

2015

Land Use and Climate Change Bubbles: Resilience, Retreat, and Due Diligence

John R. Nolon

Elisabeth Haub School of Law at Pace University, jnolon@law.pace.edu

Follow this and additional works at: <http://digitalcommons.pace.edu/lawfaculty>

 Part of the [Environmental Law Commons](#), [Land Use Law Commons](#), and the [Property Law and Real Estate Commons](#)

Recommended Citation

John R. Nolon, Land Use and Climate Change Bubbles: Resilience, Retreat, and Due Diligence, 39 Wm. & Mary Envtl. L. & Pol'y Rev. 321 (2015), <http://digitalcommons.pace.edu/lawfaculty/956/>.

This Article is brought to you for free and open access by the School of Law at DigitalCommons@Pace. It has been accepted for inclusion in Pace Law Faculty Publications by an authorized administrator of DigitalCommons@Pace. For more information, please contact cpittson@law.pace.edu.

Land Use and Climate Change Bubbles: Resilience, Retreat, and Due Diligence

John R. Nolon¹

William and Mary Environmental Law and Policy Review
(Forthcoming, Fall, 2014)

“We are the first generation to feel the impact of climate change and the last generation that can do something about it.”²

Abstract

This article examines events on the ground in several localities where climate change is lowering property values and analyzes how those changes in value can be reckoned with by regulators. It merges practices and principles of real estate transactions and finance with those of land use and environmental regulation.

Climate change is a planetary phenomenon whose environmental implications are far-reaching. Reports on climate change consequences increasingly focus on what is happening locally and presently, while speculation continues about long-term global consequences. In numerous communities, property values are declining because of repeated flooding, continued threats of storm surges, sustained high temperatures, constant fear of wildfires, lack of water in residential, commercial, and agricultural areas, and concerns with mudslides in vulnerable areas. Cumulatively, these changes are causing a reverse economic bubble associated with land use that mirrors the effect of the infamous housing bubble of 2008, but is potentially much more harmful to the nation.

¹ John R. Nolon is Professor of Law and Counsel to the Land Use Law Center at Pace Law School and Adjunct Professor of Land Use Law and Policy at Yale’s School of Forestry and Environmental Studies. This article builds on an earlier discussion of climate change, uncertainty, regulatory responses, and non-regulatory options. See John R. Nolon, *Land Use and Climate Change: Lawyers Negotiating Above Regulation*, 78 BROOK. L. REV. 521 (2013), suggesting how regulations can incorporate private sector behaviors and standards that are explored more fully here. Thanks to Roisin Grzegorzewski, my Research Assistant, for her excellent research and patient editing.

² *Years of Living Dangerously: True Colors* (Showtime television broadcast May 12, 2014) (statement by Jay Inslee, Governor of the State of Washington).

Much of the article consists of local case studies demonstrating these adverse economic effects: impacts that are being accounted for in the private sector while public regulation is stunted by concerns over the *per se* takings doctrine established in the case of *Lucas v. South Carolina Coastal Council*. The article examines the lawyer's role in assisting real estate purchasers in these vulnerable places with their due diligence duties under the historical doctrine of *caveat emptor*. This duty includes the consideration of present as well as emerging property conditions and the risks of how they are being accounted for in the casualty insurance and mortgage industries and by real estate appraisers, all of which affect the alienability and value of properties.

As the private market adapts to climate change, new building techniques and locational preferences for new construction are emerging, evidencing strategic adaptation to increasingly evident risks associated with climate change. The conclusion reflects on how these private market realities can lead to the reform of land use and environmental regulation and helps create a positive dialogue about climate change management.

I. Land Use Climate Change Bubbles: A Semaphore that Signals the Need for Land Use Reform

Rebuilding along the New York and New Jersey coast is delayed and property values are falling in some locations because of the difficulty of collecting on flood insurance, the slow pace of delivering federal assistance, the high cost of elevating new buildings under newly released Federal Emergency Management Agency (FEMA) flood plain maps, the reluctance of lenders to invest, and the fact that many of these properties are nonconforming uses under local zoning.³ These factors and the still-frightening recollection of

³ Michael Powell, *17 Months After Hurricane, Recovery Effort Plods Along*, N.Y. TIMES (Mar. 24, 2014), http://www.nytimes.com/2014/03/25/nyregion/17-months-after-hurricane-recovery-effort-plods-along.html?_r=0 (discussing that seventeen months after Superstorm Sandy, recovery efforts have made very little progress); see Rhonda Kaysen, *Back to the Jersey Shore*, N.Y. TIMES (Apr. 4, 2014), <http://www.nytimes.com/2014/04/06/realestate/back-to-the-jersey-shore.html> ("Rebuilding in a high-hazard area is not cheap. If a house was destroyed or sustained substantial damage, it must be rebuilt to local floodplain requirements, which in the most risky areas can require costly measures like elevating the house on pilings or columns. . . . Homeowners with federally backed mortgages must also buy flood insurance, which can be

the damage and despair wrought by the nightmare called Sandy are slowing sales and lowering prices in many neighborhoods, giving new meaning to “underwater properties.”⁴ Along the Atlantic Coast in Southern Florida, the risk of saltwater intrusion and ground water contamination are affecting the price of shoreline and inland residences and businesses.⁵

These consequences are not limited to coastal areas.⁶ Real estate prices in many parts of the country are beginning to fall due to the real and perceived effects of climate change on land use. The severe drought in the West has caused some communities to begin trucking in water to their residents.⁷ The specter of living on water delivered by trucks is lowering the pace of sales and the value of homes and businesses. Sustained extreme temperatures in parts of the southern Corn Belt are limiting yields, the availability of crop insurance, and lowering the value of farmlands and businesses. Imagine trying to sell a home in the shadow of an imposing cliff or

expensive. Owners who can't afford the flood insurance premiums or who can't afford to rebuild to these standards are selling.”).

⁴ Kaysen, *supra* note 3 (“Prices for waterfront property in hard-hit areas plunged after the storm, largely because of damage to houses. Suddenly, towns where land was rarely available, like Mantoloking, had listings. Of waterfront homes that sold in the area between November 2012 and June 2013, the median selling price dropped 34 percent from the same time period a year earlier, according to an analysis of listings data by Tom Wissel, Multiple Listing Service coordinator for the Ocean County Board of Realtors.”).

⁵ SCOTT T. PRINOS ET AL., U.S. DEP’T OF THE INTERIOR AND U.S. GEOLOGICAL SURV., ORIGINS AND DELINEATION OF SALTWATER INTRUSION IN THE BISCAYNE AQUIFER AND CHANGES IN THE DISTRIBUTION OF SALTWATER IN MIAMI-DADE COUNTY, FLORIDA 1 (2014), *available at* <http://pubs.usgs.gov/sir/2014/5025/pdf/sir2014-5025.pdf> (“Intrusion of saltwater into parts of the shallow karst Biscayne aquifer is a major concern for the 2.5 million residents of Miami-Dade County that rely on this aquifer as their primary drinking water supply. Saltwater intrusion of this aquifer began when the Everglades were drained to provide dry land for urban development and agriculture. The reduction in water levels caused by this drainage, combined with periodic droughts, allowed saltwater to flow inland along the base of the aquifer and to seep directly into the aquifer from the canals.”).

⁶ See *infra* Part IV. The contexts discussed in this paragraph and the previous paragraph are discussed in detail in the case studies explored in Part IV below.

⁷ See U.S. NAT’L CLIMATE ASSESSMENT, U.S. GLOBAL CHANGE RES. PROGRAM, CLIMATE CHANGE IMPACTS IN THE UNITED STATES: THE THIRD NATIONAL CLIMATE ASSESSMENT 9, 15 (2014), *available at* nca2014.globalchange.gov (Discussing that higher temperatures can be linked to more severe droughts. “[R]ecent trends show that extreme heat is becoming more common, while extreme cold is becoming less common Some extreme weather and climate events have increased in recent decades, and new and stronger evidence confirms that some of these increases are related to human activities Over the last 50 years, much of the United States has seen an increase in prolonged periods of excessively high temperatures, more heavy downpours, and in some regions, more severe droughts.”).

hillside in the Northwest after the damage witnessed in Oso, Washington.

Land Use Climate Bubbles are popping up across the nation at an increasingly rapid rate.⁸ These bubbles, where land and building values are declining due to consequences associated with climate change, provide extensive, objective evidence that climate change is real and must be dealt with on the ground.⁹ Reinforcing this dramatic local evidence of its existence and costs, climate change has been added to the list of issues that pose the greatest risks to the U.S. taxpayer because of its far-reaching economic impacts on coastal infrastructure, agriculture, energy consumption, and many other aspects of the economy.¹⁰ As a result, there is a developing urgency to understand these impacts and to learn how to properly prevent and mitigate them.¹¹

⁸ See EXEC. OFFICE OF THE PRESIDENT OF THE U.S., THE COST OF DELAYING ACTION TO STEM CLIMATE CHANGE 2 (2014) (“Based on a leading aggregate damage estimate in the climate economics literature, a delay that results in warming of 3° Celsius above preindustrial levels, instead of 2°, could increase economic damages by approximately 0.9 percent of global output. To put this percentage in perspective, 0.9 percent of estimated 2014 U.S. Gross Domestic Product (GDP) is approximately \$150 billion. The incremental cost of an additional degree of warming beyond 3° Celsius would be even greater.”). See also David Hone, *The Climate Bubble Reality Check*, THE HUFFINGTON POST (Mar. 5, 2013), http://www.huffingtonpost.co.uk/david-hone/climate-bubble-climate-change_b_3204677.html. The notion of a climate bubble first surfaced in a different context: the over investment in high carbon assets in the coal, oil, and gas industries. The specter of climate change and the threat of governmental regulation of these industries might create a reservoir of unburnable carbon reserves, leading to a decline in such investments. The underlying thought is that there is a finite limit to the capacity of the atmosphere to absorb carbon without reaching a tipping point in global warming from which we cannot return. This, in turn, will diminish the investment value of much of the world’s carbon assets. See also John Nolon, *Land Use and the Climate Bubble*, GREENLAW PACE ENVTL. LAW PROGRAMS BLOG (Feb. 3, 2014), <http://greenlaw.blogs.law.pace.edu/2014/02/03/land-use-and-the-climate-bubble/> (“Real estate prices in many parts of the country are beginning to fall due to the real and perceived effects of climate change on land use. What is happening on the land is an indicator that a climate bubble is forming Under the age-old concept of *caveat emptor*, buyers may soon enough learn not to invest in properties in threatened places. If they don’t the bursting of the climate bubble will certainly change their minds.”). See also Henry M. Paulson Jr., *The Coming Climate Crash: Lessons for Climate Change in the 2008 Recession*, N.Y. TIMES (June 21, 2014), <http://www.nytimes.com/2014/06/22/opinion/sunday/lessons-for-climate-change-in-the-2008-recession.html> (where Paulson, Secretary of the Treasury during the housing bubble era, wrote, “[w]e’re making the same mistake today with climate change. We’re staring down a climate bubble that poses enormous risks to both our environment and economy.”)

⁹ See *infra* notes 60-64 and accompanying text.

¹⁰ U.S. GOV’T ACCOUNTABILITY OFFICE, HIGH RISK SERIES: AN UPDATE 15 (2013), available at <http://www.gao.gov/assets/660/652133.pdf>.

¹¹ See A CLIMATE RISK ASSESSMENT FOR THE U.S., RISKY BUSINESS: THE ECONOMIC RISKS OF CLIMATE CHANGE IN THE UNITED STATES (2014), available at http://riskybusiness.org/uploads/files/RiskyBusiness_PrintedReport_FINAL_WEB_

Some of these Land Use Climate Bubbles have already collapsed and others are at risk of collapsing. In Sidney, New York, and in Isle de Jean Charles, Louisiana, the bubbles have burst.¹² Four other communities are described below that exemplify Land Use Climate Change Bubbles that are at risk of collapsing and suffering the potential devastating economic impacts that will result.¹³

Sidney, New York, is located in the Catskill Mountains on a floodplain just south of the Susquehanna River.¹⁴ The community was hit with major flooding in 2006 and then again in 2011 by Tropical Storm Lee. The flooding in both instances caused extensive damage to the downtown business district and a nearby residential neighborhood. Following the second storm event, new construction and demand for purchasing property in the affected area disappeared. This convinced community leaders to retreat;¹⁵ after much consideration and land use planning, the community decided to

OPTIMIZED.pdf. The report supports an independent economic analysis to quantify the range of likely costs of climate-driven impacts on everyday weather, natural disasters, and the economy of nine specific regions of the United States.

¹² See *infra* notes 74-86, 87-99 and accompanying text.

¹³ See *infra* notes 100-13, 114-21, 122-39, 140-151 and accompanying text.

¹⁴ See *infra* notes 74-86 and accompanying text.

¹⁵ “Retreat” is a relatively new strategy in resiliency planning and it collides with the intuitive notion that in America we rebuild in the wake of disasters. The costs and realities of rebuilding are reflected in a few emerging examples of policies that embody retreat. For example, “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. 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.’” John R. Nolon, *Sea-Level Rise and the Legacy of Lucas: Planning For an Uncertain Future*, 66 PLAN. & ENVTL. L. 4, 5 (2014); see also *Blue Acres Floodplain Acquisitions*, STATE OF N.J. DEP’T OF ENVTL. PROT., GREEN ACRES PROGRAM, http://www.nj.gov/dep/greenacres/blue_flood_ac.html (last updated Sept. 26, 2014) (explaining how New Jersey’s Department of Environmental Protection’s blue acres plan provides funding to acquire land and relocate citizens out of the floodplain); see also GEORGETOWN CLIMATE CTR., ADAPTATION TOOL KIT: SEA-LEVEL RISE AND COASTAL LAND USE: HOW GOVERNMENTS CAN USE LAND-USE PRACTICES TO ADAPT TO SEA-LEVEL RISE 14 (2011) (discussing “planned retreat” as a policy that “limits armoring, discourages development and redevelopment in threatened areas, and plans for the eventual relocation of structures inland, as properties become threatened by [sea-level rise]”); see also Andrea McArdle, *Storm Surges, Disaster Planning, and Vulnerable Populations at the Urban Periphery: Imagining a Resilient New York After Superstorm Sandy*, 50 IDAHO L. REV. 19, 37 (2014) (discussing “managed retreat” as a potential strategic response at the local or regional level to plan for and mitigate risks associated with global warming and sea level rise).

relocate the business district and homes in the vulnerable, high-risk area to higher elevations.

Isle de Jean Charles, is located in Terrebonne Parish, Louisiana, on a narrow Chenier plain in between Bayou Terrebonne and Point-aux-Chen.¹⁶ Southern Louisiana is exceptionally vulnerable to sea level rise, coastal erosion, and hurricanes.¹⁷ Currently, there are 20 homes and 230 people residing in Isle de Jean Charles, but residents are leaving quickly due to the damage to homes caused by flooding and storm surges. The loss of land to sea level rise has destroyed the local economy due to the loss of farmland, inability to raise livestock and crops, and the inability to use the roads that connect the community to mainland Louisiana.

Land Use Climate Change Bubbles are forming in all regions of the country:

- Miami-Dade, Florida, is a coastal county in serious danger of flooding and saltwater intrusion of its groundwater due to sea level rise, storm surges, and high winds.¹⁸ The community sits above a depleting freshwater aquifer that is extremely susceptible to salt water contamination brought by rising tides and storm events that could contaminate the potable drinking water resource for many residents of the area.¹⁹ Although real estate prices are not yet in decline, community leaders are

¹⁶ See *infra* notes 87-99 and accompanying text.

¹⁷ See *generally* UNION OF CONCERNED SCIENTISTS & THE ECOLOGICAL SOC'Y OF AM., CONFRONTING CLIMATE CHANGE IN THE GULF COAST REGION (2001).

¹⁸ See *infra* notes 100-13 and accompanying text.

¹⁹ PRINOS ET AL., *supra* note 5, at 2 (“The Biscayne aquifer underlying the study area . . . in Miami-Dade County and southern Broward County in Florida is prone to saltwater intrusion because this area has low land-surface altitude and a low topographic gradient and is bordered to the east and south by sources of saltwater in the Atlantic Ocean, Biscayne Bay, and Florida Bay. The aquifer is part of the surficial aquifer system, is semi-confined, and consists primarily of highly permeable limestone.”); see also Barry Heimlich & Frederick Bloetscher, *Effects of Sea Level Rise and Other Climate Change Impacts on Southeast Florida’s Water Resources*, FLA. WATER RESOURCES J., Sept. 2011, at 42 (“As sea level rises, the saltwater intrusion zone in the southern Everglades . . . will move northward. Saline water would inundate the surface waters of the southern Everglades watershed. As salinity levels in the ground and surface waters in the southern Everglades migrate northward, it would threaten the wellfields in southwest Miami-Dade County by contaminating the southern Biscayne Aquifer at its head waters in the Everglades.”).

acutely aware of the potential climate bubble consequences in the near term.²⁰

- In the drought stricken Southwest, Spicewood Beach became the first community in Texas that had to truck in water for its residents and businesses when its public water supply failed.²¹ Tourist activity around Lake Travis, the community's major tourist attraction, plummeted along with the property values of lake front homes.
- In the Northwest, the constant rain that plagued Oso, Washington triggered a massive mudslide in 2014 that devastated the community and threatens the small town's ability to recover economically because of its location in a mudslide prone area at the base of a mountain.²²
- In the Midwest, rising temperatures and drought threaten the survival of Elkhart, Kansas, as an agricultural community.²³ The warming of the climate and lack of water threaten agricultural productivity in a corn-dependent economy and implicate the livelihood of the entire community.

These economic disruptions operate as a semaphore: a system that is sending communities clear signals that they must embrace resilience;²⁴ create new and effective strategies for dealing with the adversity caused by the consequences of climate change. These are strong signals emerging from the private market that, in many cases, will cause local leaders to review their land use plans and regulations and reform them to reflect new realities. The legal and practical

²⁰ The U.S. National Climate Assessment lists Miami as one of the nation's most vulnerable and at risk cities to the impacts of Sea-Level Rise. U.S. GLOBAL CHANGE RES. PROGRAM, *supra* note 7, at 400.

²¹ See *infra* notes 114-21 and accompanying text.

²² See *infra* notes 122-39 and accompanying text.

²³ See *infra* notes 140-51 and accompanying text.

²⁴ COMMUNITY & REGIONAL RESILIENCE INST., DEFINITIONS OF COMMUNITY RESILIENCE: AN ANALYSIS 10 (2013). A 2013 CARRI report contains nearly fifty different definitions of community resilience. CARRI developed its own definition for resilience based on the core concepts embodied in these definitions: "Community resilience is the capability to anticipate risk, limit impact, and bounce back rapidly through survival, adaptability, evolution, and growth in the face of turbulent change." An impressive factor embraced by this report is that "[a]ny adaptation must improve the community, i.e., must result in a positive outcome (positive trajectory) for the community relative to its state after experiencing adversity. This can best be detected by considering the level of functionality of the community after a crisis."

barriers to this reform are substantial, but the power of this semaphore is capable of overcoming them.

These barriers, including the *Lucas per se* takings doctrine, are examined in Part II of this article. Part III examines land use change and the evidence of growing market risks against the backdrop of the housing bubble of 2008 and its consequences. It points out that private market forces should stimulate effective action by public regulators and that the two realms are inextricably intertwined as evidenced by the public insurance subsidies that prop up markets for coastal development, while private investment wanes.

Part IV describes in detail the six examples of Land Use Climate Change Bubbles mentioned above, providing empirical evidence of imminent property value collapse in areas typical of many regions of the country. Part V demonstrates how this evidence is being absorbed and is affecting private market real estate deals using the doctrine of *caveat emptor* and the practice of due diligence analysis in real estate transactions. This practice ensures that current changes in real estate appraisal and in insurance and mortgage underwriting will adversely affect the pace and price of real estate sales and, eventually, the location of new development.

Part VI concludes by noting that these private market forces are adapting to climate change and moving investment and building to less risky places, affecting regulatory responses in the process. Theories of change, background principles of state law, and private market movements all suggest that the regulatory world will turn, and in the not too distant future. As the private market adapts to climate change, new building techniques and locational preferences for new construction are emerging, evidencing strategic adaptation to increasingly evident risks associated with climate change. The conclusion reflects on how these private market realities at the local level should affect, in a positive way, the national debate about climate change, its consequences, and what can and should be done in response.

II. *Lucas* and the *Per Se* Takings Doctrine: Stunting Public Regulation

David Lucas was a principal in a real estate company that developed homes on the Isle of Palms, a barrier island community in South Carolina.²⁵ When the company dissolved in the early 1990s, Lucas took two lots as his share of the assets. The value of those two lots would normally have been limited because wind and flood casualty insurance were not available in the private market for the buyers of single-family homes. Without insurance, purchasers could not qualify for a mortgage; without mortgage financing, the only market for the two houses would be those relatively few purchasers with enough cash to buy the homes outright. Constraints in the private market greatly reduced the demand for his two homes and, one would assume, their value. Lucas and his lawyers would have discovered these private market limitations as they conducted their due diligence, before investing in securing local permits and constructing the homes. They would have learned that insurers and mortgagees thought the area too risky to be developed, sold, insured, and financed.

After Lucas took title to his two lots, the South Carolina Coastal Council established a no-build zone: a 1000 foot set-back line measured from the high tide line, locating it landward of Lucas's lots, effectively preventing him from building.²⁶ He brought and won a regulatory taking case.²⁷ The U.S. Supreme Court declared that such a total taking of value is compensable unless nuisance law or other background principles of state law would prevent the development.²⁸ Upon remand, no such background law was found and the court awarded Lucas compensation in excess of one million dollars. There is no evidence that private market considerations such as the lack of insurance and mortgage financing were regarded as relevant background principles.²⁹

²⁵ John R. Nolon, *Footprints in the Shifting Sands of the Isle of Palms: A Practical Analysis of Regulatory Takings Cases*, 8 J. LAND USE & ENVTL. L. 1, 6 (1992). See this article for support for the statements made in this section.

²⁶ Beachfront Management Act of 1988, S.C. CODE ANN. § 48-39-360 (2013).

²⁷ *Lucas v. S.C. Coastal Council*, 505 U.S. 1003 (1992).

²⁸ *Id.*

²⁹ This is undoubtedly due to the fact that the federal government, under the National Flood Insurance Program, provided flood insurance and that wind damage insurance policies were available under a risk sharing arrangement created by the South Carolina legislature.

The *Lucas* case was decided in 1992, precisely when the world was first formalizing its concerns with climate change in Rio de Janeiro. The Rio “Earth Summit”³⁰ led to the adoption of three critical agreements: The Rio Declaration on Environment and Development, Agenda 21, and the United Nations Framework Convention on Climate Change (UNFCCC).³¹ The UNFCCC focused on climate change and committed ratifying countries to stabilize greenhouse gas (GHG) concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.³² The U.S. was a participating nation at Rio, and the U.S. Senate ratified the framework convention.³³ The participating nations also agreed to cooperate in adapting to the impacts of climate change, such as sea level rise and natural disasters, through the development of appropriate plans for coastal zone management and the conservation of ecosystems and the built environment.³⁴

These general commitments took years to evolve into meaningful international action and many of the resulting agreements are still unrequited. In the U.S., the public’s understanding of climate change, sea level rise, and storm surges was minimal in 1992. Today, circumstances have changed; the National Climate Assessment³⁵ and Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC)³⁶ make it clear that coastal development is risky business³⁷ and that vulnerable areas will become no-build zones as developers consider and react to real risks of loss to persons, property, and infrastructure.³⁸ These reports

³⁰ 1992 United Nations Conference on Environment and Development in Rio de Janeiro (also known as the Earth Summit). Kyle Danish, *The International Climate Regime*, in GLOBAL CLIMATE CHANGE AND U.S. LAW 39 (Michael B. Gerrard & Jody Freeman, eds., 2014).

³¹ *Id.* at 39; see also JOHN R. NOLON & PATRICIA SALKIN, CLIMATE CHANGE AND SUSTAINABLE DEVELOPMENT LAW IN A NUTSHELL, 3-5, 14-17, (2011).

³² Danish, *supra* note 30, at 39.

³³ *Id.* at 41.

³⁴ *Id.*

³⁵ U.S. GLOBAL CHANGE RES. PROGRAM, *supra* note 7.

³⁶ INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2013: THE PHYSICAL SCIENCE BASIS, CONTRIBUTION OF WORKING GROUP I TO THE FIFTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (2013), available at <http://www.ipcc.ch/report/ar5/wg1/>.

³⁷ This term is taken from the report Risky Business: The Economic Risks of Climate Change in the U.S. See A CLIMATE RISK ASSESSMENT FOR THE U.S., RISKY BUSINESS, *supra* note 11.

³⁸ See *infra* Section IV (discussing the Sidney, NY, case study where, after experiencing severe flooding that severely damaged the downtown business and residential districts, the community used State grant funds to aid in relocating out of the high risk flood zones).

extend their concerns to areas experiencing prolonged heat and drought, inland flooding, and a variety of other environmental and economic consequences.

Scalia, writing for the majority in *Lucas* had this to say: "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)."³⁹ Is sea level rise a "changed circumstance?" Are recent scientific reports and maps "new knowledge?" Today, coastal developers and their lawyers would find much scientific evidence of changed circumstances and would note and react to evident disinvestment by the private market in development on the beach.⁴⁰ Today, the *Lucas* case might be decided differently, either in the courts, the marketplace, or both.⁴¹

III. Land Use and the Climate Bubble: Costs and Consequences

The collapse of the housing bubble in 2008 led to the worst economic recession our country has experienced since the Great Depression.⁴² The housing and financial crisis emerged from an unrealistic expansion of credit and artificially inflated home prices.⁴³ The nation's largest banks and financial houses engaged in these practices. Low interest, low down payment loans were created and offered to buyers with dubious credit histories; demand exploded, prices accelerated, and a nation-wide bubble was created.⁴⁴ By the

³⁹ *Lucas*, 505 U.S. at 1031 (citing RESTATEMENT (SECOND) OF TORTS § 827 (1979)).

⁴⁰ This would be so, particularly, if local governments refer by reference to scientific studies and maps in their comprehensive plans or in the findings sections of their zoning and land use ordinances. See Nolon, *Lawyers Negotiating Above Regulations*, *supra* note 1.

⁴¹ *Id.* In this article, I discuss several potential doctrinal exceptions to *Lucas*, including the public trust doctrine, the public's future interest in threatened coastal lands, the common law doctrine of waste, the natural use doctrine, and changes in the regulatory environment, and point out why most localities, for practical and political reasons, will not create no-build zones in reliance on them. The article also outlines a non-regulatory strategy for discouraging developers from building in vulnerable places by adopting comprehensive plan provisions outlining climate change risks and then negotiating in the land use review and approval process to downsize, relocate, or discourage altogether proposed projects in these places.

⁴² FIN. CRISIS INQUIRY COMM'N, THE FIN. CRISIS INQUIRY REPORT: FINAL REP. OF THE NAT'L COMMISSION ON THE CAUSES OF THE FIN. AND ECON. CRISIS IN THE U.S. 354 (2011).

⁴³ See *generally id.*

⁴⁴ *Id.* at xxv.

time the stakeholders in this national lending and underwriting system figured out that housing prices outstripped demand, that prices were falling, and that mortgagors were unable to cover their monthly payments, it was too late and, in 2008, the bubble burst.

“The financial crisis of...2008 was not a single event but a series of crises that rippled through the financial system and, ultimately, the economy.”⁴⁵ Many experts and organizations failed to identify the housing bubble and its subsequent consequences. “Indeed, the regulators, including the Fed, would fail to identify excessive risks and unsound practices building up in nonbank subsidiaries of financial holding companies.”⁴⁶ The lack of prudent mortgage lending standards paved the way for the largest recession our country has seen since the Great Depression.⁴⁷ “Despite the expressed view of many on Wall Street and in Washington that the crisis could not have been foreseen or avoided, there were warning signs. The tragedy was that they were ignored or discounted.”⁴⁸

Similarly, the Land Use Climate Bubbles that are emerging constitute a series of seemingly unrelated phenomena in different regions. In many areas, the clear signals of the National Climate Assessment and the IPCC’s Fifth Assessment report are being ignored and development continues unabated. There are clear warning signs, not just in academic and governmental reports, but also on the ground in an increasingly large and disturbing number of places where real damage is being caused. The scale of this new bubble is perhaps much greater than that of the housing bubble; we risk ignoring the signals it sending at our very great peril.

In numerous communities, property values are declining because of repeated flooding, continued threats of storm surges, sustained high temperatures, constant fear of wildfires, the lack of water in residential, commercial, and agricultural areas, and real concerns with mudslides in vulnerable areas. This persuasive evidence that bubbles are forming is reinforced by a variety of recent and persuasive reports at the national and international level.

⁴⁵ *Id.* at 27.

⁴⁶ *Id.* at 56.

⁴⁷ *Id.* at 11.

⁴⁸ *Id.* at xvii.

GAO High Risk List

The heightened cost to the federal government of climate change is evidenced by the addition of climate change to the Governmental Accountability Office's (GAO) list of issues that pose the greatest threat to the U.S.⁴⁹ In doing so, the GAO recognized that climate change threatens to inflict huge costs to the U.S. taxpayer, including damage to physical infrastructure, increased insurance liability, and disaster relief. The addition of climate change to the GAO's High Risk list demonstrates the serious financial risk that climate change poses and sharpens the focus on the threat that it entails to public health, the environment, and the economy.⁵⁰

IPCC Fifth Assessment Report

The IPCC, formed by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) in 1988, reviews and assesses the most recent scientific, technical, and socio-economic information relevant to the understanding of climate change.⁵¹ Over 150 countries, including the U.S., participate in the working groups that gather scientists, policy analysts, engineers, and resource managers to issue assessment reports approximately every six years.⁵² The IPCC, released the first volume of its Fifth Assessment Report in September 2013.⁵³ This report found that over the last fifty years, the global surface temperature and global average sea level have risen, and snow cover in both hemispheres has

⁴⁹ U.S. GOV'T ACCOUNTABILITY OFFICE, *supra* note 10.

⁵⁰ *Id.*; see also Thomas L. Friedman, *Obama on Obama on Climate*, N.Y. TIMES (June 7, 2014), <http://www.nytimes.com/2014/06/08/opinion/sunday/friedman-obama-on-obama-on-climate.html> (Quoting President Obama, “[w]ildfires are ‘now consuming a larger and larger portion of the Department of Interior budget. And if we continue to fund fighting fires in the same way we’ve done in the past, all the money for everything else – for conservation, for maintenance of forests - - all that money gets used up.’”).

⁵¹ JOHN R. NOLON & PATRICIA E. SALKIN, *supra* note 31, at 2.

⁵² *Id.*

⁵³ Michael B. Gerrard, *Introduction and Overview*, in GLOBAL CLIMATE CHANGE AND U.S. LAW 5 (Michael B. Gerrard & Jody Freeman, eds., 2014). The IPCC is a joint effort of the United Nations Environment Programme and the World Health Organization. It is a scientific intergovernmental body that produces reports that support the United Nations Framework Convention on Climate Change – the main international treaty on climate change. The IPCC does not produce its own data and instead reviews, amasses, and assesses different countries' scientific articles on the topic in non-politicized manner.

decreased.⁵⁴ These trends, caused by an increase in GHG emissions, are “largely...a result of human activities.”⁵⁵ Such gases are denominated “greenhouse gases” because the sun’s rays pass through them but they inhibit the escape of heat. This causes the atmosphere to warm and global temperatures to rise. As we burn more fossil fuels to heat and cool buildings, run appliances, and drive personal vehicles across the landscape, we increase the concentration of CO₂ and accentuate this greenhouse effect.⁵⁶

The primary purpose of this report is to inform policymakers with authoritative, non-biased scientific evidence of the impacts of climate change so that this information can be integrated into federal, state, and international programs. For example, the report states that CO₂ emissions increased by forty percent from 1750 to 2011.⁵⁷ The most critical conclusion from the report thus states: “With a *very high level of confidence*, the increase in CO₂ emissions from fossil fuel burning and those arising from land use change are the dominant cause in the observed increase in atmospheric CO₂ concentration.”⁵⁸

National Climate Assessment⁵⁹

According to the May, 2014 National Climate Assessment, “[c]limate change, once considered an issue for a distant future, has moved firmly into the present.”⁶⁰ The study, was prepared by a large scientific panel overseen by the government and concluded that the effects of climate change are being experienced throughout the United States, and have been primarily caused by human activities over the last fifty years.⁶¹ The report specifically mentions water

⁵⁴ INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, *supra* note 36, at 192, 286, 358, 1139.

⁵⁵ *Id.* at 121.

⁵⁶ See *Causes of Climate Change*, U.S. ENVTL. PROT. AGENCY, <http://www.epa.gov/climatechange/science/causes.html#greenhouseeffect> (last updated Mar. 18, 2014).

⁵⁷ INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, *supra* note 36, at 467.

⁵⁸ *Id.*

⁵⁹ U.S. NAT’L CLIMATE ASSESSMENT, *supra* note 7, at iv (“A team of more than 300 experts guided by a 60-member Federal Advisory Committee produced the report, which was extensively reviewed by the public and experts, including federal agencies and a panel of the National Academy of Sciences.”).

⁶⁰ *Id.* at 1-4.

⁶¹ *Id.* at 3, 20. This report was the result of the Global Change Research Act of 1990, which requires the U.S. Global Climate Research Program (USGCRP) to prepare and submit an assessment of effects of global change in the U.S. to the President and Congress every four years. The USGCRP is made up of thirteen federal agencies and departments, including the

growing scarcer in dry regions, torrential rains increasing in wet regions, heat waves becoming more common and more severe, wildfires growing worse, and forests dying under assault from heat-loving insects.

The report noted that U.S. average temperature increased by 1.3°F to 1.9°F since record keeping began in 1895 and that most of that increase occurred since about 1970.⁶² In addition, the panel reported if the U.S. continues its current GHG emissions path, the temperature could increase by 8-11°F by 2100.⁶³ This increase in temperature has caused many immediate effects that will only be exacerbated in the decades to come, including shorter duration of ice on lakes and rivers; reduced glacier extent; earlier melting of snowpack; reduced lake levels due to increased evaporation; lengthening of the growing season; changes in plant hardiness zones; increased humidity; rising ocean temperatures; rising sea level; ocean acidification; and extreme weather patterns, including the increased severity of winter storms, heat waves, floods, and droughts, as well as the increased magnitude and frequency of hurricanes in the North Atlantic.

Risky Business in the Private Sector

The economic risks of climate change to the private sector were the topic of a report issued in June 2014 by *Risky Business*, a joint initiative of Bloomberg Philanthropies, the Office of Hank Paulson, and Next Generation.⁶⁴ The Risky Business project frames climate change in economic terms, attempting to provide a “common language for how to think about climate risk.”⁶⁵ This project supports an independent economic analysis to quantify the range of likely

Department of Agriculture, Department of Commerce, Department of Defense, Department of Transportation, and the Environmental Protection Agency.

⁶² *Id.* at 19-20.

⁶³ *Id.* at 26.

⁶⁴ A CLIMATE RISK ASSESSMENT FOR THE U.S., RISKY BUSINESS, *supra* note 11, at 48. These groups commissioned the Rhodium Group, an economic research firm that specializes in analyzing disruptive global trends, to complete this report. Rhodium then convened a research team, co-led by climate scientist Dr. Robert Kopp and economist Dr. Solomon Hsiang, and partnered with Risk Management Solutions, the world’s largest catastrophe-modeling company for insurance and investment management companies. An independent Expert Review Panel composed of leading climate scientists and economists reviewed their work, including its methodology and statistics.

⁶⁵ *Id.*

costs of climate-driven impacts on everyday weather, natural disasters, and the economy of nine regions of the U.S.⁶⁶ It is essentially a call to action for American businesses to react on a national scale.

The report focused on both the short-term and long-term economic impacts that sea level rise, rising temperatures, and snowmelt will have on coastal infrastructure, agriculture, and energy consumption, as well as public health and labor productivity.⁶⁷ The report found, “[i]f we continue on our current path, by 2050 between \$66 to \$106 billion worth of existing coastal property will likely be below sea level nationwide, growing to \$238 to \$507 billion by 2100.⁶⁸ In addition, it concluded, “absent agricultural adaptation...national commodity crop production (corn, soy, wheat, and cotton) could decline by 14 percent by mid-century and by up to 42 percent by late century” as extreme heat spreads across the middle of the country.⁶⁹ In all, these findings “underscore the reality that if we stay on our current emissions path, our climate risks will multiply and accumulate as the decades tick by.”⁷⁰

Real Estate and the Land Use Climate Change Bubble

Climate change creates serious risk in the real estate market and real estate investors, insurers, and mortgagees are risk averse. Risks, once perceived by this market, slow the pace of sales, lower property values, increase the cost of insurance, and limit the availability of financing. The biggest economic threats of climate change, in fact, are to the real estate industry.⁷¹ In some vulnerable areas, casualty insurance rates have increased by over seventy-five percent.⁷²

Climate change factors such as extreme weather, sea level rise, coastal erosion, floods and wildfires are projected to

⁶⁶ *Id.*

⁶⁷ *Id.*

⁶⁸ *Id.* at 4.

⁶⁹ *Id.*

⁷⁰ *Id.*

⁷¹ Kelly Coplin, *How Climate Change Will Affect Home Value: Essential Answer*, STAN. MAG. (Sept./Oct. 2009), https://alumni.stanford.edu/get/page/magazine/article/?article_id=30265.

⁷² *Id.*

cause some \$300 million to \$3.9 billion in California real estate losses annually. It's a huge range, due to uncertainty in climate models, impacts and adaptation, and that uncertainty makes insurers even more nervous, because they're not quite sure what to prepare for. What we do know for sure is that California alone has \$2.5 trillion in real estate assets at risk for climate change damage. That's approximately 135 percent of the state's annual gross domestic product! Insurers have already begun cancelling homeowners' policies in high-risk areas and raising insurance costs in potentially impacted locations. In the San Francisco Bay Area, for example, most high value bayside property will be inundated if the sea level rises just one meter—well within the range of conservative scientific projections.⁷³

Given the impact on the housing bubble on the nation's economy, it is painfully clear that the bursting of Land Use Climate Bubbles in all regions of the country will have catastrophic economic ripple effects. If we do not see and respond to the warning signals, the consequences could easily dwarf those of the 2008 collapse of the housing market.

IV. Land Use Climate Change Bubbles: Region by Region

Northeast: Sidney, New York

Sidney is in retreat.⁷⁴ Situated next to the Susquehanna River in the Catskill Mountains of New York, the village was built on a

⁷³ *Id.*; see also CLIMATE CENT., WASHINGTON, D.C. AND THE SURGING SEA: A VULNERABILITY ASSESSMENT WITH PROJECTIONS FOR SEA LEVEL RISE AND COASTAL FLOOD RISK 15 (2014), available at <http://sealevel.climatecentral.org/uploads/ssrf/DC-Report.pdf> (“We find that in Washington D.C., some \$4.6 billion in property value – half in the zip code of 20024 (a large portion of Southwest DC) – and more than 1,400 people in 400 homes sit on land less than 6 feet above the local high tide line. At 10 feet the totals increase to \$9 billion and 4,833 people residing in 1,900 homes.”).

⁷⁴ See *supra* note 15 and accompanying text. An earlier example of retreat in the face of a hostile climate is found in the Village of Shishmaref, located on Sarichef Island in Alaska. At its highest point, Shishmaref is only twenty-two feet above sea level. The Chukchi Sea, surrounding the island, started freezing later in the fall and breaking up earlier in the spring, making Shishmaref more vulnerable to storm surges. A storm in 1997 removed a 125-foot strip from the north edge of the community, and in 2001, another storm threatened the village with twelve foot waves. In the summer of 2002, residents of the village of Shishmaref voted, 161 to 20, to move the entire

floodplain on the south side of the river.⁷⁵ In 2006, Sidney was hit by a record-breaking storm that dropped up to fourteen inches of rain over the upper Susquehanna Basin.⁷⁶ The village suffered major damage to multiple structures in its extensive flood prone areas, including the main street business district.⁷⁷ Many of the commercial buildings were flooded up to three feet above the ground floor and the village's largest employer, Amphenol Aerospace, located in the village's industrial park, was forced to shut down for several months.⁷⁸

Although the flooding caused major structural damage in business and residential districts of Sidney, the community focused on rebuilding because the flood was thought to be a one hundred year event and that it would not likely happen again.⁷⁹ This, however, was not the case. Just five years later, Tropical Storm Lee hit the village in 2011, causing widespread structural damage to the same businesses and residences in the flood plain.⁸⁰

These two floods had a substantial effect on businesses, homes, and the attitude of the people of the village. Amphenol Aerospace, for example, which employs over a thousand local residents, took an immense hit, losing about \$20 million dollars in both floods.⁸¹ After the 2011 flood, businesses, residents, and officials realized that it would not be sustainable for Sidney's economy to rebuild in the vulnerable flood prone area. Although Amphenol Aerospace was making plans to leave, local officials and citizens worked to find a site at a higher elevation for a new plant and

village to the mainland. ELIZABETH KOLBERT, FIELD NOTES FROM A CATASTROPHE: MAN, NATURE, AND CLIMATE CHANGE 8-9 (2006).

⁷⁵ N.Y. RISING COMMUNITIES, N.Y. RISING COMMUNITY RECONSTRUCTION PROGRAM, SIDNEY 1-2 (2014) ("In 1936 there was a wide spread flood that caused extensive damage, but seventy years of 'minimal flooding and previous near drought conditions' made the people of Sidney unanticipated by the Flood of 2006.").

⁷⁶ *Id.* at ES 2.

⁷⁷ *Id.* at ES 3.

⁷⁸ *Id.*

⁷⁹ Telephone Interview by Kevin Diffley with Andy Matviak, Mayor, Sidney, N.Y. (July 2014) ("All of us in Sidney thought and were told that it was a one in one hundred year event. Everyone said that this was a random occurrence that would not likely happen again in any of our lifetimes and looking back in history nothing like that had happened before 2006.").

⁸⁰ N.Y. RISING COMMUNITIES, *supra* note 75, at 1-5.

⁸¹ *Id.* at 4-44.

state representatives worked to secure incentive funds to encourage Amphenol to stay.⁸² The rest of the community followed suit.

Sidney's planned retreat began in 2011 when the village received a grant from the Department of State's Smart Growth, Environmental Protection Fund initiative as part of New York State's post-Irene/Lee Long Term Community Recovery Program. The village received further support from the New York Rising Community Reconstruction Program to help fund the planning and relocation of not only the downtown business district, but also residential homes to higher elevations within the community.⁸³

Mayor Andy Matviak of Sidney reported that Land Use Climate Change Bubble indicators did not appear after the 2006 flood; real estate prices did not decline, and insurance coverage and mortgage financing remained available. This changed, he said, after Tropical Storm Lee.⁸⁴ "We realized that things needed to be done about moving buildings in the vulnerable areas of Sidney to higher areas." He explained that in 2006 the focus was on getting the flooded homes immediate help rather than on preparing for another flood of similar magnitude and making sure homes would not be flooded again.⁸⁵ According to the Mayor, after Lee the market changed and property owners began to look for safer places to rebuild.

According to local officials and brokers, home prices fell drastically after Lee and many buildings became impossible to sell.⁸⁶ There is, in fact, no demand for real estate in the flood-prone areas in the village. The costs of rebuilding and financing construction in higher areas are considerable. Some owners have left buildings with outstanding mortgages unpaid; abandoned buildings in the flood plain need to be demolished. Several government programs are being tapped to help with the difficulties of transitioning to higher ground.

⁸² *Id.*

⁸³ *Id.* at 4-10.

⁸⁴ Matviak, *supra* note 79.

⁸⁵ *Id.*

⁸⁶ The information in this paragraph was obtained from telephone interviews with John Redente, local grants administrator for the village, and a local real estate broker, Suzanna Darling. Telephone Interview by Kevin Diffley with John Redente, Grants Administrator, Sidney, N.Y. (July 2014); Telephone Interview by Kevin Diffley with Suzanna Darling, Real Estate Broker, Sidney, N.Y. (July 2014).

Gulf Coast: Isle de Jean Charles, Louisiana

The Isle de Jean Charles is gradually disappearing; it is in involuntary retreat. The triple threats of subsidence, storm surges, and sea level rise threaten its few remaining homes and residents.⁸⁷ According to Albert Naquin, Chief of the Isle de Jean Charles Band of Bixoli-Chitimacha-Choctaw Confederation, the island has been reduced from five miles to a quarter mile wide during his lifetime.⁸⁸ Edison Dardar, a resident of the community, explained that in the 1960's, the land was green and full of trees. Since then, entire areas that used to be full of grass have been inundated.⁸⁹

Dardar reported that in his youth, there were around 300 houses, a church, and a grocery store, and now there are only a few houses left.⁹⁰ He explains that after Hurricane Rita, the community was told that the island would be gone in two years, so it was best to move off the island.⁹¹ At that point, a lot of people left and never returned.⁹² Chris Brune, another resident of Isle de Jean Charles, remembers when his grandfather used to tend the garden and when there used to be trees.⁹³ He knew things were serious when the trees he grew up playing in died and he associated this change with the increasingly fierce coastal storms.⁹⁴

Sea level rise and subsidence have eliminated farmland and pastures, ceased livestock operations, eliminated housing, and destroyed roads that connected the community to mainland

⁸⁷ ISLE DE JEAN CHARLES, LA., www.isledejeancharles.com (last visited Sept. 20, 2014).

⁸⁸ Rick Jervis, *Time, Nature Threaten LA. Island and Native American Tribe*, USA TODAY (Jan. 5, 2009), http://usatoday30.usatoday.com/news/nation/environment/2009-01-04-isle_N.htm.

⁸⁹ This statement was made by Edison Dardar while being filmed for the documentary "Vanishing Island" by Emmanuel Vaughan-Lee. Emmanuel Vaughan-Lee, *Vanishing Island*, N.Y. Times (June 2, 2014), <http://www.nytimes.com/video/opinion/10000002916180/vanishing-island.html> (this short documentary focuses on the residents of Isle de Jean Charles as they face the reality of their homes disappearing due to rising tides).

⁹⁰ *Id.*

⁹¹ *Id.*

⁹² *Id.*

⁹³ This statement was made by Chris Brune while being filmed for the documentary "Vanishing Island" by Emmanuel Vaughan-Lee. *Vanishing Island*, *supra* note 89.

⁹⁴ *Id.*

Louisiana.⁹⁵ The government spent over six million dollars to elevate and restore the only remaining connecting road, but still it is impassible during storm surges, trapping residents on the island.⁹⁶ There is no real estate market here any longer and questions like securing mortgages and obtaining insurance are moot.

A strategy of retreat is evident in the Isle de Jean Charles, and is in part the consequence of decisions being made by higher levels of government.⁹⁷ To reduce the costs of constructing a seventy-two mile levee system to protect nearby coastal communities, the U.S. Army Corps of Engineers and the State of Louisiana decided not to protect the Isle of Jean Charles.⁹⁸ When the U.S. Army Corps of Engineers proposed to relocate the community as part of its levee construction project, not all residents approved and the offer was dropped.⁹⁹

Southeast: Miami-Dade County, Florida

Miami-Dade County provides an example of a community in denial: a Land Use Climate Change Bubble in formation, but where increasingly dire warning signals are being ignored. “Florida is considered one of the most vulnerable areas to climate change, with Southeast Florida on the frontline to experience its impacts.”¹⁰⁰ This is due to several geographical factors: the type of porous limestone formation that underlies development there, its flat topography, and its low lying elevation.¹⁰¹ Much of the county’s population lives at less than four feet above sea level.¹⁰² The elevated property values of

⁹⁵ *The Environment*, ISLE DE JEAN CHARLES, LA., www.isledejeancharles.com/environment (last visited Sept. 20, 2014).

⁹⁶ ISLE DE JEAN CHARLES, *supra* note 87.

⁹⁷ South Carolina provides another example of intentional retreat through state policy and capital budget policy. See *supra* note 15.

⁹⁸ Dan Barry, *The Road Back: In Louisiana, a Sinking Island Wars With Water and the Government*, N.Y. TIMES (June 19, 2006), <http://www.nytimes.com/2006/06/19/us/19road.html?pagewanted=1&r=4&>.

⁹⁹ *Biloxi-Chitimacha-Choctaw Indians: Rising Tides*, TRIBES & CLIMATE CHANGE, <http://www4.nau.edu/tribalclimatechange/tribes/gulfcoast.asp> (last updated Feb. 16, 2012).

¹⁰⁰ *Climate Change*, MIAMI-DADE GREEN, <http://www.miamidade.gov/green/climate-change.asp> (last visited Sept. 20, 2014).

¹⁰¹ WORLD RES. INST., SEA-LEVEL RISE AND ITS IMPACT ON MIAMI-DADE COUNTY 3 (2014), available at http://www.wri.org/sites/default/files/sealevelrise_miami_florida_factsheet_final.pdf.

¹⁰² *Id.* “Miami-Dade alone has more people living less than 4 feet above sea level than any state in the nation except Louisiana.”

beachfront property, the fact that coastal tourism is the state's number one industry, and the extraordinary costs of rebuilding coastal infrastructure are factors that make it difficult for developers and land use planners to acknowledge the many warning signs of collapse.¹⁰³ But, this is changing.¹⁰⁴

Sea level rise is already affecting Miami-Dade County by decreasing the amount of freshwater available due to seawater intrusion. "Eighty percent of the fresh water flowing into the Everglades has been diverted, some of it into industrial-agriculture operations. Almost all of that is pumped out of the aquifer, drawing it down and allowing more and more salt water to move in. At the same time, the sea level is rising, which also helps push more salt water into the aquifer."¹⁰⁵ "Seawalls can't block seawater from infiltrating underground, and saltwater from the ocean is already contaminating freshwater aquifers."¹⁰⁶

According to a recent study by Florida Atlantic University, up to seventy percent of the drainage capacity in the land mass served by twenty-eight coastal flood and salinity control structures protecting Southeast Florida from flooding and saltwater intrusion could be lost with a sea level rise of only three to nine inches, which is anticipated to happen within the foreseeable future.¹⁰⁷ "In Miami Beach, sea level rise has made prolonged flooding a frequent event after strong storms, particularly in low-elevation neighborhoods."¹⁰⁸

Despite this evidence, "concern remains a rarity among homeowners in South Florida, where property values continue to boom in waterfront neighborhoods."¹⁰⁹ There is evidence of change, nonetheless. Prestigious commercial land planners are accounting for

¹⁰³ *Id.*

¹⁰⁴ Dan Kahan, *infra* note 216 and accompanying text.

¹⁰⁵ Jeff Goodell, *Goodbye, Miami*, ROLLINGSTONE (June 20, 2013), <http://www.rollingstone.com/politics/news/why-the-city-of-miami-is-doomed-to-drown-20130620>.

¹⁰⁶ WORLD RES. INST., *supra* note 101, at 3.

¹⁰⁷ FLA. ATL. UNIV., SOUTHEAST FLORIDA'S RESILIENT WATER RESOURCES 1 (2011), *available at* http://www.ces.fau.edu/files/projects/climate_change/SE_Florida_Resilient_Water_FAU2011.pdf.

¹⁰⁸ WORLD RES. INST., *supra* note 101, at 2.

¹⁰⁹ John Dorschner, *Rising Sea Levels, Falling Real Estate Values*, MIAMI HERALD (Nov. 9, 2013), <http://www.miamiherald.com/news/local/community/miami-dade/article1957294.html>.

sea level rise in their work with developers¹¹⁰ and mortgage and real estate industry leaders are closely watching the warning signs.¹¹¹ Real estate brokers report that many of the larger insurance carriers no longer provide flood insurance for properties in vulnerable areas and that this will soon affect homebuyers' decisions.¹¹² Where coverage is provided, premiums are much higher for homes at lower elevations.

An interview with an experienced broker in the area explained the situation artfully:

Flooding has always happened in Miami because of the hurricanes, so in many people's minds, this will continue to occur and some years will be worse than others. I do not think people have taken the rising sea levels into consideration, as it will surely have a negative impact on the real estate market if it were to be publicly proclaimed. With that, the signs are being ignored in order to maintain the allure of Miami and its real estate market. No one talks about it and that will not change, because then the economics and allure of Miami Beach would change.¹¹³

West: Spicewood Beach, Texas

¹¹⁰ *Id.* ("Jason King, with the Dover, Kohl urban planning group in Coral Gables, says the firm's planners are now factoring in changing sea level in work with developers." King also says, mortgage lenders and many others in real estate "are following the discussions very closely," however nothing has changed in their practices yet.)

¹¹¹ *Id.*

¹¹² Telephone Interview by Kevin Diffley with Daisy Nunez, Agent, Liberty Mutual (July 2014); Sean B. Hecht, *Climate Change and the Transformation of Risk: Insurance Matters*, 55 UCLA L. REV. 1559 (2008) ("According to a recent report cosponsored by a major insurer and an international environmental protection advocacy group, 'some insurers are withdrawing from high-risk coastal locations in Florida, or the state as a whole, in part because regulators are preventing them from raising rates to reflect the increasing risk, thus hampering the market's ability to send price signals to consumers that would begin to educate the public on the perils of building along exposed coastlines or fire-prone areas.'").

¹¹³ Telephone Interview by Kevin Diffley with Fred Afif, Real Estate Broker, Keller Williams (July 2014) ("Many agents and brokers are deceitful about the reality of rising tides in order to make a property sale, this is the reality of the market today, and Miami housing prices are still increasing.").

Spicewood Beach became the first community in Texas to run out of potable water in January of 2012.¹¹⁴ Imagine a potential purchaser of a lakefront home watching a truck deliver water and realizing that the faucets inside do not work. In that moment, a Land Use Climate Bubble pops. At fault is the continuing drought in the Austin area where Spicewood Beach is located.

The most coveted properties in the community were those located directly on Lake Travis, which was a major draw for tourism and supported the local economy. The lack of public water was compounded by significant lowering of the water level in the Lake, due to the drought and the release of water from the lake to aid rice farmers downstream. The local water utility determined that the most cost-effective and reliable solution to the lack of public water was, ironically, to construct a new surface water treatment plant taking its supply from Lake Travis.¹¹⁵

Between having to truck in potable water for residents and experiencing a drop of tourism because of the shrinking lake levels, property values in the Spicewood Beach have plummeted. The lakefront properties were hardest hit because people would not pay the listing prices for homes on a lake with a low water level.¹¹⁶ A full Lake Travis generates revenue from property, sales, hotel, and mixed beverage taxes that buy ambulances, maintain schools and provide state government with needed funding. When lake levels remain below 660 feet, visitations decline and businesses contract.¹¹⁷

¹¹⁴ Terrence Henry & Shawna Reding, *Spicewood Beach: The First Texas Community to Run Dry During the Drought*, STATE IMPACT, <http://stateimpact.npr.org/texas/tag/spicewood-beach/> (last visited Sept. 20, 2014). See also, Jennifer Medina, *With Dry Taps and Toilets, California Drought Turns Desperate*, N.Y. TIMES, Oct. 2, 2014, http://www.nytimes.com/2014/10/03/us/california-drought-tulare-county.html?_r=0, (referring to and then quoting a resident of another drought-stricken town, Porterfield, California: “But she has not had running water for more than five months — nor is there any tap water in her near future — because of a punishing and relentless drought in California. In the Gallegos household and more than 500 others in Tulare County, residents cannot flush a toilet, fill a drinking glass, wash dishes or clothes, or even rinse their hands without reaching for a bottle or bucket.... “We don’t have the money to move, and who would buy this house without water?”).

¹¹⁵ Press Release, Corix, New Spicewood Beach Water Treatment Plant Begins Operation (June 26, 2014) <http://www.corix.com/about-corix/news/news-details/2014/06/26/new-spicewood-beach-water-treatment-plant-begins-operation>.

¹¹⁶ *Id.*

¹¹⁷ ROBERT CHARLES LESSER & CO., LAKE TRAVIS ECONOMIC IMPACT REPORT (2011). The total assessed value of all land surrounding Lake Travis was \$8.4 billion. Lakefront and lake-cove generate higher property taxes than their non-lakefront counterparts. Lower lake levels lead to

Michael Boswell, realtor and buyer specialist at HEYL Group at Keller Williams Office, reported on the Land Use Climate Change Bubble warning signals in Spicewood Beach.

I would say over the past few months that the property values have remained stagnant. Buyers in Spicewood have been few and far between. There are many lakefront properties that just won't sell no matter how low a seller drops the price. This has caused fear in the area, not only because of lack of water, but also because people are essentially stuck in their homes. No one wants to move into the area because of the drought, so anyone who wants to get out can't because their homes will not sell. It is a sticky position for the people to be in around the area, and we are all hoping things will change very soon and the drought worries come to an end.¹¹⁸

Boswell predicts that the problem will be somewhat alleviated when the new water system eliminates the need to truck in water, at least for the businesses of the town.¹¹⁹ He fears that if water is not provided to the communities experiencing severe drought, the businesses will start to lose money, impacting the economy and making a full recovery that much more difficult.¹²⁰ Boswell states, “[n]o one wants to move into a home on a dried up lake, in an area where there is a water-shortage.”¹²¹

Northwest: Oso, Washington

A neighborhood was destroyed in Oso, Washington by a record-breaking mudslide on March 22, 2014, with disastrous

350,000 – 375,000 fewer park visits, twenty-nine lost jobs for each ten percent drop in park visits, and \$23.6 million to \$33.8 million reductions in visitor spending. When levels are low, governments could lose up to \$21.9 million in total fiscal revenues, including \$1.7 million in sales tax revenue, \$45,000 from decreased hotel receipts, and \$120,000 from fewer visitors ordering mixed drinks.

¹¹⁸ Telephone Interview by Kevin Duffley with Michael Boswell, Realtor/Buyer Specialist, Heyl Group at Keller Williams, Spicewood Beach, Tex. (July 2014).

¹¹⁹ *Id.*

¹²⁰ *Id.*

¹²¹ *Id.*

consequences.¹²² The mudslide occurred along the edge of an approximately 600 foot high plateau located above the Town of Oso. According to the U.S. Geological Survey, the area was prone to mudslides but this one was “much larger, traveled much farther and had greater destructive force than previously experienced.”¹²³ The slide’s volume was estimated to be around 10 million cubic yards and it traveled about 0.7 miles.¹²⁴ The collapsed land blocked roadways and buried homes, killing 43 people.¹²⁵ It took over six months to reopen the town’s main roadway, Highway 530, to two way traffic after it was damaged and blocked by the debris.¹²⁶ The highway is now raised 20 feet in some places, and six culverts have been installed to aid in diverting water.¹²⁷

Unlike the residents of Sidney, stakeholders in Oso had ignored numerous warning signals of this impending disaster. There were records of damaging mudslides dating back to the 1940s.¹²⁸ The State of Washington had begun to intervene by reporting on slide activity after a slide in 1949 and another in 1951.¹²⁹ Experts had suggested permanently diverting the river running through Oso or building berms to reinforce the slide area. It was known that any fix would be temporary, the slide area was expected to expand over time.¹³⁰ In 1999, a report filed with the U.S. Army Corps of Engineers forecast the likelihood of a mudslide of equal magnitude to the one that eventually occurred in March 2014.¹³¹

¹²² Kirk Johnson, *Leveled by Landslide, Towns Mull How to Rebuild*, N.Y. TIMES (Apr. 19, 2014), <http://www.nytimes.com/2014/04/20/us/leveled-by-landslide-towns-mull-how-to-rebuild.html>.

¹²³ *Landslide in Washington State*, USGS, http://www.usgs.gov/blogs/features/usgs_top_story/landslide-in-washington-state/ (last updated Oct. 1, 2014).

¹²⁴ *Id.* (“This travel distance is about three times longer than expected based on published information regarding previous slides of this height and volume worldwide.”).

¹²⁵ *Mudslide-Ravaged Highway in Oso Reopens After Six Months*, NBC NEWS, (Sept. 23, 2014), <http://www.nbcnews.com/storyline/deadly-mudslide/mudslide-ravaged-highway-oso-reopens-after-six-months-n209661>.

¹²⁶ *Id.*

¹²⁷ *Id.*

¹²⁸ Ken Armstrong et al., *Risk of Slide ‘Unforeseen’? Warnings go Back Decades*, THE SEATTLE TIMES (Mar. 25, 2014), http://seattletimes.com/html/localnews/2023218573_mudslidewarningsxml.html.

¹²⁹ *Id.*

¹³⁰ *Id.*

¹³¹ *Id.*; see also Lane Kendig, *Avoidance, Not Mitigation*, PLANNING, May 2014, at 48 (“The landslide area in Snohomish County has a floodplain a history of landslides... The appropriate strategy is avoidance. In Snohomish County, avoidance means keeping from building on the bottom or top of an unstable slope, where they are most at risk. Good planning practice dictates zoning that prohibits development in high-risk areas. This was not done in Snohomish County.”).

The State Department of Natural Resources (DNR) had approved permits for private landowners to begin logging above the slope that collapsed in Oso.¹³² In 1988, the DNR had to issue a stop-work order after realizing the seriousness of logging on the hill.¹³³ Following this, the Growth Management Act of 1990 required municipalities to adopt regulations to protect people in landslide prone areas.¹³⁴ But, contrary to these warnings and this policy, permits for logging and home developments were granted.¹³⁵

One result of the March 2014 landslide in Oso is the increase use, at a greatly increased cost, of Difference in Conditions insurance (DIC).¹³⁶

The increase in DIC insurance is because there is still fear in the area and also because people are more educated now. They realize (landslide damage) is not covered by homeowner's insurance. This separate, relatively expensive DIC policy covers landslide, quakes, and earth movement and people are realizing that it may be a good idea to purchase if they live on or around a mountainous region.¹³⁷

Increased insurance costs such as this consume a greater portion of homebuyers' income, leaving less for mortgage payments, which has the inevitable effect of lowering home values. In fact, property sales and values have decreased since the mudslide. According to an active local broker,

¹³² Mike Baker et al., *State Allowed Logging on Plateau Above Slope*, THE SEATTLE TIMES (Mar. 25, 2014), http://seattletimes.com/html/localnews/2023225363_mudslideloggingxml.html.

¹³³ *Id.*

¹³⁴ *Editorial: In Oso Mudslide, Signs that Warnings May Have Been Missed*, THE SEATTLE TIMES (Mar. 31, 2014), http://seattletimes.com/html/editorials/2023252200_editosomudslide31xml.html.

¹³⁵ Baker, *supra* note 132.

¹³⁶ Based on an interview with Kristen Granroth, owner of Granroth Insurance Agency, President of Chamber of Commerce for Arlington, and resident of Smokey Point in the vicinity of Oso. Telephone Interview by Kevin Diffly with Kristen Granrothm Owner, Granroth Insurance Agency (July 2014). DIC insurance supplements basic insurance policies, filling gaps to cover unusual risks such as water damage, flood, collapse, earthquake, landslide, etc., according to the insured's needs.

¹³⁷ *Id.*

I have a majority of my listings in Everett and also Snohomish County, where Oso is located, and as a reaction to the mudslide some people have moved out of the area. With that, I have seen a general decline in home prices around Snohomish because the demand has been low. This is probably from fear that another landslide could reoccur.¹³⁸

Another broker reports,

There is still a fearful sentiment in the area. It is in a region that is full of hills and mountains and many of the locals wonder if this could happen again with the collapse of another hill. I expect many more homeowners to purchase insurance that covers landslides and since this may become mandatory in the eyes of residents, that could also drive home prices down. Who wants to purchase a home, get homeowners insurance, and then have to search for a specialized, and likely expensive, insurance policy that covers landslides or mudslides?¹³⁹

Great Plains: Elkhart, Kansas

Prolonged drought and continued declines of the water table in the Ogallala Aquifer are threatening the economy of the town of Elkhart, Kansas. The community of 2,200 people is the economic engine and county seat of Morton County; it is dependent on large-scale corn and wheat farms, which have declined in production as the drought has worsened.

If we don't make changes -- and large changes and make them soon, we might not have anything left to talk about other than what part of the country we are moving to. In the last 10 years, some of our groundwater wells have declined 60 to 70 feet. It's serious. It's horrible. I used to measure the future of the Ogallala Aquifer in terms of

¹³⁸ Telephone Interview by Kevin Diffly with Tanya Mock, Managing Broker, Windermere Real Estate (July 2014).

¹³⁹ Telephone Interview by Kevin Diffly with Roxanne Sappingfield, Real Estate Broker, New Horizon Realty (July 2014).

decades and now it is literally coming year by year. The multi-year drought hasn't helped since it has caused irrigators to be even more reliant on the underground resource.¹⁴⁰

A local real estate broker expressed his concern about the impacts of the drought:

I am concerned with the next 10, 15, and 20 years if this drought continues what the reaction among residents will be. I would imagine that if this does continue that there will be many ghost towns around the area. If farmers have no water to farm they will not be able to live here and with that, most of the towns around here will likely be deserted.¹⁴¹

One Kansas farmer, Kenny Mitchell, a resident of Morton County said, “[i]t’s drier than I have ever seen it, and I’ve been here some 70 years.”¹⁴² On June 30, 2014, Kansas Risk Management Agency reported wheat indemnities were at nearly \$30 million on 243,004 acres.¹⁴³ This news arrived simultaneously with government officials projecting that this year’s wheat crop would be the worst since the crop harvested during the 1989 drought.¹⁴⁴ Most areas in Southwest Kansas have received below-normal rainfall levels.¹⁴⁵ Not surprisingly, given the implication of these statistics, in its mid-June report, the U.S Department of Agriculture ranked the Kansas wheat crop as sixty-three percent poor or very poor and only eleven percent

¹⁴⁰ Amy Bickel, *Water Series: Politics of Water*, KAN. AGLAND (July 20, 2014), http://www.kansasagland.com/news/local_state_news/water-series-politics-of-water/article_1f75c9b9-320f-52d9-bc8d-6410c3bbac6f.html.

¹⁴¹ Telephone Interview by Kevin Diffley with Jerry Stutzman, Principal Broker, United Country-Stutzman Realty (July 2014).

¹⁴² The Associated Press, *SW Kansas Residents Say Spring Worst in Memory*, THE TOPEKA CAP.-J. (July 5, 2014), <http://cjonline.com/news/2014-07-05/sw-kansas-residents-say-spring-worst-memory>.

¹⁴³ *Id.*

¹⁴⁴ *Id.*

¹⁴⁵ See Amy Bickel, *Hard-hit Morton Co. Embodies Drought’s Toll on Region*, KAN. AGLAND (July 2, 2014), http://www.kansasagland.com/news/stateagnews/hard-hit-morton-co-embodies-drought-s-toll-on-region/article_2bd4938c-11f4-5a5f-8076-3f93fa88ac6d.html. Southwestern quarter of Kansas is still far behind after such a lengthy dry spell. Through late June, Haskell County had only received just thirty-eight percent of normal rainfall for the year. Ness City was at fifty-four percent of normal.

as good or excellent.¹⁴⁶ Experts predict that the underground reservoir, upon which much of Western Kansas depends, will be seventy percent depleted within the next half century, if no action is taken.¹⁴⁷

Things could get worse in Elkhart and similar communities in Southern Kansas. The corn-belt is moving north. Areas in the far Northern Great Plains, once deemed inhospitable to the crop, are now growing corn at record rates.¹⁴⁸ The Department of Agriculture has forecasted that 4.1 million acres of North Dakota will soon be sown with corn, an all-time high.¹⁴⁹ Corn crops that used to only thrive farther south, now grow all the way to Manitoba.¹⁵⁰ Climate scientists point to climate change, constantly increasing heat in the summer and drought, as the cause of this northern migration of the corn-belt, some predicting that eventually corn may not grow in Kansas.¹⁵¹

Long-term, corn-belt towns dependent on agriculture will experience a precipitous decline of business and property values.¹⁵² In the short-term, record high temperatures in Kansas lower crop production where water is scarce, increase the cost of crop insurance, and lower the sales price of farmland: all indicators of a Land Use Climate Bubble.

V. Climate Risks and Caveat Emptor

Due Diligence and the Lawyers Role¹⁵³

This article focuses on real estate transactions and values in vulnerable places where the consequences of climate change are visible on the land. The common law concept guiding real estate

¹⁴⁶ *Id.*

¹⁴⁷ Roxana Hegeman, *Kansas Water Office's 50-year Plan Says Ogallala Aquifer Will Be 70% Depleted*, THE TOPEKA CAP.-J. (July 1, 2014), <http://cjonline.com/news/2014-07-01/kansas-water-offices-50-year-plan-says-ogallala-aquifer-will-be-70-percent-depleted>.

¹⁴⁸ Owen Fletcher, *U.S. Corn Belt Expands to North*, THE WALL STREET J. (June 13, 2013), <http://online.wsj.com/news/articles/SB10001424127887324904004578539352566317388>.

¹⁴⁹ *Id.*

¹⁵⁰ *Id.*

¹⁵¹ *Id.*

¹⁵² *Id.*

¹⁵³ See GREGORY M. STEIN ET AL., A PRACTICAL GUIDE TO COMMERCIAL REAL ESTATE TRANSACTIONS: FROM CONTRACT TO CLOSING (Am. Bar Ass'n ed., 2nd ed. 2008) (discussing in detail general information regarding due diligence and the lawyer's role).

transactions is *caveat emptor*: “let the buyer beware.”¹⁵⁴ Upon purchase, the buyer accepts the risk of all defects in the property not expressly assumed by the seller.¹⁵⁵ From this flows the notion that purchasers of real property must conduct “due diligence” analyses of properties before they buy.¹⁵⁶ Should they fail to do so, or to protect themselves from property defects or other conditions in the contract and deed, they have no subsequent claim against the seller for conditions they should have discovered prior to purchase.¹⁵⁷

Lawyers who represent purchasers have a duty to advise their clients regarding the risk of their prospective investments.¹⁵⁸ An attorney representing a purchaser must know the client’s plans for the use of the property, determine whether those plans can be fulfilled, and be sure that the client diligently investigates and resolves all material matters relevant to those plans.¹⁵⁹ In addition to advising the client regarding the regulations restricting the property’s use, permits that will be needed, and the physical conditions of the property, the lawyer must be sure that the purchaser has taken into consideration a trilogy of private sector matters, including the appraisal, mortgage financing, and insurance.¹⁶⁰

In the context of vulnerable places, where the consequences of climate change are evident, this due diligence investigation will disclose new risks, not typically encountered. An investigation of current movements in the secondary mortgage market, insurance industry, and appraisal profession make this clear.

Mortgage Financing

The Federal National Mortgage Association (Fannie Mae) and the Federal Home Loan Mortgage Corporation (Freddie Mac) are congressionally authorized government-sponsored enterprises

¹⁵⁴ *Id.*

¹⁵⁵ *Id.*

¹⁵⁶ *Id.* at 134.

¹⁵⁷ *Id.*

¹⁵⁸ *Id.*

¹⁵⁹ STEIN, *supra* note 153, at 160-62.

¹⁶⁰ See *Coves of the Highland Cmty. Dev. Dist. v. McGlinchey Stafford, P.L.L.C.*, 526 F. App’x 381, 384-85 (5th Cir. 2013). Sobering dictum in this case suggests that had legal counsel been hired by the buyer before the purchase of the land, the failure to obtain appropriate environmental reviews might have violated the lawyer’s duty to properly advise her client.

(GSEs).¹⁶¹ They are privately owned, but receive support from the federal government and are regulated by the U.S. Department of Housing and Urban Development.¹⁶² They were created to provide a stable source of funding for residential mortgages, including loans on housing for low and moderate-income families.¹⁶³ This is accomplished by their operations in the secondary mortgage market,¹⁶⁴ where they purchase home mortgages from the lenders that originate them.¹⁶⁵ They then pool these loans into mortgage-backed securities, guarantee these loans against losses from defaults on the underlying mortgages, and sell the securities to investors.¹⁶⁶ The mortgages that the GSEs purchase account for roughly eighty percent of the conventional home loan market.¹⁶⁷

The GSEs only buy “conforming mortgages,” defined as all home mortgages that meet their underwriting requirements.¹⁶⁸ In general, the income, down payment, loan amounts, and the credit of borrowers of these conforming loans must comply with pre-determined standards.¹⁶⁹ For example, loans must meet current conforming loan limits, borrowers must meet minimum credit score requirements, and borrowers must meet debt and income guidelines.¹⁷⁰

Many of the mortgages needed by purchasers of homes in vulnerable places will be sold by the originating institutions to these secondary market institutions. Where price declines in vulnerable areas occur, this will affect the amount of the mortgage that the secondary market will purchase. The secondary market guidelines require that loans not exceed a certain loan to value ratio. Fannie Mae, for example, requires that the mortgage amount not exceed

¹⁶¹ CONG. OF THE U. S. CONG. BUDGET OFFICE, FANNIE MAE, FREDDIE MAC, AND THE FEDERAL ROLE IN THE SECONDARY MORTGAGE MARKET VIII (2010), *available at* <http://www.cbo.gov/sites/default/files/cbofiles/ftpdocs/120xx/doc12032/12-23-fanniefreddie.pdf>.

¹⁶² *Id.*

¹⁶³ *Id.*

¹⁶⁴ *Id.*

¹⁶⁵ *Id.*

¹⁶⁶ *Id.*

¹⁶⁷ *What do Fannie Mae and Freddie Mac do?*, THE MORTGAGE PROFESSOR (Mar. 10, 2003), http://www.mtgprofessor.com/a%20%20secondary%20markets/what_do_fannie_and_freddie_do.htm.

¹⁶⁸ *Conventional*, WALLICK & VOLK, <http://wvmb.com/conventional/> (last visited Sept. 25, 2014).

¹⁶⁹ *Id.*

¹⁷⁰ *Id.*

ninety percent of the appraised value of the property to be purchased for an adjustable rate mortgage.¹⁷¹ Thus, as climate change consequences cause property values to decline, this will be reflected in the required property appraisal,¹⁷² and the amount of financing available will decline, rendering some mortgagors' applications for loans ineligible.

In addition, the mortgage industry is becoming more focused on climate change influences on mortgage values in part due to recent Security Exchange Commission (SEC) standards that apply to publicly traded financial houses that underwrite mortgage offerings in the secondary market.

On January 27, 2010, the SEC voted to publish Commission Guidance Regarding Disclosure Related to Climate Change (the Guidance), which clarifies how publicly traded corporations should apply existing SEC disclosure rules to certain mandatory financial filings with the SEC regarding the risk that climate change developments may have on their businesses. . . . Specifically, the Guidance states what companies could be required to disclose in relation to climate change under corporate disclosure requirements.¹⁷³

Pending standards contained in the Sustainability Accounting Standards Board's Draft Underwriting Requirements make these new responsibilities clear.¹⁷⁴ According to these standards,

¹⁷¹ Kristie Lorette McCauley, *Fannie Mae Underwriting Guidelines*, LOVE TO KNOW MORTGAGE, http://mortgage.lovetoknow.com/Fannie_Mae_Underwriting_Guidelines (last visited Sept. 25, 2014).

¹⁷² See *infra* notes 179-85 and accompanying text.

¹⁷³ GARY SHORTER, SEC CLIMATE CHANGE DISCLOSURE GUIDANCE: AN OVERVIEW AND CONGRESSIONAL CONCERNS, CONGRESSIONAL RESEARCH SERVICE 1 (Aug. 2013).

¹⁷⁴ SUSTAINABILITY ACCOUNTING STANDARDS BD., MORTGAGE FINANCE 1 (2013). "This Standard is an exposure draft presented for public review and comment. This version is not intended for implementation . . . The Sustainability Accounting Standards Board (SASB) provides sustainability accounting standards for use by publicly-listed corporations in the U.S. in disclosing material sustainability issues for the benefit of investors and the public. SASB standards are designed for disclosure in mandatory filings to the Securities and Exchange Commission (SEC), such as the Form 10-K and 20-F. SASB is an independent 501(c)3 non-profit organization and is accredited to set standards by the American National Standards Institute (ANSI). SASB is developing standards for more than 80 industries in 10 sectors. SASB's standards-setting process includes evidence-based analysis with in-depth industry research and engagement with a broad range of stakeholders. The end result of this process is the creation of a complete,

An increase in the frequency of extreme weather events associated with climate change may have an adverse impact on the mortgage finance industry. Specifically, hurricanes, floods, and other climate change related events have the potential to lead to missed payments and loan defaults, while also decreasing the value of underlying assets. Disclosure of overall exposure, loan forgiveness programs, and the incorporation of climate change into lending analysis will allow shareholders to determine which mortgage finance firms are best positioned to protect value in light of environmental risks.¹⁷⁵

The standards require registrants to describe how they have accounted for climate change and other environmental risks in their mortgage origination underwriting processes, specifically where risks include hurricanes, storms, floods, heat waves, cold waves, droughts, and wildfires.¹⁷⁶ These standards also require registrants to disclose how the impacts of these risks are accounted for including an “accounting for inherent risks due to location or assessing for the implementation of basic adaptive measures (e.g., reinforcement, hurricane shutters, etc.).”¹⁷⁷ Included in this analysis should be a further assessment of “[h]ow natural disaster risks affect the credit risk analysis, including if the registrant assumes that increases in natural disaster frequency and severity will increase the likelihood of default due to properties being un- or under-insured.”¹⁷⁸

Property Appraisal Standards

In order to secure a mortgage to finance the purchase or refinancing of a vulnerable property, the borrower will be required to obtain an appraisal. Appraisal standards focus on local circumstances, property values, and building costs. As Land Use Climate Change Bubbles cause property values to decline, all of the

industry-specific accounting standard, which accurately reflects the material issues for each industry.”

¹⁷⁵ *Id.* at 4.

¹⁷⁶ *Id.*

¹⁷⁷ *Id.*

¹⁷⁸ *Id.*

several appraisal techniques used by appraisers will pick up these influences and reflect them, adjusting appraisals downward in proportion to the observed effects. Chronic flooding, drought, wildfires, groundwater pollution, etc. are all locally observable effects of global climate change and will show up in matters as prosaic as appraising property values prior to purchase. These standards, in turn, will be picked up by the mortgage industry.¹⁷⁹

In most parts of the country, appraisers will use a combination of three approaches to determine value: sales comparisons, costs analysis, and income capitalization.¹⁸⁰ In the sales comparison approach, the appraisal is set by the sales prices of recently sold comparable properties adjusted to reflect differences between the comparable properties and the property being appraised.¹⁸¹ In the cost approach, the appraisal is based on the raw land value plus the net cost of property improvements less depreciation on improvements.¹⁸² Where climate change factors are evident, they can have the effect of lowering land values, increasing requirements on site expenses, such as required elevation of buildings in flood prone areas, and accelerated depreciation of structures, and infrastructure that is prematurely obsolete because of climate risks.¹⁸³ In the income capitalization approach, the appraisal is based on the net operating income generated by the property.¹⁸⁴ Operating expenses are deducted from gross income to calculate net operating income, which is then used to determine the property value.¹⁸⁵ Climate change factors can greatly reduce gross income and increase operating expenses, resulting in lower valuations.

¹⁷⁹ There is a potential connection here to high risk areas and mortgages, because ensuring that the property supports the mortgage transaction should take into consideration properties located in a declining market as well as the overvaluation of properties (the article states that the appraiser should consider the property's location and neighborhood characteristics when determining value, this could include the fact that the property is now located in flood prone area, with a lack of potable water, and high risk of natural disasters (hurricanes)). FREDDIE MAC, REVIEWING APPRAISALS IN TODAY'S MORTGAGE MARKET (2011), *available at* http://www.freddiemac.com/singlefamily/uw/docs/PLNAQ_series_Reviewing_Appraisals_in_Todays_Mtg_Mkt_Fact_Sheet_838.pdf.

¹⁸⁰ WILLIAM L. VENTOLO, JR. & MARTHA R. WILLIAMS, FUNDAMENTALS OF REAL ESTATE APPRAISAL 144 (Dennis S. Tosh & William B. Rayburn eds., 10th ed. 2008).

¹⁸¹ *Id.* at 314.

¹⁸² *Id.* at 82.

¹⁸³ *Id.* at 246-47.

¹⁸⁴ *Id.* at 345.

¹⁸⁵ *Id.* at 345.

Insurance

The availability of financing for building and rebuilding in climate-vulnerable locations is directly affected by evolving standards in the insurance industry where the consequences of climate change are restricting insurance coverage and increasing premiums. All of the risks arising in the various Land Use Climate Change Bubble locations are accounted for in the insurance industry, which changes insurance availability, coverage, and premiums according to evolving actuarial calculations. These include the risks associated with warmer temperatures, heat waves, electric grid failures and power interruptions, more moisture, mold, flooding, storm surges, inundation, failure of supportive infrastructure and building foundations, sustained drought, crop failures, brush, prairie, and forest fires, and groundwater pollution.

In some locations, private market casualty insurance is simply no longer available because of the risks associated with climate change, and in others, increased premiums exceed the ability of property purchasers to pay.¹⁸⁶ The difficulty of obtaining casualty insurance, particularly the disappearance of major companies from the market, affects real property sales and prices since mortgage

¹⁸⁶ See Coplin, *supra* note 71 (“In Florida, Allstate dropped 320,000 policies between 2004 and 2007, and is no longer writing any new policies in that state. Allstate also no longer covers as many as 40,000 coastal homeowners in New York.”); see also William E. Gibson, *Flood-Insurance Rate Increase Hits Hard in Florida*, SUN SENTINEL (Sept. 28, 2013), http://articles.sun-sentinel.com/2013-09-28/news/fl-flood-insurance-rate-hike-20130924_1_flood-prone-florida-flood-insurance-florida-flood (“Indeed, flood insurance premiums rose recently in certain parts of Florida and many Florida homeowners will see an increase of several thousand dollars a year to insure their homes. Insurers are charging seven times as much for flood insurance as they once were for new homes in flood-sensitive areas.”); see also Hecht, *supra* note 112, at 1559 (“Climate change poses an unprecedented challenge to the insurance industry, because factors such as increasing uncertainty and the potential for highly correlated losses will make it difficult to insure against climate change-related risks and will strain capital markets’ ability to compensate those who are affected.”); see also Evan Mills, *Themes: Availability & Affordability*, INS. IN A CLIMATE OF CHANGE, THE GREENING OF INS. IN A WARMING WORLD, <http://insurance.lbl.gov/availability-affordability.html> (last visited Sept. 28, 2014) (“Allstate, for instance, has said that climate change has prompted it to cancel or not renew policies in many Gulf Coast states, with recent hurricanes wiping out all of the profits it had garnered in 75 years of selling homeowners insurance. The company has cut the number of homeowners’ policies in Florida from 1.2 million to 400,000 with an ultimate target of no more than 100,000. The company has curtailed activity in nearly a dozen other states. In 2008, State Farm—Florida’s largest private insurer—stopped writing new policies in the state. This was after suspending sales of new commercial and homeowners policies in Mississippi the year before.”)

companies require adequate insurance as a prerequisite to securing a loan.¹⁸⁷ Additionally, higher insurance rates add to monthly housing costs and reduce the amount of funds homebuyers can dedicate to paying the principal and interest on needed mortgages. The effect of adverse movement in the insurance industry as it adjusts to climate change is to lower the demand for homes and slow the pace of sales as prospective buyers hunt for appropriate insurance products and pay higher rates associated with greater risks.¹⁸⁸

With respect to some of these risks, insurance companies dropped coverage years ago. Since 1968 there has been a standard homeowners' insurance exclusion for losses from "flood, surface water, waves, tidal waves, overflow of a body of water, [and] spray from these, whether or not driven by wind."¹⁸⁹ Replacing this coverage since then, the federal government provided flood insurance through the National Flood Insurance Program (NFIP), "a role it undertook partly as a way to reduce the federal government's growing outlays for disaster assistance."¹⁹⁰ This leaves the private homeowners' policy to cover losses due to wind damage, which has led to doubt and litigation regarding whether homeowner damage was caused by water, rather than wind, where both flooding and high winds occur.¹⁹¹

Private wind insurance coverage has become problematic, as climate-caused damage has accelerated. "[P]rivate insurers have increasingly been abandoning coverage for wind losses just as they abandoned the market for flood insurance during the 1960s."¹⁹² In effect, remaining private wind insurance is hollowed out, covering fewer and fewer geographical areas, providing less total coverage, and requiring higher deductibles.¹⁹³ States have responded by creating wind insurance risk pools, forcing companies licensed in the

¹⁸⁷ See *supra* notes 161-78 and accompanying text.

¹⁸⁸ MORTG. BANKERS ASS'N, WHITE PAPER, NATURAL DISASTER CATASTROPHIC INSURANCE: THE COMMERCIAL REAL ESTATE FINANCE PERSPECTIVE 45 (2006).

¹⁸⁹ Donald T. Hornstein, *Insurance at the Energy-Water Nexus*, 48 U. RICH. L. REV. 1033, 1042 (2014).

¹⁹⁰ *Id.*

¹⁹¹ *Id.*

¹⁹² *Id.* at 1043 ("Generally, they do this because state insurance regulators do not approve sufficient 'rate' to make full coverage of wind losses profitable.").

¹⁹³ *Id.*

state to participate.¹⁹⁴ To the extent that these restrict rates to below calculated risks, they tend to drive insurers away.¹⁹⁵

Perturbations in the insurance industry regarding catastrophic event coverage extends to flood insurance as well, despite the federal government's intervention over four decades ago; the NFIP has caused the Federal Treasury to borrow over \$30 billion in just the past eight years.¹⁹⁶ "Since 1989, Congress has been forced to appropriate over \$410 billion to cover catastrophe-related emergencies."¹⁹⁷ "Aggregating what it terms 'climate disruption costs,' the Natural Resources Defense Council recently concluded that United States taxpayers outspend private insurers three-to-one to cover such costs."¹⁹⁸

In response to these costs and deficits, Congress enacted the Biggert-Waters Flood Insurance Reform Act of 2012, which reduced these taxpayer-supported subsidies for flood insurance by phasing out subsidies by requiring that the owners of newly purchased properties pay premiums reflecting the actual risks associated with owning properties in high-risk flood plains.¹⁹⁹ "Rates for primary residences that had been based on risks of flooding from maps prepared by . . . FEMA, and that had previously been 'grandfathered' even when FEMA's newer maps revealed increased flooding risks, were to increase by 20% annually until their rates reflected the actuarial risk."²⁰⁰

In the wake of Sandy, the financial and political realities of the Biggert-Waters rate increases began to cause the public and politicians to rethink the reduction of subsidies.²⁰¹ "In mid-December 2012, FEMA released new flood maps that caused highly publicized political reactions from devastated Superstorm Sandy victims looking to rebuild their homes. Some homeowners faced the prospect of a ten-fold increase in premiums in order to secure NFIP coverage for

¹⁹⁴ *Id.*

¹⁹⁵ Hecht, *supra* note 112.

¹⁹⁶ Hornstein, *supra* note 189, at 1044.

¹⁹⁷ *Id.* at 1044.

¹⁹⁸ *Id.*

¹⁹⁹ *Id.*

²⁰⁰ *Id.* at 1045.

²⁰¹ *Id.*

flood damage.”²⁰² The political reaction to Biggert-Waters resulted in the partial repeal of the 2012 legislation and the resumption of federal subsidies for insurance in high-risk coastal areas.²⁰³

Notwithstanding this temporary adjustment to political realities triggered by Sandy, the stage seems set for the gradual withdrawal of the government from subsidized insurance. Not repealed, for example, was a provision that requires future FEMA maps to include climate-impact data into their calculations.²⁰⁴ The combination of NFIP deficits, the unpopularity of government support for repeated rebuilding, and the failure of subsidies and disaster payments to support the full cost of rebuilding, will likely send signals to coastal developers that it is not economically feasible to build where Land Use Climate Change Bubbles are forming.

With respect to other vulnerable areas, where wind and flood damage are not the issue but other climate-related risks are, insurance companies will surely rewrite and restrict coverage and adjust prices as real estate prices fall. These adjustments in the insurance and mortgage market will be noted and accounted for through the due diligence process and affect the pace and price of real estate accordingly.

VI. Transforming the National Climate Change Dialogue Through Local Land Use Law Reform

Zoning and land use regulations in most communities were designed to deal with different economic, demographic, and environmental issues than communities face today.²⁰⁵ As conditions change, new uses need to be promoted and uneconomical ones phased out. Amending the comprehensive plan, with which zoning must be consistent with in most states, is an excellent method of bringing the community to consensus about land use, economic development, and human settlement issues that are needed. This, in

²⁰² Hornstein, *supra* note 189, at 1046.

²⁰³ President Barack Obama signed the Homeowner Flood Insurance Affordability Act into law on March 21, 2014. Homeowner Flood Insurance Affordability Act of 2014, Pub. L. No. 113-89, 128 Stat. 1020 (2014).

²⁰⁴ 42 U.S.C. § 4101(a)-(b) (2014).

²⁰⁵ John R. Nolon, Plenary Address at the University of Kansas Journal of Law and Policy Symposium: Land Use and Sustainability: Is there Hope for Rural America? (Feb. 21, 2014).

turn, builds a constituency for effective action and the plan guides development regulations, which direct the resources and investment of the private sector.

Nowhere is this more evident than in what happened in Greensburg, Kansas, a few years ago.²⁰⁶ Within one year of being ninety percent destroyed by a devastating tornado in 2007, the citizens of Greensburg had amended their comprehensive plan. They felt that working as a community on a plan, while they restored their homes and businesses, was a good way to figure out what to do. In May of 2008, they adopted a comprehensive plan that contained this language:

Out of crisis emerges opportunity, and as a community, Greensburg citizens believe they have the chance to build a stronger, thriving town. On May 4th, 2007, an EF-5 tornado hit Greensburg, a town of 1,389 in Southwestern Kansas. Over the last four decades this small rural farm town has been declining in population with a struggling economic base. In the wake of the disaster it became apparent that big changes would have to occur to sustain the town for future generations. The community set forth to rebuild a prosperous future through sustainable community design. The immense challenges facing Greensburg's reconstruction and the desire to embrace common sense green solutions make it an ideal candidate to become a model sustainable rural community. Greensburg has the opportunity to repair the destruction with a balanced approach based on Kansas values and a promising new way of life. Greensburg can become a community with strong leaders who reach out to neighbors.²⁰⁷

The Greensburg comprehensive plan also says this:

The root of sustainability is based in common Kansas values. A Kansan thinks in terms of generations and harbors a sincere belief that decisions should build strong

²⁰⁶ COMMUNITY & REGIONAL RESILIENCE INST., *supra* note 24.

²⁰⁷ CITY OF GREENSBURG, GREENSBURG SUSTAINABLE COMPREHENSIVE PLAN 2 (2008).

communities for our children. We still believe in the power of community, and in our rural areas neighbors still gather at the coffee shop to talk about the issues of the day. A Kansan's character is rooted in the agricultural industry prominent in the region. We understand the natural systems that power a sustainable economy and know what it means to live off, and with, the land.²⁰⁸

According to a USA Today article on April 15th, 2013,

Six years after the tornado, Greensburg is the world's leading community in LEED-certified buildings per capita. The town is home to a half-dozen LEED-platinum certified buildings, including the new City Hall and the new 48,500-square-foot Kiowa County Memorial Hospital. Renewable energy powers the entire community, and the streetlights are all LED.²⁰⁹

Greensburg envisioned a new its future through land use planning. Another rural community in Northern Nebraska envisioned and then created a world-class links golf club. As farming disappears on the Great Plains, rural towns can zone in wild-recreational tourism, and disappearing groundwater may lead to growing plant material for biofuels, which are renewable raw materials used for energy, which can lead to on-farm digester systems.²¹⁰ Large-scale wind farms and solar arrays can take advantage of wind resources, which exist in many portions of the Great Plains, as the sun consistently shines there.²¹¹

Some rural communities are rezoning their downtowns and neighborhoods and hamlet crossroads areas to provide flexibility for their future.²¹² Through overlay zoning, planned unit developments, and special use permits, private sector developers can propose economical uses, rather than comply with tightly constrained zoning

²⁰⁸ *Id.* at 10.

²⁰⁹ Patrick Quinn, *After Devastating Tornado, Town is Reborn 'Green'*, USA TODAY GREEN LIVING MAG. (Apr. 25, 2013), <http://www.usatoday.com/story/news/greenhouse/2013/04/13/greensburg-kansas/2078901/>.

²¹⁰ Nolon, *Land Use and Sustainability: Is there Hope for Rural America?*, *supra* note 205.

²¹¹ *Id.*

²¹² *Id.*

districts.²¹³ This can lead to turning the single-family homes of seniors who do not need them into more affordable two and three bedroom structures; to putting elderly cottage housing in rear yards with shared parking and septic systems; to creating bed and breakfasts for visiting tourists; to aggregating parcels for the construction of affordable housing for seniors.²¹⁴

In coastal communities, local officials can engage in proactive planning following the lead of Greensburg and Sidney. Alternatively, they can incorporate the changing private market signals and use them to defend a no-build zone, hoping to create a new doctrinal exception to the Lucas total taking rule.²¹⁵ Finally, they can use these new signals from the insurance and mortgage industries to negotiate with developers to arrive at intelligent solutions to the questions of whether, where, and how much to build in vulnerable areas.²¹⁶

There is a profound point here. Those who bear the costs of local Land Use Climate Change Bubbles are acutely aware of the transactional costs of our society's failure to regulate atmospheric pollution. Land use bubbles demonstrate what is factual as opposed to what constitutes political or value judgments arrived at through normative analysis. Most of the debate about climate change is

²¹³ *Id.*

²¹⁴ *Id.*

²¹⁵ For some doctrinal exceptions to the *Lucas* total takings rule, see *supra* notes 40-41. Some communities are taking *Lucas*-related risks. See *Doherty v. Plan. Bd. of Scituate*, 5 N.E.3d 1231, 1239-41 (2014). Where the town planning board denied an application to construct new residences on two lots that were located in a flood plain that had been zoned by the town board as a water protection district: flood plain and watershed protection (FPWP). The local law required applicants to show that lots for development are "not subject to flooding," within the meaning of the local law. The property owner argued for a literal interpretation of the language derived from a map containing only elevations. The court concluded that the map does not define "subject to flooding" as meaning only whether land is above or below a certain elevation and that the planning board could consider the testimony of witnesses regarding the actual history of flooding on the property. As to this contention, the court determined that the public safety issues relative to "the damage to life and property caused by flooding," are the actual concerns, not solely the elevation of the lots. Here, a community is using evidence on the ground to determine the right to rebuild, demonstrating pragmatic solutions for Land Use Climate Change Bubbles.

²¹⁶ See Dan M. Kahn, *Climate Science Communication and the Measurement Problem*, ADVANCES POL. PSYCHOL. (forthcoming 2014) (manuscript at 35). In describing the progress made in creating a compact regarding climate action in Southeast Florida, Kahn notes that the compact negotiations put a "a *different question* from the one put in the national climate change debate. The latter forces Southeast Floridians, like everyone else, to express 'who they are, whose side they are on.' In contrast, the decision-making of the Compact is effectively, and insistently, testing *what they know* about how to live in a region that faces a serious climate problem."

decidedly normative and has been highly unproductive in designing strategies for change. The environmental and economic costs of climate change in land use bubble locations inexorably lead to cost-effective solutions that redirect building to sustainable locations and cause governments to create policies and programs by which this can be accomplished.²¹⁷

By generalizing from these economic adjustments in bubble neighborhoods and tracking the movements of the private market in response to them, it is possible to see the pattern of a larger response: one that clears the “we must rebuild” normative barrier. Property rights advocates, chambers of commerce, and environmental advocates are united in their interest in mitigating disaster damage and adopting strategies for community resilience. Since all politics is local, these signals from the bottom have the potential to affect state and federal policies, which must respond through technical and financial assistance to these local movements to higher, drier, sheltered, and more fertile ground.

There is hope for this bottom up strategy. This practical work at the local level is not just consistent with the values in Southwestern Kansas.²¹⁸ It appeals to the best in the human spirit as well. This positive work differs markedly from advocacy for climate management strategies that are based on scientific-consensus and appeals for federal government intervention. However right such advocacy might be, it risks driving certain constituencies away, indeed alienating them altogether.²¹⁹

²¹⁷ *Id.*

²¹⁸ CITY OF GREENSBURG, *supra* note 207.

²¹⁹ See Paul Krugman, *Interest, Ideology and Climate*, N.Y. TIMES (June 8, 2014), http://www.nytimes.com/2014/06/09/opinion/krugman-interests-ideology-and-climate.html?ref=opinion&_r=2. “Along come some scientists declaring that unrestricted pursuit of self-interest will destroy the world, and that government intervention is the only answer. It doesn’t matter how market-friendly you make the proposed intervention; this is a direct challenge to the libertarian worldview. And the natural reaction is denial — angry denial. Read or watch any extended debate over climate policy and you’ll be struck by the venom, the sheer rage, of the denialists. The fact that climate concerns rest on scientific consensus makes things even worse, because it plays into the anti-intellectualism that has always been a powerful force in American life, mainly on the right. It’s not really surprising that so many right-wing politicians and pundits quickly turned to conspiracy theories, to accusations that thousands of researchers around the world were colluding in a gigantic hoax whose real purpose was to justify a big-government power grab. After all, right-wingers never liked or trusted scientists in the first place.”

It is possible that the continued appearance and collapse of Land Use Climate Change Bubbles will become a semaphore²²⁰ for signaling where not to build and rebuild that will affect local land use decision making, moving the emphasis from costly rebuilding to more positive planning and development strategies. In Sidney, New York, higher ground was found and a positive movement is underway. Similarly, in Greensburg, Kansas, a new concept for the community was borne out of the disaster that nearly destroyed it.

²²⁰ See *supra* Part I.