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Shifting Paradigms Transform Environmental and Land Use Law: The Emergence of the Law of Sustainable Development

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SHIFTING PARADIGMS TRANSFORM ENVIRONMENTAL AND LAND USE LAW: THE EMERGENCE OF THE LAW OF SUSTAINABLE DEVELOPMENT

*John R. Nolon**

INTRODUCTION

The inaugural issue of the *Fordham Environmental Law Review*¹ in 1993 arrived soon after the U.S. Supreme Court's *Lucas v. South Carolina Coastal Council* decision, which classified as a compensable taking a state regulation that prevented all development of certain ocean-front lots.² Twenty years later, 2012 ended and 2013 started with Congress debating how much to appropriate to help cover the billions of dollars of damage caused by Tropical Storm Sandy, a catastrophe that literally took thousands of homes and businesses.

We now realize that where and how we build to meet the needs of a growing and changing population has much to do with mitigating and adapting to climate change. During these two decades, the state and local land use legal system evolved to respond to natural disasters, increased flooding, sea level rise in coastal states, higher temperatures everywhere, and other adverse impacts of climate change. This system of law is now adjusting to fundamental changes in demographics and real estate markets that favor new development in urban communities and that lessen demand for homes and businesses at the urban fringe. We began these two decades reacting to the rush to develop greenfields and coastal property and end it

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1. Gerald S. Dickinson and Sheila R. Foster, *Stasis and Change in Environmental Law: The Past, Present and Future of the Fordham Environmental Law Review*, 24 *FORDHAM ENVTL. L. REV.* 1 (2013).

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

wondering how to prepare more urbanized places for a growing population of smaller households who seek the amenities of urban living and some protection from the storms ahead.

This essay discusses this and nine other fundamental paradigm shifts in environmental and economic conditions that are reshaping the law and changing the way state and local governments control land use and order human settlements. They are as follows:

I. SHIFTING GROUND

Ten fundamental shifts are changing the law and its practice at the base of our legal system, changes that call for a more integrated and comprehensive response at the federal level.

The First Shift: Between 1993 and 2013 new insights regarding the safety and wisdom of development in vulnerable coastal areas have refocused the law from accommodating and controlling the rush to the shore to developing novel strategies for retreating from the sea.

The Second Shift: The *per se* taking doctrine of *Lucas* and the less-than-certain projections of sea level rise hinder the use of land use and environmental regulations, which are yielding to more flexible negotiations regarding applications to build in vulnerable places.

The Third Shift: The advent, beginning roughly between 1992 and 1993, of local environmental law is adding expansive bottom-up land use strategies to top-down environmental law: local strategies that now constitute an accepted area of practice and scholarship.

The Fourth Shift: The last two decades witnessed a surge in adopting local and state open space protection laws and strategies. These techniques are now being examined as capable of protecting and enhancing the sequestering environment, which captures and stores nearly 20% of the nation's carbon dioxide emissions.

The Fifth Shift: Roughly between 1992 and 1993, families with children predominated, creating a market for single-family, single-lot homes in suburban greenfields – the American Dream; 2013 sees a different market emerging of younger and smaller households, most of whom seek rental apartments or smaller for-sale homes in urban places, while cities learn to create sustainable neighborhoods to accommodate a new settlement pattern shaped by many American Dreams.

The Sixth Shift: Building technology and energy codes matured greatly during the last two decades making it possible for buildings,

which consume 40% of the nation's energy, to be net zero energy users, calling on government to translate technological advances into codes and to incentivize private owners to build and retrofit accordingly.

The Seventh Shift: Similar advances in district energy systems, combined heat and power, and trigeneration technologies allow multiple building owners to cooperate to produce energy on-site and share power for heating and cooling to reduce energy consumption in buildings by over 70%. Local governments are learning how to embrace and facilitate these novel land uses through zoning.

The Eighth Shift: 2012 and 2013 saw raging debates in states underlain by shale gas formations, triggering arguments about the economic, health, and environmental impacts of a seemingly more climate-friendly source of energy. As we move from coal and oil to gas, countless decisions must be made about which level of government in our legal system should regulate which aspects of this new technology.

The Ninth Shift: As the past two decades progressed, some coherence in the federal environmental legal system emerged, but climate change now demands a much clearer understanding of how an integrated federal system should work to take full advantage of local, state, and federal legal power and resources.

The Tenth Shift: During the past twenty years, sustainable development law came of age, with an increasing number of law firms, public officials, and scholars viewing environmental, land use, real estate, energy, and other related fields of law as an integrated area of practice and scholarship. This shift is consistent with the principles of sustainable development law that guided early international efforts to create jobs, livable settlements, a sound environment, and an equitable society – a unifying concept that provides the insights and strategies needed to address the nation's heightened concern over climate change.

A. *The First Shift: From Rushing to the Shore to Retreating From the Sea*³

Approximately 20 years ago, developers and home buyers were riveted on developing and living in coastal communities. Today, they realize that much of this development is in harm's way, within reach of the next Sandy or Katrina and vulnerable over time to inundation as sea levels rise. In the wake of Sandy, Katrina, and other recent catastrophes, local officials are struggling to determine the most effective land use options for their communities. As they do, one observes a gradual retreat from the sea – a retreat hastened by higher flood and wind insurance rates, expanded flood plains, higher elevations required for new development, and increasing reluctance by developers, investors, and purchasers to build, finance, and buy at the ocean's edge.

In our federal system, the primary authority to regulate land use and shape human settlements resides at the local level.⁴ Prudent planning suggests that local governments use this power to designate no-build zones where it is likely that storm surges and sea level rise will destroy or inundate newly-constructed buildings during their useful lives. Land use plans and zoning that permit the construction of homes and other buildings in areas mapped for inundation by sea level rise do just the opposite: they allow development in high-risk coastal zones to the detriment of home buyers, tenants, equity investors, mortgagees, and taxpayers who pay for public infrastructure in such areas.

This insight, however, was scarcely on the minds of regulators in 1992 when *Lucas* was decided.⁵ *Lucas*, nonetheless, is the applicable precedent and it raises a serious question: do regulations that prohibit building on fragile coastal lands destroy all economic value and thereby constitute a total taking, or does regulatory takings

3. This section is adapted from the following sources: *See generally* John R. Nolon, *Regulatory Takings and Property Rights Confront Sea Level Rise: How Do They Roll?*, 21 WIDENER L. J. 735 (2012); John R. Nolon, *Land Use and Climate Change: Lawyers Negotiating Above Regulation*, 78 BROOK. L. REV. 521 (forthcoming 2013).

4. *See* John R. Nolon, *Historical Overview of the American Land Use System: A Diagnostic Approach to Evaluating Governmental Land Use Control*, 23 PACE ENVTL. L. REV. 821, 821-22 (2006).

5. *See Lucas* at 1003.

jurisprudence harbor exceptions that validate such regulations under today's changed circumstances?

The *Lucas* Court held that a regulation that destroys all economically viable use of property is a taking unless, under the background principles of the state's law, the use that the regulation prohibits is not part of title to the property to begin with. So, for example, if the state's nuisance law would allow surrounding property owners to enjoin an owner's use of land for dangerous enterprises like brick-making, a regulation that prevents such use is not a taking. On remand, the state court in *Lucas* found that nuisance law in South Carolina at the time constituted no bar to the development proposed by the owner of the regulated lots.

The majority referred to the Court's habit of resorting to existing rules of state law to define the range of interests that qualify for protection as 'property' under the Fifth and Fourteenth Amendments: "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)."⁶

Are sea level rise, newly fierce and more frequent coastal storms, and devastating storm surges "changed circumstances"? Are recent scientific reports on and official maps of projected coastal inundation "new knowledge"? Is it possible that new information about the harm to the coastal environment and our newfound appreciation of ecosystem services would now sustain a nuisance claim against coastal development in some locations? How will the Court accommodate a fundamental change in state policy in South Carolina that bespeaks a retreat from the sea? Since *Lucas*, the state's legislature has recognized that that development has been unwisely sited too close to the sea and has deemed it in the public and private interest to protect the coastal ecosystem from this "unwise development."⁷ Because armoring coastal development with dikes, levees, floodwalls, seawalls, bulkheads, groins, and tidal barriers provides a false sense of security, South Carolina chose to severely restrict the use of hard erosion control devices to armor the beach/dune system, clearly retreating from the sea.

6. *Id.* at 1031 (citing RESTATEMENT (SECOND) OF TORTS § 827 (1965)).

7. S.C. CODE ANN. § 48-39-250(4) (2012).

Looking forward, several novel legal questions arise. Do developers with knowledge of potential future damage to proposed developments have reasonable investment-backed expectations for building in vulnerable areas? Under the public trust doctrine, does the state have some sort of enforceable future interest to prevent development in high risk zones? Do regulations that allow only the natural use of fragile ecosystems or provide only minimal use of the land consistent with projected storm damage escape *Lucas's* axe? The answers to these questions will shape how state and local regulators control coastal development. Will they be bold and adopt no-build zones, or will they be more cautious while they wait for answers to these questions to be provided?⁸

*B. The Second Shift: From Regulation to Contingency Bargaining*⁹

While we wait for regulatory takings doctrine to adjust to changed circumstances and new information, perhaps we are entering a transitional period where government will rely more on intelligent bargaining with coastal developers than on proscriptive regulations. It is doubtful that local officials will be convinced to adopt a no-build zone by their lawyer's recitation of several prospective, theoretical defenses to a total taking challenge. Even if they were willing to endure a test case, they also understand that there are practical, political, and equitable reasons to resist a total ban on development. They know that predictions of sea level rise and storm surges are uncertain; they will happen, but how fast and where is not known with certainty. These local officials also understand that local property owners acquired their properties knowing that they were zoned for housing development or other economical uses. They further understand that these owners have been paying local property taxes on their parcels, assessed at their market value as zoned. Additionally, they understand that property owners vote, have local political influence, and belong to industry groups that lobby state officials who control funding that localities need.

8. See generally, David A. Dana, *One Green America: Continuities and Discontinuities in Environmental Federalism in the United States*, 24 *FORDHAM ENVTL. L. REV.* 103, 120 (2013) (asking the question of whether there be more federal pressure and federal law that requires sensible zoning and building standards in areas near the seashore).

9. See Nolon, *supra* note 3, at 1.

Accordingly, officials may be reluctant to adopt a no-build zone; instead, they might ask their municipal attorneys if there are any non-regulatory options to limiting development in vulnerable coastal areas. Although fraught with consequences of their own, there are alternatives to using regulations to severely prevent coastal development. Communities can pursue a non-regulatory approach by inserting a sea level rise component in their local comprehensive plans that embodies recent scientific facts and projections and describes the consequences to the public and private sectors of building in vulnerable areas. This component can incorporate by reference to the latest sea level rise, storm surge, and high risk area maps issued by state and federal agencies, including FEMA.

During the development review process, the local planning commission can require developers to submit site plan drawings that show buildings and infrastructure located outside portions of the site where projected sea levels will inundate them, or where storm surges may destroy them, during their useful lives. Applicants can be required to show that they have adequate equity and debt financing, i.e., that investors will accept the risks of inundation and storm damage. They can be required to provide indemnification to the locality for any liabilities involved in approving a project in a high risk zone and to commit to removing destroyed buildings and relocating improvements required by inundation or storm damage, a commitment that must be backed by bonds or letters of credit. Should this process convince developers and their financial backers that the project is too risky to finance and build, wouldn't this non-regulatory approach simply reveal the lack of a project's economic viability rather than constitute a regulatory taking of all economic value?

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

passing phenomenon. This is the problem with regulating at a time when scientific understanding of risks is evolving and when estimates of the dates that risks will occur are uncertain.

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

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

Not only is the negotiated, non-regulatory approach less likely to be litigated or won by the developer if it is taken to court, but it is consistent with evolving norms in the land use review and approval process in a growing number of states. Developers are accustomed to providing indemnities, bonds, insurance, lines of credit, and escrow accounts. Their current experience with these mechanisms is in a much lower risk context, to be sure, but the extreme risks that

threaten coastal development call for appropriate responses. If proscriptive regulation cannot be one of them, negotiated settlements of disputes over coastal construction can be. The situation necessitates scaling up the use of familiar processes and techniques, and training lawyers and planners in the art of contingency bargaining.

*C. The Third Shift: From Top-Down Environmental Law to Bottom-up Land Use Strategies*¹⁰

Critics of any attempt to solve the problems of sea level rise and climate change at the local level have a point: this is a global matter with national implications and should be addressed through top-down national strategies, not left to the vagaries of local initiatives.¹¹ The last two decades, nonetheless, demonstrate the wisdom of enabling, encouraging, and guiding local governments to solve environmental problems at the ground level, through their delegated zoning, land use, home rule, and police power authority.¹²

National environmental policy emphasizes the central role of the federal government as the standard-setter and steward of a healthy environment. This focus on the responsibility of the national government and its various and uneven collaborations with the states all but obscured the role of local governments in environmental protection during much of the past two decades. While federal agencies have successfully reduced pollution that emanates from point sources, such as smoke stacks and water pipes, most environmental damage today is caused by nonpoint source pollution resulting from land uses that are the legal responsibility of municipal governments to regulate. Federal attempts to influence local regulatory prerogatives have been thwarted by a variety of legal, political, and practical obstacles.¹³

10. This section is adapted from John R. Nolon, *In Praise of Parochialism: The Advent of Local Environmental Law*, 26 HARV. ENVTL. L. REV. 365 (2002).

11. See generally Dana, *supra* note 8.

12. See generally Alexandra B. Klass, *Climate Change and the Convergence of Environmental and Energy Law*, 24 FORDHAM ENVTL. L. REV. 180 (2013) (arguing that states play an important role in responding to climate change and adds that traditional tools are not enough, but we ought to look to energy law to fill policy and law gaps in mitigating climate change impacts).

13. See Nolon, *supra* note 10, at 365.

Meanwhile, there has been a remarkable trend among local governments to adopt laws that protect natural resources and environmental functions. These local environmental laws take on a number of forms. They include local comprehensive plans expressing environmental values, zoning districts created to protect watershed areas, environmental standards contained in subdivision and site plan regulations, and stand-alone environmental laws adopted to protect particular natural resources such as ridgelines, wetlands, floodplains, stream banks, existing vegetative cover, and forests. The purposes of these laws are to preserve natural resources from the adverse impacts of land development and to control nonpoint source pollution. In creating these controls, local governments have used a variety of traditional and modern powers that their state legislatures have delegated to them.¹⁴

This powerful trend at the grassroots level of environmental policymaking and regulation presents an opportunity to revisit the national approach to environmental protection and to create a more integrated system that incorporates the ability of local governments to protect the public from the perils of pollution and environmental degradation.¹⁵ This has become even more evident as we learn how the shape and function of human settlements relates to mitigating, adapting to, and managing climate change. Books and articles on climate change routinely move from the top toward the bottom, seldom settling on the local level. Local governments are largely irrelevant when the topic is cap-and-trade or carbon taxation: initiatives that are desperately needed to solve the problem of a rapidly changing climate and require action at the federal or state level.

Local governments are anything but irrelevant, however, when the subject is land use and the goal is to reduce vehicle use, the source of much of the Greenhouse Gas (GHG) emissions that cap-and-trade and carbon taxes aim to limit. In fact, without understanding and utilizing the power of local governments to control land use, to engage with regional and national transportation planning, and to create energy-efficient buildings and environments, reducing vehicle

14. *Id.*

15. *Id.*

miles travelled, energy consumption, and carbon emissions will be difficult to achieve.¹⁶

The same can be said for creating resilient communities and preparing for natural disasters, particularly the flooding that caused most of the devastation when Sandy shattered neighborhoods along the east coast and Katrina flattened development in the Gulf Coast. Disaster management involves local governments, aided by FEMA maps and funding, preparing comprehensive plans for development that can withstand and recover from catastrophic events. Those plans can identify special hazard zones by incorporating revised FEMA maps and control development in those areas using a variety of traditional local land use tools. These include flood control, storm water management, wetlands and watershed protection, transfer of development rights, conservation easements, and other techniques developed over the past two decades in response to increasing threats to local environmental resources. It is hard to imagine, in fact, how the federal government could orchestrate disaster preparedness and recovery without engaging these critical local land use strategies.

*D. The Fourth Shift: From Open Space Preservation to Biological Sequestration*¹⁷

Part of the local environmental law movement of the past twenty years involved the development of a robust body of open space preservation law implemented through local regulations and the acquisition of land or development rights by state and local governments and land trusts. Open space initiatives generally protect undeveloped lands for a variety of purposes ranging from view shed protection to preserving ecosystem services. This body of law is now available to preserve and expand the natural resources that sequester carbon dioxide in ways that mitigate and adapt to the consequences of climate change in both urban and rural areas.

Biological sequestration of carbon dioxide emissions occurs within the vegetated environment: places like forests, pastures, meadows, and croplands. These landscapes naturally absorb and store carbon. According to recent EPA estimates, biological sequestration offsets

16. *See id.* at 371-72.

17. This section is adapted from John R. Nolon, *Managing Climate Change Through Biological Sequestration: Open Space Law Redux*, 31 STAN. ENVTL. L. J. 195 (2012).

approximately 18% of total domestic carbon dioxide emissions.¹⁸ Most biological sequestration is due to carbon uptake and storage by forestlands, with pastures, meadows, cropland, and urban forests contributing as well.¹⁹

Open space preservation law emerged in response to countless local perturbations: the loss of some cherished landscape feature, the gradual decline of visible open space, surface water or groundwater pollution, increased flooding, or the disappearance of valued wildlife, among others.²⁰ Under express or implied legal authority delegated by their state legislatures, local governments have adopted a variety of laws that involve open space protection or management.²¹ These include environmentally sensitive area designation; erosion and sedimentation control; standards for grading, filling, drainage, soil disturbance, and removal of vegetation; floodplains control; natural resource management; watershed, groundwater, watercourse, and wetland protection; landscaping requirements; ridgeline, steep slope, scenic resource, and shoreline regulation; stormwater management; timber harvesting regulations; and tree protection and canopy expansion programs.²²

A variety of traditional and novel land use techniques are employed to preserve and enhance these resources.²³ They include open space components of comprehensive plans, conservation district zoning, standards added to site plan and subdivision regulations, low impact development requirements, imposed conservation easements, transfer of development rights, cluster development, and density bonuses.

Land trusts are beginning to recognize the importance of carbon sequestration as they establish priorities for the acquisition of land or conservation easements. Some simply attribute a value to sequestration as worthy of consideration in deciding which lands to acquire. Others use detailed sequestration metrics in analyzing the

18. U.S. EPA, INVENTORY OF U.S. GREENHOUSE GAS EMISSIONS AND SINKS: 1990-2009, EPA 430-R-11-005 at ES-13 (2011). For a discussion on the longevity of the EPA and the assaults it has been subject to under a number of Presidential administrations.

19. See Nolon, *supra* note 17, at 197.

20. *Id.* at 202.

21. *Id.* at 201.

22. *Id.*

23. See generally Dana, *supra* note 8.

purchase of a property or the creation of an easement.²⁴ The Nature Conservancy has purchased several thousand acres as part of an initiative designed to utilize the sale of carbon offsets to make sustainable management practical.

Under New Zealand's Emissions Trading Scheme, forest landowners who can demonstrate increases in the sequestration capacity of their properties receive a carbon trading credit for each ton of carbon dioxide sequestered by these increases. These credits are tradable within the Kyoto Protocol. Participants submit maps of carbon accounting areas on their property to the Ministry of Agriculture and Forestry that demonstrate increases in forested areas on their lands. The Ministry uses a geospatial mapping system to instruct landowners how to calculate these increases. Once a landowner's submission is confirmed, the Ministry allocates trading credits to the participant's account.²⁵ This example suggests that a cap and trade program could be used to encourage local governments to protect and enhance forested areas, aided by national technology resulting in economic incentives to regulated property owners.

In the years ahead, these efforts need to be brought to scale, particularly when the objective is to achieve a goal as ambitious as climate change mitigation and adaptation. As the population grows, more food will be needed, putting pressure to convert sequestering resources such as forests, meadows, and grasslands in rural areas to farmland. It is in these places that land use law can be particularly effective in designating and protecting properties that sequester carbon. At the same time, open space policies in developing and developed places, while adding marginally to sequestration, are effective strategies to adapt to climate change in places where the population is likely to grow.²⁶

With federal and state assistance, local governments can require or encourage owners of forested lands to enhance their sequestering landscapes. Localities can also shape land development patterns through land use regulations to reduce land coverage and impervious surfaces, limit flooding, retain and add vegetation, protect community character, and prevent ground and surface water pollution. In highly developed cities; tree canopies can be increased;

24. See Nolon, *supra* note 17, at 244.

25. See *id.* at 246.

26. *Id.* at 209-10.

green infrastructure added; urban gardens promoted; and buildings oriented to reduce the heat island effect. These strategies will make cities more attractive and lively places to live, and mute the effects of the higher densities needed near transit stations to attract new residents and workers, insuring that their carbon footprints will be lighter.²⁷

*E. The Fifth Shift: From One to Many American Dreams*²⁸

Changes in demographic trends are helping reduce the demand for economic development of sequestering lands and open spaces containing valuable ecosystem services; they are also increasing demand for housing and job development in urban areas and developed suburbs. According to United States Bureau of Census estimates, the nation's population will grow to over 400 million by mid-century, an increase of nearly 90 million over the 2011 population of 312 million.²⁹ The addition of 100 million people translates into 40 million new households, whose members will travel to live, work, and shop in new buildings provided for them, consuming energy on site and en route, and emitting carbon dioxide if they travel by car. The construction and operation of new buildings, as well as the vehicle miles travelled by car for daily work, errands, and pleasure, will therefore account for a significant percentage of annual energy consumption and carbon emissions by mid-century. If this building and this travel take place in the spread-out settlement pattern

27. *Id.* at 210.

28. This section is adapted from John R. Nolon, *The Land Use Stabilization Wedge Strategy: Shifting Ground to Mitigate Climate Change*, 34 WM. & MARY ENVTL. L. & POL'Y REV. 1 (2009). Credit for naming this paradigm shift and for many of the statistics cited here is owed to Dr. Arthur C. Nelson, Director, Metropolitan Research Center, University of Utah.

29. The Census Bureau released national population projections, based on four different immigration scenarios. See *National Population Projections*, U.S. CENSUS BUREAU, available at <http://www.census.gov/population/projections/data/national/2009/2009summarytables.html> (last visited Mar. 30, 2012) (the "Low Net International Migration Series" predicted that the population would be 402,320,000 by 2043 and would be 422,554,000 by 2050); see also *Summary Tables: Low Net International Migration Series*, U.S. CENSUS BUREAU, available at <http://www.census.gov/population/projections/data/national/2009/2009lnmsSummaryTables.html> (this represents roughly a 1/3 increase in the population by the year 2043) (last visited Mar. 30, 2012).

that predominated twenty years ago, these new people will consume huge amounts of energy and emit enormous amounts of carbon.

For a variety of reasons, however, the majority of the projected 100 million new Americans will be inclined to shift ground, preferring to live in dynamic, walkable neighborhoods in urban areas. Key among these shifts is the housing preference among the growing number of older households who currently live in single-family homes on individual lots. Today there are 40 million senior citizen households; by 2040 that number will have swelled to 80 million. As these senior households age, many find single-family suburban living unsuitable and seek to move into housing in neighborhoods where services, goods, and entertainment are nearby – places where they can live independently and age in place.³⁰ Sixty percent of the seniors prefer to rent rather than buy new homes when they move, increasing the demand for rental housing, very little of which was produced over the past twenty years.

As a growing number of seniors offer their homes for sale, the supply of single-family homes available for purchase will increase, while the demand for it shrinks. Other newly forming households in the decades ahead will be composed of younger individuals and couples, mostly without children who are seeking urban neighborhoods as well and are not inclined to purchase energy-guzzling single-family homes involving long commutes to employment, entertainment, and services.³¹ Between 2010 and 2050, 70% of net gain in households will be among households without children. This imbalance in supply and demand for single-family homes means that there will be over 20 million unwanted large-lot, single-family houses on the market by 2025. This will significantly reduce the market for newly-constructed suburban and exurban single-family housing.

These demographic trends are bolstered by economic realities. Subprime mortgages, involving low down payments and flexible interest rates are a thing of the past.³² Available mortgages today require a 20% down payment, cash available for closing costs, and strong credit ratings. These changes in the mortgage market mean that households seeking to purchase housing will buy smaller homes

30. See Nolon, *supra* note 28, at 13.

31. See *id.*

32. See *id.* at 11.

or seek to rent because they lack the cash and credit needed to qualify for a loan to purchase. The cost of transportation from home to work is beginning to rival the cost of housing in many metropolitan markets for moderate- and middle-income families, further propelling households toward neighborhoods with transit or that are in closer proximity to centers of employment.

These demographic changes mean that market forces will support the movement of future populations into urban settlements and away from single-family neighborhood living. This has profound consequences for land use planning and zoning at the local level in remote locations. Shifting ground toward more climate-friendly and energy-conserving urban living is not a matter of social engineering through policy and legal change, but rather a market inevitability. As a consequence, legal strategies will reorient themselves toward creating transit-oriented developments, energy-efficient, mixed-use and compact building types, and sustainable neighborhoods.³³ Legal techniques for remediating distressed properties, developing workforce and equitable housing, and insinuating urban amenities and excellent design in redevelopment areas will be ascendant, as will methods of redeveloping countless commercial and office buildings and strips in older suburbs.

The growth of the population by 100 million, combined with the obsolescence of current buildings, means that as much as 66% of the development on the ground in 2050 will be built between now and then. This indicates that immediate changes in land use laws and settlement patterns can achieve significant results. Many urban communities are responding positively by adopting higher density, mixed-use zoning, implementing transit-oriented development plans and ordinances, and using many other techniques to accommodate these changing market forces in a way that will reduce vehicle miles travelled and per capita GHG emissions.³⁴ As further evidence of the importance of these changes to managing climate change, the Intergovernmental Panel on Climate Change (“IPCC”) is adding a chapter to its Fifth Assessment Report on Human Settlement, Infrastructure, and Spatial Planning.

33. *See id.* at 26-29.

34. *See id.* at 23-25.

*F. The Sixth Shift: From Energy Consumptive Buildings to Net Zero Performance*³⁵

As demographic and market changes attract new population to urban centers, energy consumption per household will decrease, simply because much of the development in those centers is more energy efficient than single-family homes and strip malls in spread-out suburban places.³⁶ Historically, many urban areas were developed with compact, mixed-use neighborhoods whose apartments, townhouses, two- and three-family houses, and small-lot single-family homes are well under the 2,500 square foot average nationally and, thus, consume less energy for heating and cooling.³⁷ The dramatic differences in energy consumption and carbon emissions between the single-family and the mixed-use, higher density land use pattern is due, in large part, to the size of and thermal efficiency of its housing and commercial buildings.³⁸

Residential and commercial buildings are responsible for over 70% of the electricity consumed domestically, over 40% of energy consumption, and over 35% of carbon emissions.³⁹ Because the U.S. expects over a 30% increase in population within 40 years, millions of new homes and billions of square feet of new non-residential buildings will be constructed in the next few decades.⁴⁰ By ensuring that new and renovated buildings are as energy-efficient as possible, the significant increase in energy use and carbon emissions attributable to these new households can be contained.⁴¹

New and substantially renovated buildings must receive land use approvals and comply with building and energy codes before they can be occupied.⁴² There is, therefore, a process and regulatory regime in place that can be enhanced to reduce energy use and emissions.⁴³ This system involves the enforcement by local

35. This section is adapted from John R. Nolon, *Land Use for Energy Conservation and Sustainable Development: A New Path Toward Climate Change Mitigation*, 27 J. LAND USE & ENVTL. L. 295 (2012).

36. *Id.* at 296.

37. *Id.* at 301.

38. *Id.* at 299.

39. *Id.*

40. *Id.* at 300-01.

41. *Id.* at 302.

42. *Id.* at 302-03.

43. *Id.* at 303.

governments of state-adopted energy construction codes as developers submit applications to build new buildings or to substantially renovate existing ones.⁴⁴ Using their delegated land use authority, localities in many states can enhance state-adopted energy codes, insert energy conservation standards in zoning, subdivision, and site plan regulations, and use the project review and approval process to require that energy conservation construction techniques are used.⁴⁵

Buildings and their occupants use energy in a variety of ways, principally for space heating and cooling, lighting, and water heating – uses that typically constitute about half of the building’s energy usage.⁴⁶ These end uses of energy can be reduced by legal standards that require high levels of insulation, energy efficient doors, windows, heating, cooling, and ventilation systems, and that minimize infiltration of outside air.⁴⁷ In addition, locally enforced codes and zoning laws can require or encourage passive solar design, energy efficient lighting and appliances, solar water heaters, high-reflectivity roofing materials, strategic tree and other landscape plantings, combined heat and power systems for individual buildings, and district energy systems for multiple buildings.⁴⁸

Energy consumption in buildings can be reduced by on-site renewable energy facilities, such as solar panels and wind turbines located on buildings or on site.⁴⁹ Many of these facilities are zoned out under current land use regulations, which were developed before these technologies became popular.⁵⁰ Rooftop wind turbines, for example, often exceed height restrictions in zoning codes and on-site solar panels may violate set back restrictions.⁵¹ Individual parcels in most residential neighborhoods cannot be used for small-scale solar facilities because of use restrictions.⁵² These zoning limitations are being removed or reformed in many communities, as home and

44. *Id.*

45. *Id.*

46. *Id.* at 312.

47. *Id.* at 309.

48. *Id.* at 312-17.

49. *Id.* at 329-30.

50. *Id.* at 330.

51. *Id.*

52. *Id.* at 331.

business owners and developers of new housing and commercial buildings seek to add renewable energy facilities to their properties.⁵³

These approaches can be integrated into mandatory provisions of local land use laws or they can be employed as recommended protocols during the building review and approval process itself.⁵⁴ By departmental practices, mayoral executive order, or a resolution of the city council or town board, a locality can make a commitment to energy conservation and the reduction of carbon emissions.⁵⁵ A component of the comprehensive plan can be added by amendment outlining energy conservation goals, objectives, strategies, and implementation measures.⁵⁶ This clear articulation of local policy may be enough to empower the local administrative staff and planning commission to require developers of proposed projects to submit an energy conservation plan for their building that goes beyond the standards of the energy code and moves into building design, orientation, and commissioning initiatives that have the potential to create net zero energy buildings.⁵⁷

Carbon emissions decline substantially when existing buildings are retrofitted to consume less energy.⁵⁸ Achieving energy conservation in existing compared to new buildings is more problematic, however, since the law seldom allows governments to impose regulatory requirements on already-constructed projects.⁵⁹ Many older buildings are extraordinarily inefficient with regard to their use of energy.⁶⁰ Some estimates indicate that retrofitting existing buildings by using currently available technology can reduce energy demand by over 75%.⁶¹

With existing buildings, energy retrofitting is dependent largely on incentives provided by local, state, and federal agencies that are sufficient to induce homeowners, landlords, and commercial building owners to invest in energy-saving capital projects.⁶² Most existing

53. *Id.* at 332-34.

54. *Id.* at 318.

55. *Id.*

56. *Id.*

57. *Id.*

58. *Id.* at 335.

59. *Id.* at 307-08.

60. *Id.* at 331.

61. *Id.* at 330.

62. *Id.*

subsidy programs encourage important, but relatively modest energy conservation; additional strategies are needed to realize the climate change mitigation potential that deeper retrofitting can achieve.⁶³

In the constellation of energy conservation and carbon emission reduction strategies, one of the most important actions is for state and local governments to properly enforce the energy code requirements and to adopt additional standards and incentives for achieving deep energy savings, approaching net zero energy buildings in the years ahead.⁶⁴ Federal initiatives that make funding or other incentives available for energy code enforcement, retrofitting existing buildings, and achieving energy efficiency in new structures are needed as buildings are built to house and employ the nation's growing population.⁶⁵ The advent of state-wide and regional cap and trade programs is beginning to provide funding that can be used for these purposes, all of which offset the emissions produced by the industries involved in these programs.⁶⁶

At the base of this legal system, local governments have the authority and strategies needed to significantly reduce per capita energy consumption; a partnership with state and federal governments is beginning to form and should become a central plank of the nation's energy platform in the years ahead.⁶⁷

*G. The Seventh Shift: From Remote Generation to Trigeration*⁶⁸

While as much as 70% of electricity produced nationally is used by buildings, up to 80 of that energy is wasted at the point of generation or lost during the transmission of electricity from remote sites through the electrical grid. Trigeration involves the capture of wasted energy lost in generation and its use to heat and cool buildings. The significant loss of energy in transmission lines from remote plants is prevented by placing generation systems on site

63. *Id.* at 335.

64. *Id.* at 306.

65. *Id.* at 306-07.

66. *Id.* at 307.

67. *Id.* at 334-35.

68. This section is adapted from John R. Nolon, *Land Use for Energy Conservation: A Local Strategy for Climate Change Mitigation*, 27 J. LAND USE & ENVTL. L. 295, 330-34 (2012).

where the heat generated can be captured and used for heating and cooling buildings, so called combined heat and cooling.

Zoning overlay districts can be adopted that allow for district heating and cooling systems and on-site energy generation, technologies that are now readily available but that were nonexistent when most zoning codes were adopted. These technologies are most cost-effective when used in mixed-use neighborhoods with a variety of buildings that consume significant amounts of energy, but at different times and for different purposes. Local officials are learning how to determine what types and mixes of buildings and energy uses should be incorporated into such a district and how to change land use regulations to facilitate district energy systems that involved on-site generation, combined heat and power facilities, and other technologies such as geothermal heating and cooling.

Such systems operate at a scale larger than the individual building, optimally among a large number of buildings in close proximity to one another where maximum efficiency is possible. Energy efficiencies of this sort should be a part of the neighborhood planning process and integrated into local efforts that encourage sustainability through compact, mixed/use development. Energy efficient neighborhoods can be planned, encouraging green building development, on-site generation, the use of renewable sources of power, efficient distribution systems, and combined heat and power systems shared by multiple buildings.

These new technologies are beginning to be adopted in rating systems and model codes. LEED-ND, for example, awards a credit for “District Heating and Cooling,” which a developer can earn by designing a system to meet 80% of a project’s heating and cooling consumption through district heating and cooling. ASHRAE 189.1, which operates as an enhanced energy code for large-scale residential and commercial buildings, includes a requirement that on-site renewable energy systems provide at least one percent of the electricity needed.

In higher density mixed-use neighborhoods, there is great potential for energy efficiency through the creation of a District Energy System (“DES”). A DES produces energy in the form of steam, hot water, or chilled water, which is transported through an underground closed-loop piping system to buildings connected to the district’s network. A DES can mitigate climate change even further by deriving its energy from renewable fuels such as biomass, municipal

waste, and lower carbon alternatives such as natural gas or, in some areas, wind turbines or solar arrays.

To operate most efficiently, districts should contain buildings with different energy needs, such as multi-family buildings, offices, municipal buildings, warehouses, hospitals, nursing homes, mills, and factories. When such buildings are located in reasonable proximity, the energy loads of each can complement one another (because their energy needs are varied at different times of day) and the costs of heating and cooling can be reduced. In those buildings, heat exchangers can draw the energy needed to meet their space and water heating needs, returning the water to the plant for recirculation within a closed loop system. This eliminates the need to install individual boilers in each building, which reduces capital costs. In older areas where existing furnaces, chillers, water heaters, and other cooling and water facilities are obsolete, the DES approach can cost-effectively address the need for system modernization.

A dramatic example of this technology that transcends the neighborhood scale is occurring in Sydney, Australia. The cornerstone of Sydney's new system is trigeneration that employs gas burning engines for on-site electricity generation. The engines burn either natural gas or renewable gas, thereby reducing or eliminating the amount of GHG emissions associated with providing electricity to the city. Through its Trigeneration Master Plan, the city plans to meet 70% of its energy needs by combining this local electrical generation with distributed heating and cooling. Currently 80% of Sydney's energy is provided by remote coal-fired plants, where two-thirds of the energy is lost as heat or in transmission. By reducing Sydney's dependence on coal, trigeneration will reduce Sydney's GHG emissions between 1.1 to 1.7 million metric tons a year. The capital cost of developing this plan is estimated to be \$950 million, with projected annual energy savings pegged at \$200 million.

To increase the use of district energy systems, the local land use regulatory system will need to adjust to allow and incentivize them. The facilities employed in district energy systems must be allowable uses and practices under local zoning and site plan regulations, as well as local building and energy codes. Incentives can be provided through bonus zoning provisions that provide additional development densities for developers who adopt DES technologies. Local district energy zone strategies could be greatly facilitated by state and federal

programs that provide participating building owners with tax breaks, loans and grants, and other incentives.

*H. The Eighth Shift: From Coal and Oil to Gas*⁶⁹

Electricity is produced primarily by generation plants fueled by coal and gas, which produce extensive GHGs. Since the development of new methods of hydrofracking to capture gases contained in shale formations, much of the nation has been riveted on gas drilling; a debate has erupted over its effect on climate change and its many possible impacts on the physical environment and public health. Hydrofracking dominates much of the discussion in energy law as advocates focus on the economic and environmental impacts of this relatively new technology for extracting gas stored deep in shale formations.⁷⁰ On the one hand, regulators struggle with emerging facts and evolving science as they attempt to number and measure these impacts and, on the other, they debate which level of government should regulate which aspects of this new energy technology.⁷¹

For the legal system, the challenges are two: to list and examine all of the economic, health and environmental impacts of fracking and then to decide which level of government should regulate each one.⁷² To date, states have dominated the regulation of shale gas drilling, while localities in some states have struggled to control local impacts. At the same time, the federal government has charted a modest path of regulating a few impacts of fracking that impinge on clean air and water and the protection of drinking water. In some states, the tension between state and local control is palpable. At stake are critical policy issues about who decides issues that have

69. This section is adapted from John R. Nolon & Victoria Polidoro, *Hydrofracking – Disturbances Both Geological and Political: Who Decides?*, 44 URB. LAW. 507 (2012); John R. Nolon and Steven E. Gavin, *Hydrofracking: State Preemption, Local Power, and Cooperative Governance*, 63 CASE W. RES. L. REV. (forthcoming 2013)

70. See Nolon, *supra* note 69, at 507.

71. See generally Inessa Abayev, *Hydraulic Fracturing Wastewater: Making the Case for Treating the Environmentally Condemned*, 24 FORDHAM ENVTL. L. REV. 275 (2013) (discussing “wastewater” from hydrofracking and the impact it has on the environment, while offering new solutions at the federal level to protect the environment from fracking).

72. See Nolon, *supra* note 69, at 507-08.

national, regional, and local impacts and the role of regulation in developing effective strategies for resolving such complex environmental and economic conflicts.⁷³

This tension is nowhere more evident than in New York, where state and local officials, business leaders, gas company officials, environmentalists, and the public have been locked in a fractious and escalating debate about whether and how to allow horizontal drilling for natural gas.⁷⁴ Much of the attention regarding the promise and perils of drilling for shale gas is focused on the Marcellus Shale formation, which is one of the largest shale gas formations in the United States, underlying several Mid-Atlantic states including 18,700 square miles in New York. Estimates of the number of wells that will result in this vast Marcellus region in New York alone range up to 40,000.⁷⁵

The affected public is besieged regularly by articles in the media and countless reports that either laud or vilify hydrofracking. Reports on the first earthquake in New York's recent memory were not spared from the hydrofracking debate when it was discovered that drilling was being conducted near the epicenter of the quake.⁷⁶ Localities have used their delegated zoning and police powers to ban hydrofracking, seriously limit it, or prevent it for a time by adopting moratoria on gas drilling.⁷⁷ Under zoning, gas drilling is an industrial activity and such uses, if permitted at all, are normally confined to limited portions of the community where their environmental and health impacts are regulated carefully.

Two upstate towns, Middlefield and Dryden, prohibited gas drilling by zoning it out, and were sued for doing so by petitioners who argue that local zoning power is preempted by state law in New York.⁷⁸ The towns won the first round in both instances, with lower courts holding that state legislation giving the State Department of Environmental Conservation power to regulate gas drilling did not preempt localities from using zoning to regulate traditional land use

73. *See id.* at 517-22.

74. *Id.* at 513-17.

75. *Id.* at 508-09.

76. *Id.* at 508.

77. *Id.* at 519.

78. *Id.* at 523-25.

impacts.⁷⁹ In the Middlefield case, the court spoke plainly about the intention of the state legislature, holding that it did not intend to disturb the traditional zoning power of local governments, but rather to impose uniform statewide regulation of the operation of gas drilling facilities, not their location or land use impacts.⁸⁰

Tension is evident in other Marcellus Shale states. The state legislature in Pennsylvania adopted Act 13 to make it clear that the state's power to regulate fracking preempts local land use control, only to be overturned by a Pennsylvania court that held such preemptive action invalid because it violates the basic precept that land-use restrictions designate districts in which only compatible uses are allowed and incompatible uses are excluded.⁸¹ Morgantown, West Virginia had a local law that banned fracking within one mile of its borders invalidated by a state court and then proceeded to adopt another law banning gas drilling within its city limits. Yellow Springs, Ohio, adopted a Community Bill of Rights in 2012 that bans shale gas drilling and injection wells within its borders, becoming the first municipality in the state to take such action.

These battles test our legal system's decision-making process regarding critical issues such as energy production and the protection of the environment and natural resources. If localities are preempted from regulating gas drilling and Congress and EPA do not step forward with more aggressive regulations, these issues will be decided wholly by state legislatures and state agencies. Without some method of integrating all three levels of government, the resources of the federal and local governments will not shape the outcome regarding issues of critical importance to their constituencies.⁸²

Attorneys for the involved stakeholders, in the interim, are mired down by winner-take-all advocacy in a dispute muddied by conflicting claims and data. The skills of lawyers in issue spotting, fact gathering and analysis, creating productive negotiations for the resolution of complex matters, and framing agreements need to be sharpened and engaged fully in order to influence the outcome of this

79. See *Anschutz Exploration Corp. v. Town of Dryden*, 940 N.Y.S.2d 458 (N.Y. Sup. Ct. 2012); *Cooperstown Holstein Corp. v. Town of Middlefield*, 943 N.Y.S.2d 722, 730 (N.Y. Sup. Ct. 2012).

80. See Nolon, *supra* note 69, at 524-25.

81. See *Robinson Twp. v. Pennsylvania*, 52 A.3d 463, 485 (Pa. Commonw. Ct. 2012).

82. See Nolon, *supra* note 69, at 531-32.

critical debate. The sub-optimal process being employed to decide the future of hydrofracking in the Marcellus Shale region should cause lawmakers to revisit and rethink how such critical issues are decided.⁸³

I. *The Ninth Shift: From a Fragmented to Integrated Federal System*⁸⁴

The confusion in the American legal system regarding which level of government decides environmental and land use issues transcends the current battle over regulating shale gas exploration.⁸⁵ From responding to natural disasters, managing stormwater, promoting on-site generation and renewable energy, to shaping human settlements to mitigate and adapt to climate change, local governments can play a critical role in achieving state and federal policy objectives.⁸⁶ They can attack climate change at several strategic points, using land use planning and regulation to reduce carbon dioxide emissions from buildings and personal vehicles, promoting renewable energy, enhancing the sequestering environment, and properly regulating coastal development and rebuilding.⁸⁷

Recent progress by local governments in this arena is encouraging and illustrates what can be done to harness the legal powers of cities, towns, counties, and villages to solve these problems. It also demonstrates that there is a legal system in place that can be used and expanded that is consistent with current practice, economic realities, or political sensibilities. As such, it may stand a better chance of attracting political support than strategies that impose untested burdens on previously unregulated markets. The number of local governments making meaningful progress, however, is a small fraction of the total.⁸⁸ Why is this so? What has made some aggressive and successful, while others remain on the sidelines of this

83. *Id.* at 532.

84. This section is adapted from John R. Nolon, *Katrina's Lament Reconstructing Federalism*, 23 *PACE ENVTL. L. REV.* 987 (2006) and *A NATION ON EDGE: LOSING GROUND* (John R. Nolon & Daniel B. Rodriguez eds., 2007).

85. *A NATION ON EDGE: LOSING GROUND* 25-27 (John R. Nolon & Daniel B. Rodriguez eds., 2007).

86. *See id.* at 27.

87. *See id.* at 28.

88. *See id.* at 35-39.

critical race with global warming? How can the positive examples of the few be used to encourage similar initiatives by the many?

These questions raise another: how can all three levels of government best be engaged in protecting their interests and using their legal authority and resources to engage these critical issues – Issues that affect them all? A national framework of law is called for, one that is designed and employed as the organizing force for positive change in developing a flexible and integrated approach to climate change mitigation and adaptation and to promoting sustainable development.⁸⁹ This is necessary to avoid wasteful duplication of effort, unhealthy competition among levels of government and sectors, and unnecessary opposition to needed reform.⁹⁰ Such a framework is also necessary to capture and leverage the competencies and resources of federal, state, regional, and local governments and the many stakeholders whose futures depend on our legal system to effectively address the alarming consequences of climate change.⁹¹

The importance of creating such a framework can be illustrated clearly by drawing on several of the issues discussed in this essay:

1. What level of government is responsible for listing and researching the impacts of hydrofracking and which of these impacts should be regulated at each level?
2. How do communities best prepare for and recover from natural disasters like Sandy using not only zoning and land use regulations, but stormwater management, wetlands and watershed protection, flood plain regulation, federal maps, state technical assistance, and federal funding?⁹²
3. Regarding coastal development generally, how does the local land use planning and regulatory role fit with the critical role played by state and federal agencies?⁹³

89. *See id.* at 41.

90. John R. Nolon, *Katrina's Lament Reconstructing Federalism*, 23 PACE ENVTL. L. REV. 987, 994 (2006).

91. *See id.*

92. *See* A NATION ON EDGE: LOSING GROUND, *supra* note 85, at 27-28.

93. *See id.* at 32-35.

4. In a nation struggling to reduce its dependence on imported fossil fuels and keen to promote energy conservation, how can the federal and state governments help localities encourage energy savings in residential and commercial buildings, which consume over 40% of the nation's energy?
5. How can these higher levels of government encourage localities to reform their zoning to encourage the development of district energy systems and renewable energy facilities?
6. How can local land use planning and regulation be harnessed to create human settlements that mitigate and adapt to climate change? How can federal transportation planning and local land use planning be integrated to create transit oriented development and walkable communities?
7. Given the importance of capturing carbon dioxide through biological sequestration to control GHG emissions, is there a role for the federal or state governments in helping localities protect and expand the sequestering environment?

Progress toward creating a federal framework of laws can be observed, if one looks closely enough. The Coastal Zone Management Act of 1972 created a nested hierarchy of decision-making at the federal, state, and local level regarding land use planning in coastal areas.⁹⁴ The Disaster Mitigation Act of 2000 is a federal statute that encourages states to develop disaster preparedness and recovery plans and provides incentives if local governments are involved in planning.⁹⁵ As the New York courts resolve the issue of local control over shale gas exploration, the Department of Environmental Conservation is considering a regulation that requires permit applicants to demonstrate compliance with local comprehensive plans that focus on hydrofracking. The National Flood Insurance Program requires local governments to adopt flood plain protection zoning laws to regulate development in high risk areas designated by FEMA in order to qualify local property owners

94. *See id.* at 33.

95. *See id.* at 29.

for federal flood insurance.⁹⁶ Federal transportation planning at the metropolitan area level is carried out by Metropolitan Planning Organizations, regional organizations involving local government representation that allocate federal funds to worthy projects. Through the Stormwater Management Program, EPA works with local governments that maintain separate stormwater sewer systems so that the local government controls non-point sources of pollution of surface waters, controls that are difficult for a federal agency to effect on its own.⁹⁷

Although the basic shape of a federal legal framework is somewhat visible in these initiatives, it is not strong enough to support the level of effort now needed to respond to the environmental and land use issues facing the nation. A more intentional policy of integrating the efforts of all levels of government is needed for the level of problem solving required. Instead of designing systems that respond to particular problems in the moment, we need an enduring commitment to integrated federal, state, and local problem solving. Such a commitment would, for example:

1. Lead to an Energy Conservation Zone Program where local governments receive technical assistance to identify district energy zones and where funding is provided to them and property owners to reduce energy use in those areas by up to 80%.
2. Result in the creation of a National Biological Sequestration Program that would identify the priority areas for expanding biological sequestration of carbon dioxide, assist local governments in preserving the open space resources in those areas, and perhaps create credits for participating landowners that can be sold to high emitting industries.
3. Employ the federal transportation planning process to promote not only transit oriented development around transit station areas, but also more walkable and sustainable neighborhoods in

96. *See id.* at 416.

97. *See* Nolon, *supra* note 90, at 999.

preparation for the fundamental changes in demographics that are underway.⁹⁸

4. Clearly identify the environmental and public health impacts of hydrofracking, fund research where adequate scientific information is unavailable, and be certain that each impact is effectively regulated by the appropriate governmental agency.

*J. The Tenth Shift: From Environmental Law to Sustainable Development Law*⁹⁹

The struggle to create an integrated federal legal system to deal with the issues raised by this essay illustrates that environmental law comprises much more than federal pollution control statutes and the workings of federal agencies, the central focus of environmental law teaching and practice two decades ago. Now students and lawyers must master legal competencies arising out of land use, environmental, real estate, energy, and climate change law, among others. Over the past several years, more and more law firms have announced practices in sustainable development law as a method of expressing their ability to meet the emerging needs of their clients. Most recently, they have added disaster preparedness and recovery to the suite of skills their practices offer.

Sustainable development law focuses on shaping land and economic development to have a lighter impact on the environment, including, but not limited to, climate change mitigation and adaptation. Sustainable development uses less material, avoids consuming wetlands or eroding watersheds, consumes less energy, emits less carbon dioxide (while sequestering more), lessens stormwater runoff, reduces ground and surface water pollution, and creates healthier places for living, working, and recreating.¹⁰⁰ This body of law is created mainly by state and local governments, which have the principal legal authority to regulate building construction, land use, and the conservation of natural resources at the local level where development occurs.¹⁰¹ It is guided, supported, and,

98. *See id.* at 990.

99. This section is based on JOHN R. NOLON & PATRICIA E. SALKIN, *CLIMATE CHANGE AND SUSTAINABLE DEVELOPMENT LAW IN A NUTSHELL* (2011).

100. *See id.* at 42-46.

101. *See id.* at 49-52.

sometimes, preempted by federal laws, regulations, and spending programs.¹⁰²

Policies regarding sustainable development, environmental protection, and climate change management appeared on the world stage as a single body of law and policy. In 1987, the World Commission on the Environment and Development, created by the U.N. General Assembly, issued its report entitled *Our Common Future* – sometimes referred to as the Brundtland Commission Report.¹⁰³ It noted, “There has been a growing realization in national governments and multilateral institutions that it is impossible to separate economic development issues from environmental issues; many forms of development erode the environmental resources upon which they must be based, and environmental degradation can undermine economic development.”¹⁰⁴

The Commission, nearly a quarter of a century ago, sent a clear signal: support policies that encourage the proper type of economic development in appropriate locations in order to protect the environment and ensure that development benefits all economic classes. Economic development is to be modulated both to lessen poverty and to improve the environment, and to do this with a view toward the needs of future generations.

Our Common Future followed a decade and a half of federal environmental law-making in the U.S.: top down rules and strict enforcement aimed at environmental excesses such as toxic waste and the pollution of the air and water by smoke stacks and water pipes.¹⁰⁵ The federal environmental laws adopted at this time are credited with significantly improving the quality of surface and ground water and the air.

At the same time that Congress initiated this top-down environmental law movement, a related but disconnected initiative was occurring at the state and local level. State legislatures during this era planted the seeds of sustainable development law, adopting statutes that control future land development in the interest of resource preservation. The growth management movement began in

102. *See id.*

103. *Id.* at 310-11 (excerpt from, REP. OF THE WORLD COMM’N ON ENV’T AND DEV., 1987, Annex to U.N. Doc. A/42/427 – Development & Int’l Co-operation: Environment).

104. *Id.* at 1-2.

105. *Id.* at 2, 49.

Oregon in the early 1970s with the creation of state-legislated urban growth boundaries. This gave rise to the notion that human settlements should be shaped so that they do not consume disproportionate amounts of land and resources to accommodate homes, offices, and other buildings needed by projected population growth.¹⁰⁶

Gradually, this movement merged into the smart growth campaign whose purpose is to shape human settlements to avoid the wasteful consequences of sprawl, which eats up land at a rate greatly in excess of population growth. Over the last three decades, state and local governments have adopted countless land use laws that exhibit, to greater or lesser degrees, their commitment to shaping settlements to preserve the environment and promote sustainable living.¹⁰⁷ They are working to revitalize urban centers, reconfigure older suburbs, create green buildings, and support development patterns that expand the use of transit systems.¹⁰⁸ In the last few years, there is evidence that these same governments are deliberately using smart growth tools to mitigate and adapt to climate change, including adaptation to sea level rise and tropical storms.

The connections among federal, state, and local sustainable development legal regimes are numerous, if not well understood or coordinated. Federal transportation initiatives influence where local commercial, industrial, and residential development will be served by roads and transit.¹⁰⁹ Federal housing and community development initiatives help local governments revitalize blighted areas and provide affordable housing. Federal coastal zone management initiatives enable local, state, and interstate coastal planning that influences land development and conservation laws and regulations adopted by state and local governments. Both federal and state brownfields legislation influence local plans to restore unused industrial sites to productivity.

Local efforts to protect wetlands, wildlife habitat, and surface and ground water align with and can further federal initiatives to conserve and steward these resources. Local law can protect natural resources and open space at the edge of federal parks and preserves. Federal

106. *See id.* at 81.

107. *Id.* at 82-84.

108. *Id.*

109. *See id.* at 78-80.

efforts to promote energy conservation through the use of wind turbines, solar panels, combined heat and power facilities, and district energy systems can be furthered or frustrated by local land use regulations that permit and prohibit facility location.

The connection between sustainable land development and climate change mitigation and adaptation is particularly close. How buildings are constructed, how they are arranged on the land, and how human settlement patterns are shaped are critical to our success in curbing the causes of climate change. About 85% of GHG emissions in the U.S. are carbon dioxide, much of which is caused by the buildings and land use patterns that local land use plans and regulations create, regulate, and approve.¹¹⁰ Vehicle trips and miles travelled have increased dramatically in the past three decades as development patterns have spread out, consuming land at much greater rates than the rate of population growth.¹¹¹ Today, buildings emit 35% of carbon dioxide in the U.S. Personal vehicles are responsible for 17% of total emissions.¹¹² Current undeveloped landscapes sequester 18% of carbon dioxide emissions.

CONCLUSION

The challenges of the next two decades are to piece together the international, federal, state, and local actions needed for effective problem solving, and to connect several related fields of legal study and practice. The patterns of a more coherent framework of law can be observed in the operations of each level of government and the close connections between sustainable development and climate change law. As these patterns become more evident and better understood, the prospect brightens for a robust and integrated system of international, federal, state, and local laws dedicated to sustainable development and climate change management.

110. *Id.* at 42.

111. *Id.*

112. *Id.*