Environmental Claims Journal
Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/becj20

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Published online: 30 Oct 2014.

To cite this article: Frank Piccininni (2014) The Evolving “Nature” of Environmental Risk: A Responsible Approach for Residential and Commercial Real Estate, Environmental Claims Journal, 26:4, 308-318, DOI: 10.1080/10406026.2014.962414

To link to this article: http://dx.doi.org/10.1080/10406026.2014.962414

Environmental Claims Journal, 26(4):308–318, 2014

ISSN: 1040-6026 print / 1547-657X online
DOI: 10.1080/10406026.2014.962414

The Evolving "Nature" of Environmental Risk: A Responsible Approach for Residential and Commercial Real Estate

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Environmental losses suffered by commercial and residential real estate owners are becoming more frequent and severe due to evolving regulatory regimes and the changing global climate. This article reviews the nature of environmental risk, specifically within the context of a changing climate, and proposes the large-scale installation of green infrastructure as both a business opportunity for insurers and a responsible approach.

INTRODUCTION

Owners of commercial and residential real estate face a myriad of hard-to-predict environmental risks such as bodily injury due to asbestos exposure,[1] mold contamination,[2] fuel spills,[3] on- and off-site hazardous waste disposal,[4]

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[1] See e.g., *Kosich v. Metro. Prop. & Cas. Ins. Co.*, 626 N.Y.S.2d 618,618 (N.Y. App. Div. 1995) (affirming the finding that "plaintiffs' losses were caused by asbestos contamination, coverage for which [wa]s specifically excluded under the insurance policy issued by defendant").

[2] See e.g., *American Western Home Ins. Co. v. Utopia Acquisition L.P.,* 2009 WL 792483 (W.D. Mo. 2009) (finding that mold contamination in an apartment building was not covered by a commercial general liability policy).

[3] *Watson v. Travelers Indem, Co.*, 2005 WL 839504 (Mich. Ct. App. 2005) (holding that diesel fuel, accidentally spilled during a roofing project, was a pollutant that was excluded from a commercial general liability insurance policy).

[4] See e.g., *Vermont Mut. Ins. Co. v. Parsons Hill P'Ship*, 1 A.3d 1016 (Vt. 2010) (unsafe levels of perchloroethylene (PCE) in an apartment complex's water system was outside the scope of a comprehensive liability insurance policy).

and indoor air quality issues.[5] These risks have the potential to cause catastrophic financial losses and public relations disasters. To help mitigate exposures of commercial and residential real estate owners, insurers have begun to develop comprehensive environmental coverage such as the General Real Estate Environmental Enterprises Net (GREEN) Program.[6] Despite the effectiveness of these programs, insuring against environmental losses is likely to become increasingly complex due to the imminent impacts of climate change.[7]

A recent report by the United Nations Intergovernmental Panel on Climate Change presented multiple lines of empirical support for climate change, largely due to anthropogenic activities.[8] This evidence included warming ocean temperatures, rising sea levels, changing ocean salinity, acidifying oceans, increasing frequency of warm days, lessening frost days, decreasing snow cover in most regions, degrading permafrost, increasing heavy precipitation events, and retreating sea ice and glaciers.[9] The impact of climate change, coupled with increasingly stringent regulatory policy, will increase the frequency and intensity of loss events. Furthermore, spatial and temporal variability of losses, nonlinear loss functions and single events with multiple correlated consequences will increasingly occur.[10] This article: (1) reviews the emergence and role of environmental insurance; (2) explores the changing nature of risk management for commercial and residential real estate owners in the face of the changing global climate; and (3) suggests that insurers, as proactive risk managers, are well-suited to lead by promoting adaptation to and mitigation of climate change by encouraging the installation of green infrastructure.

I. ENVIRONMENTAL RISKS

The late 1960s and early 1970s gave rise to the U.S. environmental movement, which was marked by the passage of fundamental environmental statutes such as the Comprehensive Environmental Response, Compensation, and Liability

[5] See e.g., *Clipper Mill Fed., LLC v. Cincinnati Ins. Co.* 2010 U.S. Dist. LEXIS 112172 (D. Md. 2010) (ruling that the "plain terms" of the pollution exclusion would be enforced in connection with the indoor airborne contaminants that resulted from a faulty HVAC system).

[6] See e.g., *Environmental Services*, SterlingRisk Insurance, http://www.sterlingrisk.com/business-insurance/specialties-by-industry/environmental-services/green/ (accessed June 27, 2014).

[7] See Sean B. Hecht, Insurance, in *The Law of Adaptation to Climate Change, U.S. and International Aspects,* Michael B. Gerrard and Katrina F. Kuh, eds. (Chicago: American Bar Association Publishing, 2012), 514–515 (describing the challenges that climate change poses for predicting risks and setting appropriate premiums).

[8] *Int'l Governmental Panel On Climate Change, Climate Change 2013: The Physical Science Basis*, http://www.climatechange2013.org/images/report/WG1AR5_ALL_FINAL.pdf

[9] *Id.*

[10] Evan Mills, "Insurance in a Climate of Change," *Science* 309 (2005): 1040, 1040.

Act (CERCLA)[11] and the Clean Water Act (CWA).[12] Increased regulation has created both the beginnings of protecting our natural resources and the potential for major financial liabilities from environmental contamination. These liabilities are routinely excluded from commercial general liability insurance policies.[13] To fill the coverage gap related to pollution exclusions, the insurance industry has manuscripted environmental insurance policies, such as GREEN, to manage these risks for residential and commercial real estate owners.

Environmental losses are generally classified as either first-party or third-party losses.[14] First-party losses are those suffered by the insured, whereas third-party losses include legal action arising out of bodily injury or property damage to a third party for which the insured is allegedly responsible.[15] The two common policy forms available to cover environmental losses are cost cap and pollution liability insurance.[16] Cost cap policies insure against cost overruns associated with known liabilities such as implementing a remedial action plan.[17] Pollution liability insurance insures against new environmental conditions such as newly discovered contamination.[18] Environmental claims are relatively infrequent, but, when they occur, severe and catastrophic losses can result.[19]

One environmental risk commonly faced by commercial and residential real estate owners is CERCLA liability. The act is a necessary way to manage and remediate hazardous contamination and real public threat. Liability under CERCLA is strict, joint, and several[20] and attaches to: (1) the current owner of the property contaminated with hazardous waste; (2) the owner at the time of the release of hazardous waste; (3) any person who disposes of, or arranges for, the disposal of hazardous wastes; and (4) any person who accepts hazardous

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[11] 42 USC §§ 9601 et seq.

[12] 33 USC §§ 1251 et seq.; see also Jonathan H. Alder, "Fables of the Cuyahoga: Reconstructing a History of Environmental Protection," *Fordham Environmental Law Journal* 14 (2002): 89 (describing joint state and federal efforts to respond to a "clean water crisis").

[13] T. McRoy Shelly III, "Insurance Coverage for Environmental Claims: Current Litigation Issues in the United States," *Environmental Claims Journal* 26 (2014): 4, 4–5.

[14] Rodney J. Taylor and Howard M. Tollin, "Insurance Market for Global Warming Heats up: Old Products and New Policies Respond to Climate Change Risks," *Environmental Claims Journal* 21 (2009): 247, 249–250.

[15] *Id.*

[16] Howard M. Tollin, "Environmental Insurance for a New Wave of Claims," *Environmental Claims Journal* 16 (2004): 203, 210–211.

[17] *Id.*

[18] *Id.*

[19] Howard M. Tollin and Boris F. Strogach, "Defining "Pollutant": What You Don't Know Can Hurt You," *Environmental Claims Journal* 21 (2009): 156, 157.

[20] Notably, the terms *strict, joint*, and *several* are not referenced in CERCLA, but have been routinely applied by the judiciary in CERCLA litigation. See e.g., *Burlington Northern & Santa Fe Railway Co. v. United State*s 129 S. Ct. 1870, 1882–1883 (2009) (". . .conclud[ing] that the facts contained in the record reasonably supported the apportionment of liability").

substances for disposal.[21] The term *hazardous substance* is defined extremely broadly under CERCLA,[22] and includes many substances commonly used by residential and commercial real estate owners.

The original defenses to liability under CERCLA, which must be proven through a preponderance of the evidence, included claiming that the release was an act of God, an act of war, or an act or omission of a third party not the agent or employee of the potentially responsible party.[23] Subsequently, amendments to CERCLA allow purchasers of property to potentially qualify for the innocent landowner, bona fide potential purchaser, or contiguous property owner defenses to liability if the party conducts "all appropriate inquiries" before acquiring the property.[24] Due, in part, to the deleterious consequences of hazardous waste on human and environmental health, the defenses to CERCLA liability are difficult to successfully prevail upon.[25] Thus, many unknowing real estate owners are found to be potentially responsible parties, resulting in substantial and unforeseen financial loss. For example, in *New York v. Shore Realty Corp.*,[26] the court imposed liability on Shore Realty, despite the fact that the past owners of the property actually caused the release of hazardous waste.

Access to clean water is critical to the survival of all life. Accordingly, the CWA highlights further potential for residential and commercial real estate owners to fall subject to environmental risk.[27] For example, section 303 of the act regulates the discharge of pollutants, including sediment, nitrogen, and phosphorus, into regulated water bodies.[28] These contaminants can impair local ecosystem structure and function jeopardizing the health of local inhabitants. The U.S. Environmental Protection Agency promulgates, or reviews state-promulgated, numerical or narrative water quality standards that "tak[e] into consideration their use and value for public water supplies, propagation of fish and wildlife, recreational purposes, and also tak[e] into consideration their use and value for navigation."[29] Accordingly, the federal or state

[21] 42 USC § 9607 (a).

[22] 42 USC § 9601 (14).

[23] 42 USC § 9607 (b).

[24] 42 USC § 9601 (35) (innocent landowner defense); § 9601 (40) (bonafide potential purchaser); § 9607 (q) (contiguous property owner). The guidelines for conducting all appropriate inquires are governed by regulation and require, inter alia, interviews with current and past owners, a record search for cleanup liens, and searches of government databases (40 CFR §312).

[25] See J. M. Moss, "Impact of CERCLA on Real Estate Transactions: What Every Owner, Operator, Buyer, Lender,. . .Should Know," *Brigham Young University Journal of Public Law* 6 (1992): 365, 375 (noting that courts typically construe the provisions of CERCLA liberally).

[26] 759 F.2d 1032, 1043–44 (2d Cir. 1985).

[27] 33 USC §§1251 et seq.

[28] 33 USC § 1313.

[29] 33 USC § 1313 (c)(2); see also *Pronsolino v. Nastri*, 291 F.3d 1123 (9th Cir. 2002) (upholding the Environmental Protection Agency's authority to force states to set water quality standards sufficient to protect the designated use even if pollution originated entirely from nonpoint pollution).

administrators require municipalities and industrial point source discharges to adopt best pollution control technologies and obtain a discharge permit through the National Pollution Discharge Elimination System to meet and maintain water quality standards.[30] To comply with federal or state standards, municipalities often enact local ordinances, such as stormwater management laws, that may result in enforcement actions against commercial and residential real estate owners.[31] Although federal, state, and local antidegradation jurisprudence continues to evolve[32] and enforcement is highly site-specific, regulation of water pollution is a notable environmental risk facing commercial and residential real estate owners.

Prior to the enactment of U.S. environmental law, private citizens relied on common law causes of action such as private nuisance to combat pollution from neighboring landowners.[33] Liability in private nuisance suits is found when the defendant intentionally causes a substantial and unreasonable interference with the use and enjoyment of another's land in a continuous or recurring manner.[34] These causes of action remain today and represent a risk to residential and commercial real estate owners.

Significant costs and claims against real estate owners can also result from installed and applied building materials, indoor air quality, and biological contaminates.[35] Common examples of losses include bodily injury resulting from exposure to lead paint[36] and asbestos,[37] as well as losses incurred in connection with removal and disposal of these materials. Furthermore, prior industrial use of the site or migrating irritants can leave buildings' interiors at risk of vapor intrusion and indoor contamination with hazardous wastes.[38]

[30] 33 USC § 1342. States that assume the authority to administer the CWA enact similar state level permitting regimes. See e.g., N.Y. Environmental Conservation Law § 17-0808 (McKinney).

[31] See e.g., Roslyn, N.Y., Code §400 (setting forth stormwater management and erosion control measures).

[32] See Sandi Zellmer and Robert L. Glicksman, "Improving Water Quality Antidegradation Policies," *Journal of Energy and Environmental Law* 4 (2013): 1, 1, (recommending various reforms to antidegradation policy in order to "...provid[e] a margin of safety, protect[] high-value natural resources, prevent[] the development of pollution havens, and balance[e] environmental goals and economic growth opportunities").

[33] See e.g., *Madison v. Ducktown Sulphur, Copper & Iron Co.,* 83 S.W. 658, 664 (1904) (finding that damages are properly granted against a copper smelting plant where injury is proven).

[34] *Berenger v. 261 W. LLC*, 93 AD 3d 175, 182(NY Appellate Div. 2012).

[35] Catherine E. Bostock, "Environmental Liabilities of Property Owners: Examples of Common Risks and Strategies to Anticipate and Avoid Them," *Environmental Claims Journal* 26 (2014): 27, 32–35.

[36] See Christine L. Hansen, "Lead Astray and Back Again: Alternative Solutions to the Lead Paint Poisoning Problem in Wisconsin's Rental Housing," *Wisconsin Law Review* (2000): 1073, 1073 (noting the prevalence of lead paint poisoning and its severe effects on young victims).

[37] See James A. Henderson Jr. and Aaron Twerski, "Asbestos Litigation Gone Mad: Exposure-Based Recover for Increased Risk, Mental Distress and Medical Monitoring," *South Carolina Law Review* 58 (2002): 816 (calling asbestos litigation "a blight on the American judicial system").

[38] See Chuck Wah Francis Yu and Jeong Tai Kim, "Building Pathology, Investigation of Sick Buildings-VOC Emissions," *Indoor and Built Environment* 19 (2010): 40 (reviewing some of the causes of indoor air quality issues).

Finally, biological agents, such as mold, can lead to catastrophic losses associated with remediation and bodily injury.[39]

GREEN coverage is a comprehensive environmental insurance policy offered on a "claims made" basis. The coverage is designed to insure new environmental conditions that result in first- and third-party pollution claims such as cleanup costs, associated property damage, claims for bodily injury associated with pollution, and legal defense costs.[40] In addition, coverage extends to indoor contaminates such as mold and bodily injury claims related to installed and applied materials such as lead paint and asbestos. GREEN also insures third-party claims resulting from off-site disposal of hazardous materials. Although GREEN is an innovative insurance coverage that mitigates environmental exposure to residential and commercial real estate owners, climate change is likely to impede the insurability of many environmental risks.[41] Fortunately, because of insurers' financial capacity and ability to influence private individuals and corporations more effectively than the public sector, they are in the position to act as proactive risk managers by endorsing or requiring sustainable practices and loss-prevention measures.[42] Development of such measures requires an understanding of the risks correlated with climate change.[43]

II. ENVIRONMENTAL RISKS IN A CHANGING CLIMATE

The changing climate has already begun to reveal vulnerability in natural and human systems, albeit with high amounts of spatial and temporal variability.[44] Further warming portends pervasive and irreversible effects including more frequent and intense rainfall events such as hurricanes, associated flooding, drought, sea-level rise, and heat waves. Climate risks to commercial and residential real estate owners extend well beyond the initial impact of these disasters; there are potential long-term environmental liabilities resulting from the recovery, the reconstruction, and the resumption of habitation of storm- and flood-impacted areas.

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39 Thelma Jarman-Felstiner, "Mold is Gold: But Will it be the Next Asbestos?" *Pepperdine Law Review* 30 (2002).

40 GREEN does not automatically cover underground storage tanks, or the abatement of lead or asbestos. Underground storage tanks that are not too old can, however, be added to the policy, although the premium will be adjusted to reflect the increased risk.

41 Cf. Evan Mills, "Synergisms Between Climate Change Mitigation and Adaptation: An Insurance Perspective," *Mitigation and Adaptation Strategies for Global Change* 12 (2007): 809–810.

42 *Id.*

43 See Mills supra, note 10, 1043 ("Insurance is a form of adaptive capacity for the impacts of climate change, although the sector itself must adapt in order to remain viable. It is incumbent on insurers, their regulators, and the policy community to develop a better grasp of the physical and business risks").

44 See *Intergovernmental Panel On Climate Change*, supra note 8, 7.

Although not explicitly linked to climate change, Superstorm Sandy is thought to be indicative of the frequent and extreme weather expected as our climate changes.[45] The storm pummeled the New York metropolitan area with wind gusts up to 90–100 mph, fourteen feet of storm surge during high tide, and a deluge of rainfall exceeding five inches in many places.[46] The destructive force of the storm was apparent immediately—the storm damaged more than 375,000 housing units and caused an estimated $50 billion worth of damage.[47] The true breadth of the damage, however, only began to emerge as the floodwaters receded. Hazardous materials, swept from destroyed homes and businesses, were deposited throughout the environment; raw sewage from overwhelmed water treatment facilities stood in flooded homes; and mold began to proliferate within floodwater-affected structures.[48]

As disasters such as Superstorm Sandy become more common, U.S. environmental regulatory policy and jurisprudence will likely responsibly evolve to protect health and safety. This, in turn, however, will create a number of new environmental risks to commercial and residential real estate owners.[49] For example, the way in which federal and state governments remedy the release of hazardous wastes may become more stringent, reflecting the greater risk of disturbance to contaminated sites.[50] Under the current regulatory regime, regulators often allow contamination to be remediated through monitored natural recovery or in situ capping.[51] Monitored natural recovery involves utilizing natural processes to reduce the bioavailability of sediments; in situ capping refers to the placement of clean material over contaminated sediments to prevent exposure and stabilize contaminates.[52] Climate change is likely to decrease the efficacy of such measures, as erosion, flooding, and high winds are more likely to affect those sites.[53] Accordingly, regulators are increasingly more likely to require more elaborate remedies that ultimately create greater financial liability for the responsible parties.

45 See Kim Knowlton et al., "Post-Sandy Preparedness Policies Lag as Sea Levels Rise," *Environmental Health Prospectives* 121 (2013): 208 (finding that lessons learned from the impacts of Sandy should be translated into adaptive policies).

46 Jeffery B. Halverson and Thomas Rabenhorst, "Hurricane Sandy: The Science and Impacts of a Superstorm," *Weatherwise* 66 (2013): 14.

47 John Manuel, "The Long Road to Recovery: Environmental Health Impacts of Sandy," *Environmental Health Prospectives* 131 (2013): 152.

48 *Id.*

49 See e.g., Keneth T. Kristl, "Diminishing the Divine: Climate Change and the Act of God Defense," *Widener Law Review* 15 (2010): 325 (finding that the Act of God defense in tort, admiralty, and environmental law will lose significance as the risk of climate change related weather becomes more foreseeable).

50 Katrina F. Kuh, "Climate Change and CERCLA Remedies: Adaptation Strategies for Contaminated Sediment Sites," *Seattle Journal of Environmental Law* 2 (2012): 61.

51 Environmental Protection Agency, *Contaminated Sediment Remediation Guidance For Hazardous Waste Sites* (Dec. 2005).

52 *Id.,* iii–iv.

53 Katrina F. Kuh, supra note 50, 71–75.

Similarly, regulation under the CWA is likely to become more stringent in order to deal with the impacts of climate change. Climate change is expected to contribute to the degradation of waters by increasing stormwater runoff and altering temperatures and rainfall patterns.[54] In addition, climate change is expected to alter the composition, diversity, and stability of aquatic biological communities.[55] These effects of climate change will exacerbate other anthropogenic impacts on waters such as combined sewer overflows[56] and nonpoint pollution.[57] Currently, section 208 of the CWA provides financial incentives for polluters to adopt best management practices that reduce stormwater runoff and nonpoint pollution, but does not penalize those that decline to do so.[58] In the future, regulation of point sources will likely be insufficient for maintaining quality standards, and command and control regulation of nonpoint sources will likely be enacted. Commercial and residential real estate owners will, therefore, be subject to an ever-increasing degree of liability associated with the CWA.

In addition to evolving regulatory regimes, commercial and residential real estate owners may face environmental liability from private and public common law nuisance claims due to pollution from climate change impacts. Although climate change effects on any given locality are exceedingly hard to predict, it would be prudent for both insurers and the insured to reduce exposures and increase resilience.[59]

III. INSURERS AS PROACTIVE RISK MANAGERS

Insurers have a long history of addressing root causes of risk through proactive risk management—noted examples include fostering the development of fire departments, building codes, and auto safety testing protocols.[60] Climate

[54] Margaret A. Palmer et al., "Climate Change and River Ecosystems: Protection and Adaptation Options," *Environmental Management* 44 (2009): 1053.

[55] *Id.*

[56] Combined sewers collect stormwater, industrial wastewater, and residential wastewater in one pipe and typically direct water to a wastewater treatment facility for treatment and eventual discharge. During major storm events, however, runoff overwhelms the capacity of the system, causing the discharge of untreated wastewater directly into a water body. See Maria R. C. De Sousa et al., "Using Life Cycle Assessment to Evaluate Green and Grey Combined Sewer Overflow Control Strategies," *Journal of Industrial Ecology* 16 (2012): 901, 901 (describing combined sewer overflows as a "public health and environmental liability"). Researchers anticipate that climate change is likely to increase the frequency and intensity of such overflow events. See Annette Semadeni-Davies et al., "The Impacts of Climate Change and Urbanisation on Drainage in Helsingborg, Sweden: Combined Sewer System," *Journal of Hydrology* 350 (2008): 100, 100.

[57] J. S. Baron et al., "The Interactive Effects of Excess Reactive Nitrogen and Climate Change on Aquatic Ecosystems and Water Resources of the United States," *Biogeochemistry* 114 (2013): 71.

[58] *Natural Resources Defense Council v. USEPA*, 915 F.2d 1314, 1317 (9th Circuit 1990).

[59] Cf. Mark E. Keim, "Building Human Resilience: The Role of Public Health Preparedness and Response as an Adaptation to Climate Change," *American Journal of Preventive Medicine* 35 (2008): 508, 508.

[60] Mills, supra note 10, 1043.

change presents the insurance industry the opportunity to lead adaptation and mitigation efforts by promoting it to commercial and residential real estate owners.[61] Insurers can reward such efforts by reducing self-insured retentions, decreasing premiums, or increasing aggregate limits. This responsible approach represents a business opportunity for insurance companies; insurers and brokers can provide risk management advisory services and develop innovative loss mitigation products.[62]

One climate loss prevention strategy that can be employed by residential and commercial real estate owners is the installation of green infrastructure.[63] The definition of *green infrastructure* is somewhat amorphous. It has been described broadly as an interconnected network of green spaces that conserves ecosystem structure and function among human land use.[64] Green infrastructure includes blue roofs,[65] green roofs,[66] rain gardens or planter boxes,[67] bioswales,[68] and permeable pavement.[69] The large-scale development of networks of green infrastructure will boost the resilience of the built environment—a critical first step in preparing for the imminent threat of climate change (Table 1).[70]

In addition to engineered green infrastructure, residential and commercial real estate owners can restore native ecosystems on portions of their parcels where possible.[71] Restoration will enable habitats to respond to change

61 See *id.* (noting that public-private partnerships for adaptation and mitigation are essential for spreading risk and developing loss mitigation strategies).

62 *Id.*

63 See S.E. Gill et al., "Adapting Cities for Climate Change: The Role of the Green Infrastructure," *Built Environment* 33 (2007): 115.

64 Mark A. Benedict and Edward T. McMahon, "Green Infrastructure: Smart Conservation for the 21st Century," *Renewable Resources Journal* 20 (2002): 12, 12.

65 Nonvegetated roofing materials that retains and gradually releases runoff. As a cobenefit, blue roofs provide the sustainable benefit of reducing heating costs. See *Blue Roof and Green Roof*, NYC Department of Environmental Protection, http://www.nyc.gov/html/dep/html/stormwater/green_pilot_project_ps118.shtml http://water.epa.gov/infrastructure/greeninfrastructure/gi_what.cfm*Id* (accessed August 25, 2014).

66 Roofs covered with growing media and vegetation designed to retain runoff. Green roofs also provide a myriad of cobenefits such as reducing noise pollution and cooling cost, increasing air quality, and providing wildlife habitat. *Id.*

67 Shallow, vegetated basins designed to collect water from rooftops. *What is Green Infrastructure*, U.S. Environmental Protection Agency, http://water.epa.gov/infrastructure/greeninfrastructure/gi_what.cfmId (accessed August 25, 2014). *Id.*

68 A vegetated channel designed to move water while promoting bioretention of runoff, nutrients, and other types of pollution. *Id.*

69 Porous pavement allows for infiltration of water, thereby reducing overland flow and runoff. *Id.*

70 See S. E. Gill, supra note 63; see also "The Executive Office of the President, The President's Climate Action Plan," 13, http://www.whitehouse.gov/sites/default/files/image/president27sclimate actionplan.pdf (outlining the importance of building "stronger and safer communities" to deal with the exigencies of climate change).

71 See Constance I. Millar et al., "Climate Change and Forests of the Future: Managing in the Face of Uncertainty," *Ecological Applications* 17 (2007): 2145, 2147–2149 (discussing a need for adaptive

TABLE 1. A hypothesized tabular model of the succession of anthropogenic ecosystem factors varying along a spatiotemporal gradient of green infrastructure network complexity. This tabular model is based on Eugene Odum's famous tabular model of ecological succession. See Eugene P. Odum, "The Strategy of Ecosystem Development," *Science* 164 (1969): 262, 265. The steepness of each gradient is likely to increase as the Earth's climate continues to warm. Note that natural or human disturbances are likely to reset the successional processes.

	Intensive Human Land Use with Little Green Infrastructure	Moderately Developed Networks of Green Infrastructure	Complex Networks of Green Infrastructure
Community Energetics			
Energy Demand for Cooling	High	Medium-High	Low
Vulnerability of Energy Infrastructure	High	Medium-High	Low
Urban Heat Island Effect	High	Medium	Low
Community Structure and Function			
Air Quality	Low	Medium	High
Water Pollution, Stormwater Runoff, Erosion	High	Medium-Low	Low
Resistance and Resilience to Flooding	Low	Medium-High	High
Aquifer Recharge	Low	Medium	High
Electric and Magnetic Field Shielding	Low	Medium-Low	High
Noise Reduction	Low	Medium	High
Overall Homeostasis			
Stability (resistance to external perturbations)	Low	Medium-High	High
Human Health and Well-Being	Low	Medium	High
Environmental Awareness and Prosocial Behavior	Low	High	High

by increasing ecological resistance and resilience.[72] Native forests help to buffer storm waters; lower the water table, which decreases the likelihood of flooding; and act as a mechanical filter to trap pollutants and particulate matter.[73] As our climate continues to warm, the energy demand for indoor cooling is projected to increase.[74] Native forests can help to reduce this demand, and ultimately energy consumption, by moderating the maximum

forest management); James P. Collins et al., "A New Urban Ecology: Modeling Human Communities as Integral Parts of Ecosystems Poses Special Problems for the Development and Testing of Ecological Theory," *American Scientist* 88 (2000): 416, 424 (discussing how standard ecological theory such as successional dynamics can be applied to human dominated ecosystems); Mark J. McDonnell and Steward T. A. Pickett, "Ecosystem Structure and Function Along Urban-Rural Gradient: An Unexploited Opportunity for Ecology," *Ecology* 71 (1990): 1232 ("Urbanization is a massive, unplanned experiment that already affects large acreages and is spreading in many areas of the United States").

72 See Constance I. Millar et al., supra note 71.

73 See Frank Piccininni, "Adaptation to Climate Change and the Everglades Ecosystem," *Environmental Claims Journal* 26 (2014): 63, 80–82 (discussing the stabilizing affect of native vegetation in a dynamic ecosystem).

74 Danny H. W. Li et al., "Impact of Climate Change on Energy Use in the Built Environment in Different Climate Zones—A Review," *Energy* 42 (2012): 103, 103.

surface temperatures and the urban heat island effect (Table 1).[75] Finally, planting trees, shrubs, and herbaceous flora would provide the invaluable ecosystem service of carbon sequestration to mitigate climate change.[76]

Green infrastructure provides redundancy and modularization of ecosystem services, which helps to defuse risk throughout the built environment.[77] In this way, real estate owners have to rely less on centralized infrastructure (e.g., wastewater treatment facilities), which are relatively vulnerable to failure.[78] Moreover, the benefits of green infrastructure (Table 1) are likely to reduce environmental losses associated with regulatory liabilities and common law lawsuits. Finally, and perhaps most importantly, the installation of complex networks of green infrastructure will increase environmental awareness, thereby promoting a responsible stewardship approach to real estate.[79]

CONCLUSION

Environmental law is critical for the maintenance and protection of innocent life, including our own. Yet, it also creates significant liability for residential and commercial real estate owners, which is likely to be exacerbated by the impacts of climate change. Fortunately, the insurance industry is poised to provide leadership in promoting adaptation to and mitigation of climate risk.[80] It is, therefore, incumbent upon insurers to rise to the challenge of developing novel and innovative products designed to cope with the evolving "nature" of environmental risk.

ACKNOWLEDGMENTS

I would like to extend my gratitude to Howard M. Tollin for his mentorship and invaluable guidance. Additionally, thank you to Sarah Mills-Dirlam for reviewing a draft of this article. Finally, thank you to Kristin A. Perret for editing a draft of this article, as well as for being an inspiration to me.

75 See S.E. Gill, supra note 63, 116–124 (modeling the effects of "green cover" on surface temperatures under projected climate change scenarios).

76 See Kathryn R. Kirby and Catherine Potvin, "Variation in Carbon Storage Among Tree species: Implications for the Management of a Small-Scale Carbon Sink Project," *Forest Ecology and Management* 246 (2007): 208, 214.

77 Jack Ahern, "From Fail-Safe to Safe-to-Fail: Sustainability and Resilience in the New Urban World," *Landscape and Urban Planning* 100 (2011): 341, 342–343.

78 *Id.*

79 Cf. R. Edward Grumbine, "What is Ecosystem Management?," *Conservation Biology* 8 (1994): 27 ("Ecosystem management is not just about science nor is it simply an extension of traditional resource management; it offers a fundamental reframing of how humans may work with nature."); David S. Wilson, "Human Prosociality from an Evolutionary Perspective: Variation and Correlations at a City-Wide Scale," *Evolution and Human Behavior* 30 (2009): 190 (using field observations of prosocial behavior, multivariate analysis, and spatial interpolation to demonstrate that prosocial behavior is correlated with neighborhood social support).

80 Sean B. Hecht, "Climate Change and the Transformation of Risk: Insurance Matters," *UCLA Law Review* 55 (2008): 1559, 1618.