Chapter 6: Climate Adaptation and Disaster Mitigation: Land Use Strategies

I. Climate Change, Adaptation, and Disasters
- A. Inundation, Flooding, and Fiercer Storms
- B. Policy Options
- C. The Local Role: First Affected and First To Respond

II. Federal Actions: Policy, Funding, and Technical Assistance
- A. Supportive Role Of Federal Government
- B. Disaster Mitigation Act of 2000
- C. Coastal Zone Management Act of 1972

III. State Actions: Plenary Power and Coordination
- A. Intermediary between Federal and Local Governments
- B. Types of State Actions
  - i. Maine: Direct State Permitting for Coastal Development
  - ii. Maryland: Developing Best Practices and Training Local Officials
  - iii. New York: Funding For Local Resiliency Measures
  - iv. North Carolina: Conformity of Local Plans with the State's Coastal Area Plans
  - v. South Carolina: Guiding Development toward Retreat
- C. Florida: A Case Study in Direct State Action: Beach Renourishment

IV. Local Initiatives
- A. General Strategies
  - i. Comprehensive Planning
  - ii. The Project Application Process
  - iii. Environmental Impact Review
  - iv. Project Approval Conditions
  - v. Contingency Bargaining
- B. Case Studies
  - i. Miami-Dade County Task Force: Findings
  - ii. City of Bainbridge Island, Washington: Environment Element
  - iii. Town of Duck, North Carolina: Moratorium on Rebuilding and Reconstruction
  - iv. East Hampton, New York: Local Waterfront Revitalization Plan
  - v. New York City Initiatives

V. Dealing with Judicial Decisions
- A. Ambiguity in Supreme Court Jurisprudence
  - i. *Stop the Beach Renourishment, Inc. v. Florida Department of Environmental Protection*
  - ii. *Koontz v. St. Johns River Water Management District*
  - iii. *Lucas v. South Carolina Coastal Council*
- B. Antidotes For The Legacy of *Lucas*
  - i. Adjusting Lucas to Changed Circumstances
  - ii. Public Trust and The Doctrine Of Waste

iii. Natural Use Doctrine
iv. Permitting Minimal Use of a Parcel
C. Changes In The Regulatory Environment
VI. Societies Choosing to Succeed

I. Climate Change, Adaptation, and Disasters

A. Inundation, Flooding, and Fiercer Storms

In Chapter 5, the gathering consensus regarding climate change and its impacts on the environment and human settlements are discussed. That chapter cited the increasing number of independent reports that recognize the existence of climate change and associate it with human behavior. Of importance to this chapter is the effect of climate change on sea levels, storm surges, and extreme precipitation that affect the local environment and that are driving local governments to respond to climate-induced disasters with the significant help of their states and federal agencies.

The 2013 report of the U.S. Global Change Research Program, discussed in Chapter 5, forecasts likely future changes including more intense hurricanes with related increases in wind, rain, and storm surges, and sea level rise in coastal areas.[1] In *Massachusetts v. EPA*, the Supreme Court incorporated by reference a report of the National Research Council that "identifies a number of environmental changes that have already inflicted significant harms, including the global retreat of mountain glaciers, reduction in snow-cover extent, the earlier spring melting of ice on rivers and lakes, [and] the accelerated rate of rise of sea levels during the 20th century relative to the past few thousand years."[2] Climate change causes the temperature of seawater to increase.[3] This rise in sea temperature in tropical areas increases the ferocity of hurricanes, as "[w]armer surface water dissipates more readily into vapor, making it easier for small ocean storms to escalate into larger, more powerful systems."[4]

The combination of sea level rise and more intense storm events can lead to a host of problems, including reduced freshwater supplies and severe damage to infrastructure of all types, including energy generation plants, and coastal and flood plain ecosystems.[5] The threat of extreme precipitation is of particular concern in the Northeast and Midwest regions where the intensity and number of extreme rainfall events have increased substantially over the past 30 years, with flooding drastically affecting communities in the Northeast.[6] Climate change brings with it warmer air which contains more water vapor and affects weather patterns, particularly in storm fronts in mid-latitude regions.[7] Simply put, "storm surges are exacerbated by rising sea level."[8] This danger is of no small consequence, as "thirty-nine percent of the population lives in coastal shoreline counties . . . [and] just under half of the annual GDP of the United States is generated in coastal shoreline counties, an annual contribution that was $6.6 trillion in 2011."[9]

True to these predictions, Hurricane Sandy hit the East Coast in October 2012, becoming the second costliest hurricane in the nation's history, with damage measured at $65.7 billion.[10] With wave heights peaking at over 32 feet, Sandy damaged or destroyed 650,000 homes, mostly in New York and New Jersey.[11] The extraordinary national attention Sandy attracted masks the reality that in 2012 alone, there were 11 climate related weather events with damage exceeding $1 billion in the United States.[12] Gulf Coast state residents are still recovering from Katrina, the nation's costliest hurricane with damages exceeding twice those of Sandy.[13] A Presidential task force on rebuilding post-Sandy makes it clear that climate change has "eliminated the option of simply building back to outdated standards. . . ."[14] The nation cannot continue to afford the cost of rebuilding.

Development pressure on U.S. coastlines—building allowed by local land use plans and regulations—is bound to make a bad situation worse in coming decades. In 2010, more than 123 million Americans—39%of the U.S. population—lived in coastal counties, according to the National Oceanic and Atmospheric Administration (NOAA). NOAA expects the coastal population to increase by eight percent to 133 million by 2020.[15] State and local governments in these areas are beginning to pay attention to these warnings and to real signs that the effects of climate change are already occurring, particularly at the ocean's edge. As this chapter demonstrates, local governments are rethinking and revising their land use plans and zoning to reflect what they have learned by the destruction wrought by coastal storms and unprecedented flooding.

As state and local governments struggle to frame responses to these worsening problems, certain decisions made at the federal level have rendered their task more difficult. Most notably, despite all that we have learned in the past few decades, Congress has failed to update the Coastal Zone Management Act and Disaster Mitigation Act, while the Supreme Court has created judicial barriers to effective state and local action. *Lucas v. South Carolina Coastal Council* (1992), *Stop the Beach Renourishment v. Florida Department of Environmental Protection* (2010), and *Koontz v. St. Johns River Water Management District* (2013) have had an unsettling effect on state and local agencies as they attempt to address the devastating effects of increased sea level rise and storms.[16]

B. Policy Options

There are three main policies for dealing with sea level rise: retreat, accommodation, and protection.[17] Retreat policies aim to minimize the hazards of sea level rise by restricting, prohibiting, or removing development from vulnerable areas. Examples of retreat strategies include government land acquisition, rolling easements, and setback requirements. Accommodation strategies attempt to minimize damage to structures from flooding and storm surges. Options include minimum floor elevations and structural bracing to protect against surging water or high winds. Protective measures essentially defend against the threats of sea level rise; they may be divided into two approaches: hard and soft structural options. Hard options include dikes,

levees, floodwalls, seawalls, revetments, bulkheads, groins, detached breakwaters, tidal barriers, and salt water intrusion barriers. Soft options include beach renourishment, dune building, and constructed wetlands, reefs, or barrier islands.

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Considering Retreat From the Sea in California

Sea level rise on the West Coast is causing erosion along San Francisco's Ocean Beach coastline, a 3.5 mile stretch of beach, which threatens significant Bay Area infrastructure: the Great Highway, a $220 million wastewater treatment plant, and an underground pipe that carries sewage-tainted stormwater. With California officials estimating that sea level could rise by 14 inches by 2050, local, state, and federal officials are considering whether "herculean efforts [should] be made to preserve the beach, the pipe and the plant, or [whether the community] should . . . simply bow to nature[.]"[18] One study said that sea level rise could impose costs of more than $650 million in infrastructure repair by the end of the century. Another study recommends changing a part of the highway from four lanes to two, rerouting traffic, and entirely closing off a southern section of the highway, at a cost of $30 million, which is currently under review.

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West Coast officials are struggling to determine the most effective option for their respective localities. Shoreline armoring protects infrastructure but interferes with the public's beach access and is destructive to vegetation and bird habitats. Beach renourishment replenishes lost beach and allows reconstruction of dunes and animal habitats, but sand infusions are often cost-prohibitive. Moreover, just one fierce storm can undo all renourishment efforts. Retreat allows the shoreline to move naturally inland but necessitates the removal of roads and loss of other infrastructure, not to mention homes and businesses.

South Carolina's legislature has moved toward a policy of retreat and accommodation. It declared that the dynamic beach/dune system along its coast is "extremely important" because it "generates approximately two-thirds of [the state's] annual tourism industry revenue" and functions as "a storm barrier," a "habitat for numerous species," and a "natural healthy environment for the citizens" of the state.[19] Recognizing that "development . . . has been [unwisely] sited too close to the system," the legislature deemed it in "both the public and private interests to protect the system from this unwise development."[20] Because armoring provides a "false sense of security,"[21] South Carolina chose to "severely restrict the use of hard erosion control devices to armor the beach/dune system and to encourage the replacement of hard erosion control devices with soft technologies."[22] The state prohibits most erosion control structures seaward of a setback line based on the crest of the dune system.

State policies regarding whether and how state programs will protect coasts leave unexplored the issue of whether local governments, under their land use plans and regulations, should restrict development along the coasts. The authority to regulate

land use law, as discussed in Chapters 2 and 3, has been delegated to local governments to protect the public interest. Land use plans and zoning that permit the construction of homes and other buildings in areas mapped for inundation by sea level rise do just the opposite: they allow development in high-risk coastal zones to the detriment of home buyers, tenants, equity investors, mortgagees, and taxpayers who pay for supportive infrastructure in such areas. As this chapter indicates, local strategies are changing and localities are beginning to consider how to manage coastal development and rebuilding. Prudent planning, in light of consensus estimates of sea level rise, suggests that local governments designate no-build zones where it is likely that sea level rise will inundate newly-constructed buildings during their useful lives. These raise several legal, political, and practical issues that are explored below.

C. Local Role: First Affected and First to Respond

A recurring theme in this book is how to integrate land use decisionmaking—a role generally assigned to local governments under our federal system—with state and federal environmental initiatives. Most state legislatures have delegated local governments extensive legal authority to determine what type of development may be built within their jurisdictions, including disaster-prone areas and vulnerable coastal areas. This authority is found in state constitutions, planning enabling acts, zoning enabling acts, home rule authority, and additional state laws that permit localities to protect health and safety, to preserve the local physical environment, and to mitigate disaster damage.

Using this authority, local governments can create disaster-resilient communities that have increased capacity to adapt to the effects of natural disasters, resulting in less property damage, environmental impact, and loss of life. The United Nations International Strategy for Disaster Reduction defines “resilience” as:

> The capacity of a system, community or society potentially exposed to hazards to adapt by resisting or changing in order to reach and maintain an acceptable level of functioning and structure. This is determined by the degree to which the social system is capable of organizing itself to increase its capacity for learning from past disasters for better future protection and to improve risk reduction measures.[23]

Hurricanes Andrew, Katrina, and Sandy demonstrate the critical importance of having a response and recovery plan that fully engages the municipal role and coordinates federal, state, and local responsibilities and resources. Developing disaster-resilient communities and rebuilding after a disaster strikes requires both local competency and intergovernmental coordination regarding community and land use planning. There is evidence of a shift in governmental policy toward the vertical integration of federal, state, and local governmental action in order to most effectively and comprehensively address land development in disaster-prone areas as well as a host of other economic development and environmental problems.

Traditional local land use laws can be used to create disaster-resilient communities as a key objective of a community's land use regime. There are several arguments that support this proposition. First, the zoning enabling act adopted in most states makes it clear that one of its purposes is to encourage "the most appropriate use of land throughout the municipality."[24] Laws that lessen the prospect of damage from natural disasters certainly encourage the most appropriate use of land. Further, the statutes delegating power to localities to adopt subdivision and site plan regulations make it clear that standards may be included in such regulations that prevent and control the impacts of storms and other calamities.

Beyond these familiar powers, however, there is other relevant authority that states delegate to their municipal corporations. In New York, the grant of authority encompassed in the Municipal Home Rule Law (MHRL) provides a safety net—a second tier of legal authority—for communities desiring to enact disaster mitigation laws. This, combined with the power of local governments to include disaster mitigation standards in their zoning and land use regulations provides ample authority for the state's villages, towns, and cities to create an integrated set of land use laws aimed at disaster mitigation.

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Georgia Law Promotes Local Resiliency

In Georgia, the delegation of comprehensive planning authority to local governments is tied to the state's interest in protecting and preserving natural resources, the environment, and the vital areas of the state.[25] Under the rules of the Department of Community Affairs, Office of Planning, and Quality Growth, local land use planning is to strike a balance between the protection and preservation of vulnerable natural and historic resources and respect for individual property rights.[26] Under separate state legislation, local governments in Georgia are required to identify existing river corridors and adopt river corridor protection plans as part of their planning process.[27] They also have the authority to regulate shore land developments. Georgia municipalities may regulate land-disturbing authority in order to control soil erosion and sedimentation.

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Connecticut statutes give local zoning commissions flexibility to design individual programs in order to meet their municipal development and conservation needs and to take into account unique conditions. The Connecticut Legislature has provided towns and cities with the authority to protect the environment, to acquire open space lands from private owners, and to establish conservation commissions.[28] State statutes establish a detailed system for the creation of an inland wetlands and watercourse protection regime that allows local wetland agencies to have significant control over development affecting wetlands and watercourses.[29] Development applications must contain a soil erosion and sediment control plan, and local zoning and subdivision regulations must make proper provisions for soil erosion and sediment control.

In North Carolina, the state legislature has adopted a legislative rule of broad construction of powers delegated to local governments.[30] A city of Raleigh requirement that a developer create open space in a subdivision and convey title to it to a private homeowners' association was upheld using this legislative rule of construction. The reach of this rule is evident in *Homebuilders Ass'n of Charlotte v. City of Charlotte*, which upheld the power to impose user fees on applicants for rezoning, special use permits, plat approvals, and building inspections was upheld despite the absence of expressly delegated authority.[31] Legal experts in North Carolina explain that the state's zoning enabling statute, which allows localities to regulate the percentage of lots that may be occupied, the size of yards, courts, and other open space, "provides authority to require buffers along waterways, to protect important natural areas, and to set requirements that authorize or even mandate clustered development schemes."[32] All of these techniques can be used to create communities that are more disaster-resilient.

In New Hampshire, state law requires that if local governments adopt zoning regulations they must adopt master plans, which may contain various elements including natural resource and natural hazard protection.[33] Under these provisions, municipalities are authorized to develop coastal protection ordinances to carry out master plan policies regarding the protection of natural resources and natural hazard areas. New Hampshire municipalities are empowered to use a variety of innovative land use mechanisms to phase growth in an orderly way and to conserve open space and natural resources by clustering permitted development on discrete portions of land parcels.

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Linking All Levels of Government in Coastal Regulation

A local law in New Hampshire, adopted by the city of Dover, illustrates how state laws, linked to federal statutes and international conventions, can result in compatible changes in local law and a fully integrated system of law. Dover responded to the state Comprehensive Shorelands Protection Act by adopting an Overriding Districts Ordinance.[34] Its authority to take action is found in the state land use enabling act.[35] The state of New Hampshire adopted the Shorelands Protection Act to conform to the policies of the federal Coastal Zone Management Act, linking state and federal initiatives. The Dover ordinance provides a further linkage by protecting local wetlands, watercourses, and steep slopes in the state-designated shoreland areas within its jurisdiction. With the maintenance of high water quality as its objective,[36] this local ordinance aims directly at the objectives of an international compact: the U.N. Convention on the Law of the Sea, which states that land-based activities should not contribute to the pollution of adjacent coastal waters.[37]

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II. Federal Actions: Policy, Funding, and Technical Assistance

A. Supportive Role of the Federal Government

Despite a number of policy deficiencies that will be discussed shortly, the federal government plays a serious supportive role in providing funding and technical assistance in the pre- and post-disaster stage of coastal storms and serious flood events. A lengthy report of the Presidential Task Force on Sandy is largely a litany of proposed supportive federal actions that would have helped deal with that storm's devastation. The report includes the provision of cleanup and rebuilding funding, provision of a sea level monitoring system, promotion of model resiliency and rebuilding codes, expedited approvals of federal funding for infrastructure projects, and better assistance through the Small Business Administration, such as its disaster loan program, to affected local businesses.[38]

On the policy level, Congress has enacted important legislation, such as the Coastal Zone Management Act of 1972 and the Disaster Mitigation Act of 2000, which have created important frameworks capable of dealing with the issues involved in climate change and coast development. The purpose of this section and the next is to establish the key legislative frameworks and judicial decisions that factor heavily in creating adequate measures to address sea level rise and disaster mitigation.

B. Disaster Mitigation Act of 2000

In adopting the Disaster Mitigation Act (DMA) in 2000, Congress took stock of the nation's disaster response, recovery, and mitigation efforts and created a more coordinated approach to planning at all levels of government, one that assigns roles to each. Under the DMA, a framework of federal, state, and local cooperation is evident that could be a blueprint for an integrated federalist approach to a host of land use and environmental problems.

The DMA establishes national legislative objectives that provide an opportunity to enhance local mitigation planning and implementation and to coordinate land use planning and regulation to promote disaster mitigation initiatives. The Act provides that in order to qualify for federal hazard mitigation grants, state and local governments must "develop and submit for approval to the President a mitigation plan that outlines processes for identifying the natural hazards, risks, and vulnerabilities of the area under the jurisdiction of the government."[39] The Federal Emergency Management Agency (FEMA) defines the responsibilities of local governments as follows:

> (1) Prepare and adopt a jurisdiction wide natural hazard mitigation plan as a condition of receiving project grant funds under the Hazard Mitigation Grant Program [(HMGP)] . . .; and (2) At a minimum, review and, if necessary, update the local mitigation plan every five years from date of plan approval to continue program eligibility.[40]

FEMA explains its basic approach in this way:

> Our goal is for State and local governments to develop comprehensive and integrated plans that are coordinated through appropriate State, local, and regional agencies, as well as non-governmental interest groups. . . . State level

> plans should identify overall goals and priorities, incorporating the more specific local risk assessments, when available, and including projects identified through the local planning process. Under section 322(d) of the Interim Regulations, up to 7 percent of the available HMGP funds may now be used for planning, and we encourage States to use these funds for local plan development.[41]

The proper role of state governments, according to FEMA, includes coordinating "all State and local activities relating to hazard evaluation and mitigation"[42] and providing "technical assistance and training to local governments to assist them in applying for HMGP planning grants, and in developing local mitigation plans."[43] Under DMA regulations, state governments are to submit to FEMA either "standard"[44] or "enhanced"[45] plans. FEMA has approved Multi-Hazard Mitigation Plans for all 50 states. Of these, three—from Missouri, Oklahoma, and Washington—are enhanced plans.[46]

Standard plans require a mitigation strategy that includes "a general description and analysis of the effectiveness of local mitigation policies, programs, and capabilities."[47] They also require:

> An identification, evaluation, and prioritization of cost-effective, environmentally sound, and technically feasible mitigation actions and activities the State is considering and an explanation of how each activity contributes to the overall mitigation strategy. This section should be linked to local plans, where specific local actions and projects are identified.[48]

Enhanced plans must meet all the requirements of standard plans and contain various additional provisions forming a "comprehensive mitigation program."[49] This approach includes demonstrated integration with other state and/or regional plans, documented implementation capability, and a system of review and assessment of completed mitigation actions, including an economic measure of the effectiveness of each. An enhanced plan must demonstrate that the state is committed to a comprehensive state mitigation program; this may include "a commitment to support local mitigation planning" through workshops, grants, and training of local officials.[50]

Local mitigation plans are intended to, among other things, "serve as the basis for the State to provide technical assistance and to prioritize funding."[51] FEMA states that "[a]n open public involvement process is essential to the development of an effective plan."[52] Local plans must be submitted to the State Hazard Mitigation Officer for "initial review and coordination."[53] The state then forwards the plan to FEMA for "formal review and approval."[54] A total of 20,202 communities have FEMA-approved local Multi-Hazard Mitigation Plans, and an additional 105 Native American governments have FEMA-approved Tribal Mitigation Plans.[55]

These regulations describe an intelligently interwoven system of mitigation planning and implementation. According to anecdotal information from those who prepared state and local disaster mitigation plans submitted to FEMA, however, there is little emphasis in them on the use of effective local land use strategies to create disaster-resilient, or adaptive, communities. One reason for this may be that state disaster planners do not

have a clear understanding of the considerable potential that local governments have to properly shape and strengthen community development in the interest of disaster resiliency.

C. Coastal Zone Management Act of 1972

Federal, state, and local governments all have legal jurisdiction over, and legitimate interests in, coastal development and conservation. The principal federal enactment in this field is the Coastal Zone Management Act of 1972 (CZMA).[56] The CZMA pays close attention to integrating federal, state, and local interests in coastal areas. This law, now over 40 years old, like the more recent Disaster Mitigation Act of 2000, uses national concerns and federal resources to encourage idiosyncratic planning and implementation among affected states and their local governments.

The CZMA contains a solid foundation for intergovernmental coastal policy and action. It requires state coastal plans to include several initiatives that, of necessity, involve local land use planning and zoning including: (1) coastal zone boundaries, (2) permissible uses in the zone, (3) areas of particular concern, (4) the state's method of controlling outcomes, (5) guidelines on priorities of uses, (6) the allocation of authority to state agencies and local governments, (7) a planning process for protection of public coastal areas of value, (8) a process for siting energy facilities and managing their impacts, and (9) a process for studying and managing shoreline erosion.

It is clear that the CZMA recognizes that coastal management is a land use issue. The CZMA joins, in one national program, the interrelated concerns of economic development, which it favors and promotes, and environmental protection, which it adopts as a context for development. Saliently, the CZMA exhibits clear sensitivity to its potential to mitigate the impacts of natural disasters, suggesting a federal strategy of linked initiatives. Congress was moved to adopt the CZMA because of critical threats to the stability of the nation's coastal areas and the thorough report on coastal areas prepared by the Commission on Marine Science, Engineering, and Resources (the Stratton Commission).[57] The Commission found that "coastal pollution is a national problem arising from the piecemeal development of coastal ecosystems without an overall strategy for comprehensive coastal management."[58] The breadth of congressional concern is reflected in its findings for the CZMA that coastal zones are "rich in a variety of natural, commercial, recreational, ecological, industrial, and esthetic resources of immediate and potential value" and show that "state and local institutional arrangements for planning and regulating land and water uses in coastal areas are inadequate."[59]

The CZMA directly addresses the need to protect disaster-prone areas located along the nation's coastal waters. As a national framework law, the CZMA provides structural guidance and assistance similar to that of the Disaster Mitigation Act. The federal government sets broad planning criteria, offers federal funding and technical assistance to those states and localities that abide by the national principles, and agrees to coordinate federal agency actions with approved state and local plans. The

state governments administer the federal program, molding it to fit specific state and regional concerns, and coordinating the efforts of local governments. Municipalities further tailor the management plans to local requirements.

The federal financial contribution to implementation helps states solve the resource problem. It provides an impetus to act and promises resources when states comply. Once a state has created an eligible management plan, it is eligible for two types of grants: coastal resource improvement grants and coastal zone enhancement grants. These grants can be used for stabilization and resiliency projects, including the improvement of public access, and structural reinforcement projects, such as the rehabilitation of piers, stabilization of shorelines, and replacement of pilings. Resiliency projects are funded as well; they involve protecting, restoring, or enhancing coastal wetlands; eliminating development in high-hazard areas; and controlling coastal growth.

Congress amended the CZMA in 1990, updating it in several ways, including the identification of rising sea levels as a threat.[60] Specifically, the findings section of the CZMA was augmented with this language: "Because global warming may result in a substantial sea level rise with serious adverse effects in the coastal zone, coastal states must anticipate and plan for such an occurrence."[61] As of 1990, it became national policy to assist states in the following:

> The management of coastal development to minimize the loss of life and property caused by improper development in flood-prone, storm surge, geological hazard, and erosion-prone areas and in areas likely to be affected by or vulnerable to sea level rise, land subsidence, and saltwater intrusion, and by the destruction of natural protective features such as beaches, dunes, wetlands, and barrier islands.[62]

Likewise, "the study and development . . . of plans for addressing the adverse effects upon the coastal zone of land subsidence and of sea level rise" became CZMA policy.[63]

Congress has attempted but failed to adopt further amendments to the CZMA that would have incorporated more urgent warnings of the threat of sea level rise, stimulated and assisted implementation of these policy pronouncements, and achieved closer coordination with states and local governments. As discussed in other sections of this chapter, in the absence of such statutory improvements, states and local governments are taking various steps, either in concert with somewhat-dated CZMA and DMA policies or independently, to modernize their coastal policies, regulations, incentives, and expenditures.

III. State Actions: Plenary Power and Coordination

A. Intermediary Between Federal and Local Governments

Both the CZMA and the DMA deal squarely with the limitations of federal authority and the reserved powers of state governments. These statutes envision partnerships with states through which links are created with their local governments.

The CZMA affects 35 states and territories.[64] Affected states include those with coastlines on the Atlantic, Pacific, and Arctic Oceans, the Gulf of Mexico, Long Island Sound, and the Great Lakes. The Act defines a "coastal zone" as coastal waters and adjacent shorelands, including islands, transitional and intertidal areas, salt marshes, wetlands, and beaches.[65] In adopting the CZMA, Congress expressed its understanding of the proper role of state and local governments by recommending that coastal management implementation take place at a local rather than the national level.

Prior to the enactment of the CZMA, the *Stratton Report* noted:

> The States are subject to intense pressures from the county and municipal levels, because coastal management directly affects local responsibilities and interests. Local knowledge frequently is necessary to reach rational management decisions at the State level, and it is necessary to reflect the interests of local governments in accommodating competitive needs . . . . [T]he States must be the focus for responsibility and action in the coastal zone. The State is the central link joining the many participants, but in most cases, the States now lack adequate machinery for [the] task. An agency of the State is needed with sufficient planning and regulatory authority to manage coastal areas effectively and to resolve problems of competing uses. Such agencies should be strong enough to deal with the host of overlapping and often competing jurisdictions of the various Federal agencies. Finally, strong State organization is essential to surmount special local interests, to assist local agencies in solving common problems, and to effect strong interstate cooperation.[66]

The CZMA established a process for the development of individual state coastal zone management programs. Using incentives, rather than penalties, the Act urges but does not require state implementation. It offers states unobstructed power to regulate their coastal areas, without federal agency interference, if they adopt policies consistent with the standards of the CZMA, and it provides for grants to states to prepare coastal plans and to establish administrative agencies and mechanisms to implement them. States in turn are encouraged to fund local coastal plans and empower local governments to be responsible for issuing permits for building in coastal areas.

The DMA goes farther in this direction. The DMA requires state and local governments to development disaster mitigation plans to be eligible for hazard mitigation grants. The goal is for local and state governments to develop comprehensive and integrated plans that are coordinated through appropriate state, local, and regional agencies. Local mitigation plans serve as the basis for technical assistance and funding from the state; local plans must be submitted to the State Hazard Mitigation Officer for review and coordination. The state then forwards the plan to FEMA for formal review and approval.

States, under the public trust doctrine, can act directly to require state agency permits for development on vulnerable shorelands and invest in hard and soft solutions to manage threatened coasts. States can leave the land use power of local coastal communities in place, create guidelines for localities to follow in regulating development, provide incentives to follow such guidelines, or create best practices and provide local

officials with technical assistance. Some states provide data and information about sea level rise, storm surges, and anticipated flooding as well as interpretative maps and Geological Information Service tools.

B. Types of State Actions

i. Maine: Direct State Permitting for Coastal Development

Maine has incorporated sea level rise into its planning and regulations for more than a decade. The state's Natural Resources Protection Act acknowledges the fragile and dynamic nature of dune systems and the uncertainty of the extent of future change in sea level.[67] The Act requires a permit for activities in a coastal sand dune system. The Department of Environmental Protection, in its corresponding Coastal Sand Dune Rules, "anticipates that sea level will rise approximately two feet in the next 100 years," and concludes that "[u]nder any scenario of increasing sea level, the extensive development of sand dune areas and the construction of structures increase the risk of harm, to both the coastal sand dune system and the structures themselves."[68] Standards for all projects require that a project may not be permitted if "it is likely to be severely damaged" by the two-foot rise in sea level over 100 years.[69]

ii. Maryland: Developing Best Practices and Training Local Officials

Since 2000, the Maryland Department of Natural Resources (DNR) has pursued policies for responding to a rise of two to three feet in this century. In 2007, the governor established the state Commission on Climate Change, which includes an adaption and response working group. In August 2008, the commission released its Climate Action Plan that contains an Adaptation and Response Toolbox designed to "give state and local governments the right tools to anticipate and plan for sea-level rise and climate change."[70] Maryland focus includes "agriculture, water resources, bay & aquatic ecosystems, forest & terrestrial ecosystems, human health, and growth & land use."[71] Maryland's Living Shorelines program presents management options that "allow for natural coastal processes to remain through the strategic placement of plants, stone, sand fill, and other structural and organic materials."[72] DNR assists localities to self-assess their ability to address sea level rise and provides guidance on various means to incorporate adaptation strategies into local planning frameworks and regulations, and has held training and workshops throughout the state.

iii. New York: Funding for Local Resiliency Measures

Following several serious storms, the state of New York initiated the New York Rising Reconstruction Program, funded primarily by federal recovery dollars.[73] It focuses on empowering communities that suffered serious storm damage to establish and carry out strategies to rebuild and prepare for extreme weather events in the future. Over 100 local governments are participating in this effort, each interested in developing local resiliency strategies appropriate for its circumstances. They are eligible for grants of $3 to 25 million depending on FEMA estimates of local storm damage. One of the

state's contributions to these localities is a Report on Community Resiliency Techniques, which gathers and briefly describes approaches used by communities to increase their resilience.[74]

This report contains a land use section and recommends techniques from other communities, mostly in other states, that restrict development in floodplains; define growth boundaries; insinuate resiliency in comprehensive plans; define growth boundaries; adopt regulations to protect sensitive resources facing development pressures; create overlay zoning to protect natural resource areas or high-hazard areas; prevent nonconforming uses from being rebuilt after storms; create buffers around coastal wetlands; establish surface water setbacks; and regulate development to protect wetlands, flood plains, woodlands, and steep slopes, and to preserve trees.

iv. North Carolina: Conformity of Local Plans With the State's Coastal Area Plans

North Carolina's Coastal Areas Management Act (CAMA) of 1974 aims to encourage cooperative land use planning between state and local governments.[75] All coastal communities must adopt land use plans in conformance with CAMA. It is the policy of the state that "adequate plans for post-disaster reconstruction should be prepared by and coordinated between all levels of government prior to the advent of a disaster."[76]

NOAA's summary of Coastal Programs sea level rise initiatives points out that although CAMA and the state's administrative regulations do not mention sea level rise, they recognize that shorelines are constantly changing. With minor exceptions, CAMA bans hardened oceanfront structures. Oceanfront setbacks are tied to erosion rates: "By their very nature, setbacks tied to long-term erosion rates take sea level rise into account, as it is one of the drivers of shoreline change from which erosion rates are determined."[77] New development on public trust shorelines must be set back 30 feet landward from the normal high water line (as opposed to the mean high tide line); this "is the ordinary extent of high tide based on site conditions such as the presence and location of vegetation, which has its distribution influenced by tidal action, and the location of the apparent high tide line."[78]

v. South Carolina: Guiding Development Toward Retreat

South Carolina's Office of Ocean and Coastal Resource Management (OCRM) has declared in a statement of policy:

> It has been clearly demonstrated that erosion problems of this State are caused by a persistent rise in sea level, a lack of comprehensive beach management planning, and poorly planned oceanfront development, including construction of hard erosion control structures, which encroach upon the beach/dune system. Sea level rise in this century is a scientifically documented fact. Our shoreline is suffering from its effects today. It must be accepted that regardless of attempts to forestall the process, the Atlantic Ocean, as a result of sea level rise and periodic storms, is ultimately going to force those who have built too near the beachfront to retreat.[79]

OCRM concluded that

> [T]he long-range public good is the same as the long-range private good. If the dry sand beaches of this State disappear because of the failure of its people and governmental natural resource managers to protect the beach/dune system, future generations will never have the opportunity to use and enjoy this valuable resource.[80]

The state's Coastal Zone Management Act adopts retreat and re-nourishment as basic state policies for beach preservation and restoration.[81]

C. Florida: A Case Study in Direct State Action—Beach Renourishment

Under the common law, the state of Florida owns legal title to the beach seaward of the mean high water line (MHWL), and it holds that property in trust on behalf of the public for navigation, fishing, and bathing. That boundary moves gradually landward and seaward as the beach erodes and accretes. The Florida Constitution imposes an obligation on the state to protect and conserve natural resources, including the coastal shoreline.[82] These ownership rights give the state authority to take direct action to mitigate disaster damage and attempt to influence the gradual rise of the sea.

Florida adopted the Beach and Shore Preservation Act (BSPA) in 1961, declaring beach erosion "a serious menace to the economy and general welfare of the people."[83] The state legislature's response to rampant beach erosion was to declare it a "necessary governmental responsibility to properly manage and protect Florida beaches" and to "make provision for beach restoration and nourishment projects."[84] Funding of the state's beach management plan is justified by the "legislative finding that erosion of beaches . . . is detrimental to tourism, . . . further exposes the state's highly developed coastline to severe storm damage, and threatens beach-related jobs, which, if not sopped, may significantly reduce state sales tax revenues."[85] The Florida Department of Environmental Protection is responsible for identifying those beaches that are critically eroded and authorizing funding for renourishment projects.

The statute defines beach and shore preservation to include "erosion control[,] . . . hurricane protection[,] . . . coastal flood control, shoreline and offshore rehabilitation, and regulation of work and activities likely to affect the physical condition of the beach or shore."[86] Beach restoration is "the placement of sand on an eroded beach for the purposes of restoring it," while beach nourishment is "the maintenance of a restored beach by the replacement of sand."[87] A beach restoration and nourishment project must be (1) in a critically eroded shoreline, (2) consistent with the state's beach management plan, and (3) designed to reduce upland damage from altered inlets, coastal armoring, or existing development.

When a renourishment project is undertaken, a survey of the shoreline is conducted in order to determine the areas of the beach that are in need of restoration and to locate an erosion control line (ECL). In Florida, the Board of Trustees of the

Internal Fund (Board) holds title to Florida's submerged tidal lands on behalf of the state. As such, the BSPA vests the Board with the authority to set the ECL for renourishment projects. The Board must provide notice to all riparian owners of upland property within 1,000 feet of the shoreline and hold a public hearing on the proposed ECL. In making a determination on the location of the ECL, the Board must "be guided by the existing line of mean high water, . . . the extent to which erosion or avulsion has occurred, and the need to protect existing ownership of as much upland as . . . possible."[88] In the event that a renourishment project involves the taking of upland private property (via the setting of the ECL), the state must initiate condemnation proceedings to compensate riparian owners.

Once the Board approves and records an ECL's location along a segment of the shoreline, the ECL permanently fixes the boundary between private property and public land; this replaces the shifting MHWL as the boundary line. The statute provides that the common law will "no longer operate to increase or decrease the proportions of any upland property . . . either by accretion or erosion or by any other natural or artificial process."[89] In other words, the ECL replaces the MHWL as the boundary between private and public land. With the exception of the right to accretion, upland property owners remain "entitled to all common-law riparian rights[,] . . . including but not limited to rights of ingress, egress, view, boating, bathing, and fishing."[90]

A beach renourishment project undertaken in Walton County, Florida, was challenged in *Walton County v. Stop the Beach Renourishment, Inc.*, by beachfront property owners as an uncompensated taking of their littoral property rights under Florida common law.[91] The Walton County case involved a five-mile length of critically eroded beach in Florida’s panhandle. Under local zoning, the land has been developed for tourism with a mix of high-rise hotels, mid-rise condominiums, lower density retail for the use of tourist and residents, and assorted commercial properties. Over $250,000,000 in annual revenue comes from tourism-related activities, which underlies the government’s commitment to rebuilding beaches after storm events. Some of this stretch of beach nearly disappeared after Hurricane Opal; other parts were severely narrowed. This damage affected privately owned land and businesses, while limiting public access to the beaches.

The plaintiffs owned affected littoral property. Their primary claim was that fixing the property line at the ECL constitutes a taking of their common law right of accretion and, as a corollary, their right to maintain contact with the water. Under common law, "if the beach expanded [seaward] through accretion, that new land would belong to the upland owner."[92] The plaintiffs claimed that "[t]he statute takes that right away, raising the issue of whether there exists [both the] . . . right to accretion" and the right to contact with the water under Florida common law, and, if so, whether the statute effected a taking under the Constitution.[93] The Supreme Court of Florida held that no taking occurred.

The Florida court explained that Florida common law holds that when a sudden loss or addition of land—an avulsion—occurs, the property line does not move as it

does with accretion and erosion; it remains fixed at the former MHWL. Following such an event, both the state and the upland owner have a reasonable time to reclaim their lost lands. Prior case law in Florida established that hurricanes are avulsive events and that the loss of the sovereign's interest in the beach may be recovered by self-help on the part of the state. The court explained that the statute authorizing the state to renourish beaches simply codifies the state's common law right to reclaim storm-ravaged lands by fixing the boundary line at the pre-event MHWL.

The plaintiffs petitioned the U.S. Supreme Court for certiorari, asserting that the Supreme Court of Florida "invok[ed] non-existent rules of state substantive law . . . [to] reverse . . . 100 years of uniform holdings that littoral rights are constitutionally protected."[94] They called reinterpretation of common law a "judicial taking" and asked the Court to recognize this judicial redefinition of extant rights, combined with the working of the statute to fix their property line, as a compensable taking under the Fifth and Fourteenth Amendments.[95] The U.S. Supreme Court granted certiorari to determine whether the state court reinterpreted Florida's common law as a pretext for upholding the statute against the plaintiffs' taking claim.[96]

The Court found that the Supreme Court of Florida properly interpreted Florida common law and, therefore, that the statute did not take property without just compensation in violation of the Fifth and Fourteenth Amendments. The Court ruled that there could be no such showing since, as owner of submerged land adjacent to beachfront property, the state has the right to fill that land. The Court noted that "Florida law as it stood before the decision below allowed the State to fill in its own seabed, and the resulting sudden exposure of previously submerged land was treated like an avulsion for purposes of ownership. The right to accretions was therefore subordinate to the State's right to fill."[97] The decision noted that the exposure of land previously submerged belongs to the state "even if it interrupts the [beachfront property] owners' contact with the water."[98]

The objectives pursued by beach renourishment projects in Florida are to repair the damaging effects of sea level rise and storm surges and to halt the progress of inundation. With nearly 60% of the state's sandy shoreline suffering erosion, one wonders how economically sustainable this objective is. If "thoughtful precaution" suggests that coastal states plan, on average, for a one-meter rise in sea level by the end of the century, one wonders how environmentally sustainable such an objective is and how long this type of direct action by the state will last into the 21st century.

IV. Local Initiatives

A. General Strategies

Local governments, through their land use powers, can retreat, accommodate, or protect in reaction to sea level rise and storm events. Using a variety of techniques, such as those mentioned above under the New York Rising Resiliency Program, localities can emphasize development in non-vulnerable areas; require better building techniques, including elevations, set back development from floodplains, wetlands, and

coasts; and require builders to locate their development on the least hazardous portions of their sites. In these ways, localities can accommodate sea level rise or protect the development that will occur in areas that will be inundated. Ultimately, as the effects of climate change continue, retreat will be their strategy of choice.

*****Begin Text Box*****
Checklist of Local Actions to Respond to Sea Level Rise

Actions that communities have taken in reaction to sea level rise and storm hazards include:

- Comprehensive Planning
- Creation of a Task Force
- Adoption of a Post-Disaster Moratorium
- Post-Disaster Planning
- Implementation of No-Build Zones
- Increasing Coastal Setbacks and Buffers
- Adoption of Coastal Erosion Overlay Zone
- Limiting Shoreline Protective Structures
- Requiring Elevation of Buildings
- Requiring Sea Level Rise Impact Analysis for Shoreline Development
- Implementation of Wetlands Regulations

*****End Text Box*****

Retreat, if it means adopting a no-build zone, which ultimately it must, is unlikely in the short term because local officials understand that there are practical, political, and equitable reasons to resist a total ban on development. They understand that local property owners acquired their properties knowing that they were zoned for housing development or other economical uses. They also understand that these owners have been paying local property taxes on their parcels, assessed at their market value as zoned. They further understand that property owners vote, have local political influence, and belong to industry groups that lobby state officials. Accordingly, officials may be reluctant to legislate a no-build zone, particularly in light of the uncertainty regarding how much sea levels will rise and the precise impacts on their coast during the short- and mid-term future.

As a result, they might ask their municipal attorneys if there are any nonregulatory options to limiting development in vulnerable coastal areas. Although fraught with consequences of their own, there are readily available alternatives to complete bans on building. A number of other land use strategies may be considered either alone or in combination, as the following material demonstrates.

i. Comprehensive Planning

A reasonable starting point toward a nonregulatory approach would be to adopt a component of the local comprehensive plan that both embodies the most recent scientific findings and projections regarding sea level, and cautions prospective

purchasers regarding development on vulnerable coastal properties. On point is a sea level rise chapter in the comprehensive plan of the city of Bainbridge Island, Washington, entitled the Environmental Element.[99] Flooding and erosion are principal concerns, and the city's objectives are to minimize, reduce, or eliminate their impacts. This code component mandates no net loss of the city's aquatic resources, maintenance of its vegetated buffers between proposed development and aquatic resources, and preservation of stream courses and riparian habitat, and it calls for the transfer and purchase of development rights. To mitigate damage due to frequent floods, the plan limits future development and alteration of natural floodplains, mandates the preservation of stream channels and natural protective barriers, revises the flood insurance rate map to reflect the natural migration of frequently flooded areas, and requires the implementation of nonstructural protective methods such as setbacks and natural vegetation.

Several components of the comprehensive plan in Collier County, Florida, create a planning framework for coastal development. One of its objectives calls for "mechanisms or projects which limit the effects of development and which help in the restoration of the natural functions of coastal barriers and affected beaches and dunes."[100] Another declares that "[d]evelopment and redevelopment proposals shall consider the implications of potential rise in sea level."[101] More specifically, the plan states that where an "EIS [environmental impact statement] is required, an analysis shall demonstrate that the project will remain fully functional for its intended use after a six-inch rise in sea level."[102] Given current sea level rise projections, this six-inch metric dovetails roughly with the useful life of newly constructed buildings, ensuring that investors and occupants of such buildings will not be deprived of the benefit of the new building over time.

Comprehensive plans are not regulatory documents. They establish a vision for future development, and contain goals, objectives, and recommended strategies, such as those contained in the Collier County and Bainbridge examples. Future zoning, in most states, must be in conformance with the comprehensive plan and the plan can guide local boards that approve development projects in discharging their duties. Informal protocols in the development review and approval process may be adopted that further the objectives of the comprehensive plan. Where a comprehensive plan refers to and incorporates by reference future sea level rise projections, data, maps, and documents the probable effect of sea level rise on coastal development, it can act as a predicate for a nonregulatory approach to project review and approval.

ii. The Project Application Process

Based on information contained in a sea level rise component of the comprehensive plan, local staff members can revise the application requirements for submitting projects for administrative review and approval by planning boards or commissions. They can require, for example, that the developer submit site drawings that identify any portion of the parcel likely to be inundated by sea level rise during the useful life of the building. They can further specify that the developer place any

buildings and infrastructure in a location that guarantees the safety of occupants and the stability of the building during its useful life. Applicants can be given sea level rise maps issued from a variety of sources such as state agencies, legislative committees, governor's task forces, university institutes, or other respected and objective nonprofit organizations. Depending on the source, these maps may be given judicial recognition, support the rationality of actions taken to condition or even deny the application, and be used to defend substantive due process attacks on such decisions.

In addition, the developer can be required to document the sources of financing lined up for the project, including equity investors and construction and permanent lenders. Where sea level rise projection maps are contained in an official document like the comprehensive plan or are issued by responsible agencies or organizations, investors and lenders will likely be on notice of them and only willing to invest if they believe that the project is economically viable. If investors conclude that the project is not economically feasible, then it will sink of its own weight and not proceed further in the local review and approval process. Any claim that the local process resulted in the taking of value of the proposed project can be countered with the statement that the investors and lenders made their decision based on their due diligence and what they learned about the long-term viability of the proposed investment. Under the *Lucas* doctrine, it is not the regulation that prevents the development in this instance, but rather the private market risks. To substantiate any *Lucas* claim, the owner would also have to show that all economic value of the property was taken. Proposals that envision less construction on the land to avoid development on potential inundation areas would be likely to be approved under this process, avoiding the total taking argument.

iii. Environmental Impact Review

Development projects in some states are subject to review under "little NEPAs," which require an assessment of the project on the environment. This topic is discussed extensively in Chapter 9. The effect of conditions and circumstances around a proposed development site is routinely considered in environmental impact reviews. The potential impact of sea level rise during the lifetime of a proposed building on public health and safety, on the structural integrity of proposed buildings and infrastructure, and on the environment is subject to review under federal and state environmental review statutes.

The Council on Environmental Quality issued a draft NEPA guidance document suggesting that an environmental impact statement should consider "[t]he relationship of climate change effects to a proposed action . . ., including the relationship to proposal design, environmental impacts, mitigation, and adaptation measures."[103] In New York, the State Department of Environmental Conservation (DEC) has been directed "to incorporate climate change adaptation strategies into DEC programs, actions and activities, as appropriate . . .[,]" including in Environmental Impact Statements (EIRs) prepared under the State Environmental Quality Impact Review Act (SEQRA).[104] Such analyses should "[i]dentify potential adverse impacts from climate change" and "[i]n analyses and decision-making, use best available scientific information of environmental conditions resulting from the impacts of climate change (e.g., sea level rise and

increased coastal flooding); incorporate adaptive management into program planning and actions, which uses scientifically based and measurable evaluation, testing of alternative management approaches, and readjustment as new information becomes available."[105]

*****Begin Text Box*****
County Requires Sea Level Rise Impact Analysis

The Resource Protection chapter of Collier County's Land Development Code requires a mandatory sea level rise impact analysis for shoreline development.[106] The analysis must show that the development will remain fully functional for its intended use after a six-inch rise in sea level.

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Even where state law does not require a discrete environmental impact review, state and local site plan review requirements may require a review of certain environmental impacts where they have a close nexus with the proposed project.[107] Local governments have the expressed or implied power in most states to adopt reasonable site plan and subdivision regulations and, where supported by expert reports and reliable maps, such regulations can be amended to include standards that protect property and people from dangers and "menaces" such as storm surges or inundation.

iv. Project Approval Conditions

Once a project is submitted for the review and approval of a local planning board for subdivision or site plan approval, the reviewing agency can place reasonable conditions on its approval of the proposed development to protect the public health, safety, or welfare. These conditions can be negotiated with the applicant. One such condition would be to approve the project subject to the condition that the developer agrees to remove any buildings that are destroyed by storms or that are inundated by sea level rise.[108] Under the public trust doctrine in most states, littoral property that is gradually inundated by sea level rise belongs to the state and is no longer private property.

This condition can be strengthened in a variety of ways. The developer could be required to indemnify the municipality should it have to bear any future costs regarding the damage or destruction of infrastructure or the property itself. The developer could be asked to insure against its own future liabilities by posting a bond, providing a letter of credit, or purchasing liability insurance. If the developer cannot secure these guarantees at an affordable price and the planning board does not approve the project, the locality is insulated from a total takings claim because it is the private market's risk assessment that has prevented the development, rather than local regulation. In property law terms, *caveat emptor*. A prospective purchaser of property is charged with due diligence, including knowledge of sea level rise projections, maps that support them, and the risks and costs of developing in areas vulnerable to inundation and storm surges.

Alternatively, or additionally, the developer could be required to impose deed restrictions, such as conservation easements, that require the developer to remove or relocate buildings and restore ecosystem services where the property is inundated or suffers severe damage. Normally such restrictions protect the environment from the adverse impacts of the proposed development in the present, but there is no reason that they couldn't be used to protect the environment, including the public, in the future.

*****Begin Text Box*****
Wetlands Regulations to Protect Coastal Lands

The town of Falmouth, Massachusetts, explicitly addresses the impacts of accelerated sea level rise through extensive wetlands regulations.[109] The wetland ordinance and regulations identify specific resource areas for protection, including coastal wetlands, beaches, dunes, and marshes; land subject to tidal action, flooding, inundation, or coastal storm flowage; and any land within 100 feet of the protected resource areas. The regulations require special protection for coastal floodplains immediately landward of salt marshes, coastal beaches, dunes, banks, and barrier beaches. Any buildings in these areas should be designed to incorporate a relative sea level rise of at least one foot per 100 years in FEMA designated A-zones and at least two feet per 100 years in FEMA designated V-zones.

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v. Contingency Bargaining

Perhaps developing coastal properties in locations vulnerable to near-term sea level rise should be handled in many communities through negotiated project review, or contingency bargaining. Developers normally have short-term financial objectives, measured by the time it takes them to secure approvals, build, obtain a certificate of occupancy, and sell the buildings. Even where they retain title, their objectives are almost always shorter-term than the useful lives of their buildings or the time that it will take for sea level rise to inundate their projects. They, to be sure, will argue that their properties will not be damaged by sea level rise, and they may be able to back up their assertions with data produced by scientists who doubt main stream projections, have different maps of their own, or believe that climate change is a passing phenomenon.

Contingency bargaining can be used in such situations. In business dealings, contingency contracts allow parties to accommodate disagreements about future events, such as sea level rise in our context or the number of likely viewers of a proposed television series in a more familiar context. A deal is struck in the television example based on an estimate of viewers, but the network gets a rebate or draws from an escrow fund if the viewers are fewer than projected. Alternatively, if the viewers exceed the projected number, a surcharge is stipulated to the benefit of the scriptwriter. In a similar fashion, negotiation between a developer and a local land use board can arrive at an agreement that the project may not be inundated or damaged by storm surges within an agreed period, with the local board taking the position that, if it is, there

should be consequences, such as drawing funds to cover its remediation costs from an escrow account or using a bond, insurance policy, and underlying indemnity agreement to secure the developers' contingent liabilities.

This type of accommodation is difficult to achieve in adopting a zoning regulation, particularly a no-build zone, which has an all-or-nothing consequence. The regulator says, "because sea level is expected to inundate your property within X period, we are prohibiting all development and your property now has no value." The developer says, "but those projections are contested, and there is doubt that sea level rise will affect this particular area of the coastline that much." If the regulator proceeds, the developer can bring a *Lucas*-style total takings case or a substantive due process action alleging that the regulation is arbitrary and capricious, leaving the matter in the hands of judges.

Not only is the negotiated, nonregulatory approach less likely to be litigated, or won by the developer if it is taken to court, but it is consistent with evolving norms in the land use review and approval process in a growing number of states. Developers are accustomed to providing indemnities, bonds, insurance, lines of credit, and escrow accounts. They also have experience with having protective deed restrictions imposed on their land for environmental purposes. Their current experience with these mechanisms is in a much lower risk context, to be sure, but the extreme risks that threaten coastal development call for appropriate responses. If regulation cannot be one of them, negotiated settlements of disputes over coastal construction can be. The situation necessitates scaling up the use of familiar processes and techniques, such as those described above.

B. Case Studies

i. Miami-Dade County Task Force: Findings

It is without question that one of the states that is going to be affected most severely by sea level rise is Florida. Florida has 1,260 miles of coastland, comprising 825 miles of sandy shoreline. Of those 825 miles, 485 are eroded and 388 are listed as "critically eroded," signifying that they are in need of restoration under the law.[110] Aside from state efforts, local governments have also had an instrumental role in addressing these concerns. In 2006, the Miami Dade Climate Change Advisory Task Force was created to provide technical assistance and advice to the Board of County Commissioners concerning mitigation and adaptation measures in response to the impacts of global climate change.[111] The Science and Technology Committee of the Task Force published, in 2007, a statement documenting the "very real threat" posed by accelerated sea level rise. The report noted that South Florida's relative sea level rise over the last 70 years was about eight times greater than the rise over the previous 2,500 years and projected a rise of at least 1.5 feet in the next 50 years and three to five feet by 2100.

The committee report emphasized the urgency "of reconsidering nearly every aspect of the county's management, zoning, infrastructure, and planning," and

recommended establishing sea level rise scenarios reflecting future rise to help determine what must be done to preserve habitability and what infrastructure will "need to yield to the rising sea."[112] The report called for detailed documentation of infrastructure elevations, areas susceptible to erosion and pollution, drainage and storm-surge risks, and water supplies from across the county's various departments. The data and subsequent modeling of different sea level rise scenarios has been compiled in the committee's "Climate Change Briefing Book," which discusses the county's vulnerability to sea level rise and catalogs specific adaptive steps.

*****Begin Text Box*****
Miami-Dade County Climate Change Task Force Findings

> Developed Miami-Dade County as we know it will significantly change with a 3-4 foot sea level rise. Spring high tides would be at about +7 to 8 feet; freshwater resources would be gone; the Everglades would be inundated on the west side of Miami-Dade County; the barrier islands would be largely inundated; storm surges would be devastating; landfill sites would be exposed to erosion contaminating marine and coastal environments.[113]

*****End Text Box*****

ii. City of Bainbridge Island, Washington: Environment Element

The city of Bainbridge Island has explicitly addressed the potential for sea level rise in the environment element of its comprehensive plan. Adopted in 2004, the plan recognizes that Bainbridge Island is potentially subject to sea level-related impacts including flooding and erosion. The overall goal of the element is to avoid adverse impacts where possible; to minimize, reduce, or eliminate impacts over time; and to compensate for unavoidable impacts.[114] The plan outlines protections for critical areas including transfer of and purchase of development rights; provides for the use of the city's Shoreline Management Master Program to address and protect marine fish and marine shoreline habitat; mandates no net loss of the city's remaining regulated aquatic resources; requires the maintenance of vegetated buffers between proposed development and aquatic resources; calls for the preservation of stream courses; and the protection or restoration of natural functions of riparian habitat.

The Frequently Flooded Areas component of the element specifically recommends mitigating measures that include a limitation on development and the alteration of natural floodplains; preservation of stream channels and natural protective barriers; revision of the flood insurance rate map to reflect the natural migration of frequently flooded areas; and implementation of nonstructural protective methods such as setbacks and the use of natural vegetation.

*****Begin Text Box*****
Bainbridge Island, Washington: Sea Level Rise

> Sea level rise may happen as the result of natural or human activity such as geologic subduction or global warming. Here in the Puget Sound we experience

> the affects of both the geologic and hydrologic events. Regardless of the cause assigned, cumulative sea level rise has serious implications for the shorelines and lowland areas that are potentially affected by beach, bluff erosion and loss of intertidal zones. These areas serve such purposes as nursery habitat, feeding grounds for fish and fowl, stormwater collection and water filtration.[115]

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iii. Town of Duck, North Carolina: Moratorium on Rebuilding and Reconstruction

North Carolina's Coastal Areas Management Act of 1974 encourages cooperative land use planning between state and local governments[116] and it is the state's policy that "adequate plans for post-disaster reconstruction should be prepared by and coordinated between all levels of government prior to the advent of a disaster."[117] The State Design and Construction Guidelines for local hazard mitigation plans further provide that coastal communities should "outline a post-disaster permitting process that facilitates repairs but remains steadfast to the need to mitigate against future disasters."[118] One way to accomplish this is to create a short-term building moratorium to allow the community time to assess damage and consider mitigation measures.

The town of Duck, on North Carolina's Outer Banks, is a coastal community that has adopted local regulations implementing these state coastal policies.[119] The code chapter on Rebuilding and Reconstruction sets out procedures for assessing damage, declaring a building moratorium, and defining types of moratoriums that may be declared in the aftermath of a damaging storm.[120] The ordinance is intended to ensure that rebuilding occurs "in an orderly manner," and with the opportunity to identify "appropriate areas for post-storm change and innovation."[121]

iv. East Hampton, New York: Local Waterfront Revitalization Plan

The town of East Hampton on Long Island has been planning and regulating for sea level rise for years and has made specific reference to sea level rise in its comprehensive plan. In its Local Waterfront Revitalization Program as the Coastal Management Component of its comprehensive plan, the town states:

> Future planning efforts should examine the likely effects of global warming, including increasing sea level rise and storm and hurricane activity on the Town's coastline. Beginning to plan for these effects, assessing potential damage to public resources and infrastructure, and evaluating methods of protection and associated costs are vital for future coastal management.[122]

East Hampton has also adopted coastal setbacks as much as 125 feet and no-build zones in high hazard floodplains.[123] East Hampton's coastal erosion overlay zone regulates the construction and alteration of shoreline protective structures.[124] To protect the natural shoreline, the town severely limits the construction of coastal erosion structures.

v. New York City Initiatives

New York City has also taken significant steps to address the threat of sea level rise around the metropolitan region. There is a citywide strategic planning process for climate change adaptation, including adaptation to sea level rise. In 2008, Mayor Bloomberg launched the Climate Change Adaptation Task Force and the New York City Panel on Climate Change (NPCC) to develop adaptation strategies to secure the city's infrastructure from the effects of climate change.[125] The ask force is one of the 127 initiatives proposed in PlaNYC, the city's long-term sustainability plan.[126] In 2012, the New York City Council mandated both the task force and panel to meet regularly and expand their focus; today, they continue to report their resiliency recommendations.[127]

The NPCC's 2013 Report projects significant increases in temperature, and precipitation in New York City in the coming decades.[128] Its recommendations include developing improved methods for estimating changes in projected climate-induced hazards, improving modeling of the climate system and coastal flooding and storm surge mapping, increasing the level of understanding of neighborhood vulnerability to storm surges, developing a system of indicators and monitoring to track climate data, and improving ways to communicate this data in a way that offers transparency to potential users of these models.

Post-Hurricane Sandy, Mayor Bloomberg convened the Special Initiative for Rebuilding and Resiliency (SIRR) to analyze the impacts of the storm on the city, assess the climate hazards facing the city in the coming decades, and outline strategies for effectively mitigating those risks. The result of this effort is *A Stronger, More Resilient New York*, which assesses the impacts of Hurricane Sandy, includes NPCC's 2013 climate projections and FEMA's New York City flood maps, and outlines coastal protection strategies for addressing the city's most vulnerable areas.[129] Key components of the coastal protection strategies include raising coastal edge elevations, minimizing upland wave zones, protecting against storm surges, and improving coastal design and governance. In order to sustainably accomplish these goals some suggestions include the implementation of beach nourishment projects, bulkheads, floodwalls, levees, storm surge barriers, and the maintenance of natural and open spaces.

V. Dealing With Judicial Decisions

A. Ambiguity in Supreme Court Jurisprudence

Three recent decisions of the U.S. Supreme Court are fraught with ambiguity and threaten to confuse and cloud state and local coastal planning and resiliency efforts.

i. *Stop the Beach Renourishment, Inc. v. Florida Department of Environmental Protection* (2010)

Prior to *Stop the Beach Renourishment, Inc. v. Florida Department of Environmental Protection* (*STBR*),[130] there was no ambiguity regarding the power of state courts to decide matters of state property law. This abiding judicial principle was disturbed in STBR, which held that "[a] constitutional provision that forbids the uncompensated taking of property is quite simply insusceptible of enforcement by federal courts unless they [the federal courts] have the power to decide what property rights exist under state law."[131] This insinuation of federal courts into the interpretation of state common law property rights adds great uncertainty as localities and states attempt to regulate land use. At issue in STBR were several common law property rights enjoyed by the owners of coastal property. The Florida Supreme Court had clearly articulated what those rights were and determined that they were not violated by a state statute that provided for beach renourishment along Florida's highly eroded coastlines. The Supreme Court, in holding for the first time that federal courts can review and determine the validity of state court interpretations of state common law, greatly confused matters as states and localities determine their strategies. Their decisions are now subject to the extensive vagaries of federal courts under federal principles that are unsupported by existing precedent.

ii. *Koontz v. St. Johns River Water Management District* (2013)

Prior to *Koontz v. St. Johns River Water Management District*,[132] courts deferred to the decisions of local land use boards in denying land use permits in coastal areas or imposing monetary conditions on developers to mitigate the adverse impacts of projects on these vulnerable areas. *Koontz* changed this by subjecting such decisions to heightened scrutiny under its previous decisions in *Nollan* and *Dolan*.[133] Those cases applied to the imposition of a "title exactions": a requirement that an easement or title to some of the property be dedicated to the public. Other actions**—**such as permit denials or monetary exactions**—**under U.S. Supreme Court jurisprudence, were deferred to by the courts, presumed valid, and the burden of proving that they constituted takings was placed on the applicant. *Koontz* extends the principles and standards of *Nollan* and *Dolan* to permit denials and monetary exactions greatly expanding the reach of federal constitutional concerns deeply into the state and local land use system. As a result of *Koontz*, state and local officials must bear the burden of proving that not only title exactions, but also monetary exactions and permit denials meet the higher scrutiny tests of the Court's *Nollan* and *Dolan* cases.

iii. *Lucas v. South Carolina Coastal Council* (1992)

The Supreme Court's *Lucas v. South Carolina Coastal Council* decision held that a regulation that destroys all "economically viable use" is a taking unless, under the "background principles of the [s]tate's law," the use that the regulation prohibits is "not part of his title to begin with."[134] *Lucas* involved a state regulation that prevented beachfront development on the Isle of Palms, South Carolina, a barrier island community. The South Carolina Coastal Council prevented David Lucas from building homes on two lots because of their proximity to ecologically sensitive dunes. For example, if the state's nuisance law would allow surrounding property owners to enjoin

an owner's use of land for unhealthy enterprises like brickmaking, a regulation that prevents such use is not a taking.[135] On remand, the state court found that nuisance law constituted no bar to the development proposed by *Lucas*.

B. Antidotes for the Legacy of *Lucas*

i. Adjusting *Lucas* to Changed Circumstances

State and local regulations that prohibit building on coastal lands raise complicated Fifth Amendment issues. Don't they, on their face, destroy all economic value, thereby constituting a total taking under *Lucas v. South Carolina Coastal Council*? In *Lucas*, Scalia referred to the Court's "traditional resort to 'existing rules or understandings that stem from an independent source such as state law' to define the range of interests that qualify for protection as 'property' under the Fifth and Fourteenth Amendments."[136] He further noted that although "[i]t seems unlikely that common-law principles would have prevented the erection of any habitable or productive improvements on [Lucas]'s land[,] . . . [t]he question . . . is one of state law to be dealt with on remand."[137]

The *Lucas* decision accommodates the notion that change in common law principles occurs regularly. "The fact that a particular use has long been engaged in by similarly situated owners ordinarily imports a lack of any common-law prohibition (though changed circumstances or new knowledge may make what was previously permissible no longer so)."[138] Is sea level rise a "changed circumstance"? Are recent scientific reports and maps "new knowledge"? Further, how will South Carolina's adoption of a state policy against coastal armoring, making the disappearance of coastal land due to sea level rise likely, change the legal landscape? Is it possible that new knowledge about the harm to the coastal environment and our newfound appreciation of ecosystem services would now sustain a nuisance claim against coastal development in some locations?

There are several defenses available to local governments when their no-build zones are attacked as total takings under *Lucas*. Courts, as this *dictum* from *Lucas* indicates, may be susceptible to such defenses, even where they are novel.

ii. Public Trust and the Doctrine of Waste

A classic formulation of the public trust doctrine was articulated by the U.S. Supreme Court in *Shively v. Bowlby*:

> By the common law, both the title and the dominion of the sea, and of rivers and arms of the sea, where the tide ebbs and flows, and of all the lands below high water mark, within the jurisdiction of the Crown of England, are in the King. Such water, and the lands which they cover, either at all times, or at least when the tide is in, are incapable of ordinary and private occupation, cultivation, and improvement; and their natural and primary uses are public in their nature . . .[139]

Is it possible, in South Carolina for example, where the state has adopted a policy against armoring the beach and interrupting the rise of the sea, that the public enjoys a future interest in coastal properties and that current owners, by analogy to the law of life estates, have an obligation not to waste the inheritance of the remainderman? Perhaps more consistent with the ownership of a fee simple, is the present interest of littoral owners subject to a condition subsequent, with the public owning a future interest similar to the reversionary interest known as either a possibility of reverter or a right of reentry? In either case, regulation of the current right to use the land to prevent waste of the public's future interest might be justified. Does this mean that a regulation requiring removal of buildings after they are inundated by sea level rise would be sustained by this background principle? If so, could a locality require a developer to impose a deed restriction requiring the building to be removed in the future if inundation occurs?

iii. Natural Use Doctrine

A rough analogy to a local no-build zone is found in a 1963 New Jersey opinion that invalidated as a regulatory taking the creation of a Meadow Development Zone that prevented residential development in a 1,500-acre swamp to preserve open space and prevent flooding.[140] The land use regulation limited development to a variety of agricultural, outdoor recreational, conservation, and public uses, which the court found left no economically viable use of the land. Nearly 30 years later, the New Jersey courts, based on their more evolved understanding of swamps as valuable wetlands, disregarded the holding in the earlier case. In *Gardner v. New Jersey Pinelands Commission,* the court upheld a development restriction that placed most of an existing farm in a district restricting uses to agricultural with limited possibilities to develop the land.[141]

The *Gardner* court rejected the landowner's takings claim, finding a lack of investment-backed expectations, and in the course of the opinion disapproved of much of the language in the 1963 case. The court relied on *American Dredging Co. v. State*, which noted that:

> Where the effect of the governmental prohibition against use is not in furtherance of a governmental activity, such as flood control or preservation of land for a park or recreational area, but rather to preserve the land for ecological reasons in its natural environment without change, the consideration of the reasonableness of the exercise of the police power must be re-determined.[142]

It was during the 30-year period between *Gardner* and *Morris County* that land use patterns rapidly sprawled beyond urban boundaries, and that the resulting ecological damage became manifest. By the date of *Gardner*, a discernible environmental ethic had entered land use legislation and jurisprudence.

iv. Permitting Minimal Use of a Parcel

The regulation at issue in the *Gardner* case allowed some use, albeit minimal in the eyes of the owner, of the land. Where developers propose significant projects near

the beach, is it a total taking if a small portion of the land is allowed to be developed, such as that part of the parcel least likely to be inundated? Justice Stevens noted that "[a] landowner whose property is diminished in value 95% recovers nothing, while an owner whose property is diminished 100% recovers the land's full value."[143] Where some development value is left, a takings claim would be decided using the multifactor balancing test of the *Penn Central* case. One of the factors is "the extent to which the regulation has interfered with distinct investment backed expectations."[144] If it is now known that sea level rise endangers development, does a landowner have legitimate expectations to fully develop the parcel?

C. Changes in the Regulatory Environment

In *Colorado Department of Health v. The Mill,* the mill owners brought a takings action challenging the department's regulations that imposed use restrictions on the uranium mill operation. The Colorado Supreme Court held that The Mill should have known that "the right to make any use of the property that would create a hazard to public health by spreading radioactive contamination was excluded from The Mill's title at the onset."[145] The court held that the restrictions fell under the "background principles" exception to the *Lucas* total taking doctrine referring to the "regulatory environment" governing radioactive materials.[146] This included Colorado common law nuisance, state nuisance statutes, the department's regulations, and federal standards contained in the Uranium Mill Tailings Radiation Control Act.

Is the danger to life and property inherent in building on coastal properties that are vulnerable to inundation and storm surges analogous to the dangers of radioactive contamination? Are recent international, national, and state scientific studies and maps sufficiently well understood to qualify as changed circumstances under the language of *Lucas* and the Restatement of Torts? Do these create an environment in which severe regulations are to be expected, following the logic of *The Mill* case?

VI. Societies Choosing to Succeed

The consequences of climate change and the challenges that states and localities confront are too serious to confound these entities' thinking and confuse their responses with conflicting and dated messages from our nation's highest authorities. The Court's doctrinal ambiguity is unfortunate and the failure of Congress to update its seminal legislation is baffling. This pattern is reflected in climate change policy generally. The absence of a clear framework of law and guiding principles adversely affects local and state action regarding disaster planning. Local governments react to perturbations on the land and at the water's edge by reforming and updating their laws, policies, and programs in times of crisis. The Court and Congress should do the same.

The existing policies and initiatives of federal, state, and local governments demonstrate that numerous strategies are being employed and suggest that more effective partnerships across jurisdictional and sectoral lines are needed to respond to the gradual movement and sudden lurches of the sea upon the beach and beyond. Two

notions should guide the development of a national strategy to harmonize discordant governmental and private sector action: the use of an interjurisdictional framework law and the adoption of a reflexive law approach to create that framework.

National legislatures are encouraged by the U.N. Environment Program (UNEP) to adopt framework laws for land, resource, and environmental protection. A framework law establishes basic legal principles but does not contain regulatory standards. Framework laws begin with a statement of land use and environmental goals and policies and create logical institutional arrangements among levels and agencies of government as well as the procedures to be used for land use decisionmaking. Existing land use and environmental laws are left in place for the moment, with the intention that they will be amended as the more integrated governmental system matures.

This chapter explores how federal and state framework laws themselves can be linked, vertically and horizontally. The CZMA includes among its policies the mitigation of disaster damage. The DMA is a federal law that encourages state and local governments to conduct disaster mitigation planning by awarding them financial incentives if they do so. These laws have horizontal consistency, promoting through institutional arrangements both economic development and environmental protection. They operate vertically as well, relying on state and local authority to adopt disaster and coastal plans and implement them with federal encouragement, funding, and assistance. Using their police power authority, the states have created comprehensive regimes for land use control relying mostly on local land use planning and regulation, completing the vertical dimension. This local authority is guided, in turn, by state policies and plans enacted in response to federal coastal zone management and disaster mitigation statutes.

The problem with our national land use and environmental “legal system” is that its dated standards and many disconnections fall far short of a cogent framework of laws. The vertical and horizontal intersections described above are relatively random within the overall system, not the result of an overt, intentional, and consistent federal policy.

The disintegrated, uncoordinated nature of our country’s land use system—its vehicle for making choices regarding what happens to its land and resources—is not an incidental matter. Societies that have ignored the warnings of natural disasters and the degradation of their natural resources in the past have not fared well. The book *Collapse: How Societies Choose to Fail or Succeed* reflects on the costs to society caused by failing to heed the early warnings of long-term problems, such as those caused by major natural disasters and other recent damage to the physical environment. Societies that choose to succeed engage in the type of long-term planning that “characterizes some governments and some political leaders, some of the time.”[147] The integration of policy and implementation evident in the DMA and CZMA and the evidence of their influence in inducing coastal protection at the local level in Dover, Rhode Island, for example, illustrate how the country can succeed by combining the

energies and resources of various levels of government in a coordinated planning and development program aimed at preventing coastal degradation.

Is it possible to see the process of adopting linked framework laws that value and promote economic development and environmental conservation as the vehicle for confronting a host of challenging development and environmental issues? In this age of citizen participation, public hearings, open meetings, negotiated rulemaking, mediated settlement, and rapid exchange of information through technology, is it possible to see the process of adopting framework laws as a means of engaging stakeholders in deciding how the land and its resources should be used, by whom, and when?

Land use law evolves. It is a flexible and expansive vessel into which new content is poured and from which the old is drained. Consider a local comprehensive plan. Today it may contain the vision of yesterday's leaders of their community's future and the measures they selected to achieve their vision. As things change, the plan can be amended by local citizens attuned to the urgency of climate change, as can the land use laws selected to respond to new challenges and opportunities.

State legislatures are constantly responding to evidence of change and adopting and amending laws to manage coasts, mitigate disasters, and encourage local governments to do the same. In response to 50 years of experience of assuming greater responsibility for disaster response and recovery, the federal government adopted a new approach in the DMA. In response to the difficulty of rebuilding after several hurricanes and disasters experienced since it was last amended in 1990, the CZMA can be amended to marshal the resources, legal authority, and energies of the private market, and the agencies of government to enable us to do better as storms worsen.

In developing a set of linked framework laws, can the private sector, individual citizens, and their elected representatives at all levels of government be engaged in a conversation about the hard choices our society must make? Can the process of negotiating the details of vertically- and horizontally-connected land use laws provide the means through which our society can chose to survive? It can. The business of amending the law provides an important part of that answer.

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