

ANNALS OF THE NEW YORK ACADEMY OF SCIENCES

Issue: *New York City Panel on Climate Change 2010 Report***Chapter 5: Law and regulation****Lead authors**Edna Sussman¹ and David C. Major²¹SussmanADR LLC, Scarsdale, New York. ²Columbia University Center for Climate Systems Research, New York, New York**Contributing authors**Rachel Deming,³ Pamela R. Esterman,⁴ Adeeb Fadil,⁵ Amy Fisher, Esq., Fred Fucci,⁶ Roberta Gordon,⁷ Caroline Harris,⁸ J. Kevin Healy,⁹ Cullen Howe,¹⁰ Gail Port,¹¹ Kathy Robb,¹² Jeffrey A. Smith,¹³ and Gail Suchman¹⁴³Scarola Ellis LLP. ⁴Sive Paget & Reisel PC. ⁵Simpson Thacher & Bartlett LLP. ⁶Arnold & Porter LLP. ⁷Bryan Cave LLP.⁸GoldmanHarris LLC. ⁹Bryan Cave LLP. ¹⁰Arnold & Porter LLP. ¹¹Proskauer Rose LLP. ¹²Hunton & Williams LLP. ¹³Cravath Swaine & Moore LLP. ¹⁴Stroock Stroock & Lavan LLPAddress for correspondence: Edna Sussman, SussmanADR LLC, 20 Oak Lane, Scarsdale, NY 10583. Voice: 914-472-9406. esussman@sussmanADR.com

- 5.1 Using the law to promote adaptation
- 5.2 Land use and zoning
- 5.3 Environmental impact statements
- 5.4 Energy
- 5.5 Transportation
- 5.6 Water
- 5.7 Communications
- 5.8 Other issues: Air quality, hazardous waste, and emergency preparedness
- 5.9 Conclusions and recommendations

Introduction

This chapter examines a wide range of current environmental laws and regulations at all levels relevant to New York City to determine their applicability to climate change adaptation efforts, and also examines some basic legal frameworks that govern infrastructure, which also need to adapt (see CPL, Appendix C, for further information). Laws applicable to New York City are enacted by legislative bodies, the U.S. Congress, the New York State Legislature, and the New York City Council. Regulations, as the term is used in this chapter, are issued by governmental agencies or authorities and have the force of law and may be issued in many forms, including rules, orders, procedures, and administrative codes

(Table 5.1). The chapter discusses initiatives New York City has already undertaken and also suggests additional measures that might be useful in fostering adaptation to climate change. New laws and regulations and an examination of legal and regulatory impediments may be required that reflect the changes to the city's environmental baselines and the environment in which infrastructure is operating; however, this was beyond the scope of this work.

The chapter has nine sections in addition to this introduction. First, there is a discussion of using law to promote adaptation to climate change. This is followed by a discussion of law and regulation related to land use—a body of law and regulation that determines much of the how, where, and what of the built environment and can significantly influence the degree of vulnerability of infrastructure. Then there is an assessment of the role of environmental impact statements (EISs) at the federal, state, and local levels. Next are four sections dealing with the infrastructure sectors that are the focus of the New York City Climate Change Adaptation Task Force. These sectoral discussions generally correspond to the four working groups used by the Task Force, except that material dealing with parks is primarily in section 5.2.¹ Finally, there is a section on several other areas of law, including air quality, hazardous

Table 5.1. Examples of laws, regulations, and standards

Sector	Type	Jurisdiction	Examples	Source
Land use	Statute	Federal	National Environmental Policy Act (NEPA)	U.S. Congress
	Statute	State	NYS Environmental Quality Review Act (SEQRA)	NYS Legislature
	Regulation	State	DEC SEQRA regulations	NYS Department of Environmental Conservation
	Statute and regulation	Local	City Environmental Quality Review (CEQR)	NYC Council and Office of Environmental Coordination
	Statute	Local	NYC Zoning Resolution	NYC Council
	Statute	State	Tidal Wetlands Act	NYS Legislature
Energy	Statute	Federal	Energy Policy Act of 2005	U.S. Congress
	Statute	Federal	The Energy Conservation and Production Act	U.S. Congress
	Regulations	Federal	DOE regulations	Department of Energy
	Statute	State	NY Public Service Law	NYS Legislature
	Programs	State	Incentive programs	NYS Energy Research and Development Authority
	Regulation	State	Regulation and policy	NYS Public Service Commission
	Administration and policy	State		NY Independent System Operators
	Statute	State	Energy Conservation Construction Code	NYS Legislature
	Statute	State	Uniform Fire Prevention and Building Code	NYS Legislature
	Statute	Local	Building and Sewer Codes	NYC Council
	Standards	National	ASHRAE Standards	American Society of Heating, Refrigerating and Air-Conditioning Engineers
	Standards	International	International Code Council standards	International Code Council
Transportation	Statute	Federal	Safe, Accountable, Flexible, Efficient Transportation Equity Act	U.S. Congress
	Regulation	Federal	Regulations, Directives, and Policy Memoranda	Federal Highway Administration
	Statute	State	NYS Administrative Procedure Act, Title 17 (transportation)	NYS Legislature

Continued.

Table 5.1. Continued

Sector	Type	Jurisdiction	Examples	Source
Water	Regulation	State	Regulation and Policy, such as Policy on Large Truck Freight Movement	NYS Department of Transportation
	Statute	Local	Clean Air Taxis Act	NYC Council
	Policy	Local	Policy development	NY Metropolitan Transportation Council
	Standards	National	AASHTO standards	American Association of State Highway and Transportation Officials
	Statute	Federal	Clean Water Act	U.S. Congress
	Statute	Federal	Coastal Zone Management Act	U.S. Congress
	Statute	Federal	Safe Drinking Water Act	U.S. Congress
	Statute	State	NYS Administrative Procedure Act, Title 10 (health), chapter 3 (public water supplies)	NYS Legislature
	Regulation and standard	State	Wastewater treatment standards—individual household systems	NYS Department of Health
	Regulation	State	Surface water and groundwater quality standards	NYS Department of Environmental Conservation
Communications	Implementation and Policy	Local	Multiple programs	NYC Department of Environmental Protection
	Standards	National	EPA safe drinking water standards	U.S. Environmental Protection Agency
	Statute	Federal	Communications Act of 1934	U.S. Congress
	Regulation	Federal	Emergency Alert System	U.S. Federal Communications Commission
	Statute	State	Public Service Law	NYS Legislature
	Regulation	State	Order concerning critical facilities and telecommunications	NYS Public Service Commission
	Standards	National	NRIC best practices	Federal Communication Commission’s Network Reliability and Interoperability Councils

Note: There are thousands of relevant laws, regulations, standards, and policies; this table is only intended to illustrate the multiplicity and multijurisdictional nature of the relevant legal provisions.

waste, and emergency preparedness, that are significant in planning adaptation to climate change. (Insurance issues and the ramifications of some of the insurance programs established by law, such as the National Flood Insurance Program, are discussed in Chapter 6 of this report.) A section of Conclusions and Recommendations completes the chapter.

The intent of this chapter is to provide a broad outline of the principal areas of the law that can be explored to advance adaptation measures. A complete menu of possible revisions or an identification of all laws and regulations at the federal, state, and local levels, which might be useful to an adaptation analysis, is beyond the scope of the chapter, and indeed many of the investigations required to undertake such a comprehensive review remain to be implemented.

5.1 Using the law to promote adaptation

The focus of the chapter is on how legal avenues can foster adaptation by reducing vulnerability, increasing resilience, enabling effective preparation for disasters, and increasing capacity to respond to disasters; this section provides an overview of this approach. The analysis recognizes the need to adapt existing laws or develop new law to maintain flexibility in the future in line with the risk management perspective described in Chapter 2. Measures and laws that mitigate greenhouse gas (GHG) emissions are not included in this discussion unless they also significantly serve adaptation purposes, as many do. Many steps generally viewed as mitigation actions are also of great importance for adaptation, and the co-benefits make the adoption of such measures all the more compelling.² While immediate disaster management can to some extent be considered a separable problem from climate change, long-term adaptations to climate change can significantly reduce the challenges of disaster management.

The discussion of laws and regulations in this chapter relates to the Climate Protection Levels (CPL) workbook (Appendix C).³ CPLs are defined by the New York City Panel on Climate Change (NPCC) as climate-based, expert-determined benchmarks that are achieved through the implementation of design and performance standards with the express purpose of limiting the climate change risk exposure of critical infrastructure. CPL measures are designed to limit climate

risk exposure of critical infrastructure to socially acceptable levels.

Perhaps the most general way of stating it is best: the legal system will be involved in many phases of assessing climate protection levels. The ongoing risk dialogue among all stakeholders will include a number of participants from the legal system. Setting climate protection levels also involves applying design and performance standards to which the infrastructure is built and managed, and here again, legal activity will be woven into the process. An important perspective, however, is that while there are many promising avenues of improving adaptation through law and regulation, all of these will require significant legal and administrative effort to be implemented effectively.

The NPCC recommends several follow-on activities, such as formal reviews of existing laws that require legal attention. Some of this discussion is presented in the CPL workbook (Appendix C), which examines risks posed by coastal flooding and storm surge, inland flooding, heat waves, and extreme wind events and highlights areas where climate change may necessitate changes to existing design standards.⁴ An example of risk for which close examination is necessary is what variant of the 1-in-100 year flood could be used as a new design and performance standard. Also required are engineering-based studies, which will provide the foundation for ongoing legal activity. Finally, current policy gap assessments study ways to further ensure climate protection through closing these gaps, work which must also be informed by legal considerations.

Laws and regulations offer significant opportunities for advancing adaptation to climate change. In many instances, current laws already further that goal and require only new tailored agency guidance or requirements. Other laws and regulations are promising but require amendment to effectively promote a climate-resilient New York City.

To handle the legal aspects of climate change adaptation, the law must be flexible and responsive as science evolves and more information becomes known about the actual impacts on specific communities. Where possible, laws and regulations could be crafted to facilitate ready adjustments to unfolding realities; this will help to reduce legislative or administrative delays and facilitate the use of the Flexible Adaptation Pathways introduced in Chapter 1 and the Adaptation Assessment Guidebook

(AAG).⁵ Where that is not possible, any recommendations implemented could be reviewed and revised on a periodic basis, to address the latest scientific predictions provided by scientists, at the level of certainty determined by the decision makers.

In assessing the level of certainty necessary to trigger adaptations, if changes that permit appropriate responses to new facts are not already drafted into the law, adaptations can be significantly hindered. Accordingly, serious consideration could be given to the desirability of applying the precautionary principle as specific policy decisions are made and alternatives are considered. As the precautionary principle provides, “where threats of serious or irreversible damage to people or nature exist, lack of full scientific certainty about cause and effect” should “not be viewed as sufficient reason . . . to postpone measures to prevent the degradation of the environment or protect the health of . . . [the] citizens. Any gaps in scientific data uncovered by the examination of alternatives . . . [should] provide a guidepost for future research, but . . . [should] not prevent protective action being taken. . . .”⁶ Thus, reasonable, prudent, and feasible measures should not necessarily be deferred pending scientific narrowing of uncertainty ranges.

Laws and regulations relating to adaptation to climate change are in a state of flux at all levels of government. For example, federal law is being developed to address adaptation, and it is now an integral part of the discourse on national climate change policy. On June 26, 2009, the United States House of Representatives passed the American Clean Energy and Security Act of 2009, H.R. 2454 to, among other objectives, address climate change. It devotes significant attention to adaptation measures. Among other important steps, the bill directs that the National Oceanic and Atmospheric Administration (NOAA) develop and distribute forecasts and warnings relating to climate change and establish a National Climate Service. It distributes emission allowances to the states for building resilience to the impacts of climate change, requires that states develop a climate change adaptation plan as a condition of receiving allowances, and provides for the President to establish a natural resources climate change adaptation panel. The bill also requires the Secretary of Health and Human Services to promulgate a national strategy for preparing for and responding to the public health effects of climate change, and it creates an

International Climate Change Adaptation Program to address international adaptation issues by providing U.S. assistance to the most vulnerable developing countries for adaptation to climate change. The bill does not address the role of cities and local governments in responding to climate change or developing and enacting adaptation strategies. As large cities are responsible for the development and enforcement of many of the legal levers that foster adaptation, including zoning, energy, and building codes as well as emergency management, they have an important role to play in developing effective adaptation strategies and should have a formal role to play in any national legislation.

At present, the extent to which the current patchwork of localized initiatives will be replaced or supplemented by a more comprehensive, centralized federal approach is unclear. In addition to federal legislation, the role of the Clean Air Act in addressing climate change is under review following the Environmental Protection Agency’s endangerment finding on GHGs.⁷ A centralized overall legal structure might serve well to complement, and in some cases enable or require, local climate change adaptation measures.

Any laws and regulations that may be crafted are subject to limitations arising out of both the Federal and the New York State Constitutions. At the federal level, the Supremacy Clause of the United States Constitution provides that the laws of the United States are “the supreme law of the land,” the “laws of any state to the contrary notwithstanding.”⁸ Any state or local law that conflicts with, or attempts to regulate an area reserved to, federal law will be preempted. Moreover, any attempt at regulation ought to consider the Fifth Amendment, which prohibits the taking of private property for public use without just compensation.⁹ At the state level, consideration may be appropriate as to whether proposed legislation falls within the home rule powers of New York City under Article IX of the State Constitution¹⁰ and the Municipal Home Rule Law,¹¹ or is otherwise preempted by state law. Any New York City laws and regulations intended to address adaptation to climate change will need to be carefully drafted to survive constitutional challenges, both on the state and the federal level.¹²

There is, however, considerable latitude in the constitutional framework to allow local action. New York City has local control over land use,

zoning, building codes, emergency management, and other legal avenues that could be employed to foster adaptation. The New York City Mayor's Office of Long-Term Planning and Sustainability, with its established relationships with multiple stakeholders, is positioned to explore and foster the implementation of many adaptation solutions based on law and regulation.

5.2. Land use and zoning

Because land use decision making in the United States is largely decentralized, New York City's control over land use within its borders can be exercised with close attention to the likely local impacts of climate change. Because of the City's general control over land use within its borders, and because this volume is a report about the City, this chapter emphasizes law and regulation within the City's control but it should be noted that laws at the state and federal levels must also play a significant role in adaptation. Moreover, although zoning and other land use regulations may generally affect future rather than current uses and so may not have as immediate an impact as other measures, the length of time in which climate change will take place means that zoning and land use regulations will affect an increasing proportion of land use.

An important exception to the City's control of land use issues within its borders is the State's authority to regulate land use within tidal wetlands and their adjacent areas. The New York State Department of Environmental Conservation has authority over modifications to land or structures in this area, which can extend as much as 150 feet inward from mean high water. Many such modifications require discretionary permits. The anticipated effects of climate change, including adaptation measures to address the vulnerability of infrastructure, will likely affect the volume and type of such permit applications. While a detailed exploration of these State regulations is beyond the scope of this chapter, these provisions and the effects they may have upon adaptation efforts should also be evaluated.

Land use planning is critical to the achievement of adaptation goals, and it is a major vehicle for improving resilience. Sea level rise may cause the permanent loss of land or otherwise impact (through storm surge and salt water intrusion, for example) important portions of New York City's land mass,

requiring planning as to what, where, when, and how development could occur. Flooding is likely to increase with the expected increase in intense precipitation events; land use planning and other interventions can lessen the impact of such events. Appropriate land use measures can blunt the impacts of warmer weather resulting from climate change, and can soften increases in demand for energy in the hotter summer months ahead. Substantial interventions, such as the creation of defensive infrastructure, would likely require land use planning and review.

Zoning, a principal method of regulating land use, determines the types of uses permitted in different districts and the relationships among the different districts. It sets the parameters for the sizes and shapes of buildings, the densities of the city's varied neighborhoods, and the streetscape. The process of land use planning and the development of the regulations contained in New York City's Zoning Resolution¹³ can be powerful tools in adaptation. Adapting to new conditions and policies is an integral part of planning. "As time passes, land uses change and zoning policy accommodates, anticipates, and guides those changes. . . Zoning is never final; it is renewed constantly in response to new ideas—and to new challenges."¹⁴ Adaptation to climate change is such a new challenge.

New York City's Zoning Resolution categorizes land in the city into one of three general districts: residential, commercial and manufacturing, and numerous subdistricts and Special Districts. The Zoning Resolution regulates, within each district, the bulk of structures allowed on a lot, the specific uses permitted on the lot, parking requirements, and signage allowed, among other things.¹⁵

Increased temperature and heat waves

Climate change is expected to produce an increase in annual temperatures and extreme temperature events, such as heat waves. These could cause an increase in peak electricity usage and resulting power outages and potential disruption of electrical service. Thermal maps and other data regarding the heat generated in different neighborhoods and energy usage by different types of facilities can provide vital information, not only to the utilities that plan and maintain energy infrastructure, but also to land use planners. Using this information, zoning

regulations or other measures can be explored either on a targeted neighborhood or on a citywide basis to reduce air temperature and energy demand, and to reduce the likelihood of power outages. These measures can increase system resilience and help to adapt to climate change.

Zoning regulations and other measures could help to reduce the temperature in a neighborhood. Streets are the most space efficient and one of the most cost-effective measures for reducing the urban heat island effect. Street tree planting requirements, which existed in certain residential districts and were extended to all zoning districts in 2008, require new developments and significant enlargements to plant street trees along their frontage. Neighborhoods that have very high heat quotients could be targeted for measures proven to reduce urban heat island effect, such as green and cool roofs (the latter of which is already required under new construction codes), green walls, vegetated open space, high-albedo surfaces, and enhanced energy efficiency to reduce heat exhaust from climate control, in addition to satisfying applicable building code requirements relating to energy efficiency and reduction of GHG emissions.^{16,17} Co-benefits can be derived from some of these measures, including increased use of insulating green roofs, which provide advantages for stormwater management, increase energy efficiency and reduce the heat island effect, which, in turn, enhances the reduction of energy demand. Those exploring these types of zoning provisions would need to consider how contributions of a given measure to heat island reduction could be assessed and verified for the purposes of administering them. It should also be noted that, while such measures are beyond the scope of this chapter, other non-zoning incentives may also be used to promote these types of features within areas with high heat quotients.

Changes in the zoning regulations also can increase energy supply and reduce the likelihood of power outages, another instance of co-benefits, in which a policy measure can help both mitigation of carbon emissions and climate change adaptation. The Zoning Resolution currently limits the ability to install power substations and renewable energy resources, both of which would contribute to minimizing the number and scope of power outages. The Zoning Resolution allows power substations on an as-of-right basis only in commercial and manufacturing districts. They are allowed in residential

districts only with a special permit.¹⁸ The special permit process is discretionary in nature; it formally involves the Community Board, Borough Presidents, and City Council. In this regard, an approach that targets the “heat reduction districts” on a citywide analysis, if feasible, may be more appealing than a site-by-site approach in providing information to local decision makers that can be integrated into their decisions as to whether to issue special use permits in residential districts.

Modifications of the Zoning Resolution could foster the installation of alternative renewable energy resources, which would relieve the stress on the electricity grid that will be caused by the predicted climate change–related higher temperatures. Amending the Zoning Resolution to allow for the installation of solar energy panels, small wind turbines, and other innovative renewable energy and energy-saving mechanisms on the roof, above the maximum permitted height of a building or in the rear yard, while complying with safety and fire standards, would facilitate their installation.¹⁹ The supplemental power provided by these renewable energy resources might help avert a power outage or minimize its scope from a building or neighborhood perspective.

Precipitation, flooding, and stormwater management

Precipitation, flooding, and stormwater management are problems that demand correct and periodically updated information, including flood hazard and topographical maps. These could be based on future predictions and not just historical data regarding areas vulnerable to flood hazard and sea level rise. This regularly updated information is essential to guide the planners’ decisions regarding the appropriate zoning districts and regulations to reduce flooding and mitigate the impacts.²⁰

As part of the implementation of PlaNYC, New York City released the PlaNYC 2008 Sustainable Stormwater Management Plan (SSMP),²¹ a comprehensive study of stormwater management. Stormwater management is generally regulated by the City’s sewer code. However, to help reduce flooding and decrease the incidence of combined sewer overflow events and related pollution, provisions that promote or facilitate on-site stormwater management could be incorporated throughout

the Zoning Resolution. Increasingly, the Zoning Resolution recognizes the importance of vegetated and pervious surfaces where it is feasible to assist in stormwater management.²²

Changes to the Zoning Resolution could be explored to increase the percentage of open space on a lot that is required to contain vegetated surfaces or surfaces composed of pervious materials; green roofs and green walls can be encouraged by allowing greater flexibility for green roofs to qualify as open space, or by allowing more flexibility in the building envelope to allow the space required to accommodate green roofs and green walls. Recent amendments to the text of the Zoning Resolution upgraded design standards applicable to yards, plazas, esplanades, and tree plantings to further encourage²³ plantings and permeable surfaces. Extension of similar planting standards to other required “open space” can be explored.

The Zoning Resolution could provide additional flexibility for buildings in flood-prone areas to provide “freeboard” (additional elevation of the finished floor level above the FEMA Base Flood Elevation-BFE). Currently, for buildings in flood zones within most districts, the base plane from which building heights are measured is established at the FEMA BFE. Buildings providing freeboard can earn discounts on their flood insurance; however, they are subject to the same zoning height limits as buildings that do not. Allowing additional height commensurate with the freeboard provided would eliminate this disincentive for improved flood resistance.

Regardless of the amount of Floor Area allowed, consideration could be given to having the Zoning Resolution restrict the use of basement and ground floor space, and to addressing the location of mechanical and safety equipment in flood prone districts. Emergency generators could be required to be located above flood hazard levels. The Zoning Resolution could selectively bar certain uses of vulnerable populations (such as nursing homes) from these floors. It could require on-site evacuation plans and equipment. Although these appear to be building code issues, the Zoning Resolution could be amended if these requirements displace other uses that must be located on certain floors of the building, cause the height of a building to be increased above an applicable limit, or result in a loss of Floor Area.

Sea level rise and flooding

There are several substantial initiatives under way in New York State relating to sea level rise in addition to New York City’s efforts. The New York State Energy Research and Development Authority (NYSERDA) has sponsored the ClimAID study, a statewide assessment of adaptation potential, including coastal adaptation measures for sea level rise and storm surge. A New York State Sea Level Rise Task Force has been created by act of the New York State Legislature²⁴ to protect New York’s coastal ecosystems and natural habitats and increase coastal community resilience in the face of sea level rise. Good planning and cost-effective steps taken now as new development takes place or properties are retrofitted with regard to climate change predictions can prevent significant losses in the future.²⁵ Effective stormwater management is vital, and land use and building code regulations that protect property and life can be established. To the extent that such regulations restrict uses below the design flood elevation, applicable height limitations, if they exist, can be increased.

The Federal Coastal Zone Management Act²⁶ calls for state implementation of coastal zone management plans and provides the backbone for state and local planning and regulatory action in coastal areas. The 1990 amendments explicitly reference potential sea level rise as a factor that should be “anticipated and addressed” in the state plans prepared.²⁷ In New York State, the Department of State oversees the plan and implements it by means of the Local Waterfront Revitalization Program pursuant to which New York City has authority to prepare its own plan.²⁸ In New York City, the Department of City Planning is responsible for this effort and is currently in the process of reviewing and revising the City’s Comprehensive Waterfront Plan and its Local Waterfront Revitalization Program. These plans could be revised with an eye toward the possibility of climate change-related coastal flooding.

The prospect of rising sea levels has brought about a national discussion as to what coastal developments should be permitted and how they should be built. The basic choices can be summed up in the following words: “armor, elevate, or retreat.”²⁹ These options can be applied individually or in combination, and decisions about these approaches should carefully consider the context of the area

and the consequences of alternative courses of action. Increased intensity or density of development increases the number of people that are located in a flood-prone area. This may lead to increased flooding impacts as well as increased complexity in responding to an emergency. However, replacing older, non-flood-resistant construction with newer, flood-resistant construction, even at higher densities, and potentially in conjunction with shoreline protection measures, can improve overall resilience. In addition, the replacement or relocation of existing fixed infrastructure and established communities may be challenging or infeasible. The risks posed by climate change do not necessarily dictate that the city should retreat from highly populated and developed areas or avoid all development in areas where flood risks exist. However, approaches to land use regulation in the future should consider a range of options for managing these risks, such as establishing or increasing buffer areas between flood-prone waterfront and new development, as well as considering whether and how new development could improve the area's resilience to flooding events. In areas of greatest risk and vulnerability to sea level rise, stricter restrictions on development or permitted uses could be considered.³⁰ While perhaps not widely feasible in New York City, zoning and land use policies can be changed to provide for a systematic retreat from vulnerable areas to allow for migration of beaches and the creation of replacement natural wetlands in coastal areas that are not already built up.³¹

Finally, while not part of zoning regulation, planners have other land use measures at their disposal. While again perhaps feasible only in a limited number, if any, of locations in New York City, rolling easements have been enacted in a few jurisdictions that prevent property owners from holding back the sea but otherwise do not alter what they can do with the property; as the sea advances, the easement automatically rolls landward thus permitting the creation of new wetlands and preserving public access to the shore. The private owner can develop and use the land as long as it is above sea level and can plan accordingly.³² Whether such easements must be paid for or belong to the government as part of the public trust is an open issue.

The coastal development permit program, run by the New York State Department of Environmental Conservation (DEC), in concert with the

NYC Department of Building guidelines, regulates construction procedures and other activities that may contribute to increased coastal erosion. Permits are a traditional mechanism for regulating all aspects of project development from planning and siting through operation and maintenance—construction, structural modification, wastewater discharges into coastal areas, floodplains, wetlands, and other environmentally sensitive areas. Adjusting permit criteria to reflect anticipated climate change impacts could significantly decrease vulnerability.

5.3 Environmental impact statements

The National Environmental Policy Act (NEPA),³³ the New York State Environmental Quality Review Act (SEQRA),³⁴ and the City Environmental Quality Review (CEQR)³⁵ (Fig. 5.1) are laws that could address climate change adaptation across sectors at the federal, state, and city levels. NEPA requires the preparation of an EIS for “major Federal actions significantly affecting the quality of the human environment,” and the EISs must address not only direct effects, but also indirect effects that are reasonably foreseeable. Many states, including New York with SEQRA, have enacted “little NEPAs” creating similar requirements for many governmental actions on the state and local levels. New York City developed its own additional procedural requirements with CEQR.

SEQRA, the regulations adopted under SEQRA by DEC (the “DEC Regulations”),³⁶ and the CEQR requirements provide a potential framework for planning for adaptation to the problems of climate change. The basic legal structure for utilization of such laws and regulations for that purpose is already in place. However, the state and the city could include in climate change planning documents descriptions of the analyses expected in connection with adaptation to climate change, and provide guidance on how such analyses could be conducted. The development of such guidance will require focused, and perhaps difficult, legal, administrative, and technical efforts as well as climate change projections detailed enough for site specific analysis.

SEQRA, the DEC Regulations, and CEQR currently require that state and city agencies carefully examine the potentially significant adverse environmental impacts of their proposed actions. Where SEQRA applies, impacts subject to review may



Figure 5.1. The New York City Environmental Quality Review Technical Manual (A Guidance Document).

include not only the direct and indirect effects that the actions proposed may have on the environment, but also the effects that the *environment* may have upon the *projects*. In certain instances, for example, DEC and involved city agencies require the examination of noise and air pollution emitted not only from the project under review, but also from pre-existing sources that may affect a project. Thus, the opportunity exists under current law to assure that climate change adaptation issues relating not only to the effects of proposed actions, but also upon proposed actions (i.e., impacts of climate change on a project) are factored into the environmental review process. Injecting these considerations into governmental decision making at an earlier time may also serve to further the purposes of environmental review statutes and regulations. This element of SEQRA could well be imitated in other jurisdictions.

New York State Environmental Quality Review Act

Under SEQRA, an environmental assessment is prepared to determine whether a proposed action (either alone or in combination with related actions)

may have significant short-term or long-term adverse impacts on the environment. If, as a result of the initial assessment, one or more potentially significant environmental impacts are identified, an EIS is prepared to examine all potentially significant impacts, consider alternatives that could avoid or minimize those impacts identified as significant, and discuss measures that could be implemented to mitigate them. Upon completion of the EIS and prior to taking the action under consideration, the agency issues findings under SEQRA certifying that the requirements of the law have been satisfied, and that the action will, among other things, include measures to mitigate identified environmental impacts to the maximum extent practicable.

Climate change adaptation issues fit into the SEQRA framework. The identification of impacts that climate change may have on a project and the consideration of alternatives and measures to mitigate such impacts could create a vehicle for assessing adaptation needs and enable more informed adaptation planning. Accordingly, there appears to be no necessity for amending the existing environmental review laws or regulations to address, in appropriate cases, adaptation to climate change.³⁷

Assessment documents to address adaptation

Relevant agencies could usefully issue planning and guidance documents to assure that the analyses prepared under SEQRA effectively align governmental actions and public and private projects with the new realities of climate change. DEC is currently revising various SEQRA-related documents, and a revised Environmental Assessment Form (EAF) has been released for comment to a group of stakeholders.³⁸ DEC has also recently finalized a new technical guidance document to assist project sponsors in calculating GHG emissions in EISs where DEC has permitting authority,³⁹ and the City is working on the issue as well. Other states, including California, Massachusetts and Washington have also developed such additional planning tools related to climate change, although the work completed to date has focused on mitigation rather than adaptation.⁴⁰

The EAF could be further revised to explore adaptation issues. For example, the queries in the current draft of the revised EAF issued by DEC seek information about whether the project is in a floodway, a 100-year flood plain, a 500-year flood plain, or within a designated Coastal Erosion Hazard Area.⁴¹ As new policies and standards related to climate change adaptation are developed, these inquiries should be expanded to include questions relevant to updated regulations. For example, consideration could be given to including such inquiries as whether the project is subject to standards regarding adaptation, anticipated increases in mean annual and extreme temperatures, increases in precipitation and extreme precipitation events, and sea level rise. It can also include other elements such as questions as to whether the site is complying with standards to prevent the leaching of hazardous materials in the event of flooding, to require incorporation of water conservation elements or measures to reduce stormwater runoff in the design.⁴²

The coastal assessment form

For properties on the coast, an expanded coastal assessment form⁴³ could be developed. Such a coastal assessment form could further explore not only the effect of the project on the environment, but the effect of the environment on the project, and determine consistency with the state's coastal policies,⁴⁴ which, *inter alia*, seek to "minimize damage to . . . property from flooding and erosion, including improper location of new land development." The new

form could require an analysis of the project based on specified updated climate change predictions. It could ask such questions as whether any measures were being taken to render the project more robust to meet potential rising sea levels, and whether any steps were being taken in the project design to facilitate and lessen the potential cost of later retrofits to prevent damage from such rising sea levels. The form could also ask whether the project siting or design can be modified to lessen the impact of such rising sea levels.

Revising the technical guidance

The City and/or DEC could also issue technical guidance that explicitly identifies as a criterion for conducting environmental reviews, "climate change impacts upon the proposed project or action under consideration," sets forth a protocol for analyzing such impacts, and includes a description of reasonable measures to be considered to avoid or mitigate these impacts. In addition, the goal, and it is a challenging one, is to have guidance that is updated periodically to revise the analysis parameters and climate change scenarios in light of new information related to the effects of climate change. DEC could revise its technical guidance addressing climate impacts under SEQRA to incorporate impacts on a project, a topic currently excluded from that document. The CEQR Technical Manual could be revised to include a similar consideration.

Adoption of an official adaptation plan

One of the criteria of significance under SEQRA relates to the conformity of an action to an officially adopted plan of a community. It could therefore be useful for the City to include in any climate change adaptation plans the considerations it deems important in the context of planning climate change. Specific guidance could also be prepared and incorporated into the CEQR Technical Manual with respect to the analyses required to address such issues. The EAF could further be revised to include a question regarding consistency of the proposed action with the City's (or other locally adopted) climate change adaptation plan.

5.4 Energy

Climate change is expected to affect energy infrastructure in many significant ways. Concerns with

clear legal implications include sustained higher summer temperatures and extended heat waves, permanent sea level rise, and increased severity of rain and wind storms. In 2008, in response to the many concerns about energy in New York, Governor David A. Paterson established a State Energy Planning Board to consider New York's energy needs. The Board released a draft Energy Plan in August 2009.⁴⁵ The draft plan assumes as a planning goal that New York State will meet 45% of its electricity needs through improved energy efficiency and clean renewable energy by 2015.

However, complicated regulatory and market frameworks impede easy reform. Numerous stakeholders, including federal, state, and local regulators (many with overlapping jurisdiction), and private companies are involved in New York City energy issues. Each of the regulatory stakeholders has considerable discretion by statute or regulation, and limited new legislation is required to provide requisite regulatory authority to effectuate these modifications. Most of the regulatory bodies conduct public hearings prior to determining policy. New York City could use these sessions to ensure that climate change adaptation is appropriately considered.

Development of new power generation resources⁴⁶

Currently, it is difficult for power developers that want to replace old, inefficient facilities to rely solely on the New York Independent System Operator (NYISO) power markets as a revenue source. In February 2009, the New York State Public Service Commission (PSC) adopted guidelines (Regulated Reliability Guidelines)⁴⁷ establishing a process to approve nonmarket (i.e., regulated) projects to facilitate development of new resources. The Regulated Reliability Guidelines provide flexibility to the PSC to consider numerous factors, not limited to price, in determining the most advantageous projects. This could provide additional efficient and flexible generating resources to address climate-related increases in electric use.

Although these regulations appear well designed to address the need for "peaking" resources or other adaptive resources *when* they are determined to be required, NYISO and the New York State Reliability Council (NYSRC) have determined that no such resources are currently required. NYISO and NYSRC

forecasts do not specifically address climate change. However, the PSC is about to develop a long-range electricity infrastructure plan based on the forthcoming report of the State Energy Planning Board. Referred to as "Initiative III," the planning process will solicit public comment. Any planning for the development of new power generation could include a review of whether mechanisms for assuring market revenue predictability are required to create the necessary economic incentive to make such development feasible.

Development and siting of distributed generation and demand response resources

Small, flexible generation resources (including solar or rooftop wind turbines) distributed near load centers, such as hospitals, can be effective to provide emergency power or reduce peak demand on the grid. In addition, these resources can be used to provide "baseload" power for certain operations, mitigating the severity of localized weather-related electric outages, for example, when a lightning strike hits a transformer on the distribution system. Further, because "distributed generation" resources are co-located with the power user, they increase efficiency by reducing the loss of electricity through transmission from a distant power source. Efficient use of electricity will help reduce the need for additional generation resources to address climate change.

Programs that encourage installation of these "distributed generation" resources are already in place through NYSEERDA, but development can be further encouraged through the New York City Construction Codes⁴⁸ or, on the state level, through the Public Health Law. A particularly positive development in New York has been the amendment of "net metering" regulations by the PSC in August 2008,⁴⁹ which further expand and clarify the circumstances in which a customer can be given credit for electricity generated by a distributed generation resource against electricity charges otherwise due.

With recent improvements in technology, distributed *renewable* resources are particularly valuable for modest electricity needs. For example, New York City now powers many of its parking meters with batteries recharged by solar photovoltaic arrays on the meter itself. New technology for very small distributed wind turbines has been deployed in various settings, such as parking lots or on

buildings, to generate power for lighting or other building systems.⁵⁰ Dispersed sources of electrical power can be highly adaptive, and solar electricity generation is in large part congruent with times of peak demand.

Another alternative to building new generation is to reduce overall electric demand notwithstanding increasing temperatures and more frequent heat waves. The NYISO conducts a number of programs that enable power consumers (“load”) to be compensated for agreeing in advance to be curtailed under certain circumstances.⁵¹ On August 2, 2006, when record peak usage was reached in New York, demand response programs enabled reduction of peak load by 1000 MW (2.9%). The PSC currently has an open docket for consideration of energy efficiency programs⁵² and has increased the system benefits charge to ratepayers to permit incentives for installation of time-of-use thermostats and other equipment in return for a consumer’s agreement to participate in the NYISO demand curtailment programs. New York City has participated extensively in development of these energy efficiency programs and could continue to encourage their expansion to reduce energy demand as an adaptation measure. It might be appropriate for the PSC to move quickly to approve these programs and ensure that funds are directed to programs that maximize energy efficiency, such as those that target multi-family buildings or densely populated areas.

The transmission/distribution system as a “smart grid”

For the purposes of addressing adaptation concerns, the grid could be upgraded to include technology and equipment that can be monitored for potential outage problems, such as voltage fluctuation, and can point immediately to damaged equipment. Such a system would also allow “peak shaving” (reducing the need for incremental reliability resources), because it will more precisely indicate power flows and load requirements. North American Electric Reliability Corporation (NERC) and NYSRC reliability standards require certain grid upgrades and the Public Service Law permits rate-based recovery to investor-owned utilities (IOUs) making the upgrades. New York City could advocate for consideration of adaptation concerns with the PSC, the Federal Energy Regulatory Commission (FERC),

and NYSRC to encourage smart grid upgrades as well as any enabling laws or regulations that may be necessary.

Greening the building infrastructure

New York City has approximately 950,000 buildings and 5.2 billion square feet of floor space.⁵³ Buildings offer significant and unique opportunities for adaptation measures that have the co-benefits of reducing GHGs by helping to make the system more resilient while diminishing the projected demands on energy and water resources from climate change. Legal requirements and incentives to foster green building development are increasingly being enacted in New York City, New York State, and throughout the country.

Green buildings, as they are commonly known, are high-performance buildings that (1) increase the efficiency with which buildings use energy, water, and materials, and (2) reduce building impacts on human health and the environment through better siting, design, construction, operation, maintenance, and removal. The benefits of improving building performance can be achieved with actual cost savings or in some cases at minimal additional cost, even on a first-cost basis and certainly on a life-cycle basis.⁵⁴ Thus, green buildings are a crucial sector to address in fostering adaptation measures.⁵⁵ In New York City, the New York City Building Code is the basic governing regulation, but other provisions may be applicable, including the New York State Energy Conservation Construction Code, the Multiple Dwelling Law and Housing Maintenance Code, and Fire Department requirements.⁵⁶ Greener building can be achieved through amending these codes.

The development and enforcement of energy codes is a shared responsibility of state and local government. In 2002, New York State adopted a new Energy Conservation Construction Code as required by the U.S. Department of Energy (DOE), which was updated in 2007. In July 2007, New York City went beyond the State Energy Code and adopted the International Building Code and related Codes developed by the International Code Council.⁵⁷ An important aspect of that enactment is a requirement that the Building Code be updated every three years. At the request of the City, the New York City Chapter of the U.S. Green Building council convened a Green Codes Task Force to make recommendations

for amending the building and energy codes to meet today's needs. It is anticipated that these recommendations will serve to significantly address climate change challenges through provisions for design and construction both for stormwater management and for reducing energy demand.

New York City has for some time required green construction for public buildings.⁵⁸ Now, in addition to revising the codes, the Mayor proposed and the City Council enacted landmark legislation with respect to existing buildings, which requires energy audits and cost-effective energy efficiency action every 10 years on buildings of 50,000 gross square feet or more and requires reporting on energy and water usage ("benchmarking") annually for public dissemination. Another bill requires buildings of over 50,000 square feet to upgrade their lighting to meet new energy code standards by 2025.⁵⁹ As lighting in New York City accounts for approximately 20% of the energy use in buildings, this could be a significant driver for energy demand reduction. Additional New York City legislation to green New York City's privately owned building stock is under consideration.⁶⁰

5.5 Transportation

Transportation systems are at risk from climate change, which may lead to a wide variety of operational delays and disruptions. Responsibility for transportation infrastructure is decentralized and is shared not only by various levels of government (such as the Metropolitan Transportation Authority), but also with the private sector. Planning and investment decisions for publicly owned land transportation infrastructure are made within the framework and requirements defined by the planning provisions contained in legislation codified in Title 23, U.S.C. This was most recently amended in August 2005 by the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users. State departments of transportation and metropolitan planning organizations (MPOs), working in coordination with local governments, have lead responsibilities for planning transportation. New York City's MPO is the New York Metropolitan Transportation Council (NYMTC), which includes the New York City Transportation Coordinating Committees (TCC), the Mid-Hudson South TCC, and the Nassau/Suffolk TCC. NYMTC's area includes the five

boroughs as well as Nassau, Suffolk, Westchester, Rockland, and Putnam Counties. Privately owned transportation is governed by relevant zoning provisions and governing codes and regulations.

Coordinated planning

With this diffuse responsibility for transportation, legal mandates can prove useful to motivate the necessary cooperation among the various responsible parties to meet adaptation challenges. The Transportation Research Board (TRB) in its comprehensive 2008 report⁶¹ recommended that federal planning regulations should require that climate change be included as a factor in the development of public-sector, long-range transportation plans and that regulation eliminate any perception that such plans should be limited to a 20- to 30-year outlook. Further, the TRB recommended that regulations should require collaboration in plan development with agencies responsible for land use, environmental protection, and natural resource management to foster more integrated transportation and land use decision making. Thus, legislative direction at the federal level could go far toward fostering adaptation solutions oriented toward transportation.

Smart growth

New York City can be said to be a model of smart growth with a geographically concentrated population and residents generally living near mass transit. Many suburbs of New York City are now turning to address the question of smart growth in their planning efforts, which can have positive effects for the city. Smart growth reduces air pollution for the entire metropolitan area and reduces additional stress on the city's roadways by reducing vehicular traffic; it also helps to reduce the loss of green fields and so increases water infiltration. Thus, smart growth has clear attractions for New York and the region. While some of New York City's transit facilities are located in areas that may be vulnerable to flood events, this transit infrastructure may be prohibitively expensive to replace at new locations. Therefore, adaptation strategies should be considered that protect existing transportation infrastructure and facilitate smart growth in the areas served by it. Legislation necessary to provide funding for improvements and expansions of mass transit options could be explored. California recently enacted SB 375,

commonly referred to as the “climate change smart growth bill.”⁶² This legislation creates a new regional planning document called a “sustainable communities strategy,” a blueprint for regional transportation infrastructure and development. This legislation could be reviewed to determine if any elements could usefully be added to the City’s existing initiatives.

Specific design requirements

Transportation infrastructure design is governed by various federal statutes and individual state legislative measures. These, including New York State’s, are generally based on standards issued by the American Association of State Highway and Transportation Officials (AASHTO), a national nonprofit, nonpartisan association, which represents all five transportation modes: air, highways, public transportation, rail, and water. Those standards can be amended to meet the challenges of climate change. For example, standards for flood protection of transportation infrastructure could be adapted to reflect projected increases in flood risks. Use of alternate materials that will better withstand the impacts of climate change could be reviewed. Inspection protocols required by law, such as the Federal Highway Administration requirements for inspection for bridge scour, could be amended to require such inspections as are determined to be necessary to assure safety in the face of projected climate change impacts.

The transportation system also affords significant opportunities for stormwater management. Roads and sidewalks comprise approximately 27% of the city’s land area and approximately 34% of its impervious surfaces. The SSMP⁶³ highlights some of the steps that can be taken to reduce stormwater runoff through incorporating source control into roadway and sidewalk reconstruction projects, green streets, highway swales, and greener parking lots. These can be incorporated into DOT standards.

5.6 Water

For New York City, climate change impacts on water supply and quality may include damage and destruction of infrastructure (corrosion and destruction of pipes, underground transportation systems, transmission lines); an overload of sewer systems; intrusion of seawater into freshwater sources; in-

creased polluted stormwater runoff discharged untreated into water bodies; a potential increase in waterborne diseases; damage to ecosystems; coastal erosion, flooding, and destruction; and decreased efficiency of power plants.

A principal regulatory statute of the water sector is the federal Clean Water Act (CWA).⁶⁴ The CWA takes a “cooperative federalism” approach with states and localities toward the regulation of water quality. The CWA focuses on point source pollutants. As originally contemplated under the CWA, these programs have now been transferred to 46 of the 50 states for implementation. There are many other statutes at the federal level that regulate water directly or indirectly: the Coastal Zone Management Act (CZMA),⁶⁵ the Endangered Species Act (ESA),⁶⁶ the Marine Mammal Protection Act,⁶⁷ the Safe Drinking Water Act,⁶⁸ the Surface Mining Control and Reclamation Act,⁶⁹ the Oil Pollution Act,⁷⁰ NEPA,⁷¹ the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA),⁷² EPA’s Phase I and Phase II Stormwater Regulations, and others. Added to this are New York State statutory counterparts to the federal statutes, state and local regulations of land use, zoning, and other activities that impact water, and regional collaborations to address water issues across political boundaries, like the Delaware River Basin Commission and other interstate compacts governing aspects of waters shared by New York with other states. As a result, there are numerous laws applicable to water in New York City.

In the context of water, adaptation offers tangible and cost-effective means for dealing with climate change. The New York City Department of Environmental Protection has made significant strides in this regard, as reported in its *Assessment and Action Plan* (2008), which lays out a comprehensive adaptation plan for the agency. But in the legal context, it will require more than a mere tweaking of existing law and regulation to accomplish the necessary changes. Truly effective adaptation will require further legal efforts to address issues (1) across political boundaries comprehensively on a watershed and basin-wide level, (2) across industries, including taking into account at every turn the inextricable link between energy and water,⁷³ and (3) through financial partnerships that include the public and private sectors. Thus, changes that could be encouraged through revised laws and regulation require a

perspective beyond the borders of New York City. The effort includes addressing agricultural runoff upstate, water efficiency and conservation across industries, and political boundaries. New partnerships are needed to engage these legal efforts and to fund them. Such changes, which could be encouraged through revised laws and regulation, will entail perspectives across political boundaries.

Stormwater management

The SSMP⁷⁴ provides a comprehensive review and analysis of the many initiatives that can be undertaken to manage stormwater. Buildings and developed lots represent 45% of the land area in the city, displacing significant land forms from their prior natural stormwater infiltration function. Measures considered include detention, which temporarily stores water; retention, which removes water from the sewer system; and biofiltration/bioretention, which uses vegetated source control techniques. Such measures can not only reduce the likelihood of flooding but can also reduce nonpoint source pollution. Revisions to sewer regulations and other relevant codes, along with the establishment of incentives, are identified in the SSMP as means of implementing the measures identified as best suited to New York City.⁷⁵ As is already planned by New York City, all new developments and enlargements can be required to have a program for on-site stormwater retention. Issues, such as whether ground pollution makes water infiltration undesirable in some areas of the city, whether new stormwater management techniques will perform well over the long term, and an assessment of cost factors, are questions that could continue to be explored by the city as part of its ongoing examination and development of stormwater management policy. Opportunities can be explored for extending Staten Island's Bluebelt Program, which directs stormwater from private and public land toward streams, ponds, wetlands, and other natural drainage systems to create an integrated solution that preserves public open space while controlling pollution and flooding, helping to alleviate the anticipated impacts of climate change.

Water conservation

It is important that adaptation approaches for water address water conservation and reuse, both to

reduce water flow through the city's sewers and to reduce energy consumption and the impacts of drought. In New York City, efforts to promote water conservation have been effective in recent years. Legal requirements could emphasize conservation, requiring or encouraging additional low-flow fixtures, sprinkler systems, and lawn watering restrictions. Analysis of, and legal encouragement of, on-site water reuse through regulation and incentives would also further adaptation, although there are public health and environmental issues regarding reuse that need to be investigated further. Wide support for the overall effort at water conservation is necessary, and pricing needs to be properly calculated to be both accepted and effective.

Water supply infrastructure and wastewater infrastructure

Water infrastructure risks from flooding can be severe. Wastewater treatment plants are generally located on the shores and are susceptible to sea level rise and flooding. Potable water supply pipelines and sewer lines may be damaged by flooding conditions, infiltration of sewer lines may increase, and repairs made more difficult. Engineering codes and standards could be reviewed and amended with climate change risks in mind to protect such infrastructure.

5.7 Communications

Telecommunication infrastructure in New York City could be damaged from increased coastal and inland flooding and severe weather events, such as severe winds and heat waves. The New York PSC has substantial authority under the Public Service Law to regulate network reliability as part of its statutory obligation to ensure "adequate" service.⁷⁶ Best practices designed to ensure reliability of specific elements of the network are published by the Federal Communication Commission's Network Reliability and Interoperability Council. The PSC can issue performance thresholds pursuant to its authority and require reporting of compliance with such performance requirements.

A comprehensive analysis of network reliability was conducted by the PSC in the wake of September 11th, 2001.⁷⁷ Recommendations made in this 2002 report, many of which have been implemented, can serve as well to address the vulnerabilities created by climate change and would serve as adaptation

measures. For example, such steps as requiring more distributed switching, eliminating single points of potential failure in likely flood areas, improving information on equipment locations, and reviewing material specifications could be explored to safeguard telecommunication systems. In addition, requiring certification for compliance with Network Reliability and Interoperability Council standards and other stricter standards developed with an eye toward climate change could be considered. Continuing analysis of steps to meet climate change challenges will undoubtedly lead to further solutions.

5.8 Other issues: air quality, hazardous waste, and emergency preparedness

A discussion of legal avenues to foster climate change adaptation would not be complete without a brief discussion of relevant aspects of the law relating to air quality, hazardous waste, and emergency preparedness.

Air quality

Air emissions regulation may play an important role in New York City's adaptation strategies with the anticipated effects of climate change, especially higher temperatures, on ground-level ozone formation. Ground-level ozone forms when precursor chemicals—nitrogen oxides and volatile organic compounds—in the atmosphere are exposed to sunlight and warmer temperatures. Higher temperatures for longer periods may lead to more frequent periods of elevated concentrations of ground-level ozone, as well as elevated ozone concentrations that are higher than they otherwise would be.⁷⁸ In turn, such conditions may affect human health (especially respiratory illnesses and conditions),⁷⁹ and environmental quality (such as stressing types of vegetation).⁸⁰ Elevated ozone levels may also have significant regulatory consequences under the Clean Air Act; areas the U.S. EPA designates under the Clean Air Act as “nonattainment” for ozone are subject to, among other things, restrictive permitting conditions for new sources of pollution that contribute to ground-level ozone formation,⁸¹ and these conditions become more onerous as an area's classification for nonattainment worsens.⁸²

Currently designated under the Clean Air Act as a nonattainment area for ozone, New York City already labors under the burden of ground-level ozone

issues. With no change in current law, New York City eventually would be compelled to address an ozone nonattainment problem exacerbated by climate change. Thus, it may be prudent to include in New York City's planning for adaptation to climate change a way to address earlier the emission of ozone precursors. Doing so could help diminish the health, environmental, and regulatory impacts that may otherwise be anticipated.

Research is under way to identify how climate change may affect various aspects of local and regional air quality. Regulatory agencies appear to be relatively early in the process of researching and understanding the linkages between climate change and air quality. For example, in 2002, the EPA began the Climate Impact on Regional Air Quality (CIRAQ) project.⁸³ The NASA Goddard Institute for Space Studies, based in New York City, has also been researching linkages between climate change and air quality.⁸⁴ As such, climate change/air quality linkages become better understood, a process for identifying them and addressing their implications early across a broad spectrum of planning areas could significantly improve New York's ability to adapt to the consequences of climate change.

Hazardous waste management

Contaminant leaching at brownfield sites in New York City has been identified as one of the risks of rising sea levels resulting from climate change. Leaching of sites containing hazardous materials has the potential to contaminate the surrounding environment and potentially exposing populations to those materials. With respect to hazardous waste sites, brownfields, and hazardous waste management, the law is already largely in place to adapt New York City to the eventuality of rising sea levels. The goal is to achieve greater vigilance, better management, and appropriate remedies with respect to those sites at greatest risk, using technical tools already at our disposal.

Hazardous waste sites

CERCLA, also known as Superfund, establishes a federal regulatory framework for governmental parties to perform cleanups of seriously contaminated sites or to require private parties to do so.⁸⁵ In addition, New York State has a state Superfund program for the cleanup of severely contaminated inactive

hazardous waste disposal sites.⁸⁶ Thus, the statutes and regulations to address the potential problems that rising sea levels may cause with respect to hazardous waste sites⁸⁷ are largely already in place. As a result, regulators could currently conduct new kinds of surveys and mapping at all levels of government. These maps could identify hazardous waste sites at the shoreline and low-elevation areas vulnerable to rises in sea level, as well as identify waste sites likely to be at greatest risk for leaching as a result of sea level changes. Current regulations likely allow existing Site Management Plans and permits to be updated or new Site Management Plans and permits drafted to account for rising sea levels at sites where leaching is likely to occur. However, laws may need to be modified if it is determined that it is appropriate to increase the use of financial assurance in the form of insurance, bonds, escrows, and other devices for the highest risk sites.

Brownfield programs

Federal, state, and local programs have been created to establish parameters and provide incentives and assistance for the voluntary cleanup and redevelopment of contaminated sites. The federal brownfield program provides various types of grants to encourage remediation and redevelopment of contaminated sites.⁸⁸ Under New York State's Brownfield Cleanup Program, the DEC admits certain redevelopment sites into the program and oversees the remediation of those sites by the applicants. In many cases, tax credits are available to the parties performing the cleanup.⁸⁹ In addition, New York City now houses a brownfield cleanup program within the Mayor's office, which establishes city-specific remediation guidelines and provides oversight for cleanups of sites not enrolled in other brownfield programs.⁹⁰

The legislation already exists to address brownfield and urban fill sites, which generally have less serious contamination than their hazardous waste counterparts. In addressing legal issues pertaining to brownfields, the remedial actions involved are voluntary and are performed in conjunction with redevelopment. Worthy projects with marginal funding, such as low-income housing, might not proceed if the financial barriers are too steep. As with hazardous waste sites, regulations already exist to allow for mapping of sites, adjustments to management plans, and requirements for impermeable caps at the appropriate sites. At most, only minimal changes in

regulation and/or guidance would be required, because regulators are already accustomed to coping with sites where high water exists. The key will be to apply those concepts to a new set of sites now subject to flood potential. It is possible that the risks of leaching of urban/historic fill sites may not be substantially increased as a result of rising sea levels. In New York City, water levels are already high and the land is low, and some sites have been leaching for 100 years or more and may not pose a present or significantly enhanced future risk. However, existing regulations relating to erosion control and generic management in place will continue to be applicable to such sites, and in particular, monitoring could continue.

Hazardous waste storage and handling⁹¹

Active facilities where hazardous waste is generated and stored also need to be considered. The Federal Resource Conservation and Recovery Act (RCRA) regulates the generation, transportation, treatment, storage, and disposal of hazardous waste. It establishes a cradle-to-grave approach to hazardous waste management.⁹² New York State's hazardous waste management program is based on the federal RCRA and focuses on the criteria to determine which wastes are hazardous and the requirements for hazardous waste handlers. It also provides means for addressing past environmental releases of contaminants through investigation and corrective action activities.⁹³

While the statutes are already in place, regulations and guidance might be modified to limit storage of hazardous waste in areas subject to inundation. For permitted facilities, regulatory modifications implemented in response to climate change might be incorporated in facility permits during permit renewal, if not earlier. Importantly, storage of high volume/high hazard products, including, for instance, petroleum, occurs at a variety of facilities, and such hazardous materials exist in greater volumes than hazardous waste. Laws to address such storage could be reviewed in relation to expected rises in sea levels.

Emergency preparedness

New York City is governed by a mixture of state and local laws and regulations concerning emergency preparedness. Significantly, though, these existing laws and regulations merely describe a process for

how the State and City are to carry out their respective duties when and if certain emergencies occur. As such, they do not mention climate change explicitly, nor do they take into account adaptation measures to plan for emergencies that may be caused by localized climate change-related impacts, such as flooding caused by higher sea levels or heat waves caused by higher summer temperatures. This is a serious omission that could be addressed in future regulatory revisions. Because of climate change impacts, such as increased flooding, emergency responses can be expected to be initiated more frequently in the future. Even in the absence of such regulatory requirements the City is attempting to account for climate change impacts through the New York City Office of Emergency Management (OEM) emergency planning.

Federal Emergency Management Agency requirements and climate change

In 2008, OEM released a New York City Draft Natural Hazard Mitigation Plan, which it was required to prepare to receive nonemergency natural hazard mitigation funding from the Federal Emergency Management Agency (FEMA) pursuant to the Disaster Mitigation Act of 2000.⁹⁴ Pursuant to the Act, states and municipalities must have an approved mitigation plan to be eligible to apply for and receive hazard mitigation funds. The Natural Hazard Mitigation Plan, which has been approved by FEMA, assesses natural hazard vulnerabilities in the city and identifies mitigation opportunities. However, as FEMA does not require or provide guidance on incorporating climate change adaptation into these plans, the Natural Hazard Mitigation Plan does not contain a comprehensive examination of climate change and does not explicitly analyze any potential hazard through the lens of expected localized climate change-related impacts. Pursuant to federal regulations, the Natural Hazard Mitigation Plan must be updated every 5 years.

Ways to prepare for climate change

New York City's existing laws and regulations concerning emergency preparedness describe a *process* for responding to emergencies in general, and certain aspects of climate change fall under the emergency management category. While climate change is not explicitly incorporated into emergency preparedness, at least the types of climate change-

related emergencies that may arise in the future—such as storm surges, inland flooding, and heat waves during summer months—appear to be adequately addressed by these existing procedural laws and regulations, which provides a basis for dealing with climate change. Yet there are no regulations or guidance documents that take into account specifically emergencies that are likely to arise as a result of climate change and what should be done to plan for and lessen their impact. It would be useful if NOAA and FEMA provided updated maps. For example, the current FEMA maps to determine the 100-year flood plain are based on historical data and do not take into account rising sea levels as a result of climate change. Thus the 100-year flood plain is likely a poor guide to flood areas in the future. Updated maps would enable the City to prepare a Natural Hazard Mitigation Plan consistent with FEMA requirements that better fits anticipated climate change realities.

New York City has taken steps to review the issues. In response to extreme weather events in recent years, New York City appointed a Flood Mitigation Task Force. The goals of the Task Force were to first, develop a Citywide Emergency Flood Response Plan to coordinate agency responses to predicted and in-progress heavy rain events; second, develop community education and outreach materials for empowering residents to protect themselves and their property; and third, identify and examine Stormwater Mitigation Study Areas (SMSAs) for strategies that will improve stormwater management in the most affected areas in the short term. The Task Force released an Emergency Flood Response Plan as well as the Ready New York Flooding guide, which included recommendations to minimize flooding, such as backwater valve installations and ejector pump systems, which have been or can be included in the Building Code.⁹⁵

5.9 Conclusions and recommendations

As the U.S. Supreme Court Justice Oliver Wendell Holmes (1841–1935) said: “100 years after we are gone and forgotten, those who never heard of us will be living with the results of our actions.” Our actions with respect to our legal frameworks need to be part of our preparation to ensure the future. In addressing climate change adaptation it will be necessary to review and coordinate the many

existing laws and regulations and develop new ones to provide enhanced expert guidance in many fields; make key policy decisions; enlist the support of multiple stakeholders; and engage communities beyond city boundaries. Given the ability of cities to control local building, zoning, and emergency management codes, regulation and enforcement, it can be argued that municipalities, like New York City, are well suited to manage adaptation planning, though alignment of policies at the state and federal level is also important.

As discussed throughout this chapter, there is a host of laws and regulations implicated in adapting to climate change. In framing relevant new laws or regulations, or applying or revising existing ones, consideration could be given to climate change and to the need to address adaptation. New York City can take an active role in bringing climate change adaptation concerns to the attention of decision makers to inform their judgments. The precautionary principle, pursuant to which reasonable, prudent, and feasible action is taken without waiting for absolute scientific certainty, may be useful in guiding those decision makers.

A great many relevant statutory and regulatory schemes, either by reference or adoption, are keyed to compliance with “standards” or “codes” issued by various associations and agencies. Review of those standards and codes with an eye toward their revision to meet climate challenges, or the enactment of local laws and regulations that exceed the existing codes and standards, can be the most effective tool to drive progress in many areas. At the same time existing laws and regulations should be reviewed to determine whether and how they present impediments to adaptation.

The engagement of a broad range of stakeholders, both governmental and private, will be necessary to make optimal decisions, to inspire individual action, and create the political will to implement adaptation action steps. Coordinating the measures taken and law-related revisions implemented by the many legislative branches, governmental authorities, and agencies that can influence climate change adaptation is necessary to achieve optimal results.

Many of the climate impacts could be met by a regional approach. Essential resources for New York City are inextricably linked to communities outside the city. New York City’s water, electricity, transportation systems for much of its labor force, and telecommunication systems all enter the city

from beyond its borders. A regional approach is necessary in many areas to maximize adaptation objectives.

There will be many policy decisions to be made as adaptation initiatives are developed. Among the challenges will be that short-term goals may conflict in some instances with long-term goals. For example, the desire to close more polluting electricity generation facilities now may conflict with long-term needs for adequate generation to meet increased demand. Siting a new facility above a future flood plain may require users today to travel longer distances in GHG emitting transit modes. Thus, adaptation measures may in some instances conflict with mitigation measures.⁹⁶ Careful consideration will have to be given to these competing interests and to the ramifications of actions to be taken.

The New York specifics

This chapter has identified a number of legal and regulatory measures that can foster climate change adaptation in New York City. Among these are:

Land Use and Zoning

- Identify appropriate means of targeting various cooling measures within neighborhoods with higher ambient temperatures, as well as measures to assist the appropriate siting of power substations;
- Issue evacuation plans that include surface mass transit in flood-prone areas;
- Make use of regularly updated information on precipitation, flooding, and stormwater to guide planners’ decisions;
- Increase the percentage of open space on a lot that must contain vegetated surfaces or surfaces composed of pervious materials, green roofs, and green walls, which can be encouraged by allowing green roofs to qualify as open space or by giving green roofs and green walls a Floor Area bonus;
- Upgrade design standards in the zoning texts relating to “open space,” yards, plazas, esplanades, and tree plantings;
- Consider restricting the use of the basement and ground floor space, and addressing the location of generation, mechanical, and safety equipment in flood prone districts;

- Take necessary steps to implement a comprehensive “bluebelt program” such as Staten Island’s Bluebelt program, for other suitable areas within the city limits;
- Consider barring certain uses of vulnerable populations (such as nursing homes) from basement and ground floors;
- Revise existing coastal plans with an eye toward the possibility of climate change–related coastal flooding;
- Consider rolling easements, if feasible anywhere in New York City, which have been enacted in a few jurisdictions and prevent property owners from holding back the sea but otherwise do not alter what they can do with the property, where appropriate.

Environmental impact statements

- Develop an expanded coastal assessment form for properties on the coast;
- Consider the possibility of revising the Technical Guidance for the City, the DEC, and the CEQR Technical manual to include climate change impacts upon the proposed project or action under consideration; and
- Adopt an Official Adaptation Plan.

Energy

- Include in periodic updates of the building code more detailed attention to revisions necessary to meet adaptation goals;
- Review the development of additional generation necessary and best suited to adaptation needs; and
- Develop demand response programs and incentives.

Transportation

- Amend transportation infrastructure design standards to meet the challenges of climate change.

Water

- Review engineering codes and standards and amend with climate change risks in mind to protect water supply and wastewater infrastructure;

- Incorporate best practices for on-site stormwater management into zoning and other regulations;
- Require, as is already planned by New York City, all new developments and enlargements to have a program for on-site stormwater retention; and
- Encourage on-site water reuse through regulation and incentives to further adaptation where appropriate after consideration of public health and the environment.

Communications

- The PSC could use its authority under the Public Service Law to regulate network reliability as part of its statutory obligation to ensure “adequate” service in order to address the vulnerabilities created by climate change.

Air Quality

- Air quality regulations could be reviewed as the science on the impact of climate change on air quality progresses to identify whether and what additional adaptation measures should be employed to assure compliance with the applicable air regulations.

Hazardous waste

- Limit storage of hazardous waste in areas subject to inundation through modification of existing regulations.

Emergency preparedness

- Encourage the updating of FEMA and NOAA maps to incorporate climate change projections; and
- Continue to modify emergency preparedness plans to address climate change adaptation issues.

New York City is well on its way toward adaptation and is actively working through planning, zoning, and code changes to require a host of measures to further adaptation through law and regulation. Beyond the legal issues, the NPCC report and workbooks provide an essential framework for both public and private development that will increase robustness and resilience to climate change. To maximize the efficacy of its efforts, New York City

is engaging in a regional effort to develop plans for the future regarding energy, water, transportation, and telecommunication to advance adaptation and to develop its public outreach campaign.

The periodic review of New York City's progress on the cutting edge of climate science, adaptation, and updated adaptation planning can be advanced by legal requirements. Following the issuance of PlaNYC,⁹⁷ Local Law No. 17⁹⁸ created an Office of Long-Term Planning and Sustainability and required an annual assessment and report on the City's performance with respect to identified sustainability indicators and the development of an updated long-term sustainability plan every 4 years. A parallel requirement for comprehensive adaptation planning and assessments could be enacted to assure continued progress on adaptation measures. As planning for adaptation is strengthened by frequently updated scientific information and predictions, the institutionalization of a local scientific and technical advisory body would be of great assistance to New York City in its planning efforts.

Stakeholders in New York City are likely to steer a course between adapting to climate change by reacting to changes as they occur and embarking on a more proactive effort to minimize future damage.⁹⁹ Law and regulation can and is playing an important role in New York City's efforts toward proactive adaptation.

Endnotes, references, and further reading

¹In addition, hazardous waste is discussed in section 5.8; in the Task Force working groups, waste is combined with water and wastewater treatment.

²For example, reducing energy demand serves to reduce GHG emissions but also serves the very important goal of minimizing the likelihood of power outages and brownouts that may occur in the wake of higher temperatures. Similarly, increasing on site water retention saves energy by reducing flow through pumping stations and wastewater treatment plants, which in turn reduces GHG emissions. At the same time, water retention on site also serves to diminish the likelihood of flooding from severe storm events.

³NPCC, Climate Protection Levels ("CPL Report").

⁴For example, the CPL Report suggests that permit programs subject to the WRP that protect New York City from climate-related hazards could be in-

ventoried and assessed in light of up-to-date climate change risk information to ensure that they incorporate climate change projections. As flood frequency and flood intensity potentially increase in response to sea level rise, the criteria through which bridges are inspected for scour may need to be adjusted. For example, it could be considered that in order to allow for the projected elevations of the 1-in-100 year flood for the 2080s, the Federal Highway Administration alter its requirement that bridge owners check for scour associated with the 1-in-100 and 1-in-500 year event. Similarly, NYS DOT could consider adjusting requirements of substructure openings to account for the increase in flood elevation and flood extent expected with the projected elevations of the 1-in-100 year flood for the 2080s, and evaluate the adequacy of the current design wind speed of 3-second gust at 98 mph measured 33 feet above the ground in light of likelihood of more frequent coastal storms.

⁵For a discussion of adaptive management, see J.B. Ruhl, *Regulation by Adaptive Management*, Minn. J.L. Sci. & Tech Vol 7:1 (2005).

⁶Adapted from San Francisco's Precautionary Principle Policy adopted June 23, 2003, available at http://www.sfenvironment.com/our_policies/overview.html?ssi=14.

⁷Federal Register, December 2009, available at <http://www.epa.gov/climatechange/endangerment.html>.

⁸U.S. Const. art. VI § 2.

⁹U.S. Const. amend. V.

¹⁰N.Y. Const. art. IX, §2.

¹¹N.Y. Mun. Home Rule Law. art. 2 § 10.

¹²For a discussion of these issues, see James B. Slaughter and James M. Auslander, *Preemption Litigation Strategies Under Environmental Law*, 22 Nat. Res. and Env't No. 4 (Spring 2008); F. Patrick Hubbard, *The Impact of Lucas on Coastal Development: Background Principles, The Public Trust Doctrine, and Global Warming*, 16 S.E. Env't. L.J. 66 (2007); James G. Titus, *Rising Seas, Coastal Erosion, and the Takings Clause: How to Save Wetlands and Beaches Without Hurting Property Owners*, 57 Md. L. REV. 1279 (1998). Further guidance on these issues may be forthcoming in the Supreme Court's decision in *Stop the Beach Renourishment Inc. v. Florida Department of Environmental Protection*, Docket No. 08-1151.

¹³Zoning Resolution of the City Of New York, effective Dec. 15, 1961, and as subsequently

amended, available at <http://www.nyc.gov/html/dcp/html/zone/zonetext.shtml/>. For manufacturing districts, the Zoning Resolution also establishes performance criteria in order to limit the negative impacts of any noxious qualities of the industry.

¹⁴About NYC Zoning, History, available at <http://www.nyc.gov/html/dcp/html/zone/zonehis.shtml>.

¹⁵Within the category of “bulk,” the Zoning Resolution addresses the amount of floor area that may be incorporated in a building, the maximum height of the building, setbacks, lot coverage, open space, yards, permitted obstructions above the stated height and in the required yards, requirements for recreation space, and plazas. It also addresses waterfront accessibility and protection of natural areas.

¹⁶The installation of green roofs and green walls and light-surfaced roofs throughout a neighborhood would reduce ambient air temperature in that neighborhood and provide additional environmental and health benefits. Rosenzweig, C., W.D. Solecki, and R. Slosberg. 2006. *Mitigating New York City's Heat Island with Urban Forestry, Living Roofs, and Light Surfaces*. New York City Regional Heat Island Initiative Final Report. New York State Energy Research and Development Authority.

¹⁷Since much of the urban heat is caused by automobile usage, some City policies would have to be engaged to address reduction of heat on the streets in the heat reduction districts. “Mass-transit only” districts during peak heat periods, green walls, second story window boxes, more tree plantings, and more natural or artificially shaded areas in parks and public spaces during peak periods are several ideas.

¹⁸The New York City Board of Standards and Appeals may issue the special permit in the case of smaller sites (under 40,000 s.f.), and the City Planning Commission may issue it in the case of larger sites (over 40,000 s.f.).

¹⁹Provisions would have to be made to protect adjacent property owners from noise or unsightliness by requiring a minimum distance from existing windows, noise attenuation and screening, for example.

²⁰Such regulations would be contained in Article VI (Special Regulations Applicable to Certain Areas) or in Article XII (Special Purpose Districts).

²¹PlaNYC Sustainable Stormwater Management Plan 2008 (Dec. 2008) (SSMP) available at http://www.nyc.gov/html/planyc2030/downloads/pdf/sustainable_stormwater_plan.pdf.

²²For example, Section 23–451 of the Zoning Resolution sets forth requirements for vegetation in required yards in residential districts.

²³These could include grading surfaces toward vegetated areas, tree guard-type low fencing instead of curbs that create hydrologic barriers, curb inlets that direct water to soil, permeable pavement or porous concrete, stormwater controls in parking lots, and converting asphalt fields, playgrounds and school yards to turf.

²⁴L. 2007, ch. 613.

²⁵Hurricane loss prevention steps and preparedness measures have reduced damage by as much as 85% so that an investment of \$2.5 million resulted in \$500 million in avoided losses. See Heinz Center and CERES, *Resilient Coasts: A Blueprint for Action*, 2009, available at http://www.heinzctr.org/publications/PDF/Resilient_Coasts.Blueprint.Final.pdf.

²⁶Public Law 92–583

²⁷Federal Coastal Zone Management Act 1990 Amendments. See also U.S. Congress, Office of Technology Assessment, *Preparing for an Uncertain Climate, Volume I*, OTA-O-576 (Washington, DC Oct. 1993) at 37 and Ch 4.

²⁸Additional information about this program is available at http://nyswaterfronts.com/aboutus_LWRP.asp.

²⁹A tangible example of using elevation to adapt infrastructure was the raising of an outlet structure for the Third Water Tunnel on Roosevelt Island in New York City, which was moved higher than originally specified to accommodate climate change–related sea level concerns. David C. Major and Richard A. Goldberg, Ch. 6, “Water Supply,” in *Climate Change and a Global City: The Potential Consequences of Climate Variability and Change, Metro East Coast*, Report for the U.S. Global Change Research Program, Columbia Earth Institute, 2001.

³⁰As noted supra at section 5.1 there may be constitutional law limits on such regulations.

³¹For a discussion of options for coastal areas in the Mid-Atlantic, <http://www.climatescience.gov/Library/sap/sap4-1/final-report/sap4-1-final-report-all.pdf>.

³²U.S. Climate Change Science Program, *Synthesis and Assessment Product 4.1, Coastal Sensitivity to Sea level Rise: A Focus on the Mid-Atlantic Region* (Jan. 15, 2009) at 442–444, available at <http://downloads.climatescience.gov/sap/sap4-1/sap4-1-final-report-all.pdf>; John S. Jacob, Luis

E. Ramos, Ivonne Ortiz, *Policy Frameworks for Adaptation to Climate Change in Coastal Zones: The Case of the Gulf of Mexico* (OECD, May 2007).

³³42 U.S.C. §§ 4321 *et seq.*

³⁴N.Y. Env'tl. Cons. Law (ECL) §§ 8–0101 *et seq.*

³⁵CEQR Technical Manual, which includes the CEQR Rules of Procedure for City Environmental Quality Review, available at <http://nyc.gov/html/oec/html/ceqr/ceqrpublish.shtml>.

³⁶6 N.Y.C.R.R. Part 617.

³⁷In evaluating whether mitigation is practicable, it may be reasonable for the agency preparing an EIS to consider the costs of including reasonable mitigation measures in a project design from the outset in light of the potential costs of retrofitting a project post-construction, at such time as such measures are required to protect a project against climate change–related impacts.

³⁸Letter from Anne Reynolds and Betty Ann Hughes, DEC, to Interested Stakeholders and Draft EAF at 2 (Sept. 17, 2008) [hereinafter “Draft EAF”], available at <http://www.nyupstateplanning.org/EAFLetterToStakeholders.pdf> and http://lawoftheland.files.wordpress.com/2009/01/eaf_prelimdraft-label_15sep08.pdf.

³⁹NYS Department of Environmental Conservation, *Draft Guide for Assessing Energy Use and Greenhouse Gas Emissions in Environmental Impact Statements* (2009), available at http://www.dec.ny.gov/docs/administration_pdf/eisghgpolicy.pdf.

⁴⁰See, e.g., CEQA Guidelines and Greenhouse Gases, available at <http://www.opr.ca.gov/index.php?a=ceqa/index.html>; Mass. Exec. Office of Energy and Env'tl. Affairs, *Greenhouse Gas Emissions Policy* (2007), available at <http://www.mass.gov/envir/mepa/pdffiles/misc/ghgemissionspolicy.pdf>.

⁴¹Draft EAF at 13.

⁴²The proposed draft EAF issued by DEC already asks whether energy conservation elements were incorporated into the design. Draft EAF at 9.

⁴³New York State Department of State Coastal Management Program, Coastal Assessment Form, available at http://www.dec.ny.gov/docs/permits_ej_operations_pdf/coastassess.pdf.

⁴⁴New York Executive Law, Article 42.

⁴⁵Executive Order No. 2: Establishing a State Energy Planning Board and Authorizing Creation and Implementation of a State Energy Plan (April 9, 2008). The 2009 interim plan is available at <http://www.nysenergyplan.com/NYS%20Energy%20Plan%20-%20Interim%20Report%20-%20March%202011%202009-web.pdf>.

⁴⁶Most of the current in-City generation resources use either oil or gas as a fuel. Both of these fuels are well suited, using today's turbine and generator technology, to provide the type of rapid-cycle, flexible electricity that can be used to support the increasingly volatile power needs that will arise as climate change accelerates. However, these fuels also release carbon dioxide (as well as other pollutants), which exacerbates climate change. Other technologies that do not emit carbon dioxide, such as wind and solar, are currently considered intermittent resources, because the electric output generated depends on weather conditions. Advances in battery storage technology and the developments in plug-in electric automobiles may soon mitigate the disadvantages of these renewable technologies. Until that time, planners will need to balance the desire to mitigate climate change with the needs of adaptation.

⁴⁷New York State Dept. of Public Service, Policy Statement on Backstop Project Approval Process, Case 07-E-1507, Issued and Effective February 18, 2009 pursuant to N.Y. Pub. Serv. § 66.

⁴⁸New York City Local Laws concerning the City Construction Code are compiled and available at <http://www.nyc.gov/html/dob/html/model/model.shtml>.

⁴⁹Information about these net metering regulations is available at <http://www.dps.state.ny.us/distgen.htm>.

⁵⁰For a review of the options available to local governments to create a meaningful review process for wind facilities, see Katherine Daniels, N.Y. State Energy Research and Dev. Auth., “The Role of Government Agencies in the Approval Process” 4 (2005), available at http://www.powernaturally.org/Programs/Wind/toolkit/16_rolegovernmentagencies.pdf. The National Renewable Energy Laboratory produced state-by-state Small Wind Electric Systems Consumer's Guides to help homeowners, ranchers, and small businesses decide if wind energy will work for them. See U.S. Dep't of Energy, “Small Wind for Homeowners, Ranchers, and Small Business,” available at http://www.eere.energy.gov/windandhydro/windpoweringamerica/small_wind.asp.

⁵¹See http://www.nyiso.com/public/products/demand_response/index.jsp for a discussion of

these programs that include payments under the Emergency Demand Response Program and the Special Case Resources ICAP program, which entitle the NYISO to cut power usage to a customer, as well as the Day-Ahead Demand Response Program, which allows load to bid its electric usage into the Day-Ahead energy market administered by the NYISO in return for the market price of electricity paid to suppliers for that day.

⁵²New York State Department of Public Service Case 07-M-0548 (Energy Efficiency Portfolio Standard); Order entered June 23, 2008.

⁵³See Sallan Foundation, *Decoding the Code: How Can NYC's 2007 Building Code Help Meet PlaNYC's 2030 Energy/Carbon Reduction Goals* (2008) ("Decoding the Code"), available at <http://www.sallan.org/Decoding-the-Code/index.php>.

⁵⁴Davis Langdon Adamson, *Costing Green: A Comprehensive Cost Data Base and Budgeting Methodology* (July 2004); Steven Winter Associates, *GSA LEED Cost Study* (Oct. 2004); Greg Katz, *The Costs and Financial Benefits of Green Buildings: A Report to California's Sustainable Building Task Force* (Oct. 2003), available at <http://www.cap-e.com/spotlight/index.cfm?Page=1&NewsID=25770>.

⁵⁵The need for New York City to take steps to require and incentivize green building and energy efficiency best practices is particularly compelling. In the most recent greenhouse gas emissions inventory prepared by the City, existing buildings account for approximately 78% of the City's GHGs. See Inventory of New York City Greenhouse Gas Emissions (Sept. 17, 2008 and updated Feb. 24, 2009), available at www.nyc.gov/planyc.

⁵⁶For a review of the various codes that govern building construction in New York City, see *Decoding the Code* supra n. 53.

⁵⁷Press Release, International Code Council, "New York City Adopts International Codes to Save Lives and Protect Property" (July 12, 2007), available at <http://www.iccsafe.org/news/nr/2007/0712NYC.html>.

⁵⁸See New York City Local Law 86, available at http://www.nycouncil.info/pdf_files/bills/law05086.pdf.

⁵⁹Int. No. 967 (April 22, 2009); Int. No. 973 (April 22, 2009).

⁶⁰For a review of many measures that have been taken by local governments, see Edna Sussman, *Re-*

shaping Municipal and County Laws to Foster Green Building, Energy Efficiency, and Renewable Energy, NYU Environmental Law Journal, Vol. 16, No. 1 (2008).

⁶¹Transportation Research Board Special Report 290, *Potential Impacts of Climate Change on US Transportation* (2008).

⁶²For a discussion of the California Smart Growth legislation SB 375, see Communities Tackle Global Warming: A Guide to California's Sustainable Communities and Climate Protection Act (SB 375), available at <http://www.nrdc.org/globalwarming/sb375/>. This and several other excellent recommendations for legislative changes are contained in the Report of the Blue Ribbon Commission on Sustainability and the MTA, *Greening Mass Transit & Metro Regions* (Jan. 2009).

⁶³See Stormwater Management supra n. 21

⁶⁴33 U.S.C. §§ 1251 *et seq.*

⁶⁵33 U.S.C. §§ 1451 *et seq.*

⁶⁶35 U.S.C. §§ 1531 *et seq.*

⁶⁷16 U.S.C. §§ 1362 *et seq.*

⁶⁸42 U.S.C. §§ 300 *et seq.*

⁶⁹30 U.S.C. §§ 1201 *et seq.*

⁷⁰33 U.S.C. §§ 2701 *et seq.*

⁷¹42 U.S.C. §§ 4321 *et seq.*

⁷²42 U.S.C. §§ 9601 *et seq.*

⁷³Sandia National Labs, *Energy Demands on Water Resources: Report to Congress on the Interdependency of Energy and Water* (Dec. 2006), available at <http://www.sandia.gov/energy-water/docs/121-RptToCongress-EWwEIAComments-FINAL.pdf>.

⁷⁴See supra n. 21

⁷⁵See Section. 5.2, Land Use, supra

⁷⁶See Public Service Law § 91.

⁷⁷New York State Department of Public Service Office of Communications, Network Reliability After 9/11, Nov. 2, 2002.

⁷⁸Intergovernmental Panel on Climate Change, Air Quality and Ground-Level Ozone, in *The Regional Impacts of Climate Change: An Assessment of Vulnerability* (1997), available at <http://www.ipcc.ch/ipccreports/sres/regional/231.htm>.

⁷⁹See, e.g., U.S. EPA, "Health Effects of Ozone in the General Population," <http://www.epa.gov/03healthtraining/population.html> (last visited April 1, 2009). See also "Low-level ozone exposure found to be lethal over time," Los Angeles Times (March 12, 2009), available at <http://www.latimes.com/>

news/science/environment/la-sci-ozone12-2009mar12,0,5652358.story.

⁸⁰See, e.g., U.S. EPA, “Ground-level Ozone: Health and Environment,” available at <http://www.epa.gov/air/ozonepollution/health.html> (last visited April 1, 2009).

⁸¹See 42 U.S.C. §7511a.

⁸²See *id.* An area’s nonattainment classification can be any of five categories ranging from “marginal” to “extreme.” 42 U.S.C. §7511(a)(1).

⁸³U.S. EPA, Atmospheric Modeling and Analysis Division, “Climate Impact on Regional Air Quality (CIRAQ),” available at <http://www.epa.gov/asmdnerl/Climate/ciraq.html>; U.S. EPA, Atmospheric Modeling and Analysis Division, “Linkages Between Climate and Air Quality,” available at <http://www.epa.gov/asmdnerl/Climate/index.html>.

⁸⁴Drew Shindell, NASA Goddard Institute for Space Studies, Science Brief, “Science to Support a Unified Policy on Climate Change and Air Quality” (Dec. 2008), available at http://www.giss.nasa.gov/research/briefs/shindell_11.

⁸⁵42 U.S.C. §§ 9601–9675.

⁸⁶N.Y. Env’tl. Cons. Law §§ 27–1301 to 27–1323.

⁸⁷This subsection focuses on inactive hazardous waste sites governed by Superfund, but also is applicable at least in part to certain treatment, storage and disposal (“TSD”) facilities regulated under the Resource Conservation and Recovery Act.

⁸⁸Pub. L. No. 107–118 (2002).

⁸⁹N.Y. Env’tl. Cons. Law §§ 27–1401 to 27–1435.

⁹⁰See New York City Office of Environmental

Remediation, available at <http://www.nyc.gov/html/oer/html/home/home.shtml>.

⁹¹Rising sea levels could also affect management of nonhazardous solid waste. The issues are similar to those pertaining to hazardous waste and would involve regulation on the federal, state, and local level.

⁹²42 U.S.C. §§ 6901–6992k.

⁹³N.Y. Env’tl. Cons. Law §§ 27–0900 to 27–0926.

⁹⁴The Plan is available at http://www.nyc.gov/html/oem/html/about/planning_hazard_mitigation.shtml.

⁹⁵NYC Flood Mitigation Task Force, Emergency Flood Response Plan, April 2008 is available at http://www.nyc.gov/html/ops/downloads/pdf/agency_services/flood_mitigation_taskforce_summary_of_results.pdf; Ready New York, Preparing For Emergencies in New York City, available at http://www.nyc.gov/html/oem/html/ready/ready_guides.shtml.

⁹⁶See Elisabeth M. Hamin and Nicole Gurran, *Urban Form and Climate Change: Balancing Adaptation and Mitigation in the U.S. and Australia*, Habitat International Volume 33, Issue 3 (2009).

⁹⁷PlaNYC, A Greener Greater New York (2006).

⁹⁸Local Laws of the City Of New York No. 17, amends the City Charter and the Administrative Code, passed by the City Council April 30, 2008 and approved by the Mayor on May 6, 2008.

⁹⁹Ira Feldman and Joshua H. Kahan, *Preparing for the Day After Tomorrow: Frameworks for Climate Change Adaptation*, 8 Sustainable Dev L. & Pol’y. 61 (2007).