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Land Use and Climate Change: Lawyers Negotiating Above Regulation

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Land Use and Climate Change

LAWYERS NEGOTIATING ABOVE REGULATION

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In our changing world one thing is certain: uncertainty will characterize predictions about the impact of new urban developments on the risks of floods, earthquakes, traffic congestion, or environmental harms.

Dolan v. City of Tigard, 1994[1]

I. *TEMPORA MUTANTUR*[2]

These are challenging times. Scientists and objective observers are certain that the climate is changing and that human behavior is its cause.[3] The 2009 report of the U.S. Global Change Research Program details the many readily observable impacts of climate change.[4] Rampant and repeated flooding in the Northeast and fires of unprecedented intensity and frequency in the drought-plagued Southwest are only the most recent evidence of deteriorating environmental conditions.[5]

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[1] Dolan v. City of Tigard, 512 U.S. 374, 411 (1994) (Stevens, J., dissenting).

[2] *"Tempora mutantur, et nos mutamur in illis." See* Livingston's dissent in Pierson v. Post: "If anything, therefore, in the digests or pandects shall appear to militate against the . . . foxhunter, we have only to say *tempora mutantur*; and if men themselves change with the times, why should not laws also undergo an alteration?" 3 Cai. 175 (N.Y. Sup. Ct. 1805).

[3] *See* Kevin Trenberth, *Check with Climate Scientists for Views on Climate*, WALL ST. J. (Feb. 1, 2012), http://online.wsj.com/article/SB10001424052970204740904577193270727472662.html?KEYWORDS=no+need+to+panic+about+global+warming ("Research shows that more than 97% of scientists actively publishing in the field agree that climate change is real and human caused. It would be an act of recklessness for any political leader to disregard the weight of evidence and ignore the enormous risks that climate change clearly poses.").

[4] U.S. GLOBAL CHANGE RESEARCH PROGRAM, GLOBAL CLIMATE CHANGE IMPACTS IN THE UNITED STATES 9 (2009) [hereinafter GLOBAL CLIMATE CHANGE IMPACTS IN THE U.S.]. The U.S. Global Change Research Program was charged with the responsibility of preparing this report by the Federal Advisory Committee Act.

[5] Hurricane Sandy caused 132 deaths in the United States, damaged 377,000 buildings in New York and New Jersey, cost $71 billion in damages in the two

This research report also forecasts likely future changes that include more intense hurricanes with related increases in wind, rain, and storm surges;[6] sea-level rise in coastal areas;[7] and even drier conditions in some already drought-ridden regions.[8] These changes, it reports, will affect human life and health as well as water supply, agriculture, coastal areas, and many other aspects of the natural environment.[9]

The U.S. Supreme Court agrees. In *Massachusetts v. EPA*, the Court wrote:

> The harms associated with climate change are serious and well recognized. Indeed, the [National Research Council] Report itself—which EPA regards as an objective and independent assessment of the relevant science, . . . 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.[10]

Climate change is caused by the accumulation of Greenhouse Gases (GHGs) in the atmosphere, which admit solar radiation but block the escape of heat.[11] This chemical process,

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states, and resulted in up to $22 billion in insurance payouts. Andy Newman, *Comparing Hurricanes: Katrina vs. Sandy*, N.Y. TIMES, Nov. 28, 2012, at A28.

[6] *See* Ning Lin et al., *Physically Based Assessment of Hurricane Surge Threat Under Climate Change*, 2 NATURE CLIMATE CHANGE, June 2012, at 462-67.

[7]

> Climate change-driven sea-level rise occurs for two main reasons. First, water expands as it increases in temperature, and rising global air temperatures have been causing corresponding increases in ocean temperatures. Second, hotter atmospheric temperatures are also causing ice caps and glaciers all over the world to melt, providing influxes of fresh water to the oceans and increasing the total volume of water that they hold.

Robin Kundis Craig, *A Public Health Perspective on Sea-Level Rise: Starting Points for Climate Change Adaptation*, 15 WIDENER L. REV. 521, 526 (2010).

[8] Melissa Gaskill, *Climate Change Threatens to Create a Second Dust Bowl*, SCI. AM. (Nov. 27, 2012), http://www.scientificamerican.com/article.cfm?id=climate-change-threatens-second-dust-bowl.

[9] Craig, *supra* note 7, at 521.

[10] Massachusetts v. EPA, 549 U.S. 497, 521 (2007) (internal quotation marks omitted); *see generally* Coal. for Responsible Regulation v. EPA, 684 F.3d 102, 114 (D.C. Cir. 2012) (affirming EPA's endangerment finding that CO_2 and other greenhouse gas emissions constitute a danger to public health and can be regulated under the Clean Air Act). The Court found that the EPA's finding was based on good science and careful research. The decision upheld the EPA's regulation of fuel efficiency standards and its timetable for controlling emissions from large stationery sources of CO_2 such as electrical generation plants.

[11] U.S. ENVTL. PROT. AGENCY, OUR BUILT AND NATURAL ENVIRONMENTS: A TECHNICAL REVIEW OF THE INTERACTIONS BETWEEN LAND USE, TRANSPORTATION, AND

known as the greenhouse effect, causes the planet to warm and weather conditions to change, which in turn exacerbates the frequency and ferocity of storms and flooding.[12] Carbon dioxide makes up approximately 85 percent of total U.S. GHG emissions and is primarily emitted by electricity-generation plants, buildings of every type, and automobile tailpipes.[13] The amount of CO_2 in the atmosphere has increased from a pre-industrial rate of 280 parts per million (ppm) to 393 ppm today.[14] Scientific opinion has concluded that 350 ppm is the tipping point beyond which climate change becomes particularly dangerous to society, especially with regard to sea-level rise caused by the warming of the seas and the melting of polar ice caps, arctic ice, glaciers, and formerly permanent mountain snow caps.[15]

The absence of effective national and international GHG emission-reduction mechanisms raises a serious concern that government inaction will permit an alarming increase in accumulation of these gases in the atmosphere.[16] Strategies that reduce or capture carbon emissions are needed to respond

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ENVIRONMENTAL QUALITY 29-30 (2001), *available at* http://www.epa.gov/smartgrowth/pdf/built.pdf.

[12] *Id.* at ii, 31.

[13] *Carbon Dioxide Emissions*, U.S. EPA, http://www.epa.gov/climatechange/ghgemissions/gases/co2.html (last visited Apr. 15, 2013) (reporting that in 2010 carbon dioxide "accounted for about 84% of all U.S. greenhouse gas emissions from human activities," and that the main sources are electricity generation, fossil fuel combustion, and industrial operations.).

[14] RESEARCH & INNOVATIVE TECH. ADMIN., BUREAU OF TRANSP. STATISTICS, NATIONAL TRANSPORTATION STATISTICS 2011, tbl.1-11: Number of U.S. Aircraft, Vehicles, Vessels, & Other Conveyances (2011), *available at* http://www.bts.gov/publications/national_transportation_statistics/html/table_01_11.html; *cf.* FED. HIGHWAY ADMIN., U.S. DEP'T OF TRANSP., TRAFFIC VOLUME TRENDS (Sept. 2012), *available at* https://www.fhwa.dot.gov/policyinformation/travel_monitoring/12septvt/12septvt.pdf; *see also* J.D. Harrington et al., *Study Finds Ancient Warming Greened Antarctica*, NASA (June 17, 2012), http://www.nasa.gov/home/hqnews/2012/jun/HQ_12-202_Antarctica_Greener_Warmer.html; Robert E. Lang et al., *American Demographics—Circa 2109*, PLANNING, May 2009, at 10.

[15] James Hansen et al., *Target Atmospheric CO_2: Where Should Humanity Aim?*, 2 OPEN ATMOS. SCI. J. 217, 217, 226 (2008) (paleoclimate evidence suggests that 350 ppm of CO_2 will keep global temperatures to within two degrees Celsius of their current levels).

[16] *See* COMM. ON AM.'S CLIMATE CHOICES, NAT'L ACAD. OF SCI., AMERICA'S CLIMATE CHOICES 21 (2011) (showing projections ranging from 450 ppm to over 950 ppm by 2100); *see also* Trenberth, *supra* note 3 ("The National Academy of Sciences of the U.S. (set up by President Abraham Lincoln to advise on scientific issues), as well as major national academies of science around the world and every other authoritative body of scientists active in climate research have stated that the science is clear: The world is heating up and humans are primarily responsible. Impacts are already apparent and will increase. Reducing future impacts will require significant reductions in emissions of heat-trapping gases.").

to this phenomenon. One such strategy is to preserve and enhance forests.[17] Trees and the vegetated environment naturally absorb and store more than 15 percent of total U.S. carbon emissions.[18] Most biological sequestration results from carbon uptake and storage by forests.[19]

At early common law, however, trees were regarded as a nuisance to farming, a critical economic enterprise during the period of westward expansion. Clear-cutting was not only allowed; it was encouraged. In a 1911 case, *Pardee v. Camden Lumber*, a West Virginia court wrote: "In early days, [forests were] regarded as an [e]ncumbrance and burden upon lands. Having nothing but forests, the chief object or purpose of land owners everywhere was to get rid of the forests, and prepare their lands for agriculture."[20] After examining cases holding that forests constitute nuisances, the court refused to apply those precedents to the controversy at hand. Times had changed. A century before *Pardee*, forests were a nuisance; at the turn of the twentieth century, the West Virginia court deemed them an economic asset. Today, over 100 years later, they may well be invaluable. The mitigation of climate change through organic sequestration underscores the importance of forests and other vegetated landscapes to the survival of society.

Change in society causes adjustments to statutes as well as the common law. Reliance on nuisance law to control the use of private property proved inadequate to protect property investments and the quality of community life in post industrial America.[21] Threatened by the march of skyscrapers up Fifth Avenue and industrial development along rail lines paralleling Euclid Avenue, the City of New York and the Village of Euclid, Ohio, respectively adopted innovative and

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[17] John R. Nolon, *Managing Climate Change Through Biological Sequestration: Open Space Redux*, 31 STAN. ENVTL. L.J. 195, 196-97 (2012).

[18] U.S. ENVTL. PROT. AGENCY, INVENTORY OF U.S. GREENHOUSE GAS EMISSIONS AND SINKS: 1990–2009, EXECUTIVE SUMMARY ES-7 (2011), *available at* http://www.epa.gov/climatechange/Downloads/ghgemissions/US-GHG-Inventory-2011-Executive-Summary.pdf [hereinafter EPA GREENHOUSE GAS INVENTORY EXEC. SUMMARY].

[19] *Id.* (863.1 Tg of CO_2 equivalent (eq.) attributed to forest land out of a total of 1,015.1 Tg CO_2 eq. sequestered by all U.S. carbon sinks). Given the statistics presented in this report, the following strategies are important to the United States' current biological sequestration portfolio: forest land remaining forest land; cropland remaining cropland; grassland remaining grassland; and converting land to grassland. *See id.*

[20] Pardee v. Camden Lumber Co., 73 S.E. 82, 85 (W. Va. 1911).

[21] *See* NEWMAN F. BAKER, LEGAL ASPECTS OF ZONING 33-39 (1927); SEYMOUR I. TOLL, ZONED AMERICAN (1969).

comprehensive zoning ordinances that drastically limited the ways in which private property could be used.[22]

In finding such regulations constitutional, the Supreme Court in *Village of Euclid v. Ambler Realty Co.* noted that "while the meaning of constitutional guaranties never varies, the scope of their application must expand or contract to meet the new and different conditions which are constantly coming within the field of their operation. In a changing world, it is impossible that it should be otherwise."[23] Within a half century following the *Euclid* decision, local governments were using their delegated police and zoning power in a novel way: to adopt a wide range of innovative environmental laws, responding to perturbations in the local environment and further restricting the use of private land.[24] Today, sea-level rise requires a new paradigm for controlling the development of coastal lands that sit in harm's way, calling for significant adjustments in the law and legal practice.

This article looks closely at both climate change and sea-level rise, as well as the challenges they pose to the legal system, practice of law, and legal education. Part I explains that the law, both in its interpretation and application, periodically changes to address the needs of a changing society. Part II explains the process and rate by which the physical environment is changing because of climate change and also describes some responsive changes that are already observable in legal institutions, strategies, and statutes. This part also reflects on how the lack of certainty regarding the pace of sea-level rise shapes these evolving legal strategies. Further, it refers to path dependency theory to suggest that certain prospects of sea-level rise present a unique opportunity for fundamental legal change, such as banning or heavily regulating the construction of new buildings in threatened areas. Part III explores how the total-takings barrier of the *Lucas v. South Carolina Coastal Council*[25] decision confounds attempts to prevent building in vulnerable coastal communities. Although *Lucas* contains interpretative threads that infuse some flexibility in its application to these new conditions, its core principle combines with other practical and political difficulties

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[22] *See generally* TOLL, *supra* note 21.

[23] Vill. of Euclid v. Ambler Realty Co., 272 U.S. 365, 387 (1926).

[24] *See* John Nolon, *In Praise of Parochialism: The Advent of Local Environmental Law*, 26 HARV. ENVTL. L. REV. 365, 365-77 (2002).

[25] 505 U.S. 1003 (1992).

to militate against severe development restrictions in coastal areas. Part IV illustrates how, through negotiation and the sensitive use of existing local land use procedures, lawyers can propose and advocate for effective alternatives to the traditional regulatory approach. Part V concludes by explaining how we can embrace the challenges of these rapidly changing times by reorienting legal education and the practice of law so that lawyers are capable of creating needed new legal institutions, procedures, and strategies.

II. CHANGING CLIMATE, INSTITUTIONS, AND STRATEGIES

In order for the law to adapt to climate change, it must measure and react to the extent and nature of that change. The less certain we are about the particulars, the more challenging it is to develop needed changes to legal regimes and practices. We know that climate change is occurring, but we do not know, for example, how fast sea levels will rise, precisely where along coastal waters inundation will occur, or where and how ferociously storm surges will strike. Additionally, the more quickly and efficiently society addresses the causes of climate change, the less impact it will have. This lack of certainty is particularly apparent if one focuses on the land use dimensions of climate change.

Climate change is caused in significant part by the generation of electricity needed to heat and cool buildings[26] and by the combustion of fossil fuels in day-to-day travel in and around the built environment. Human activity that removes vegetation from the natural landscape, such as residential subdivision development, further exacerbates the problem, given that vegetation sequesters a significant percentage of annual carbon emissions.[27] In short, how buildings are built, where they are located, how many vehicle miles Americans travel

[26] The Department of Energy projects that by 2035, residential and commercial buildings will use 76.5 percent of the total electricity in the United States. *See* U.S. Dep't of Energy, *U.S. Residential and Commercial Buildings Total Primary Energy Consumption*, *in* BUILDINGS ENERGY DATA BOOK tbl.1.1.1: U.S. Residential and Commercial Buildings Total Primary Energy Consumption, *available at* http://buildingsdatabook.eren.doe.gov/TableView.aspx?table=1.1.1 [hereinafter BUILDINGS ENERGY DATA BOOK] (last updated Mar. 2012).

[27] *See* EPA GREENHOUSE GAS INVENTORY EXEC. SUMMARY, *supra* note 18, at ES-1 to ES-7.

from place to place, and how much vegetated land will be consumed by land development all matter a great deal.[28]

Sprawl development causes numerous environmental problems as a result of its emphasis on large-lot, single-family housing and the rigid separation of building uses among districts.[29] Local land use regulations have permitted and promoted sprawl development over the past several decades, resulting in an unsustainable rate of energy consumption and CO_2 emissions.[30] Emerging policies in some states promote an alternative human settlement pattern: compact, mixed-use development concentrated in and around existing urbanized areas.[31] States are entering into compacts to create new and promising institutions tasked with climate-change mitigation, and innovative strategies include efforts to unite stakeholders in voluntary approaches to mitigate the effects of climate change.[32] We are nonetheless guided by estimates, not certainty, with respect to these matters, despite encouraging evidence that these more sustainable development policies and initiatives will succeed in reducing the consequences of climate change. Although the trends are clear, the pace of their development is not. In this section, we examine these important climate-change influences and the types of institutions and strategies that are evolving to better mitigate and adapt to climate change.

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[28] For a complete explanation of this assertion, see generally John R. Nolon, *The Land Use Stabilization Wedge Strategy: Shifting Ground to Mitigate Climate Change*, 34 WM. & MARY ENVTL. L. & POL'Y REV. 1 (2009).

[29] *See, e.g.*, Michael Lewyn, *Sprawl in Canada and the United States*, 44 URB. LAW. 85, 86-87 (2012).

[30] Nolon, *supra* note 28, at 11.

[31] *See* Smart Growth Public Infrastructure Policy Act, N.Y. ENVTL. CONSERV. LAW § 6-0105 (McKinney 2010). It states:

> It is the purpose of this article to augment the state's environmental policy by declaring a fiscally prudent state policy of maximizing the social, economic and environmental benefits from public infrastructure development through minimizing unnecessary costs of sprawl development including environmental degradation, disinvestment in urban and suburban communities and loss of open space induced by sprawl facilitated by the funding or development of new or expanded transportation, sewer and waste water treatment, water, education, housing and other publicly supported infrastructure inconsistent with smart growth public infrastructure criteria.

[32] *See infra* Parts II.B & C.

A. *Uncertain Forces Affecting the Rate of Climate Change and Sea-Level Rise*

The generation of electricity to heat and cool buildings is responsible for over one-third of total CO_2 emissions.[33] Recent population growth has increased demand for development. The United States population in 1990 was 248,709,873;[34] as of 2010, it was 308,745,538.[35] There were 102.2 million housing units in 1990,[36] compared with 131.7 million housing units in 2010.[37] In 1990, the residential sector consumed 10.39 quadrillion BTU,[38] while that figure increased to 15.34 quadrillion in 2010.[39] The commercial sector consumed 9.43 quadrillion BTU in 1990 and 14.05 quadrillion BTU in 2010.[40]

Nationally, the EPA found that "[t]ransportation activities . . . accounted for 33 percent of CO_2 emissions from fossil fuel combustion in 2009 . . . . Nearly 65 percent of [these] emissions resulted from gasoline consumption for personal vehicle use."[41] A count of the total vehicle miles traveled (VMT) by Americans presents a useful measure of transportation levels. Annual VMT rose from 2.1 trillion in 1990 to 2.9 trillion in 2010.[42] VMT have increased three times faster than the population since 1980.[43] This increase appears to have resulted

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[33] John R. Nolon, *Land Use for Energy Conservation and Sustainable Development: A New Path Toward Climate Change Mitigation*, 27 J. LAND USE & ENVTL. L. 295, 299 (2012).

[34] *1990 Census*, U.S. CENSUS BUREAU, http://2010.census.gov/main/www/cen1990.html (last visited Apr. 24, 2012).

[35] *2010 Census Data*, U.S. CENSUS BUREAU, http://2010.census.gov/2010census/data/index.php (last visited Apr. 24, 2012) (scroll down to graphic under "Redistricting Data" heading).

[36] U.S. CENSUS BUREAU, 1990 CENSUS OF POPULATION AND HOUSING: 1990 POPULATION AND HOUSING UNIT COUNTS tbl.2, *available at* http://www.census.gov/population/www/censusdata/files/table-2.pdf (last visited Oct. 10, 2012).

[37] CHRISTOPHER MAZUR & ELLEN WILSON, U.S. CENSUS BUREAU, HOUSING CHARACTERISTICS: 2010, C2010BR-07, at 2 (2011), *available at* http://www.census.gov/prod/cen2010/briefs/c2010br-07.pdf. Note that of these 131.7 million, only 116.7 million were occupied. *Id.*

[38] BTU or Btu means British Thermal Unit. "One Btu is the heat required to raise the temperature of one pound of water by one degree Fahrenheit." *Frequently Asked Questions*, U.S. ENERGY INFO. ADMIN., http://www.eia.gov/tools/faqs/faq.cfm?id=45&t=8 (last updated Sept. 17, 2012).

[39] BUILDINGS ENERGY DATA BOOK, *supra* note 26, at tbl.2.1.1: Residential Primary Energy Consumption, *available at* http://buildingsdatabook.eren.doe.gov/TableView.aspx?table=2.1.1.

[40] *Id.* at tbl.3.1.1: Commercial Primary Energy Consumption, *available at* http://buildingsdatabook.eren.doe.gov/TableView.aspx?table=3.1.1.

[41] EPA GREENHOUSE GAS INVENTORY EXEC. SUMMARY, *supra* note 18, at ES-9.

[42] *Id.* at ES-6.

[43] Keith Bartholomew & Reid Ewing, Address at the 87th Transportation Research Board Annual Meeting: Land Use-Transportation Scenario Planning in an Era

largely from personal auto use, as "[VMT] by light-duty motor vehicles (passenger cars and light-duty trucks) increased 39 percent from 1990 to 2009."[44] In fact, "[VMT] may exceed seven trillion . . . miles by 2055."[45]

According to projections, the United States population will continue to grow, calling for more building and electricity, and causing more energy consumption and driving.[46] These projections hold that, by the year 2039, the United States population will have increased by nearly a third to over 400 million people.[47] Between 2010 and 2030, it is projected that the private sector will add 37 million new homes and 76 billion square feet of nonresidential construction to accommodate this growth and to replace obsolete buildings.[48] The addition of 100 million people translates into 40 million new households whose members will live, work, and shop in these buildings, traveling largely by car.

To the extent that these population and settlement increases occur, the accumulation of CO_2 in the atmosphere will continue to escalate. The Intergovernmental Panel on Climate Change (IPCC)[49] reported an atmospheric CO_2 concentration of

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of Global Climate Change 4 (Nov. 5, 2007), *available at* http://faculty.arcn.utah.edu/bartholomew/Bartholomew_Ewing_Revision.pdf.

[44] U.S. ENVTL. PROT. AGENCY, INVENTORY OF U.S. GREENHOUSE GAS EMISSIONS AND SINKS: 1990–2009, COMPLETE REPORT 2-21, *available at* http://www.epa.gov/climatechange/Downloads/ghgemissions/US-GHG-Inventory-2011-Complete_Report.pdf.

[45] AM. ASS'N OF STATE HIGHWAY AND TRANSP. OFFICIALS, FUTURE NEEDS OF THE U.S. SURFACE TRANSPORTATION SYSTEM 18 (2007).

[46] *U.S. Population Projections, Table 1: Projections and Components of Change for the United States: 2010 to 2050*, U.S. CENSUS BUREAU (Aug. 14, 2008), http://www.census.gov/population/www/projections/summarytables.html (follow "Projections of the Population and Components of Change for the United States: 2010 to 2050" hyperlink). The United States population in 2006 was 299.4 million people. U.S. Census Bureau, *Population Estimates*, http://www.census.gov/popest/data/historical/2000s/vintage_2006/index.html/ (follow "Annual Estimates of the Population for the United States, Regions, States, and for Puerto Rico: April 1, 2000 to July 1, 2006" hyperlink) (last visited Oct. 8, 2009). Population projections are estimates only. They depend on fertility, immigration, and aging trends that are difficult to project. That said, most credible evidence indicates that the U.S. population will increase significantly throughout the next century. "[I]t is very likely that the U.S. population will be at 400 million by midcentury." Lang et al., *supra* note 14. Calculations used in this article assume generally that within three or four decades there will be 100 million more Americans and that the average household size will be 2.5 persons per household, resulting in a net increase of 40 million households. The official projection for the next 100 years conducted by the U.S. Census Bureau, using a medium scenario for growth, projects a doubling of the 2000 population by the year 2100, a total of 571 million people.

[47] Lang et al., *supra* note 14, at 10.

[48] *See* ARTHUR C. NELSON, RESHAPING METROPOLITAN AMERICA: DEVELOPMENT TRENDS AND OPPORTUNITIES TO 2030, at 80-82 (2013).

[49] INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2007: SYNTHESIS REPORT (2007), *available at* http://www.ipcc.ch/pdf/assessment-report/ar4/

353 ppm in 1990[50] and 379 ppm in 2005.[51] As of February 2012, the National Oceanic and Atmospheric Agency reported that the global atmospheric CO_2 concentration was approximately 393 ppm.[52] With additional households, continued building, and more driving, these accumulations will only increase further.

That these changes will cause additional sea-level rise is clear. The greenhouse effect causes polar ice and glaciers to melt, reduces the reflection of the sun's rays, and warms seawater through intensified absorption of solar radiation.[53] Warmer seawater increases both the wind speed of coastal storms and the moisture they release. Increased water temperature also melts sea ice, ultimately contributing to sea-level rise.[54] The U.S. Climate Change Science Program (CCSP)

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syr/ar4_syr.pdf [hereinafter IPCC SYNTHESIS REPORT]. The Intergovernmental Panel on Climate Change was formed in 1988 as a scientific body that reviews and assesses the most recent scientific, technical, and socio-economic information relevant to climate change. More than 150 countries participate in working groups of the IPCC. The Fourth Assessment Report was released in 2007. *See generally* JOHN R. NOLON & PATRICIA E. SALKIN, CLIMATE CHANGE AND SUSTAINABLE DEVELOPMENT LAW IN A NUTSHELL 22-23 (2011) (indicating the sufficiency of the reports on which the IPCC report was based by stating that "[o]ver 40 writing teams and 450 lead authors—selected as lead authors because of their expertise—contributed to the Fourth Assessment Report. The report contains over 18,000 citations to scientific reports, the majority of which were published in peer-reviewed journals. The lead authors were assisted by over 800 scientists and analysts who participated as contributing authors on specific topics. These authors contributed their time and were assisted by four Technical Support Units with paid staff.").

[50] R.T. Watson et al., *Greenhouse Gases and Aerosols*, *in* CLIMATE CHANGE: THE IPCC SCIENTIFIC ASSESSMENT 5 (J.T. Houghton et al., eds., 1990), *available at* http://www.ipcc.ch/ipccreports/far/wg_I/ipcc_far_wg_I_chapter_01.pdf.

[51] IPCC SYNTHESIS REPORT, *supra* note 49, at 37.

[52] *Trends in Atmospheric Carbon Dioxide*, NOAA EARTH SYS. RES. LAB., http://www.esrl.noaa.gov/gmd/ccgg/trends/global.html (last visited Sept. 22, 2012) (under Recent Global CO_2 heading); *see also* Harrington et al., *supra* note 14.

[53] Global warming results from the accumulation of man-made gases, released into the atmosphere from such activities as the burning of fossil fuels, deforestation, and the production of chlorofluorocarbons, which trap solar heat in the atmosphere and raise temperatures worldwide. Global warming could result in significant global sea-level rise by 2050 resulting from ocean expansion, the melting of snow and ice, and the gradual melting of the polar ice cap. Sea-level rise will result in the loss of natural resources such as beaches, dunes, estuaries, and wetlands and will contribute to the salinization of drinking water supplies. Sea-level rise will also result in damage to properties, infrastructures, and public works. There is a growing need to plan for sea-level rise. Coastal Zone Act Reauthorization Amendments of 1990, Pub. L. No. 101-508, 104 Stat. 1388-299, 6203(a)(3) & § 1451(*l*) (codified as amended at 16 U.S.C. §§ 1451-1455).

[54] GLOBAL CLIMATE CHANGE IMPACTS, *supra* note 4, at 18 ("ocean water expands as it warms, and therefore takes up more space"); *see also* Vincenzo Artale et al., *Observations: Oceanic Climate Change and Sea Level*, *in* CLIMATE CHANGE 2007: THE PHYSICAL SCIENCE BASIS 408 (2007), *available at* http://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-chapter5.pdf ("[G]lobal mean sea level change results from two major processes[:] . . . i) thermal expansion, and ii) the exchange of water between oceans and other reservoirs (glaciers and ice caps, ice sheets, other land water reservoirs . . .)."); *see generally Water—Thermal Properties*, ENGINEERING

found that "[e]xtrapolating the recent acceleration of ice discharges from the polar ice sheets would imply an additional contribution up to 0.20 m [to the IPCC estimates]. If melting of these ice caps increases, larger values of sea-level rise cannot be excluded."[55] Therefore, "thoughtful precaution suggests that a global sea level rise of 1 [meter] to the year 2100 should be considered for future planning and policy discussions."[56] Indeed, studies more recent than the CCSP's report indicate that "[e]ven for the lowest emission scenario [generated by previous estimates], sea-level rise is then likely to be ~1 m; for the highest, it may even come closer to 2 m [over 1990 levels]."[57]

"Thoughtful precaution" is an appropriate term. Despite the overwhelming consensus that sea levels will rise as carbon emissions and global temperature increase, experts do not know precisely when or where that rise will occur, or by how much.[58] This makes it difficult to control coastal development in the near-term, for example, through prescriptive regulation. Do we know for sure that buildings constructed today will be affected by inundation or storm surges during their useful lives? This lack of certainty has inhibited coastal regulation, but it has not checked the growth of new legal institutions and the emergence of new coping strategies.

The certainty of sea-level rise itself, however, is precipitating changes in law, policy, and institutions during a crisis of unknown proportions. We are seeking new solutions. Path dependence theory explains these changes to an extent. The

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TOOLBOX, http://www.engineeringtoolbox.com/water-thermal-properties-d_162.html (last visited Feb. 22, 2012) (showing that water expands when heated).

[55] *See* U.S. CLIMATE CHANGE SCI. PROGRAM, COASTAL SENSITIVITY TO SEA-LEVEL RISE: A FOCUS ON THE MID-ATLANTIC REGION 13, 15 (2009), *available at* http://www.climatescience.gov/Library/sap/sap4-1/final-report/sap4-1-final-report-all.pdf [hereinafter CCSP COASTAL SENSITIVITY].

[56] *Id.* at 20; *see also* James G. Titus, *Greenhouse Effect, Sea Level Rise and Land Use*, 7 LAND USE POL'Y 138, 144 (1990). "In many states the total shoreline retreat from a [one meter] rise would be much greater than suggested by the amount of land below the [one meter] contour on a map because shores would also erode." *Id.* at 141.

[57] Martin Vermeer & Stefan Rahmstorf, *Global Sea Level Linked to Global Temperature*, 106 PROC. NAT'L ACAD. SCI. U.S. 21527, 21531 (2009), *available at* http://www.pnas.org/content/106/51/21527.full.pdf; *see also, generally*, Asbury H. Sallenger Jr. et al., *Hotspot of Accelerated Sea-Level Rise on the Atlantic Coast of North America*, NATURE CLIMATE CHANGE (June 24, 2012), *available at* http://www.cityofboston.gov/Images_Documents/Hotspot%20of%20accelerated%20sea-level%20rise%20-%20USGS%206-25-12_tcm3-33215.pdf.

[58] Sallenger et al., *supra* note 57, at 1 ("Climate warming does not force sea-level rise (SLR) at the same rate everywhere. Rather, there are spatial variations of SLR superimposed on a global average rise. . . . Here, we present evidence of recently accelerated SLR in a unique 1,000-km-long hotspot on the highly populated North American Atlantic coast . . . .").

theory posits that "an outcome or decision is shaped in specific and systematic ways by the historical path leading to it."[59] It refers to the causal relationship between stages in a sequence.[60] In other words, path dependence suggests that "what happened at an earlier point in time will affect the possible outcomes of a sequence of events occurring at a later point in time."[61]

When path dependence theory is applied to the law, it suggests that early decisions—whether court cases, agency rules, or institutional policies—can lock in future judicial doctrine, regulatory policy, and administrative action.[62] Theorists who study path dependency believe that "the opportunities for significant legal change in a common law system are brief and intermittent, occurring during critical junctures when new legal issues arise or higher courts or legislatures intercede."[63] These junctures, or punctuations, offer opportunities to shape and reform decision making and policies.[64]

Climate change and the growing evidence of its harmful consequences have, most certainly, brought us to such a juncture in American law. The question here is how our recent understanding of, and adjustment to, climate change has caused path-altering changes in institutional arrangements and led policy makers and professionals to implement impressive new institutions and strategies.

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[59] Oona A. Hathaway, *Path Dependence in the Law: The Course and Pattern of Legal Change in a Common Law System*, 86 IOWA L. REV. 601, 604 (2001).

[60] Holmes said:

> [I]f we want to know why a rule of law has taken its particular shape, and more or less if we want to know why it exists at all, we go to tradition. We follow it into the Year Books, and perhaps beyond them to the customs of the Salian Franks, and somewhere in the past, in the German forests, in the needs of Norman kings, in the assumptions of a dominant class, in the absence of generalized ideas, we find out the practical motive for what now best is justified by the mere fact of its acceptance and that men are accustomed to it. The rational study of law is still to a large extent the study of history. History must be a part of the study, because without it we cannot know the precise scope of rules which it is our business to know. It is a part of the rational study, because it is the first step toward an enlightened scepticism, that is, toward a deliberate reconsideration of the worth of those rules.

Oliver Wendell Holmes, Jr., *The Path of Law*, 10 HARV. L. REV. 457, 469 (1897).

[61] Hathaway, *supra* note 59, at 604 (quoting William H. Sewell, Jr., *Three Temporalities: Toward an Eventful Sociology*, *in* THE HISTORIC TURN IN THE HUMAN SCIENCES 226-63 (Terrance J. McDonald ed., 1996)).

[62] J.B. Ruhl & James Salzman, *Mozart and the Red Queen: The Problem of Regulatory Accretion in the Administrative State*, 91 GEO. L.J. 757, 818 (2003).

[63] Hathaway, *supra* note 59, at 605.

[64] *Id.*

B. *Changes in Institutions*

Concern over the consequences of climate change and the lack of effective action at the national and international levels has led state governments to create new institutions to manage climate change. In this section, we examine the workings of the Regional Greenhouse Gas Initiative (RGGI), the Transportation Climate Initiative (TCI), and the California Air Resources Board (CARB). All three chart new paths for managing climate change and have the potential to alter the rate at which the causes of climate change occur. The coincidence of these state and interstate initiatives—and the failures at the international and national levels—presents a powerful opportunity for progress at the local, state, and regional level.

The United Nations Framework Convention on Climate Change (UNFCCC) was signed at the Earth Summit in Rio de Janeiro in 1992.[65] The Convention created a Conference of the Parties (COP) and charged it with meeting regularly to develop mechanisms to implement the Convention's commitment to GHG reductions.[66] The third meeting of the COP was held in 1997 in Kyoto, Japan, resulting in an agreement that committed developed countries to limit the tons of CO_2 they may emit.[67] This cap was to be implemented in two ways: 1) through the purchase of Emission Reduction Units from other developed countries; and 2) through the Clean Development Mechanism, which allows developed countries to earn Emission Reduction Units by implementing emissions-reductions projects in developing countries.[68]

The Kyoto Protocol, which expired in 2012 and was extended through 2020 pursuant to the Doha Amendment,[69] was reviewed in December 2009 at the fifteenth meeting of the COP in Copenhagen.[70] The parties failed to agree on whether the Protocol would continue, but they did endorse achieving economy-wide emission targets by 2020 in an effort to cap global temperature increases at two degrees Centigrade—or 3.6 degrees Fahrenheit—a temperature identified as the tipping point for

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[65] Kyle W. Danish, *The International Regime*, *in* GLOBAL CLIMATE CHANGE AND U.S. LAW 31, 33 (Michael B. Gerrard ed., 2008).

[66] *Id.* at 35.

[67] *Id.* at 36.

[68] *Id.* at 42-44.

[69] U.N. Framework Convention on Climate Change, *Kyoto Protocol*, UNFCCC, http://unfccc.int/kyoto_protocol/items/2830.php (last visited Mar. 10, 2013).

[70] NOLON & SALKIN, *supra* note 49, at 6.

global warming.[71] Developed countries that signed the Copenhagen Accord, including the United States, agreed to report biennially on the progress they make in reducing emissions.[72]

In June 2009, the Waxman-Markey bill—known as the American Clean Energy and Security Act of 2009—passed the House of Representatives, setting the stage for a highly effective cap and trade program in the U.S.[73] The bill would have curbed GHG by setting a limit on overall national emissions while allowing utilities, manufacturers, and other emitters to trade pollution permits or allowances among themselves.[74] But the comparable bill in the Senate failed to emerge from committee,[75] and by the time the Copenhagen Accord was signed, it was highly doubtful that initiatives at the national level in the U.S. would be successful. This set the stage for effective state and interstate action as one method of fulfilling the country's Copenhagen obligations.

1. Regional Greenhouse Gas Initiative

In 2005, the governors of the ten states[76] that were parties to the Regional Greenhouse Gas Initiative (RGGI) in the Northeast[77] signed a Memorandum of Understanding establishing emissions caps and a trading system to implement them.[78] Participating states currently include Delaware, New York, Connecticut, Rhode Island, Massachusetts, Vermont, New Hampshire, Maine, and Maryland.[79] The cap-and-trade program has not only secured the support of critical stakeholders—like power plant owners and environmental

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[71] *Id.* at 7.

[72] *Id.*

[73] H.R. 2454, 111th Cong. (2009).

[74] *Id.*

[75] The Clean Energy Jobs and American Power Act, S. 1733, 111th Cong. (2010).

[76] There are currently only nine participating states after Gov. Chris Christie of New Jersey announced that his state would withdraw from the initiative. Mireya Navarro, *Christie Pulls New Jersey From 10-State Climate Initiative*, N.Y. TIMES, May 26, 2011 at A20, *available at* http://www.nytimes.com/2011/05/27/nyregion/christie-pulls-nj-from-greenhouse-gas-coalition.html.

[77] *See* REG'L GREENHOUSE GAS INITIATIVE, http://www.rggi.org (last visited July 4, 2012). The body that administers RGGI is RGGI, Inc.

[78] *Memorandum of Understanding*, REG'L GREENHOUSE GAS INITIATIVE, http://www.rggi.org/design/history/mou (last visited Apr. 25, 2012).

[79] *Id.* Gov. Chris Christie of New Jersey pulled the state out of the program in 2011. *See* REG'L GREENHOUSE GAS INITIATIVE, NEW JERSEY WITHDRAWAL OF AGREEMENT TO MEMORANDUM OF UNDERSTANDING (Nov. 9, 2011), *available at* http://www.rggi.org/docs/Documents/NJ-Statement_112911.pdf.

leaders—but has also proven to have a workable collaborative governing structure, which has begun to show effective results.[80]

The governors of the member states negotiated and signed a Memorandum of Understanding in 2009, promulgated regulations based on a model rule, and created an implementing agency to administer the program, naming the member states' environmental and energy commissioners to serve as directors.[81] The regulations apply to fossil-fuel-fired power plants with a capacity of twenty-five MW or more.[82] RGGI caps CO_2 emissions at 2009 emission levels through 2014.[83] The regulations then provide for a 2.5 percent annual reduction in emission levels through 2019, with the goal of reaching a 10 percent reduction of CO_2 emissions below 2009 levels.[84] States distribute CO_2 allowances in quarterly auctions, and regulated power plants purchase the number of allowances they need to equal their projected emissions.[85] The revenue generated by these auctions is divided among member states for investment in clean-energy technology and energy-efficiency development programs.[86] Each state may direct RGGI proceeds to encourage a clean-energy economy within its borders or put them to other uses.[87]

As of February 2011, auction revenue from allowance proceeds totaled approximately $993 million.[88] States invested 80 percent of that revenue into energy programs designed to improve energy efficiency, promote the deployment of renewable energy technologies, and provide energy bill payment assistance. Additionally, the revenue provides for some greenhouse gas reduction programs aimed at abating carbon emissions, reducing

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[80] N. Jonathan Peress, *RGGI After One Year: Evaluation and Lessons*, 41 ABA TRENDS, May/June 2010, at 12-13.

[81] Memorandum of Understanding Regarding Ne. & Mid-Atl. Low Carbon Fuel Standard, Dec. 29, 2009, *available at* http://thehill.com/images/stories/blogs/lowcarbon.pdf.

[82] Peress, *supra* note 80, at 12; *see also* REG'L GREENHOUSE GAS INITIATIVE, ABOUT THE REGIONAL GREENHOUSE GAS INITIATIVE (RGGI) (Sept. 28, 2012), *available at* http://www.rggi.org/docs/Documents/RGGI_Fact_Sheet_2012_09_28.pdf.

[83] Peress, *supra* note 80, at 12.

[84] *Id.*

[85] *Id.*

[86] *See RGGI Benefits*, REG'L GREENHOUSE GAS INITIATIVE, http://www.rggi.org/rggi_benefits (last visited Nov. 17, 2012) [hereinafter *RGGI Benefits*]; *see also* discussion of the Cleaner, Greener Communities Program in New York, *infra* notes 126-29 and accompanying text.

[87] *See RGGI Benefits*, *supra* note 86.

[88] REG'L GREENHOUSE GAS INITIATIVE, INVESTMENT OF PROCEEDS FROM RGGI CO_2 ALLOWANCES (Feb. 2011), *available at* http://www.rggi.org/docs/Investment_of_RGGI_Allowance_Proceeds.pdf.

VMT, and encouraging carbon sequestration.[89] RGGI reports that evaluations of these state programs show benefits of three to four dollars for each dollar invested.[90]

An independent study published in November 2011 reported that the initiative had saved electricity consumers almost $1.1 billion and created 16,000 new jobs in the first three years of its existence.[91] The study found that while the program had led to a less-than-one-percent increase in electricity rates, the energy-efficiency measures that auction proceeds funded—including retrofitting homes and buildings—had reduced demand and thereby lowered energy bills.[92] Savings averaged $25 for residential consumers, $181 for commercial consumers, and $2,493 for industrial consumers.[93] Furthermore, one of the study's authors stated that CO_2 emissions in the region were "6 percent lower than they would have been without the program."[94]

The program is undergoing its first comprehensive review this year, and many expect a reduction in the emissions ceiling.[95] Several states announced in January 2012 that they were retiring sixty-seven million unsold carbon allowances, which translates into a reduction in the cap of sixty-seven million tons.[96] Although the program has proven successful, the oversupply of allowances has limited its impact.[97]

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[89] *Id.* at 4.

[90] *Id.* at 5.

[91] PAUL J. HIBBARD ET AL., THE ECONOMIC IMPACTS OF THE REGIONAL GREENHOUSE GAS INITIATIVE ON TEN NORTHEAST AND MID-ATLANTIC STATES 4-7 (2011), *available at* http://www.analysisgroup.com/uploadedFiles/Publishing/Articles/Economic_Impact_RGGI_Report.pdf.

[92] *Id.* at 30.

[93] *Id.* at 4.

[94] Mireya Navarro, *Regional Cap-and-Trade Effort Seeks Greater Impact by Cutting Carbon Allowances*, N.Y. TIMES, Jan. 26, 2012, at A22, *available at* http://www.nytimes.com/2012/01/27/nyregion/in-greenhouse-gas-initiative-many-unsold-allowances.html?_r=3.

[95] *Program Review*, REG'L GREENHOUSE GAS INITIATIVE, http://www.rggi.org/design/program_review/ (last visited July 4, 2012).

[96] Shama Gamhkar & J. Mitch Pickerill, *The State of American Federalism 2011–2012: A Fend for Yourself and Activist Form of Bottom-Up Federalism*, 42 PUBLIUS: J. FEDERALISM 357, 370 n.6 (2012), *available at* http://publius.oxfordjournals.org/content/42/3/357.full.pdf+html?sid=0a4d06ff-7004-4783-bb89-24d6a1a7aa63 ("On January 17, New York, Connecticut, Delaware, Massachusetts, Rhode Island, and Vermont announced that they were permanently eliminating 72 percent of the unsold carbon allowances, or a total of sixty-seven million. (Each allowance amounts to one ton of carbon dioxide emissions.)").

[97] Bloomberg reported that the value of global carbon markets fell over 20 percent in the first quarter of 2012. Although the value of the carbon market is down, the trading has increased by 17 percent over last year. *See Bloomberg: World's Carbon Markets Down 20 Per Cent in 2012*, BUSINESSGREEN (Apr. 5, 2012),

2. Transportation and Climate Initiative: Building Sustainable Communities[98]

Another promising new institution that is addressing the causes of climate change is the Transportation and Climate Initiative. RGGI, described immediately above, is not guided by the involvement of state transportation agencies. But because the transportation sector contributes nearly 30 percent of GHG emissions in the Northeast and Mid-Atlantic region, an obvious need exists to incorporate transportation strategies as part of these efforts to mitigate climate change in the Northeast.[99] In June 2010, transportation, energy, and environment officials from twelve Northeast and Mid-Atlantic jurisdictions launched the Transportation and Climate Initiative (TCI).[100] The TCI's chief goals are to reduce GHG emissions, "minimize the transportation [sector's] reliance on high-carbon fuels," reduce VMT, and promote sustainable development and a clean-energy economy.[101]

The TCI's Declaration of Intent specifies that the regional collaboration is expected to:

- Reduce traffic congestion;
- Encourage job growth and accommodate the flow of goods and services . . . ;
- [Establish] state and local land use strategies that . . . increase[] commercial and residential housing density and encourage transit-friendly design;

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http://www.businessgreen.com/bg/news/2166311/bloomberg-worlds-carbon-markets-cent-2012.

[98] "It is very difficult to get consensus where officials are working together within a state. But across state lines, tension goes away and consensus comes together." Telephone Conversation with Jeanne Herb, Research Program Coordinator, Nat'l Ctr. for Neighborhood & Brownfields Redevelopment (Apr. 13, 2012).

[99] *See Northeast and Mid-Atlantic States Launch Major Climate and Transportation Initiative*, GEORGETOWN CLIMATE CTR. (June 16, 2010), http://www.georgetownclimate.org/northeast-and-mid-atlantic-states-launch-major-climate-and-transportation-initiative.

[100] Participating jurisdictions include Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and the District of Columbia. *See Transportation & Climate Initiative*, GEORGETOWN CLIMATE CTR., http://www.georgetownclimate.org/state-action/transportation-and-climate-initiative (last visited Apr. 25, 2012).

[101] *See Northeast and Mid-Atlantic States Launch Major Climate and Transportation Initiative*, *supra* note 99.

- Improve the performance of existing highway, transit, and other transportation modes while enhancing neighborhoods and urban centers; and

- Promote mixed-use development that supports viable alternatives to driving.[102]

To achieve these goals, the TCI has identified four main areas to address: clean vehicles and fuels, sustainable community development, communication and information technology, and freight transportation efficiency.[103] For the purposes of this article, the principal focus is on TCI's efforts to shape human settlements through land use strategies, the enhancement of urban centers, and the promotion of mixed-use development. TCI's member agencies have pledged to partner with housing and land use agencies at the local, regional, and federal levels to expand transportation options, enhance natural resource protection, and minimize adverse environmental impacts.[104] The TCI's initial efforts in this area have been to develop state-level smart growth planning policies that promote transit-oriented development and decrease travel demand.[105] It is also working toward bridging federal support and local action for sustainable development policies by "leveraging state resources."[106] For example, the TCI seeks to "incorporat[e] climate change . . . [considerations] in state infrastructure investment; develop[] metrics [that] reflect climate [change] impacts in state-level policies; [encourage] partnering [between] regional and local entities to promote consistent practices . . . [in building] sustainable communities; develop[] best practices and model . . . policies . . . ; [and] . . . enhance . . . state climate action planning."[107] It is, of course, too early to assess the effectiveness of these initiatives, but it is not too early to note the evolution in institutional arrangements that TCI exhibits. As a consortium of state agencies, it can influence a remarkable

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[102] Jared Snyder, *The Transportation and Climate Initiative of the Northeast and Mid-Atlantic States: An Agenda for Progress, in* CLEAN AIR: LAW, POLICY, AND PRACTICE 194 (ALI-ABA Course of Study, SS023 ALI-ABA, Dec. 2-3, 2010).

[103] *Transportation and Climate Initiative Kicks Off Work in Four Areas,* GEORGETOWN CLIMATE CTR. (Nov. 4, 2010), http://www.georgetownclimate.org/transportation-and-climate-initiative-kicks-off-work-in-four-areas.

[104] *TCI Sustainable Communities Agreement,* GEORGETOWN CLIMATE CTR. (June 8, 2011), http://www.georgetownclimate.org/tci-sustainable-communities-agreement.

[105] TRANSP. & CLIMATE INITIATIVE OF NE. & MID-ATL. STATES, TRANSPORTATION AND CLIMATE INITIATIVE (TCI) 10, http://climatechange.transportation.org/pdf/markstout_trclimateinit.pdf (last visited Dec. 27, 2012).

[106] *Id.*

[107] *Id.*

range of resources and policy decisions at a large enough scale to favorably impact climate change.

3. California Air Resources Board

On the west coast, a new strategy undertaken by the California Air Resources Board (CARB) shows real promise for mitigating climate change by reducing GHG emissions through land use and transportation planning. California's state legislature enacted AB 32, the California Global Warming Solutions Act, in 2006.[108] The statute requires the state to reduce GHG emissions by 25 percent to 1990 levels by the year 2020.[109] CARB, the agency responsible for implementing the statute, is currently implementing this GHG cap-and-trade program. The rules establish an emission cap that covers nearly 85 percent of the state's GHG emissions. Officials anticipate annual proceeds approaching $1 billion to $3 billion at the outset, and possibly reaching $14 billion by 2015. These proceeds, like RGGI's, can be dedicated to renewable energy, transit-oriented development, and forest restoration projects.[110]

Recognizing transportation's enormous impact on the state's GHG emissions and the necessity of discouraging sprawl, California took a further step in 2008 by enacting SB 375, the Smart Growth Act, to "help implement AB 32 by aligning planning for housing, land use, transportation, and greenhouse gas emissions." SB 375 seeks to advance these goals in a number of ways. It requires regional transportation plans to include strategies to reduce GHG emission, connects zoning and housing-development plans to regional transportation plans, and incentivizes certain types of development.[111] Under SB 375, CARB develops regional GHG emission "targets for 2020 and 2035 for [the] automobile[] and light[-]truck[sectors]."[112]

California's eighteen metropolitan-planning organizations (MPOs)[113]—which are transportation-planning agencies that

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[108] CAL. HEALTH & SAFETY CODE ANN. § 38550 (West Supp. 2012).

[109] DAVID R. WOOLEY & ELIZABETH M. MORSS, CLEAN AIR ACT HANDBOOK § 10:18 (21st ed. 2011).

[110] Paul Rogers, *Windfall of Cash Could Hit State Treasury from Global Warming Program*, MERCURYNEWS.COM (Apr. 7, 2012), http://www.mercurynews.com/science/ci_20348096/windfall-cash-could-hit-state-treasury-from-global.

[111] Elisa Barbour & Elizabeth A. Deakin, *Smart Growth Planning for Climate Protection*, 78 J. AM. PLANNING ASS'N 70, 71 (2012).

[112] *Id.* at 73.

[113] *Metropolitan Planning Organizations*, WIS. DEP'T OF TRANSP., http://www.dot.state.wi.us/projects/planorg/mpo.htm (last modified July 16, 2010).

dictate the expenditure of federal transportation funds—must then prepare a sustainable communities strategy within their regional transportation plans with the goal of reducing VMT in order to reach the region's GHG emissions target. If the target cannot be met, SB 375 requires the MPOs to adopt an alternative planning and settlement strategy to achieve the emission-reduction target.

C. *Changes in Strategies*

These institutional changes enable and encourage stakeholders to create innovative strategies to manage climate change. For example, TCI could create a certification system for cities that adopt land use plans and regulations promoting compact, mixed-use developments, and those cities could be eligible for RGGI funding in the nine participating states in order to implement those plans and regulations. Apart from such institutional strategies, lawyers and other professionals can adopt a variety of nonregulatory approaches to climate-change problem solving. Their abilities in this regard are evident in the following examples.

A metropolitan planning organization is an organization of primarily local elected officials who provide a forum for local decision-making on transportation issues of a regional nature. The federal government requires that an MPO be designated for each urbanized area with a population greater than 50,000.

This designation must be agreed on by the governor and the units of general purpose local governments that together represent at least 75 percent of the affected population (including the central city or cities as defined by the Bureau of the Census).

Each MPO has a policy board that is generally comprised of chief elected officials who represent different parts of the region served by the MPO. This board is advised by a technical committee (typically referred to as a Technical Advisory Committee, or TAC) that consists of planning and engineering staff from jurisdictions within each region.

The TAC develops high quality technical tools and analysis for the region, and advises the MPO policy board on technical and administrative issues related to regional transportation planning. Some MPOs also utilize a citizen advisory committee and other specialized committees to advise the policy board.

Funding for MPO transportation planning is provided through a combination of federal, state and local funds.

Id.

1. Negotiated Dispute Resolution and Rulemaking

Two years before California enacted the Global Warming Solutions Act, CARB promulgated vehicle emissions standards for GHGs for vehicle model years 2009–2016. The standards become increasingly stringent over time, with an estimated 30 percent reduction in GHG emissions by 2016. Before the regulations could take effect, however, California had to overcome several obstacles to justify and assert its authority to regulate. For one, states were able to issue emissions standards only upon the EPA's waiver of federal preemption under Clean Air Act (CAA), which California sought in 2005.[114] If waiver was granted, this would result in separate and more stringent standards in California and several other states that joined in the waiver request. Although the request was initially denied in 2008 under the outgoing Bush administration,[115] President Obama issued a directive for his administration to reconsider California's application.[116]

Additionally, the auto industry had also challenged California's regulations in court, arguing that they were preempted by the Energy Policy and Conservation Act (EPCA). Under the EPCA, the National Highway and Traffic Safety Administration (NHTSA) was required to set Corporate Average Fuel Economy (CAFE) standards, but CARB had set more stringent emission targets than the federal CAFE standards. At the same time, the EPA was also studying federal options for regulating GHG emissions under the CAA. Upon issuing a determination that new vehicle emissions would endanger public health, the EPA was required under the CAA to set emissions standards for new vehicles. As a result, while California had to struggle to assert its legal authority over vehicle emissions, the auto industry faced the prospect of three

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[114] Letter from Catherine Witherspoon, Exec. Officer, Cal. Envtl. Prot. Agency, to Stephen L. Johnson, Adm'r, U.S. Envtl. Prot. Agency (Dec. 21, 2005), *available at* http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OAR-2006-0173-0017; *see also* 42 U.S.C.A. § 7543(a)-(b) (West 2012); *California Greenhouse Gas Waiver Request*, EPA.GOV, http://www.epa.gov/otaq/climate/ca-waiver.htm (last updated July 31, 2012).

[115] Notice of Decision Denying a Waiver of Clean Air Act Preemption for California's 2009 and Subsequent Model Year Greenhouse Gas Emission Standards for New Motor Vehicles, 73 Fed. Reg. 12,156 (Envtl. Prot. Agency Mar. 6, 2008), *available at* http://www.epa.gov/fedrgstr/EPA-AIR/2008/March/Day-06/a4350.pdf.

[116] The information regarding this negotiation is taken from Jody Freeman, *The Obama Administration's National Auto Policy: Lessons from the "Car Deal,"* 35 HARV. ENVTL. L. REV. 343, 349-59 (2011). During the negotiations described, Ms. Freeman served as energy and climate counsel to the White House.

regulators—the State of California, the NHTSA, and the EPA—each possessing flexibility under their respective enabling statutes to create compliance programs for new automobiles.

In this volatile situation, the parties turned to a nonregulatory process—beyond the traditional administrative and judicial system—to create a voluntary agreement.[117] As a result of this process, the auto industry and state and federal agencies agreed to a negotiated set of standards, which would be implemented and enforced through novel legal devices such as good-faith letters of commitment and nonbinding memoranda of understanding.[118] One of the lead participants in this process, Professor Jody Freeman, described this strategy in this way:

> Finally, the new policy relied on a number of creative procedural innovations beyond joint rulemaking. The "letters of commitment" signed by the stakeholders, although not legally binding, resemble legal documents. They envision a detailed step-by-step process of implementation, which requires reciprocal demonstrations of good faith by regulators and industry: the auto companies would stay the lawsuits upon issuance of the NOI; EPA would make a final decision on California's preemption waiver; EPA and NHTSA would propose the new rule; California would formally amend its regulations to implement the new agreement; the auto industry would dismiss its preemption lawsuits; and so on. All of this was done, not under a consent decree and with the imprimatur of the court in the context of litigation, but voluntarily. Thus the parties entered an agreement that is best described as a "trust, but verify" regime.[119]

Professor Freeman believes that these kinds of innovations that improve and supplement the regulatory process can be duplicated using

> joint rulemaking or similar uniformity-promoting mechanisms, along with extralegal tools like commitment letters that can memorialize agreements and specify implementation plans. Indeed, one of the most lasting legacies of the car deal may be its example of how agencies might use such regulatory and dispute resolution techniques to simplify and harmonize regulation.[120]

2. Incentives for Sustainable Development to Mitigate Climate Change

There are no federal or state standards for certifying a city as one that promotes sustainable development. There are,

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[117] *Id.* at 369.
[118] *Id.*
[119] *Id.*
[120] *Id.* at 374.

however, climate action plans and a few initiatives working in that direction. The International Council for Local Environmental Initiatives (ICLEI) runs a national climate campaign for local governments.[121] ICLEI is developing a star-communities index that, when finished, will give guidance to localities regarding indicators they can follow in order to qualify as a sustainable city.[122] Communities in New York can take a pledge to serve as a climate-smart community by setting goals to reduce GHG emissions and adapt to predicted climate change.[123] One of the ten steps in the Climate Smart Communities (CSC) program includes the promotion of climate protection through community land use tools.[124] Communities are instructed to "update land use policies, building codes and community plans in ways that reduce sprawl, minimize development in floodplains and protect forests."[125] No further guidance is available to cities under the CSC at the moment.

Sustainable Jersey is a completed rating system that municipalities can follow to become "Sustainable Jersey Certified" at one of two levels by earning points under the categories of "Prosperity," "Planet," and "People."[126] There are sixteen subcategories with a total of seventy-one items for which credits can be earned.[127] These items are as diverse as setting up a buy-local program, hosting green fairs, creating safe routes to school, and offering green-building training.[128] One of the subcategories is "Land Use and Transportation," which has six items within it.[129]

The current convention for certification allows cities to earn points in a broad range of categories, giving them many options for obtaining favorable ratings.[130] None of these systems yet provide a sufficient emphasis on the tremendous potential for the emissions reductions that come from compact, mixed-use development and transit orientation.

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[121] *See* INT'L COUNCIL FOR LOC. ENVTL. INITIATIVES, http://www.icleiusa.org/ (last visited Sept. 26, 2012).

[122] *See STAR Community Index*, INT'L COUNCIL FOR LOC. ENVTL. INITIATIVES, http://www.icleiusa.org/sustainability/star-community-index (last visited Sept. 26, 2012).

[123] *See Adopt the Climate Smart Communities Pledge*, N.Y. STATE DEP'T ENVTL. CONSERVATION, http://www.dec.ny.gov/energy/53013.html (last visited Mar. 10, 2013).

[124] *Id.*

[125] *Id.*

[126] *See* SUSTAINABLE JERSEY, www.sustainablejersey.com (last visited July 5, 2012).

[127] *See Actions for Sustainable Communities*, SUSTAINABLE JERSEY, http://www.sustainablejersey.com/actionlist.php (last visited July 5, 2012).

[128] *Id.*

[129] *Id.*

[130] Land Use Law Ctr., Pace Law Sch., Preliminary Report on Certifying Sustainable Cities 13-15 (Winter 2012) (unpublished manuscript) (on file with author).

The Cleaner, Greener Communities Program in New York could potentially lead to the creation of such a system. Funded with some of the state's RGGI proceeds,[131] the program begins with the development of a regional sustainability plan in ten regions of the state that already have Economic Development Councils (EDCs) and economic-development strategies.[132] In 2011, New York launched this economic-development initiative and used nearly $1 billion in state funds to support job-producing projects that conform to the regional economic development strategies.[133] In 2012, the state initiated the Cleaner, Greener Communities program, formed sustainable planning groups in each region, and charged them with the development of sustainability plans by the end of the calendar year.[134] In 2013, the EDCs will administer these regional sustainability plans as part of the regions' articulated economic development strategies.[135] Compliance with the sustainability plan will be necessary for communities to qualify for $90 million in additional program funds also taken from RGGI proceeds.[136]

These regional plans can provide model language for localities to use in creating mixed-use, compact development zones; transit-oriented development; sustainable neighborhood development; district energy zones where new development is served by combined heat and power and on-site energy generation; and similar strategies that lower the emissions attributable to new development by a significant degree. The program could require communities to adopt an appropriate number of these model initiatives in order to receive funding from the EDCs. The state

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[131] *See Evaluation of RGGI Funds*, N.Y. STATE ENERGY RESEARCH & DEV. AUTH. (NYSERDA), http://www.nyserda.ny.gov/en/Regional-Greenhouse-Gas-Incentive/Evaluations-of-Funds.aspx?sc_database=web (last visited Nov. 30, 2012).

[132] *See Cleaner, Greener Communities Programs*, NYSERDA, http://www.nyserda.ny.gov/Cleaner-Greener (last visited July 5, 2012).

[133] *Id.*

[134] *See* MID-HUDSON PLANNING CONSORTIUM, ZONING AND PLANNING FOR A SUSTAINABLE REGION: CERTIFYING SUSTAINABLE COMMUNITIES (Nov. 2012), *available at* http://law.pace.edu/sites/default/files/LULC/Conference_2012/Zoning%20and%20Planning%20for%20a%20Sustainable%20Region.pdf.

[135] NYSERDA, CLEANER, GREENER COMMUNITIES PROGRAMS: SUSTAINABLE, SMART GROWTH PRACTICES FOR EVERY NEW YORK REGION 2, *available at* http://www.nyserda.ny.gov/Statewide-Initiatives/~/media/Files/EERP/Cleaner%20Greener/Cleaner_Greener_Communities_Fact_Sheet.ashx (last visited Mar. 10, 2013).

[136] *See Phase 2 of the Cleaner, Greener Communities Programs*, NYSERDA, http://www.nyserda.ny.gov/Statewide-Initiatives/Cleaner-Greener-Communities/Implementing-Smart-Development-Projects.aspx (last updated Aug. 20, 2012); *see also* NYSERDA, NEW YORK'S RGGI-FUNDED PROGRAMS: STATUS REPORT, YEAR ENDING DECEMBER 31, 2010, at 2-2 (2011) ("New York State enacted numerous deficit reduction measures that included the transfer of $90 million in RGGI auction proceeds to the General Fund.").

can then use these models to determine which localities to certify as sustainable—a rather different approach from the current sustainable communities certification programs. This approach, if adopted in New York, could serve as a model for the nation or, at the least, for the twelve-state TCI consortium.

3. Negotiated Settlements in Lieu of Regulation

In another example of compromise and collaboration, a new natural-gas drilling project in Utah has been approved by the Bureau of Land Management. Anadarko Petroleum Corporation plans to drill 3675 new wells over ten years, requiring "594 miles of new roads, 1100 miles of buried and surface gas and water pipelines, and seven miles of . . . power lines."[137] The drilling project would probably "not have been allowed to move forward without lengthy challenges if the company had not been willing to compromise."[138] The Uintah Basin has experienced deteriorating air quality as a result of wintertime ozone—a "relatively rare phenomenon"—and some experts say that the ozone precursor pollutants come from the thousands of gas wells and equipment in the basin.[139]

Anadarko officials have committed to pollution-reduction strategies to curb the project's impact to regional air quality; more specifically, the company has agreed to implement technology like electric-powered compressor engines and a closed-loop pipeline to capture and/or reduce fugitive emissions of natural gas and other pollutants.[140] Additionally, the company met with the Southern Utah Wilderness Alliance and committed to limit the number of wells to be drilled in wilderness-quality lands along the White River.[141] Anadarko's general manager of regulatory affairs commented that the agreement provides "a common-sense solution that satisfies the environmentalists' concerns while boosting badly needed domestic energy production."[142]

Hydraulic fracturing (colloquially known as hydrofracking) represents another context in which the current regulatory paradigm is inadequate. Until recently, the federal

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[137] Scott Streater, *Utah Drilling Project Earns Praise from Enviros*, ENERGYWIRE (Apr. 9, 2012), http://www.eenews.net/energywire/2012/04/09/4.

[138] *Id.*

[139] *Id.*

[140] *Id.*

[141] *Id.*

[142] *Id.*

government has been relatively absent from the regulatory conversation, while state and local governments have struggled with the issue of whether states should preempt local land use control—with results differing from state to state.[143] Horizontal hydrofracking is a recently evolved well stimulation technique—designed for areas underlain by large shale formations—in which millions of gallons of water containing large amounts of proprietary chemicals are pumped down the wells under high pressure to create fractures in the hydrocarbon-bearing shale.[144] This causes the release of the natural gas contained in the shale and allows it to be pumped to the surface.[145]

Hydrofracking is directly related to climate-change mitigation, since gas-powered electric-generating plants emit less GHG than do coal-fired operations. But the science of hydrofracking is uncertain; there is much debate about the life-cycle effect of gas production on climate change, for example, and the technology may generate a host of other environmental and economic consequences.[146] This gives rise, first, to settlement-based solutions in lieu of regulation, such as those demonstrated in the Uintah Basin example discussed above. Second, it encourages government agencies to assume new roles and embrace innovative strategies that operate independently of the regulatory function or as its complement.[147]

4. Statutes That Embody Stakeholder Negotiations

These negotiated settlements can be induced, to a degree, by state regulation itself. In 2011, for example, the New York State legislature adopted a statutory utility siting system that furnishes much of the power to the state, without excluding local governments and stakeholders from influencing the official permit outcome.[148] This law reauthorized and revised Article X of the Public Service Law, allowing an electric-generation siting board—which includes two residents of the affected community serving as ad hoc members—to review and

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[143] *See generally* John R. Nolon & Victoria Polidoro, *Hydrofracking: Disturbances Both Geological and Political: Who Decides?*, 44 URB. LAW. 507 (2012).

[144] *See* ENV'T N.J. RESEARCH & POL'Y CTR., THE COSTS OF FRACKING: THE PRICE TAG OF DIRTY DRILLING'S ENVIRONMENTAL DAMAGE 7-9 (2012), *available at* http://www.environmentnewjersey.org/sites/environment/files/reports/The%20Costs%20of%20Fracking%20vNJ.pdf.

[145] *Id.*

[146] *See* Nolon & Polidoro, *supra* note 143, at 509.

[147] *Id.* at 526-30.

[148] *See generally* N.Y. PUB. SERV. LAW §§ 160-173 (2011).

approve the siting of electric utility generators of twenty-five Megawatts or greater.[149] This board is empowered to override local land use laws that it deems "unreasonably burdensome."[150]

Following the expiration of a previous version of Article X but prior to the adoption of this law, localities regulated this land use and often opposed or significantly delayed the approval of generation plants that were vitally needed by the state's power grid. In establishing a state-controlled siting system, the New York legislature required input from the affected locality and local stakeholders.[151] In addition to requiring local residents to sit on the siting board, the revised Article X requires applicants to set up a fund that will enable affected local governments, environmental groups, and the community at large to hire experts, lawyers, and other consultants to participate in the process of creating a scope of review for the proposed utility.[152]

The revised version of Article X encourages applicants to enter into agreements with these parties regarding the scope of review and requires the appointment of a hearing examiner to resolve any disputes that arise over the scoping.[153] While it does not impose a collaborative decision-making process on affected agencies, governments, and private actors, this legislative approach sets the table and provides significant resources to develop such a process.

The previous four examples of new institutions, processes, and statutes evolving in response to climate change provide an important context for evaluating legal strategies that will be effective in practice. These examples illustrate how lawyers and lawmakers are exploring and creating options to regulate and prevent the negative effects of climate change. The traditional approach to determining where to develop land is a regulatory one, and lawyers and legal educators tend to default to regulations as a solution to such problems. In the next section, we address the difficulties involved in severely limiting or banning development in coastal areas sensitive to inundation and severe storms; this sets the stage for employing nonregulatory devices and methods.

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[149] *Id.* § 162.
[150] *Id.* § 168(3)(e).
[151] *Id.* § 166(j), (k).
[152] *Id.* § 163(4)(a).
[153] *Id.* § 163(5).

III. SEA-LEVEL RISE CONFRONTS THE LEGACY OF *LUCAS*

Climate-change experts agree that sea levels will rise and that coastal storms will become stronger as temperatures increase. Since these conditions will damage or destroy properties built in vulnerable areas, strict regulations should be enacted to prevent new development in carefully crafted no-build zones—in particular, areas that are likely to be inundated, and areas that are subject to the highest winds and most severe flooding.[154] In *Lucas v. South Carolina Coastal Council*, however, the Court held that regulations preventing all economic use of the land are compensable takings, unless the landowner's use of the land constituted a nuisance or was otherwise inconsistent with preexisting background principles of state law.[155] This is an unfortunate Catch-22 situation for land use regulators: caution suggests that they must proscribe development in dangerous areas, yet they must also be careful not to effect a compensable taking. It is possible, however, that *Lucas*'s prescriptive language and seemingly narrow exceptions provide courts leeway to interpret the case using background principles of state law to uphold severe restrictions in threatened areas, demonstrating the tendency of the law to change with the times.

A. *Sea-Level Rise*

Sea-level rise presents one of the most pressing challenges of the twenty-first century, expected to expose over four million properties worth an estimated $710 billion to storm surges and flooding.[156] As of the date of its Fourth Assessment Report, the IPCC predicted a global average sea-level rise of 0.18 meters to 0.59 meters by the end of the century.[157] However, a more recent report by the CCSP found

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[154] One option for preventing development in the most threatened coastal areas is to amend zoning and building codes to require that new development be protected from flooding (through elevating the land, building on platforms, anchoring buildings to concrete slabs, etc.) and fortified against hurricane force winds (by requiring better materials and construction techniques). There is a point, however, beyond which building technology is simply not up to the task of protecting buildings and their occupants from severe damage. It is in these places that, inevitably, the issue of banning development will be raised and discussed, presenting the questions and issues addressed in this part.

[155] Lucas v. S.C. Coastal Council, 505 U.S. 1003, 1030 (1992).

[156] HOWARD BOTTS ET AL., 2012 CORELOGIC STORM SURGE REPORT 8, *available at* http://www.corelogic.com/about-us/researchtrends/asset_upload_file227_15276.pdf.

[157] IPCC SYNTHESIS REPORT, *supra* note 49, at 45.

that "the recent acceleration of ice discharges from the polar ice sheets would imply an additional contribution up to 0.20 m [to the IPCC estimates],"[158] which suggests "that a global sea-level rise of 1 [meter] to the year 2100 should be considered for future planning and policy discussions."[159] Indeed, studies more recent than the CCSP's report indicate that "[e]ven for the lowest emission scenario [generated by the IPCC], sea-level rise is then likely to be ≈1 m; for the highest, it may even come closer to 2 m [over 1990 levels]."[160]

Since 1990, policymakers have done little to advance effective responses to sea-level rise.[161] Generally speaking, there are three main policies toward sea-level rise: retreat, accommodation, and protection.[162] Retreat policies aim to minimize the hazards of sea-level rise by restricting, prohibiting, or removing development from vulnerable areas.[163] Examples of "[r]etreat strategies include rolling easements, [government] land purchases, and setback requirements."[164] 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 and high winds."[165] Protective measures essentially defend against the threats of sea-level rise—such as "flooding, . . . [damage to] infrastructure, shore erosion, salinity intrusion[,] and the loss of natural resources"[166]—and are typically implemented on a smaller scale, for example, by individual buildings or sites rather than entire neighborhoods. Defensive solutions may be split into "hard and soft structural [options]."[167] Hard options include dikes, levees, floodwalls, seawalls, revetments, bulkheads, groins, detached breakwaters, tidal barriers, and salt-water intrusion barriers.[168] Soft options include

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[158] CCSP COASTAL SENSITIVITY, *supra* note 55, at 15.

[159] *Id.* at 20.

[160] Vermeer & Rahmstorf, *supra* note 57, at 21531.

[161] *C.f.* J. DRONKERS ET AL., INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, REPORT OF THE COASTAL MGMT. SUBGROUP, STRATEGIES FOR ADAPTATION TO SEA LEVEL RISE 6-8 (1990), *available at* http://papers.risingsea.net/federal_reports/IPCC-1990-adaptation-to-sea-level-rise.pdf [hereinafter IPCC SEA LEVEL RISE] (noting possible responses to sea-level rise); CITY OF NEW YORK, VISION 2020: NEW YORK CITY COMPREHENSIVE WATERFRONT PLAN 109-10 (2011), *available at* http://www.nyc.gov/html/dcp/pdf/cwp/vision2020_nyc_cwp.pdf [hereinafter NYC WATERFRONT PLAN] (same).

[162] *See* NYC WATERFRONT PLAN, *supra* note 161, at 109.

[163] *See id.*

[164] *See id.*

[165] IPCC SEA LEVEL RISE, *supra* note 161, at 7.

[166] *Id.*

[167] *Id.* (internal quotation marks omitted).

[168] *Id.* at 8.

beach renourishment, dune building, and constructed wetlands, reefs, or barrier islands.[169]

Consider, for example, the erosive effect of sea-level rise on the West Coast of the United States. Erosion along San Francisco's Ocean Beach coastline—a 3.5 mile stretch of beach—threatens significant Bay Area infrastructure, including "the Great Highway, a $220 million wastewater treatment plant, and a[n] . . . . underground pipe" that carries sewage-tainted storm water.[170] With California officials estimating that the sea level could rise by fourteen 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[.]"[171] One study said that sea-level rise could impose more than $650 million in infrastructure repair costs by the end of the century, a large proportion of which stem from the wastewater treatment plant.[172]

Officials are struggling to determine the most effective option for their respective localities. Indeed, these decisions require difficult judgments. Shoreline armoring protects infrastructure, but it interferes with the public's beach access and is destructive to vegetation and bird habitats.[173] Beach renourishment replenishes lost sand and allows reconstruction of dunes and animal habitats, but sand infusions are often cost-prohibitive.[174] Moreover, just one fierce storm can undo all renourishment efforts.[175] Retreat allows the shoreline to move naturally inland, but it necessitates the removal of roads and loss of other infrastructure, putting homes and other structures at risk.[176] Notwithstanding these complexities, officials have begun making proposals in San Francisco, and a draft plan is currently under review. The plan recommends changing a part of the highway from four lanes to two, rerouting traffic, and

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[169] *Id.*; NYC WATERFRONT PLAN, *supra* note 161, at 110.

[170] Felicity Barringer, *Both Coasts Watch Closely as San Francisco Faces Erosion*, N.Y. TIMES, Mar. 24, 2012, at A18, *available at* http://www.nytimes.com/2012/03/25/science/earth/san-francisco-fights-erosion-as-coastal-cities-watch-closely.html?_r=1.

[171] *Id.*

[172] *Id.*

[173] *Id.*

[174] NAT'L OCEANIC & ATMOSPHERIC ADMIN., STATE, TERRITORY, AND COMMONWEALTH BEACH RENOURISHMENT PROGRAMS: A NATIONAL OVERVIEW 3 (2000), *available at* http://coastalmanagement.noaa.gov/resources/docs/finalbeach.pdf.

[175] *Id.*

[176] *Id.* at 11.

entirely closing off a southern section of the highway at a cost of $30 million.[177]

South Carolina's legislature has moved toward a policy of retreat and accommodation. It declared that the dynamic beach–dune system along its coast remains "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.[178] 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."[179] Because armoring provides a "false sense of security,"[180] 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 . . . ."[181] The state prohibits most erosion-control structures seaward of a setback line based on the crest of the dune system.[182]

State policies dealing with the issues of whether and how state programs should protect the coasts leave unexplored the issue of whether local governments, under their land use plans and regulations, should restrict development along the coasts. What happens, for instance, if a state like South Carolina adopts a policy of retreat and ceases all efforts to build protective structures but local governments continue to allow development in areas that will be inundated as state-planned retreat happens? Conversely, what happens if the state government adopts a policy of armoring coastal communities and a local government wishes to prevent development in an area that it knows is particularly vulnerable to inundation and coastal storms? The authority to regulate land use has been delegated to local governments to protect the public interest.[183] At a minimum, state and local coastal development policies

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[177] Barringer, *supra* note 170.

[178] S.C. CODE ANN. § 48-39-250(1)(a)-(d) (2008).

[179] *Id.* § 48-39-250(4).

[180] *Id.* § 48-39-250(5).

[181] *Id.* § 48-39-260(3).

[182] *See id.* §§ 48-39-220(A)-(D), -290(B)(2)(a)-(b) (explaining the prohibition of erosion control structures based on the crest of the dune system).

[183] John R. Nolon, *Historical Overview of the American Land Use Law System: A Diagnostic Approach to Evaluating Governmental Land Use Control*, *in* COMPARATIVE LAND USE LAW AND GLOBAL SUSTAINABLE DEVELOPMENT 581, 587-88 (Cambridge Univ. Press 2006).

must be coordinated, and local land use regulations that permit the construction of homes and other buildings in areas mapped for inundation should be reconsidered. Where zoning allows such construction, it permits development in high-risk coastal zones to the detriment of homebuyers, tenants, equity investors, mortgagees, and the taxpayers who finance supportive infrastructure in such areas.

Where local governments severely regulate coastal development, whether by their own initiative or in accordance with state policy, they face a formidable obstacle in the total-taking doctrine of the *Lucas* case, decided two decades ago when much less was known about sea-level rise and the effect of higher global temperatures on coastal storms. This case must be understood and evaluated for interpretive paths that can align its holding with present realities.

B. The Legacy of Lucas

State and local regulations that prohibit building on coastal lands raise complicated Fifth Amendment issues. Do they not, on their face, destroy all economic value, thereby constituting a total taking under *Lucas v. South Carolina Coastal Council*?[184] *Lucas* involved a state regulation that prevented shoreline development on the Isle of Palms, South Carolina, a barrier-island community.[185] The South Carolina Coastal Council prevented David Lucas from building homes on two lots because of their proximity to ecologically sensitive dunes. The Court held that a regulation that destroys all "economically viable use"[186] of a claimant's property constitutes a taking unless, under the "background principles of the [s]tate's law,"[187] the property use that the regulation prohibits is "not part of his title to begin with."[188] For example, if the state's nuisance law would permit surrounding property owners to enjoin an owner's use of land for unhealthy enterprises like brick-making, a regulation prohibiting that use is not a taking.[189] On remand, the state court found that nuisance law

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[184] Lucas v. S.C. Coastal Council, 505 U.S. 1003, 1030 (1992).

[185] *Id.* at 1006-07.

[186] *Id.* at 1016 (internal quotation marks omitted).

[187] *Id.* at 1029.

[188] *Id.* at 1027.

[189] *See generally* Hadacheck v. Sebastian, 239 U.S. 394, 413 (1915) (holding that despite the preexisting use of the land as a brickyard, the changing character of the surrounding area rendered the use a hazard to public health).

constituted no bar to the development proposed by Lucas.[190] Accordingly, it awarded him compensation for the taking of his property by the state regulation.[191]

Notably, in an effort to emphasize the importance of state law in regulatory takings jurisprudence, the majority cited 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."[192] The Court 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."[193] It has been over twenty years since the *Lucas* decision, and we have accumulated most of our knowledge about sea-level rise during that time. Nevertheless, the language of the *Lucas* decision itself, in light of its enumerated exceptions, the seriousness of climate change, and the coastal damage it portends, may provide courts the leeway they need to support no-build zones and highly prescriptive regulations regarding coastal development.

C. *Reinterpreting the Legacy of* Lucas *in a Changing Environment*

This quote from the *Lucas* decision underscores the ambivalence of the common law with respect to changing conditions: "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)."[194] 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—threatening the disappearance of coastal land due to sea-level rise—change the legal landscape?[195] Is it possible that new knowledge about the harm to the coastal environment and our

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[190] Lucas v. S.C. Coastal Council, 424 S.E.2d 484, 486 (S.C. 1992).

[191] *Id.*

[192] *Lucas*, 505 U.S. at 1030 (quoting Bd. of Regents of State Colls. v. Roth, 408 U.S. 564, 577 (1972)).

[193] *Id.* at 1031.

[194] *Id.* (citing RESTATEMENT (SECOND) OF TORTS § 827 (1965)).

[195] *See supra* notes 121-25 and accompanying text.

newfound appreciation of ecosystem services[196] would now sustain a nuisance claim against coastal development in some locations?[197]

Several defenses are available to local governments when their no-build zones are attacked as total takings under *Lucas*. And courts may be receptive to these defenses, even where they are novel. In 1924, the Oregon Supreme Court encouraged progressive interpretation of common law principles with this language:

> The very essence of the common law is flexibility and adaptability. . . . If the common law should become . . . crystallized . . . , it would cease to be the common law of history, and would be an inelastic and arbitrary code. It is one of the established principles of the common law, which has been carried along with its growth, that precedents must yield to the reason of different or modified conditions.[198]

For instance, the law of nuisance is one of the oldest and most contextual doctrines of common law, and courts may expand it to support regulations that prevent coastal development. Nuisance is but one of many "background principles of state law"[199] that can be relied upon to show that beachfront development is not part of the landowner's title.[200]

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[196] "'[E]cosystem services,' refers to 'a wide range of conditions and processes through which natural ecosystems, and the species that are part of them, help sustain and fulfill human life.'" Keith H. Hirokawa, *Sustaining Ecosystem Services Through Local Environmental Law*, 28 PACE ENVTL. L. REV. 760, 760 (2011) (quoting Gretchen Daily et al., *Ecosystem Services: Benefits Supplied to Human Societies by Natural Ecosystems*, 2 ISSUES IN ECOLOGY 1, 2 (1997)).

[197] *See* J.B. Ruhl, *The "Background Principles" of Natural Capital and Ecosystem Services—Did* Lucas *Open Pandora's Box?*, 22 J. LAND USE & ENVTL. L. 525, 540 (2007) ("[W]hen [damage to] the environment can be linked to utilitarian costs and benefits, which is precisely what the burgeoning research on natural capital and ecosystem services is revealing about ecological resources, the common law is more likely to pay attention. The cases are not numerous by any means, but there is evidence that this theme is being picked up in the law of public nuisance and of the public trust doctrine.").

[198] *In re* Hood River, 227 P. 1065, 1086-87 (Or. 1924).

[199] Michael C. Blumm & Lucus Ritchie, Lucas*'s Unlikely Legacy: The Rise of Background Principles as Categorical Takings Defenses*, 29 HARV. ENVTL. L. REV. 321, 333 (2005) ("[T]he *Lucas* defense is not limited to harm-preventing nuisance restrictions. Instead, the background principles defense potentially applies to any use-limiting regulation.").

[200] *See* Glenn P. Sugamelli, Lucas v. South Carolina Coastal Council*: The Categorical and Other "Exceptions" to Liability for Fifth Amendment Takings of Private Property Far Outweigh the "Rule,"* 29 ENVTL. L. 939, 959 (1999). "In the years since *Lucas* was decided, the Supreme Court has consistently allowed state (and federal) courts leeway to define general or state-specific background principles, rejecting every petition for certiorari that has attempted to challenge decisions that denied takings claims based on background principles." *Id.*

1. Public Trust and the Doctrine of Waste

A classic formulation of the public trust doctrine was articulated by the 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 . . . .[201]

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 remaindermen? 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 entry?[202] In either case, the current right to use the land might be properly regulated to prevent waste of the public's future interest.[203] Does this mean that a regulation requiring removal of buildings after they are inundated by sea-level rise would be sustained under this background principle?[204] 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?

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[201] Shively v. Bowlby, 152 U.S. 1, 11 (1894).

[202]

> If the transfer of title at the dynamic property boundary of the shore is a contingent future interest, then the littoral owner could be seen as holding a fee simple defeasible subject to the future condition of sea level rise. A fee simple defeasible is a type of property interest in which the fee holder's title is subject to the performance (or non-performance) of a condition specified by the grantor. Once that condition occurs, however, the fee owner immediately loses title to the property and it passes to the third party who held the contingent future interest.

Margaret E. Peloso & Margaret R. Caldwell, *Dynamic Property Rights: The Public Trust Doctrine and Takings in a Changing Climate*, 30 STAN. ENVTL. L.J. 51, 87 (2011).

[203] Because the state will take title to coastal lands submerged by sea-level rise, "it appears the state could maintain an action in waste, and the logical extension is that the state may also use the prevention of waste as a justification to deny development. Waste is a common law property doctrine and as such qualifies as a *Lucas* background principle." *Id.* at 85.

[204] *See* discussion *infra* Part IV.

2. Natural Use Doctrine

A rough analogy to a local no-build zone can be 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 1500-acre swamp to preserve open space and prevent flooding.[205] 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.[206] Nearly thirty years later, the New Jersey courts, based on their more evolved understanding of swamps as valuable wetlands, disregarded the holding in the earlier case.[207] In *Gardner v. New Jersey Pinelands Commission*, the court upheld a development restriction that prohibited the residential development of farmland because the restriction permitted only agricultural uses with limited possibilities for other economic development of the land.[208]

The *Gardner* court rejected the landowner's takings claim, finding a lack of investment-backed expectations, and in the course of its opinion, the court disapproved of much of the language in the 1963 case.[209] The court relied on *American Dredging Co. v. State Department of Environmental Protection*,[210] 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 redetermined.[211]

It was during the thirty-year period between *Gardner* and *Morris County* that land use patterns rapidly sprawled beyond

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[205] Morris Cnty. Land Improvement Co. v. Parsippany-Troy Hills Twp., 193 A.2d 232, 234, 241-42 (N.J. 1963).

[206] *Id.*

[207] Gardner v. N.J. Pinelands Comm'n, 593 A.2d 251, 257 (N.J. 1991).

[208] *Id.*

[209] *Id.* at 261-62.

[210] *See generally* Am. Dredging Co. v. State Dep't of Envtl. Prot., 391 A.2d 1265 (N.J. Super. Ct. Ch. Div. 1978), *aff'd*, 404 A.2d 42 (N.J. Super. App. Div. 1979).

[211] *Id.* at 1268. A number of other cases in New Jersey failed to follow or distinguished the *Morris County* case. *See, e.g.*, Matter of Loveladies Harbor Inc., 422 A.2d 107, 111 (N.J. App. Div. 1980); Usdin v. State Dep't of Envtl. Prot. of Water Res., 414 A.2d 280, 285-86 (N.J. Super. Ct. Law. Div. 1980); N.J. Bldg. Ass'n v. Dep't of Envtl. Prot., 404 A.2d 320, 330 (N.J. App. Div. 1979); Toms River Affiliates v. Dep't of Envtl. Prot., 355 A.2d 679 (N.J. App. Div. 1976); Sands Point Harbor, Inc. v. Sullivan, 346 A.2d 612, 614 (N.J. App. Div. 1975).

urban boundaries, and the resulting ecological damage became manifest. By the date of *Gardner*, a discernible environmental ethic had entered land use legislation and jurisprudence.

3. Permitting Minimal Use of a Parcel

Case law suggests that allowing some economic use of the land will save a regulation from a total-takings claim. In *Lucas*, the state regulation prevented all development of Lucas's two residential lots. In *Gardner*, however, the regulation allowed some but, in the eyes of the owner, minimal economic use 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 the portion of the parcel least likely to be inundated? Where some development value remains, a takings claim will be decided using the multifactor balancing test of *Penn Central Transportation Co. v. City of New York*.[212] One of the factors includes "the extent to which the regulation has interfered with distinct investment backed expectations."[213] If it is now known that sea-level rise endangers development, does a landowner have legitimate expectations to fully develop the parcel?[214]

4. Changes in the Regulatory Environment

In *Colorado Department of Health v. The Mill*, mill owners brought a takings action challenging the Department of

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[212] Penn Cent. Transp. Co. v. City of New York, 438 U.S. 104, 124 (1978). In *Palazzolo v. Rhode Island*, 533 U.S. 606, 632 (2001), almost all of the plaintiff's land was designated as coastal wetlands, leaving only a fraction of the land eligible for development. The Court, in referring to the state court's holding regarding the plaintiff's regulatory taking claim, stated,

> The court did not err in finding that petitioner failed to establish a deprivation of all economic value, for it is undisputed that the parcel retains significant worth for the construction of a residence. The claims under the *Penn Central* analysis were not examined, and for this purpose the case should be remanded.

Id.

[213] *Palazzolo*, 533 U.S. at 633-34 (internal quotation marks omitted).

[214] *See* S.D. DEP'T OF LEGISLATIVE AUDIT, ACCOUNTING MANUAL, SEC. IV—ACCOUNTING RECORDS illus. 23: Useful Life Table (Apr. 2002), *available at* http://legislativeaudit.sd.gov/Counties/Accounting_Manual/County_Section_4/County_Section%204_Useful_Life_Table.pdf [hereinafter S.D. Useful Life Table]; *see also, e.g.*, *Palazzolo*, 533 U.S. at 617 (explaining the holding of *Penn Central*) ("Where a regulation places limitations on land that fall short of eliminating all economically beneficial use, a taking nonetheless may have occurred, depending on a complex of factors including the regulation's economic effect on the landowner, the extent to which the regulation interferes with *reasonable investment-backed expectations*, and the character of the government action." (emphasis added)).

Health's regulations imposing use restrictions on the uranium mill operation.[215] 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."[216] The court, in referring to the "regulatory environment" governing radioactive materials, held that the restrictions fell under the "background principles" exception to the *Lucas* total-taking doctrine.[217] 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.[218]

Is the danger to life and property inherent in building on coastal properties 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?[219] Do these create an environment in which severe regulations are to be expected, following the logic of *The Mill* case?

IV. EASING THE TRANSITION: ABOVE REGULATIONS

The prospect of enacting regulations to control coastal development is frustrated not only by the *Lucas* doctrine but also by the uncertainty of how much the sea level will rise in any given location,[220] the relatively long-term nature of the dangers involved, and the practical considerations of imposing severe limitations on local property owners. Local officials in particular understand that local property owners acquired their properties knowing that they were zoned for housing

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[215] State Dep't of Health v. Will, 887 P.2d 993, 997 (Colo. 1995)

[216] *Id.* at 1002.

[217] *Id.* at 1001-02.

[218] *Id.* at 1002-03.

[219] *See* Lucas v. S.C. Coastal Council, 505 U.S. 1003, 1031 (1992).

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> [S]ea-level rise poses two challenges for leaders trying to formulate adaptation plans. First, sea-level rise is slow, measured in millimeters per year, and the full extent of climate change-driven sea-level rise is expected to take centuries to manifest. This is a planning horizon outside the political ken of most governmental bodies; indeed, planning horizons longer than a few decades are extremely rare. Second, scientists are still uncertain as to the extent of the problem. Specifically, how high will the oceans rise?

Craig, *supra* note 7, at 521.

development or other economically viable 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. For all of these reasons, officials may be reluctant to legislate a no-build zone based on the uncertainty of sea-level rise and its potential impact 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 available to limit development in vulnerable coastal areas. Although fraught with consequences of their own, there are readily available alternatives to onerous coastal regulation.

A. 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 rise and cautions prospective purchasers regarding development on vulnerable coastal properties.[221] A chapter on sea-level rise in the comprehensive plan of the City of Bainbridge Island, Washington, entitled the *Environmental Element*,[222] is directly on point in this regard. Flooding and erosion are principal concerns for the city, and its objectives are to minimize, reduce, or eliminate their impact.[223] 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.[224] It also calls for the transfer and purchase of

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[221] In some states, this may be problematic given pronouncements by the state legislature, governor, or state agencies that flatly prevent public action to be taken based on climate change. For example, despite the North Carolina Coastal Resource Commissions Report recommending that the state plan for approximately thirty-nine inches of sea-level rise, the North Carolina Senate passed legislation that prevents state and local agencies from developing regulations related to sea-level rise. Instead, the state's coastal management will have to rely on historic data about sea-level rise, not data accounting for climate change. Rob Young, *Shoot the Messenger: Carolina's Costly Mistake on Sea Level Rise*, YALE ENV'T 360 (2012), *available at* http://e360.yale.edu/content/print.msp?id=2543.

[222] CITY OF BAINBRIDGE ISLAND, COMPREHENSIVE PLAN: ENVIRONMENTAL ELEMENT (2004), *available at* http://www.ci.bainbridge-isl.wa.us/comprehensive_plan.aspx.

[223] *Id.* at 8.

[224] *Id.* at 5-6.

development rights.[225] 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.[226] These requirements are imposed by the National Flood Insurance Program, which limits the availability of flood insurance to property owners who build in accordance with local zoning prescriptions that regulate development in Special Flood Hazard Areas designated by FEMA Flood Insurance Rate Maps.[227] When applied to areas subject to coastal flooding due to storm surges, this program provides an effective method of putting property purchasers on notice of worsening conditions along the coasts since the FEMA maps are regularly updated to reflect current conditions.

Several components of the comprehensive plan in Collier County, Florida, create a planning framework for coastal development.[228] 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."[229] Another declares that "[d]evelopment and redevelopment proposals shall consider the implications of potential rise in sea level."[230] More specifically, the plan states that where an "[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."[231] 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.[232]

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[225] *Id.* at 4.

[226] *Id.* at 9.

[227] *See* Flood Disaster Protection Act of 1973, 42 U.S.C. §§ 4001-4130 (documenting how NFIP works).

[228] COLLIER CNTY. PLANNING SERVS. DEP'T, COUNTY GROWTH MANAGEMENT PLAN: CONSERVATION AND COASTAL MANAGEMENT ELEMENT 46-50 (2011), *available at* http://www.colliergov.net/Modules/ShowDocument.aspx?documentid=41172.

[229] *Id.* at 46.

[230] *Id.* at 48.

[231] *Id.* at 50.

[232] GA. DEP'T OF CMTY. AFFAIRS, OFFICE OF AFFORDABLE HOUS., ARCHITECTURAL MANUAL: EXPECTED USEFUL LIFE TABLE 2 (2011), *available at* http://www.dca.ga.gov/

Comprehensive plans are not regulatory documents.[233] They establish a vision for future development, and they contain goals, objectives, and recommended strategies, such as those contained in the Collier County and Bainbridge examples.[234] 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.[235] The development-review and approval process may adopt informal protocols that further the objectives of the comprehensive plan.[236] Where a comprehensive plan refers to and incorporates by reference future sea-level-rise projection data (including maps and documents indicating the probable effect of sea-level rise on coastal development), it can provide a predicate for a nonregulatory approach to project review and approval.

B. The Project Application Process

Planners who advise local land use boards can use the information contained in a sea-level rise component of the comprehensive plan to revise the application requirements governing local administrative review of project submissions. 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.[237] They can further require—through conditions imposed on subdivision and site plan approvals—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 provided with sea-level rise maps issued from a variety of sources, including state agencies,[238] legislative committees, governors' task forces,[239] university institutes,[240] or other respected and objective

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housing/HousingDevelopment/programs/downloads/2011QAPDocs/Manual/2011%20OAH%20Manual/Application%20Process%20to%20Construction%20Completion/B.%20Architectural/Forms/PNA%20Forms/9ExpectedUsefulLife.pdf.

[233] *See* BARRY CULLINGWORTH & ROGER W. CAVES, PLANNING IN THE USA: POLICIES, ISSUES, AND PROCESSES 126 (3d ed. 2009).

[234] *Id.*

[235] *Id.* at 131-32.

[236] *Id.* at 134-35.

[237] *See* S.D. Useful Life Table, *supra* note 214.

[238] *See, e.g.*, SW. FLA. REG'L PLANNING COUNCIL, CHARLOTTE COUNTY FLORIDA 5' SEA LEVEL RISE (2007), *available at* http://www.swfrpc.org/content/GIS/images/chsearise.pdf.

[239] *See, e.g.*, ADAPTATION SUBCOMM., GOVERNOR'S STEERING COMM. ON CLIMATE CHANGE, THE IMPACTS OF CLIMATE CHANGE ON CONNECTICUT AGRICULTURE,

nonprofit organizations. Depending on the source, these maps may be given judicial recognition, support a court's finding of rationality for actions taken to condition or 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 secured 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 issued by responsible agencies or organizations, investors and lenders will likely be on notice of them and will only be willing to invest if they believe the project is economically viable. If investors conclude that the project is not economically feasible, then it will sink under its own weight and fail to proceed any 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 by showing that investors and lenders made their decision based on knowledge they gained about the long-term viability of the proposed investment through the exercise of due diligence. Under the *Lucas* doctrine, it is not the regulation that prevents the development in this instance but rather the private market risks.[241] To substantiate any *Lucas* claim, the owner would also have to show that all economic value of the property was taken.[242] Proposals that envision less construction on the land in order to avoid development on potential inundation areas would likely be approved under this process, precluding availability of the total-taking argument.

C. *Environmental Impact Review*

Development projects in some states are subject to review under "little NEPAs," which require an assessment of the project's

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INFRASTRUCTURE, NATURAL RESOURCES AND PUBLIC HEALTH 105 (2010), *available at* http://ctclimatechange.com/wp-content/uploads/2010/05/Impacts-of-Climate-Change-on-CT-Ag-Infra-Nat-Res-and-Pub-Health-April-2010.pdf.

[240] *See, e.g.*, KLAUS H. JACOB ET AL., LAMONT-DOHERTY EARTH OBSERVATORY OF COLUMBIA UNIV., RISK INCREASE TO INFRASTRUCTURE DUE TO SEA LEVEL RISE 16 (2000), *available at* http://metroeast_climate.ciesin.columbia.edu/reports/infrastructure.pdf; *Model of Sea Level Rise, Coastal Erosion, and Wave Overtopping in Waimanalo*, UNIV. OF HAWAII: SEA LEVEL RISE WEBSITE (2008), http://www.soest.hawaii.edu/coasts/sealevel/Runup_animation.html.

[241] *See* Lucas v. S.C. Coastal Council, 505 U.S. 1003, 1034-35 (1992) (Kennedy, J., concurring in judgment).

[242] *Id.* at 1015 (majority opinion).

impact on the environment.[243] Environmental impact reviews routinely consider the effect of conditions and circumstances around a proposed development site. Federal and state environmental-review statutes mandate review of 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.[244]

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."[245] 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 prepared under the State Environmental Quality Impact Review Act (SEQRA).[246] 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); [i]ncorporate 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[.][247]

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.[248] Local governments have the expressed or implied power

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[243] *See, e.g.*, N.Y. Dep't of Envtl. Conservation, *Environmental Impact Assessment in New York State*, http://www.dec.ny.gov/permits/357.html (last visited Oct. 15, 2012).

[244] *See* Patrick Woolsey, *Sea Level Rise Addressed in Environmental Impact Statements*, CLIMATE L. BLOG (Dec. 12, 2011), http://blogs.law.columbia.edu/climatechange/2011/12/12/sea-level-rise-addressed-in-environmental-impact-statements/.

[245] Memorandum from Nancy H. Sutley, Chair, Council on Envtl. Quality, to Heads of Federal Departments and Agencies (Feb. 18, 2010); 40 C.F.R. § 1502.15 (1978).

[246] N.Y. Dep't of Envtl. Conservation, *Commissioner's Policy—Climate Change and DEC Action*, http://www.dec.ny.gov/regulations/65034.html (last visited Oct. 15, 2012).

[247] *Id.*

[248] *See, e.g.*, TOWN OF WAWAYANDA, N.Y. ZONING CODE, art. VII, § 195-68(N) (2013) (requiring applicants for site-plan approval to demonstrate conformance with stormwater pollution prevention plan), *available at* http://ecode360.com/12930522; N.Y. VILL. LAW § 7-725-a (McKinney 2011); N.Y. GEN. CITY LAW § 27-a(4) (McKinney 2003);

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.[249]

D. Project Approval Conditions

Once a project is submitted for the review of a local planning board to approve the subdivision or site plan, the reviewing agency can place reasonable conditions on the approval of the proposed development for the protection of the public health, safety, or welfare. These conditions can be negotiated with the applicant. For example, a board could decide to approve the project only on the condition that the developer agrees to remove any buildings that are destroyed by storms or that are inundated by sea-level rise.[250] 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.[251]

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 resulting from the damage to or destruction of infrastructure or the property itself. The developer could agree 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 the private

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N.Y. TOWN LAW § 274-a(4) (McKinney 2004) (all stating that "the authorized board shall have the authority to impose such reasonable conditions and restrictions as are directly related to an incidental to the proposed site plan").

[249] *See, e.g.*, TOWN OF CARLISLE, N.Y., SITE PLAN REGULATIONS 56 (2013) ("The purpose of these regulations is to protect the health, welfare, and safety of the inhabitants of the Town of Carlisle by enforcement of the Carlisle Site Plan Review Regulations so that land to be subdivided may be free from the peril of flood, fire, health endangerment, or other *menace* prior to the erection of buildings." (emphasis added)), *available at* http://www.schohariecounty-ny.gov/CountyWebSite/towncar/CarlisleSitePlan.pdf; *see also* JOHN R. NOLON, OPEN GROUND: EFFECTIVE LOCAL STRATEGIES FOR PROTECTING NATURAL RESOURCES 12-13 (2003).

[250] *See* NEW YORK STATE SEA LEVEL RISE TASK FORCE, DRAFT REPORT TO THE LEGISLATURE 45, 46 (Nov. 2010), *available at* http://www.dec.ny.gov/docs/administration_pdf/slrtdrpt.pdf (suggesting policies to make coastal retreat more possible "by requiring development projects to internalize the risks of sea level rise and storms in coastal development planning and decisionmaking").

[251] *See* discussion *supra* Part III.B.

market's risk assessment—rather than local regulation—has prevented the development.[252] 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 proposed development in the present, but there is no reason that they could not be used to protect the environment, including the public, in the future.

E. Contingency Bargaining

This type of negotiated project review may prove essential for the future development of coastal properties vulnerable to near-term sea-level rise. 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 it will take for sea-level rise to inundate their projects. To be sure, they 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 mainstream projections, have different maps of their own, or believe that climate change is a passing phenomenon.[253] These possibilities demonstrate the problem with regulating at a time when the scientific understanding of risks continues to evolve and estimates of the dates when risks will materialize remain uncertain.

Contingency bargaining can prove useful in these 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

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[252] *See supra* note 241.

[253] *See* Young, *supra* note 221.

context).[254] In the television example, a deal may be based on an estimate of viewers, but the network may receive a rebate or draw from an escrow fund if the viewers are fewer than projected. Alternatively, the parties could stipulate to a surcharge to the benefit of the script writer if the viewers exceed the projected number. In a similar fashion, a developer and a local land use board could agree that if a project becomes inundated or damaged by storm surges within an agreed-upon period, the local board may draw funds from an escrow account to cover its remediation costs, or it could secure developer's contingent liabilities with a bond, insurance policy, or underlying indemnity agreement.[255]

Practical difficulties limit the ability to achieve this type of accommodation in a zoning regulation, particularly a no-build zone, which has an all-or-nothing consequence. The regulator says, "Because the 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 very 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 are familiar with local governments that impose protective deed restrictions on their land for environmental purposes. Their current experience with these mechanisms resides in a much lower-risk context, to be sure, but the extreme risks that threaten coastal

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[254] "[G]enuinely held disagreements about the future present an important opportunity for negotiators to discover an attractive exchange. The vehicle for capturing this potential is the contingent agreement." Michael L. Moffitt, *Contingency Agreements*, *in* THE NEGOTIATOR'S FIELDBOOK 455 (2006).

[255] Moffitt counsels that "[o]ne challenge in crafting a contingent agreement is identifying the boundaries of future possible conditions with sufficient clarity to know what obligations attach." *Id.* at 457; *see also* DAVID A. LAX & JAMES K. SEBENIUS, THE MANAGER AS NEGOTIATOR: BARGAINING FOR COOPERATION AND COMPETITIVE GAIN 97 (1986) ("Even when negotiators have discovered a difference in forecasts, however, considerable ingenuity may be required to find an appropriate uncertain event that all sides can observe and that no one can manipulate.").

development call for appropriate responses. If regulation cannot, as a practical matter, serve as one of these responses, negotiated settlements of disputes over coastal construction can. The situation necessitates scaling up the use of familiar processes and techniques such as those described above.

V. CONCLUSION: THE ROLE OF LAWYERS AND LEGAL EDUCATION

In considering the regulation of coastal development and many other aspects of climate-change management, we have entered a transitional era. Profound conflicts of opinion and the absence of scientific certainty make it difficult for existing institutions to solve problems through traditional litigation, regulation, and decision-making processes. The practice of law, the administrative decision-making model, and the law-school curriculum are path dependent,[256] directed by more than thirty years of traditional approaches to solving problems. In this pivotal moment, these paths will change; lawyers are challenged to rethink their practices, agencies to rethink their strategies, and law professors to rethink what they teach.

This article documents a sea change both in the environment and in approaches to problem solving in the context of sea-level rise and coastal land development. It reports on the innovative institutions and strategies created by agency officials, industry representatives, and their attorneys.[257] Their achievements should inform legal practice, administrative procedures, and legal education. In light of the constant appeals for law schools to reorient their teaching toward the experiences of lawyers in practice, particularly those practicing at the cutting edge, law schools should be ready to heed the call.

Twenty years ago the American Bar Association's Task Force on Law Schools and the Profession: Narrowing the Gap, issued its report entitled, *Legal Education and Professional Development—An Educational Continuum*.[258] A key finding of the report was that law schools were not adequately instilling the types of professional skills and values necessary to the practice of law in their students.[259] Five years ago, two additional

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[256] *See supra* notes 57-61 and accompanying text.

[257] *See supra* Part II.B.

[258] AM. BAR ASSOC., LEGAL EDUCATION AND PROFESSIONAL DEVELOPMENT—AN EDUCATIONAL CONTINUUM ("MACCRATE REPORT") (1992).

[259] *Id.* at 266 ("If professional competence is the goal, the fact is troubling that so many young lawyers are seen as lacking the required skills and values at the time

reports stepped up and sharpened this criticism of legal education: the Carnegie Foundation's, *Educating Lawyers*, in 2007,[260] and the Clinical Legal Education Association's (CLEA) report entitled, *Best Practices for Legal Education*.[261]

These critiques urge law schools to change their teaching goals and methods to ensure that law-school graduates are ready for practice in the modern era. This article describes contemporary challenges that lawyers face, but these challenges differ markedly from the litigate-and-regulate approach to environmental protection that characterized practice in the first three decades of the federal environmental law era. They differ from the advocate-and-decide approach to influencing land use decision making, as well. There, lawyers practice and professors teach vigorous adjudication in administrative tribunals, such as planning boards and zoning boards of appeal, with litigation as the ever-present default.

A key principle of legal education found in *Best Practices* is that law schools should commit to preparing students to practice law "effectively and responsibly in the contexts they are likely to encounter as new lawyers."[262] Because sea-level rise may be the cutting edge of climate change, it is a worthy context for exposing law students to the challenges of practice—particularly as the consequences of climate change worsen. For today's students to be prepared, they need to know that the law is not a code of rigid rules. Instead the law is an organic body that changes with the times, particularly in modern times, when existing rules and practices seem inapplicable to emerging disputes and circumstances.[263]

Students need to understand when legal rules work and when they must be revised. Major changes in the legal rules

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the lawyer assumes full responsibilities for handling a client's legal affairs. Much remains to be done to improve the preparation of new lawyers for practice, both in law school and after law school, in bridge-the-gap and other skills-oriented CLE programs.")

[260] *See* WILLIAM M. SULLIVAN ET AL., EDUCATING LAWYERS: PREPARATION FOR THE PROFESSION OF LAW 12-13 (2007).

[261] ROY STUCKEY ET AL., BEST PRACTICES FOR LEGAL EDUCATION: A VISION AND A ROAD MAP 8-27 (2007). CLEA was incorporated in 1992 with a mission of developing and supporting clinical education as a means of preparing law students and lawyers for more effective legal practice. *See Mission*, CLEA, http://cleaweb.org/mission (last visited Nov. 2, 2012).

[262] *See* STUCKEY ET AL., *supra* note 261, at 39.

[263] *See* Hathaway, *supra* note 59, at 641 (arguing that "[u]nlike biological evolution, legal evolution is not always constrained to draw on the existing stock of material during periods of rapid change. A higher court may create a new legal rule that departs significantly from the past rule, though it will remain constrained to some extent by its own precedents and by the decisions of any higher court.")

occurred in *Pardee* (1910),[264] *Euclid* (1926),[265] and *Massachusetts v. EPA* (2009).[266] What was happening in society at each of these junctures that led the law to strike out on a new path? What role did lawyers play in gathering the facts, identifying the issues, and advocating a new paradigm? Why did the courts abide their pleadings?

What are the appropriate roles for the private sector and each level of government in solving problems during times of crisis? When progress stalled at the Conference of the Parties to the UNFCCC at Copenhagen, what could the U.S. government do to effectively lower carbon emissions?[267] What then occurred after the promise of Waxman-Markey deflated with the collapse of a Congressional solution in Kerry-Boxer?[268] How did stakeholders avoid the uncertainty of regulations in the Uintah Basin[269] and with respect to setting CAFE standards?[270]

What teaching lessons emerge from the creation and potential impact of RGGI and TCI—interstate institutions operating largely outside the ambit of federal influence?[271] The states that created them seemed reinvigorated by inept approaches at higher levels of government and have created entirely new agencies with access to impressive resources. These resources in turn can be used to incentivize local governments to adopt and implement land use plans that greatly reduce energy consumption and carbon emissions. Can government policy at the interstate level work with market forces to shape human settlement patterns so as to drastically reduce per-capita carbon emissions? RGGI and TCI are worthy experiments that merit study and support. What are the advantages and disadvantages of this more devolved approach to action needed to solve such critical problems?

As states move toward a posture of accommodation and retreat from sea-level rise, how can the legacy of *Lucas*'s total-takings doctrine be reinterpreted?[272] Common law doctrines of nuisance, waste, and public trust[273] can be seen in new light as

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[264] *See* Pardee v. Camden Lumber Co., 73 S.E. 82, 83, 85-86 (W. Va. 1911).
[265] *See* Vill. of Euclid v. Ambler Realty Co., 272 U.S. 365, 386-88 (1926).
[266] *See* Massachusetts v. Envtl. Prot. Agency, 549 U.S. 497, 498-99 (2007).
[267] *See* Danish, *supra* note 65, at 29-33.
[268] *See generally* H.R. 2454 111th Cong. (2009).
[269] *See* Streater, *supra* note 137.
[270] *See* Freeman, *supra* note 116, at 344-46.
[271] *See generally* REG'L GREENHOUSE GAS INITIATIVE, *supra* note 77.
[272] *See* Lucas v. S.C. Coastal Council, 505 U.S. 1003, 1004 (1992).
[273] *See* discussion *supra* Parts III.B & C.

hard-headed practices of due diligence, real property estates, and judicial precedents combine to shape our understanding of the background principles of state law[274] and legitimate investment-backed expectations.[275] Traditional processes used by administrative boards can be tweaked and supplemented to employ and memorialize the deals that rely on contingency bargaining—deals that accommodate uncertainty in ways that regulation cannot.[276]

These questions and observations merit exploration in the law-school curriculum. The intersections of the common law, statutory principles, administrative regimes, regulatory-takings jurisprudence, transactional practice, administrative adjudication, and intergovernmental policy can teach law students the intricate interconnectedness of the law and legal institutions. With this framework in mind, they will graduate from law school ready for the challenges their profession faces. The progress described in this article has created a new "regulatory environment"[277]: one in which lawyers are learning to operate above regulations and beyond the confines of current practices, using new tools and techniques appropriate to a rapidly changing world.

[274] *See* discussion *supra* Parts III.B & C.
[275] *See* discussion *supra* Parts III.B & C.
[276] *See* discussion *supra* Part IV & notes 251-54.
[277] *See* Colo. Dep't of Health v. The Mill, 887 P.2d 993, 1001 (Colo. 1994).