sea level rise on coastal landscapes can be significant and markedly different than the other dynamic forces of tides and storm events mentioned above. Unlike these other forces, sea level rise fundamentally changes the land-sea interface, particularly for low-lying coastal areas where there is a slight and gradual gradient of elevation moving landward from the ocean. In low-lying coastal areas, modest increases in sea level rise can impact large swaths of adjacent dry land, creating permanently submerged land from what was previously dry land. This kind of change to the coastal landscape is significant because, in many cases, it is irreversible in timescales that are operative for human beings.

The fact is sea level rise alters coastal landscapes, particularly by moving the sea inland and thus creates special considerations for the kinds of coastal landscape protections traditionally used along coastal areas. The purpose of this article is to highlight the impact of sea level rise on coastal landscape protections. To begin, a summary is provided of how coastal land is both utilized and protected. The utilization of coastal land includes a discussion of the values associated with coastal zones, including the development value of coastal land and the intrinsic ecological values that exist within coastal

landscapes. From this summary, the issue of coastal landscape protection is discussed in relationship to sea level rise. This discussion focuses on two main choices relative to sea level rise response: staying at the coastline or, alternatively, retreating from the coastline. The factors impacting a stay or retreat decision are identified and explored. Next, the legal considerations associated with the two choices—staying or retreating—are summarized. The relative benefits and costs of each choice are reviewed in relation to maintaining coastal landscape features, as are the potential legal impacts of government policies that affect private property rights in coastal land. Finally this article concludes with some recommendations on planning for the impacts of sea level rise from a programmatic standpoint, including the need to prioritize a response to sea level rise, understand the implications of choosing between staying at the shore and retreating from the shore, and understanding how these choices help to define and impact both the physical makeup and use of the coastal landscape in the future.

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## Sea level rise alters coastal landscapes and creates special considerations for the kinds of coastal landscape protections traditionally used along coastal areas.

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Coastal landscape protections have evolved over time as the ecological values of coastal regions have become realized. Early in our history, coastal areas were often filled or altered in order to support human development. In addition, hard armoring techniques were often employed to create barriers—such as seawalls—as a means of protecting developed coastal areas from inundation as a result of storms, hurricanes, and other forces with the potential to negatively impact coastal development. These actions—filling and hard armoring—often resulted in a loss of coastal landscape features such as wetlands, sandy beaches, dunes, native shoreline grasses, and other characteristics often found in traditional undisturbed coastal habitats. For example, a seawall made of hard substances like concrete or granite and erected near the shoreline to protect against storm surges often interrupts the natural coastal landscape by dividing the normal physical, biological, and chemical

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connections between the land and sea in a coastal area.

Scientific advancements in areas such as coastal ecology and biogeochemistry have helped to create an understanding of the value of coastal features. Coastal wetlands provide important nursery habitat for valuable commercial and recreational marine species such as fish, crab, oysters, and clams. In addition, uninterrupted physical and chemical processes in coastal bays and tidal rivers contribute to important regulating services such as the filtration of water, which helps maintain and often enhance overall water quality of the coastal feature. There are many other examples of the importance of a functioning coastal landscape; as our understanding of ecosystem sciences have evolved, our understanding of the value of coastal landscapes has also evolved. State and federal laws protecting water quality standards, wetlands, and ecological values through endangered and threatened species are all indicators of a public policy movement toward greater recognition of the ecological values associated with intact and undisturbed landscapes.

Most coastal landscape protections that exist today in the law are aimed at protecting against human actions that directly threaten explicitly identified ecosystem values. For example, state wetland protection laws often prevent the filling or altering of wetlands by humans without first meeting established criteria for the protection of identified ecosystem values and showing how those values will be protected through mitigation techniques. For proposed wetland filling that meets federal jurisdiction requirements, the Federal Clean Water Act requires a permitting process through the Army Corps of Engineers. 33 U.S.C. §1344. The permitting process, like similar state wetland laws, is geared toward protecting the ecosystem values associated with wetland resources to ensure those values are not being unduly abused in any filling process. In both the state and federal wetland protection laws, the “trigger” for regulatory protection is a purposeful and planned human activity; humans are actually planning to fill wetlands, and this planned action is a condition precedent that triggers the regulatory safeguards.

These regulations must be differentiated from the *passive* act of sea level rise and its impact on changing coastal landscapes. Although humans may have an indirect influence on sea level rise, no one is purposefully intending to make the sea levels rise or taking other action that directly results in impact. Thus, there is no regulatory requirement that proactively protects coastal landscape features, including important coastal landscape ecological functions, from the impacts of sea level rise. For example, sea level rise can work progressively over time to inundate wetland areas and dry land, essentially destroying the ecological functions of the coastal area as the seas move landward. However, because this action is occurring without direct influence by humans, there are no legal mechanisms to directly address the impact of sea level rise on the coastal landscape. Thus, the impacts must be dealt with more indirectly through land use planning that includes making decisions today about the influence of sea level rise on the coastal landscape tomorrow. The remainder of this article focuses on the kinds of land use planning mechanisms involved in this process. By defining the impact of land use decisions on coastal landscape features under conditions of sea level rise, important themes can be identified that help those working in coastal areas identify the values associated with coastal landscapes and, through identification of these values, be better equipped to understand the tradeoffs between land use planning decisions impacting these values both today and tomorrow.

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### *Incorporating Sea Level Rise in Coastal Land Use Planning*

Incorporating sea level rise into coastal land use planning requires a proactive approach where future sea level rise is internalized in the decision-making process of how land is used today. This kind of planning is different because it presumes a changing landscape resulting from sea level rise where the extent of that change is unknown. For example, the sea may rise only a few inches and have a relatively negligible effect on a particular coastal area in terms of how far the sea moves landward. Or, the sea may rise a few feet; depending on the geography of the coastal area, in that circumstance, a low-lying coastal area could experience inundation landward on the order of tens to hundreds of feet.

Planning for unknown sea level rise presents challenges, particularly when the goal of the planning is to provide for the greatest degree of human use in the coastal area while also ensuring the protection of important coastal functions. In making these kinds of decisions, there are generally two approaches one can take toward sea level rise: stay at the shore or retreat from the shore. There are numerous factors involved in choosing to either stay or retreat from the shore, such as the preexisting commitments to the shoreline. Manhattan, for example, presents a substantial commitment of human resources and intensity of development that weigh heavily in favor of staying. Rural areas with limited coastal development, on the other hand, may present better opportunities for retreat, particularly where the surrounding coastal landscape is unaltered and contains a host of ecological values.

Without identifying every factor involved in a stay versus retreat determination, major considerations between the two approaches are outlined below. Staying at the coast represents a commitment of resources and, potentially, the need to either impact the integrity of the coastal landscape by protecting against an approaching sea or accept the losses associated with rising sea levels. Conceptually, there are two ways in which one can employ a “stay” approach in land use planning along the coast in response to sea level rise. The first approach is to stay and armor against the incoming tide. The second approach is to stay and allow the sea to move landward naturally, altering behavior patterns depending on the extent of the sea level rise that actually occurs. The two approaches to staying at the coastline have different impacts on the coastal landscape, especially if we assume sea level rise will continually occur over time and, in the aggregate, substantially alter the coastline in question.

Staying and armoring against the incoming tide impacts the

coastal landscape by placing a physical structure in the path of the rising sea. With hard armoring, a seawall or similar structure establishes a fixed point from which the sea can migrate no further inland. Once the seawater meets the wall, the natural transition zones of the coastal area are interrupted. There is no longer a direct connection between the sea and coastal features such as an intertidal zone, sandy beach, dunes, sea grasses, and wetlands. In removing the physical characteristics between the upland and sea, hard armoring devices also inhibit the ecological functions associated with coastal areas. Sea level rise simply acts as a catalyst for this process; as the water rises to greater depths at the seawall, the chemical, physical, and biological conditions necessary to support a coastal ecosystem community are further diminished.

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## Government can opt to focus on managing human expectations in a way that accommodates sea level rise, including the approach of the sea landward.

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Alternatives to hard armoring include the use of softer and impermanent armoring techniques that provide a degree of protection from immediate sea level rise, but are not meant to serve as long-term preventative measures to hold back the sea. Beach nourishment projects help to reinforce the height and stability of coastal areas, while other techniques attempt to raise the height of the land-sea interface using geo-tubes and other devices to better mimic natural background conditions. These softer forms of armoring provide a greater capacity for coastline features to move landward with sea level rise and thus maintain some of the ecological values associated with the coast. However, these softer techniques provide less protection against the rising tide and may be disfavored amongst private coastal landowners who are less willing to commit resources to development of the area without a more definitive set of protections. In addition, the ability to insure against property loss along coastal areas affected by sea level rise is likely influenced by the degree to which the potential impacts of sea level rise are mitigated; in this case hard armoring techniques might provide a greater degree of insurability over soft armoring methods.

Rather than armoring against the tide to protect citizens remaining at the shoreline, government can opt to focus on managing human expectations in a way that accommodates sea level rise including the approach of the sea landward. The choice to allow the sea to migrate inland has different impacts on coastal features than the choice to armor against the tide. The lack of armoring allows the uninhibited migration of the sea, including the opportunity for coastline characteristics to also migrate inland. Depending on the rate of sea level rise, coastal features such as wetlands and associated biota can also move incrementally inland; unobstructed movement can allow

for ecosystem services and values to be maintained. The issue really becomes one of managing the expectations of those who remain at the coastal zone. For example, some have suggested rolling easements—a land use planning device that allows existing land use patterns to migrate in-step with changing conditions in the coastal zone—could be utilized in situations where the sea is allowed to move landward unabated; the easement rights are generally based on existing dimensions of the coastal zone and can include public access rights to the coastal zone in certain states.

As sea level moves inland, the dimensions of those public rights also move landward. For example, coastal zone characteristics, including natural transitions between dry land and the sea, can often include wetlands and sandy beach as intermediary zones between the dry land and sea. Assuming incremental advance of the sea landward under conditions of sea level rise, a rolling easement would follow the changing aspects of the coastal zone characteristics landward. As the wetland and sandy beach areas move inland so too do the public rights that follow those land characteristics. For example, a public right of access may be created in an area that was once wholly private land without such access rights. In addition, the creation of new wetlands may restrict private development opportunities depending on applicable federal and state law. The effect can be that adjacent private property owners lose rights to portions of their private property as the easement rights “roll” landward. (For a detailed explanation of rolling easements, see 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. 1279 (1998)). This kind of alteration of public and private rights due to an encroaching sea raises important legal questions relative to private property interests as the expectations of private landowners are often not matched to the idea of losing property rights over time, particularly when government regulations prevent the ability of the private landowner to defend against the approaching sea by erecting barriers or similar protective techniques.

The alternative to remaining at the coastal zone under a “stay” policy—whether that policy includes armoring or not—is to retreat from the shoreline as sea level rise occurs. Retreat can be done in many ways, but the meaning of the term here refers to a planned set of principles proactively developed to move people away from the shoreline as seas move landward. The most programmatic approach is to develop comprehensive land use planning principles, sometimes referred to as zoning overlay districts, which exist in addition to background land use planning requirements and are concentrated within a specified geographic proximity to the shoreline. Zoning overlay districts work to establish land use restrictions that, like rolling easements, move with the tide landward. For example, an overlay district might be defined as beginning at a baseline and extending landward a certain distance, such as 1,000 feet. The baseline is generally the mean (average) high or low tide mark. As sea levels move landward, the baseline also moves landward thus incrementally moving the overlay district from wherever sea level resides to 1,000 feet inland from that point.

Within the 1,000 feet of the zoning overlay district there may be a number of subzones. An area closest to the shoreline, such as 100 feet, may be prohibited from development (the actual area determined may be based on background rates of erosion or inundation as the sea moves landward). The next 400 feet landward may be under a restricted set of building



standards that include structural elements designed to mitigate the influence of sea level rise; for example, a requirement that the building be raised or easily capable of being moved. The final 500 feet landward may be under the least restrictive set of requirements within the zoning overlay district.

Where one's private property exists within the overlay district will define the current expectations of the landowner in relation to sea level rise. If and when sea level rises sufficiently, private landowners may have to change their expectations based on their property existing in a more restrictive zone of the overlay district. Incrementally, the overlay district helps to manage private landowner expectations by establishing standards that change depending on the extent of sea level rise. In addition, the general stance on retreat from the shoreline is one that provides an opportunity for coastal landscapes to maintain their features and integrity over time by allowing room for the features to move landward in concert with the extent of sea level rise.

### Legal Considerations

Land use planning techniques that allow coastal landscape features to move inland in conjunction with sea level rise tend to provide the best means of maintaining those features and, by doing so, protect important ecosystem functions of the coastal landscape. However, there are important legal considerations in adopting land use planning techniques that allow for the free movement of the sea landward, including the takings clause of the Fifth Amendment to the U.S. Constitution.

From a constitutional perspective, government restrictions on land use are limited to the extent those restrictions are seen to overly burden the private land and thus violate the Fifth Amendment's prohibition on the taking of private property without a public purpose and justly compensating the affected private landowner. Government conduct can enter within the zone of influence of Fifth Amendment takings protections in two primary ways: it can either engage in purposeful acts of taking private land for a public purpose, or it can engage in acts that do not intend a taking of private land but are nevertheless deemed to constitute a taking due to the effect and impact the government conduct has on private property. When government acts to take private land for a public purpose, it generally does so under its eminent domain powers and provides the private landowner with just compensation determined by the fair market value of the land at the time of the taking. An example in the context of sea level rise might be an eminent domain procedure to purchase a section of land parallel to the shoreline in order to erect a seawall for the protection of the areas landward of the wall. Another example may be where government, enacting and implementing a zoning overlay district as discussed earlier, uses its eminent domain power to compensate private landowners whose property might exist within the most restrictive "no development" zone of the overlay district, the area immediately adjacent to the shoreline.

The more difficult situation for takings purposes is when government enacts regulations, like a zoning overlay district, but does not attempt to exercise its eminent domain power as the means of implementing the restrictions within the newly created zoning district. In this situation government is generally relying on its constitutional police powers, suggesting the restrictions are needed to protect the public safety and welfare

against the dangers associated with sea level rise. The legal question, then, is whether the government conduct is a legitimate exercise of its police powers, or whether the impact of the action on private landowner rights is of the kind that triggers a Fifth Amendment takings claim under a theory that the government action results in an unconstitutional *regulatory taking* of private property rights. There is no clear answer to this question as it touches upon an area of law that is highly fact specific and contingent on the kinds of background principles of property law that exist within the individual state in which the action is taking place. For those seeking a more elaborate discussion on the principles of regulatory takings law in relation to sea level rise, please see Chad J. McGuire and Jason Hill, *Climate Adaptation and the Fifth Amendment of the U.S. Constitution: A Regulatory Takings Analysis of Adaptation Strategies in Coastal Development with Application to Connecticut's Coastal Management Regime*, 5 SEA GRANT LAW & POLICY JOURNAL 140 (2012), available at: <http://nsglc.olemiss.edu/SGLPJ/vol5No1/McGuire.pdf>. It is apparent, however, that there is a greater likelihood of takings challenges by private landowners when government engages in coastal landscape protections that include the following characteristics:

- Substantial limitations by government are placed on the use of private property.
- The government limitations are not clearly supported by background principles of state property law.
- Government is unwilling to pay just compensation to private landowners for the loss in the use of their land.

When these characteristics are present, government conduct moves away from its constitutional police powers and closer toward an unconstitutional taking of private property rights. Thus, the manner in which government chooses to engage in coastal landscape protections is critical when analyzing the likelihood of a regulatory taking challenge; avoiding the characteristics listed above is critical to insulate government actions against takings claims.

Based on what has been described above, we can entertain how government actions can move toward implementing coastal landscape protections in response to sea level rise while limiting the potential for those actions being characterized as unconstitutionally impinging on private property rights. First, it must be acknowledged that the protection of coastal landscape features under the threat of sea level rise implicates private land use limitations that will likely trigger regulatory takings challenges. As shown in this article, protecting coastal landscape features means allowing the sea to move landward uninhibited by armoring or other techniques that impact the integrity of coastal features. By doing so, private land will undoubtedly be impacted. For those closest to the sea, private land will become submerged land without protection and thus revert to public ownership, at least under traditional legal interpretations of "natural" shifts in the land-sea interface. Second, where zoning overlay districts might be implemented, the capacity to develop private land may be limited in the most at-risk areas. Given the financial value typically associated with coastal lands, these limitations will likely trigger takings challenges. Governments may choose to pay for the loss in property rights to avoid regulatory takings challenges. This may in fact be a superior option for certain coastal areas where the values being protected clearly exceed the costs of compensating affected landowners through the government action. However, many state and local governments

may lack the resources to provide compensation, despite the value that may be associated with the protection that would be gained. The fact that ecological benefits tend to accrue to all members of society—we all benefit from biodiversity and its associated values, for example—may provide some equitable basis for expanding the funding mechanism to protect coastal landscapes beyond state and local governments, for example, by triggering federal funding mechanisms to help mitigate the costs of providing such protections where the impacts to private property rights demand compensation under the law.

### ***Recommendations***

It is critical for governments to establish clear priorities ahead of sea level rise and implement these priorities in a programmatic policy approach aimed squarely at the impacts of future sea level rise on the coastal landscape of the area under consideration. The priorities and policy approaches developed by government need to incorporate, among other considerations, the impacts of legal frameworks on policy directions. For example, will the response in a particular coastal area be to stay or retreat? If the response is to stay, will armoring be chosen to protect the coastal area, or will the sea be allowed to migrate landward? If armoring is chosen, then the impacts on the coastal landscape, including the impact on ecological values, should be assessed. Alternatively, if the sea is allowed to migrate landward, then government needs to assess the viability of takings challenges in the region and then either choose to pay private landowners for their losses through eminent domain powers or prepare to defend against takings claims by understanding the relationship between the regulations enacted and background principles of state property law. If the choice is to retreat from the shore, the same issues related to takings challenges must be entertained, particularly if government opts for land use instruments such as rolling easements and zoning overlay districts that place greater emphasis on the ecological integrity of the coastal system, including public rights in coastal areas, thereby diminishing the protection of private rights in the coastal zone. Finally, part of the planning process must include an understanding of the impact of these choices on the coastal landscape, including the relationship of the coastal landscape to other important values of the particular coastal region under consideration.

It is important to remember that government has a number of options regarding how to approach sea level rise adaptation issues in the coastal zone. Beyond the power of planning, zoning and other regulatory instruments, there are also spending, taxing, and market-based tools that may be employed to achieve coastal landscape protections. Government can engage in the purchase of target coastal areas; for example, capital can be spent to purchase undeveloped tracks of coastal land strategically based on both the ecological values of the land and its role in protecting against coastal hazards. In addition, government can engage in buyout programs for developed coastal land; some buyout programs are focused specifically on coastal areas ruined by recent storm events and thus shown to be in unstable and dangerous locations. These tracts of developed land can be identified based on established

risk factors and essentially “retired” from development to help provide a buffer against sea level rise and potentially allow for coastal landscape features to migrate inland. Government may also choose to alter the conditions upon which it insures coastal properties (for example, under the federal National Flood Insurance Program); by removing insurance subsidies, some of the more sensitive coastal areas may be protected from future development due to the private internalization of risk that results from removal of public insurance subsidies.

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## **Governments must establish clear priorities ahead of sea level rise and implement them in a programmatic policy approach aimed at the impacts of future sea level rise.**

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Taxing and market-based incentives can also aid in providing protections to existing coastal landscape features. Tax incentives, including lowered assessment rates and deferral of property taxes, can create incentives for private coastal landowners to keep coastal tracts in an undeveloped state; conservation restrictions are often used to accomplish open space goals by reducing the tax burden of the landowner in exchange for an agreement to refrain from developing the land. Market incentives, such as locating enterprise zones away from coastal areas, may help to alleviate coastal development pressure by moving the locus of the development landward. Also, disclosure requirements for market-based transactions, such as the purchase and sale of coastal real estate, may help to limit the purchase of coastal properties where forecasts of future sea level rise indicate a strong likelihood of inundation and increased risk to storm exposure (insurance industry adjustments for such risks can be helpful in this regard as well). Collectively, the use of taxing authority and ensuring transparency through the disclosure of certain key information can aid in protecting coastal landscape features in the face of sea level rise.

Sea level rise has the capacity to significantly alter coastal landscapes. Assuming the rate of sea level rise occurs slowly enough to allow for adaptation, many coastal landscape features can successfully migrate inland where the land is unobstructed and can otherwise accommodate such a migration. Obviously this will occur most easily in areas that are undeveloped or where human expectations have been managed in such a way that allow for the relatively free movement of coastal features in step with sea level rise. Government has a role to play in helping to resolve these complex issues, which are surmountable. What is most important is to begin taking proactive steps now because, in a world where sea levels are rising, these problems will not go away on their own. 🌳