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RESEARCH REPORT

A Report to the IPCC on Research Connecting Human Settlements, Infrastructure, and Climate Change

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Author's Note:

In April 2010, the Intergovernmental Panel on Climate Change ("IPCC") conducted an experts' meeting on human settlements, infrastructure and climate change in Calcutta, India, to consider whether enough research exists to support a chapter in the IPCC's Fifth Assessment Report on the connection between human settlements and climate change. The author prepared this research report, which documents the connection between climate change and land use law, for Professor John R. Nolon of Pace University School of Law to present at this meeting. This report comprises research conducted at the Land Use Law Center at Pace University School of Law, as well as student research from the Spring 2010 Land Use Planning and Practice Course at Yale School of Forestry and Environmental Studies. Professor Nolon taught the Yale class, and the author was his teaching assistant. Further, this report combines this research with student project information and institutional knowledge to create an annotated list of sources and examples in order to help facilitate the IPCC's research on climate change and human settlements. Readers with questions regarding specific information contained in the report may contact the author for further information.

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I. INTRODUCTION

Land use plans and the techniques used to implement them determine where development occurs on the American landscape. Planning, zoning, and other land use regulations are the principal techniques employed to achieve sustainable urban development and to conserve critical landscapes. In most of the fifty states, land use planning and regulation is conducted principally at the local level, while regional planning is encouraged.

Local land use policy, planning, and regulations can be used to manage climate change. Although local land use plans and regulations traditionally encourage sprawl and increase fossil fuel consumption, contributing significantly to climate change, local governments can use their existing legal authority to reshape these patterns and manage climate change through both mitigation and adaptation. At the level of the city, municipalities can use land use planning and regulation to chart the path toward a sustainable development pattern. At the level of the neighborhood they can create transit oriented development ("TOD") and green infrastructure. At the building level, local governments can require energy efficiency and renewable energy generation through local codes and incentive programs. At the urban edge and in rural areas, localities can preserve and enhance vegetative carbon sequestration and food production through open space preservation, low impact development, and exacted conservation easements. Faced with sea level rise and increased storm intensity, municipalities can use their land use authority to adapt to the consequences of climate change and to create more resilient communities.

Although it does not directly address the relationship between human settlement patterns, sustainable development and climate change, the IPCC's Fourth Assessment Report ("AR4") begins to describe this important connection. For example, AR4 Volume II, entitled the "Impacts, Adaptation and Vulnerability Report," describes how the amount of flood damage from increased rainfall associated with climate change will depend on settlement patterns and building structure quality and warns that infrastructure located in low-lying areas is vulnerable to sea level rise. AR4 Volume II also links sea level rise adaptation through coastal planning to climate change mitigation

through settlement patterns that reduce green house gas emissions. In addition, AR4 Volume III, which focuses on climate change mitigation, describes mitigation options for buildings, including energy efficiency and retrofitting techniques for existing buildings. AR4 Volume III also discusses how denser cities can help reduce green house gas emissions through reduced motorized travel and how transportation and urban planning influence transportation energy consumption.

To further demonstrate the connection between human settlement patterns and climate change, this article presents selected scientific research, white papers and articles. It begins by listing and describing research articles that provide a theoretical description of climate change resulting from land use and land cover change, as well as documentation showing how municipalities traditionally used land use law to facilitate sprawl, which contributes to climate change. Next, this report describes how land use law directly controls several current greenhouse gas reduction strategies, lists research showing how traditional land use patterns result in greater greenhouse gas emissions than denser patterns, describes how municipalities can use the same land use authority to manage climate change through denser land use patterns and more energy efficient buildings, and reports that demographic and economic trends support more dense land use patterns. Lastly, this report details the various types of sustainable development plans, laws and policies that municipalities may implement to mitigate and adapt to climate change. For each sustainable development strategy, this report summarizes the strategy, lists relevant sources, and offers examples from actual localities.

II. THE CONNECTION BETWEEN LAND USE AND CLIMATE CHANGE

Climate change results from land use and land-cover change. Local governments control this change through their authority to regulate land use and building. Traditionally, municipalities have used this authority to permit low-density residential sprawl across landscapes. This type of land use results in high greenhouse gas ("GHG") emissions; however, localities can use the same authority to facilitate and require more dense land use

patterns and more energy efficient buildings associated with lower GHG emissions.

A. Theoretical Description of Climate Change Resulting From Land Use: The Physical Manifestation of Urbanization at Regional Scales

At global scale, land use and land-cover change ("LULCC") is responsible for releasing greenhouse gases to the atmosphere, thereby driving global warming. LULCC includes urban sprawl, deforestation, and agriculture practices. LULCC can increase the release of carbon dioxide to the atmosphere by disturbance of terrestrial soils and vegetation, and the major driver of this change is deforestation, especially when followed by agriculture, which causes the further release of soil carbon in response to disturbance by tillage. Changes in land use and land cover are also behind major changes in terrestrial emissions of other GHGs, especially methane (altered surface hydrology: wetland drainage and rice paddies; cattle grazing), and nitrous oxide (agriculture: input of inorganic nitrogen fertilizers; irrigation; cultivation of nitrogen fixing plants; biomass combustion).

Sources

Land Cover Changes May Rival Greenhouse Gases as Cause of Climate Change, GODDARD SPACE FLIGHT CENTER (Oct. 1, 2002), http://www.gsfc.nasa.gov/topstory/20020926landcover.html.

Global Warming: The Impact of Land Use on Climate Change, UNION OF CONCERNED SCIENTISTS, http://www.ucsusa.org/global_warming/science_and_impacts/impacts/the-impacts-of-land-use-on.html (last updated July 14, 2003).

Erle Ellis, *Land-Use and Land-Cover Change*, ENCYCLOPEDIA OF EARTH (Aug. 10, 2007), http://www.eoearth.org/article/Land-use_and_land-cover_change.

B. Land Use Law and its Connection to Climate Change

Current local law facilitates sprawl. Municipalities have authority to regulate local land use, and localities have used this

authority historically to separate uses and facilitate low density residential development. An early Ninth Circuit court case, *Construction Industry Association of Sonoma County v. City of Petaluma*, 522 F.2d 897 (9th Cir. 1975), demonstrates the tendency of local governments to create sprawl, as well as their legal authority to control it. In *Petaluma*, the city's zoning map included the bulk of its land area in single-family zoning districts, resulting in nearly 90% of housing permits issued for single-family homes in the early 1970s. This resulted the city gradually sprawling eastward, a large deficiency in moderately priced multi-family and apartment units, and little urban infill construction. Walkability suffered and vehicle miles traveled increased.

Under the city's new master plan, the "Petaluma Plan," which the Ninth Circuit upheld in this case, the city imposed a growth limit, established a greenbelt around the city to serve as a urban expansion boundary, directed that building be more balanced between single-family and multi-family residences, provided that the sections of the city nearest the center be developed first to infill vacant areas, and provided that a certain percentage of new housing be affordable for low and moderate income households. This revised blueprint not only checks sprawl but facilitates more thermally-efficient buildings, promotes walkability, and provides workforce housing close to jobs, which are critical elements of climate change mitigation today.

Sources

ROBERT H. FREILICH, FROM SPRAWL TO SMART GROWTH: SUCCESSFUL LEGAL, PLANNING, AND ENVIRONMENTAL SYSTEMS (2000).

LAND USE AND COMMUNITY DEVELOPMENT: CASES AND MATERIALS v, v-vi (John R. Nolon et al. eds., 7th ed. 2007).

C. Managing Climate Change Through Land Use Patterns

Local land use authority controls how people use the land, and municipalities traditionally zone to allow suburban sprawl. Single family, detached homes on large lots contribute to climate change because of increased energy consumption associated with

the heating, cooling and transportation to and from these homes. Alternatively, municipalities can use this same land use authority to manage climate change by facilitating compact, mixed-use development patterns, more energy efficient buildings, and preservation of carbon sequestering open space.

1. Stabilization Wedges: Reducing GHG Emissions

Although historically used to facilitate sprawl, now municipalities can use planning, zoning, and other land use techniques to change land use patterns and mitigate climate change. Princeton professor Robert Socolow identified and described fifteen categories for organizing climate change mitigation efforts. Local land use authority can directly control five of these categories: reduced use of vehicles, energy efficient buildings and appliances, vegetative carbon sequestration, wind power, and solar power. Local governments can realize these categories' GHG emission reduction goals through land use techniques such as zoning for transit oriented development and strict energy efficiency code requirements for buildings.

Sources

Stephen Pacala & Robert Socolow, *Stabilization Wedges: Solving the Climate Problem for the Next 50 Years with Current Technologies*, SCIENCE, Aug. 13, 2004, at 968, 970, *available at* http://www.sciencemag.org/cgi/reprint/305/5686/968.pdf.

John R. Nolon, *Climate Change and Sustainable Development: The Quest for Green Communities*, 61 PLAN. & ENVTL. L. 10 (2009), *available at* http://www.pace.edu/lawschool/files/landuse/PEL1.pdf.

John R. Nolon, *Climate Change and Sustainable Development: The Quest for Green Communities, Part II*, 61 PLAN. & ENVTL. L. 11 (2009), *available at* http://digitalcommons.pace.edu/cgi/viewcontent.cgi?article=1644&context=lawfaculty.

John R. Nolon, *The Land Use Stabilization Wedge Strategy: Shifting Ground to Mitigate Climate Change*, 34 WM. & MARY ENVTL. L. POL'Y REV. 1 (2009), *available at* http://digitalcommons.pace.edu/lawfaculty/630.

2. Land Use Patterns, Consumption, and Green House

Gas Emissions

People who live in denser communities and who rely more heavily on alternate forms of transportation produce fewer GHG emissions than those living in a traditional, suburban neighborhood. Single-family detached homes use more energy for heating and cooling than multi-family homes, and larger homes use more energy per person than smaller homes. Additionally, sprawling suburban land use patterns are associated with greater energy consumption for transportation than more compact development. This is due to larger trip distances and number of trips.

Sources

Land Use Primer: How Does Land Use/Land Cover Affect Global Change?, CONSORTIUM FOR ATL. REG'L ASSESSMENT, http://www.cara.psu.edu/land/lu-primer/luprimer14.asp (last updated May 8, 2006) ("Single family homes use more energy per person than multifamily homes. Larger homes use more energy per person than multifamily homes. The farther new homes are from existing population centers, from work and shopping, the greater the additional energy use in transportation per home and per person.").

Reid Ewing & Fang Rong, *The Impact of Urban Form on U.S. Residential Energy Use*, 19 HOUSING POL'Y DEBATE 1, 20 (2008) ("Compared with households living in multifamily units, otherwise comparable households living in single-family detached units consume 54 percent more energy for space heating and 26 percent more energy for space cooling. Not surprisingly, energy for heating, cooling, and all other uses increases with house size. Compared with a household living in a 1,000-square-foot house, an otherwise comparable household living in a 2,000-square-foot house consumes 16 percent more energy for space heating and 13 percent more energy for space cooling.").

REID H. EWING ET AL., GROWING COOLER: THE EVIDENCE ON URBAN DEVELOPMENT AND CLIMATE CHANGE 2 (2008).

EPA, OUR BUILT AND NATURAL ENVIRONMENTS: A TECHNICAL REVIEW OF THE INTERACTIONS BETWEEN LAND USE, TRANSPORTATION, AND ENVIRONMENTAL QUALITY 21 (2001), *available at* http://www.epa.gov/smartgrowth/pdf/built.pdf ("[L]and use patterns . . . have led to increases

in average trip distances (38 percent) and in the number of trips made (25 percent).”).

EPA, DRAFT INVENTORY OF U.S. GREENHOUSE GAS EMISSIONS AND SINKS: 1990–2007 Table ES-2 (2011), *available at* http://www.epa.gov/climatechange/emissions/downloads11/US-GHG-Inventory-2011-Executive-Summary.pdf (reporting that in 2007, out of the 6103.4 Tg CO_2 released in the U.S., 1887.4 Tg CO_2 was attributable to transportation sources).

3. Mitigating Climate Change Through Land Use Strategies

It is possible to mitigate climate change through land use strategies, which result in buildings and development that generate fewer GHG emissions than traditional structures and land use patterns. Developments that are zoned for sufficient density, around fifteen dwelling units per acre, support transit systems, giving residents an alternative to auto travel. Stricter energy conservation codes result in more energy efficient buildings, a policy supported by the federal government. In addition, local governments could require cool roofs that reflect heat and zone for cluster development and conservation subdivisions to help preserve the sequestering environment. All of these strategies, as well as others, would help mitigate climate change by reducing GHG emissions associated with land use.

Sources

About Us, ARCHITECTURE 2030, http://architecture2030.org/about/about_us (last visited Mar. 1, 2011) (Edward Mazaria established the 2030 Challenge in 2002, along with Architecture 2030, a non-profit, non-partisan and independent organization. “[Architecture] 2030’s mission is to rapidly transform the US and global Building Sector from the major contributor of greenhouse gas emissions to a central part of the solution to the global-warming crisis. Our goal is straightforward: to achieve a dramatic reduction in the global-warming-causing greenhouse gas . . . emissions of the Building Sector by changing the way buildings and developments are planned, designed and constructed.” The 2030 Challenge was adopted by the American Institute of Architects, the U.S.

Conference of Mayors, and the International Council for Local Environmental Initiatives ("ICLEI")).

Felicity Barringer, *White Roofs Catch On as Energy Cost Cutters*, N.Y. TIMES, July 30, 2009, at A1 ("Researchers estimate that if 80 percent of commercial buildings were retrofitted with 'cool' roofs that reflected heat, the nation could save enough on air-conditioning to reduce carbon dioxide emissions by 6.23 million metric tons annually—the equivalent of taking 1.2 million cars off the road." Thus, cool roofs could be required or encouraged by state energy conservation codes or local site plan regulations to achieve further emissions reductions).

BUILDING CODES ASSISTANCE PROJECT, http://www.bcap-energy.org (last visited Mar. 1, 2011) (Energy conservation codes are either adopted by state governments—which typically require local enforcement and allow localities to adopt stricter standards—or by local governments directly).

BUILDING CODES ASSISTANCE PROJECT, BUILDING CODES IN THE AMERICAN RECOVERY AND REINVESTMENT ACT OF 2009 (2009), *available at* http://bcap-energy.org/files/Building_Codes_in_the_ARRA_2009.pdf.

John R. Nolon, *The Land Use Stabilization Wedge Strategy: Shifting Ground to Mitigate Climate Change*, 34 WM. & MARY ENVTL. L. POL'Y REV. 1, 7 n.33 (2009), *available at* http://digitalcommons.pace.edu/lawfaculty/630_("The use of the American Recovery and Reinvestment Act to incentivize state adoption of the more strict 2009 ICC energy conservation code is an example of a catalytic action at the federal level that can change radically state and local land use regulations and dramatically reduce energy use and CO_2 emissions.").

INST. OF TRANSP. ENG'RS, A TOOLBOX FOR ALLEVIATING TRAFFIC CONGESTION (1989), *available at* http://ntl.bts.gov/lib/jpodocs/repts_te/10803.pdf ("Transit systems require riders. Transit oriented communities must have enough population to support passenger rail service, bus rapid transit, or other commercial, multi-person conveyances. The Institute of Traffic Engineers estimates that four to five housing units per acre are necessary to support a transit system at a minimum level, and approximately 15 units per acre are needed to support frequent service. Increased commercial density also increases transit ridership." John R. Nolon, *Zoning, Transportation, and Climate Change*, 8 ZONING L. & PRAC. REP. 1, 3 (2007), *available at* http://digitalcommons.pace.edu/lawfaculty/457).

Brian Kane & Jeff Kirwan, *Value, Benefits and Costs of Urban Trees*, VA. COOPERATIVE EXTENSION, no. 420-181, 2009, *available at* http://pubs.ext.vt.edu/420/420-181/420-181.html.

David J. Nowak, *Atmospheric Carbon Reduction by Urban Trees*, 37 J. ENVTL. MGMT. 207, 207 (1993), *available at* http://www.fs.fed.us/ccrc/topics/urban-forests/docs/Atmospheric%20carbon%20reduction%20by%20Urban%20Trees.pdf ("[I]ncreasing the amount of trees can potentially slow the accumulation of atmospheric carbon. Managers in urban areas must be aware of the potential of trees to mitigate atmospheric carbon, one of many benefits derived from urban trees.").

Diane E. Pataki et al., *Urban Ecosystems and the North American Carbon Cycle*, 12 GLOBAL CHANGE BIOLOGY 1, 4 (2006), *available at* http://www.fs.fed.us/ccrc/topics/urban-forests/docs/UrbanEcosystems&N.AmericanCO2Cycle.pdf.

Rowan A. Rowntree & David J. Nowak, *Quantifying the Role of Urban Forests in Removing Atmospheric Carbon Dioxide*, 17 J. ARBORICULTURE 269, 270 (1991), *available at* http://nrs.fs.fed.us/pubs/jrnl/1991/ne_1991_rowntree_001.pdf ("[T]he net amount of carbon sequestered by urban forests in the United States is estimated at about 6.5 million tons/year." This translates into twenty-six million tons of CO_2).

Robert H. Socolow & Stephen W. Pacala, *A Plan to Keep Carbon in Check*, SCI. AM., Sept. 2006, at 52, *available at* http://cmi.princeton.edu/resources/pdfs/carbon_plan.pdf ("The task of holding global emissions constant would be out of reach, were it not for the fact that all the driving and flying in 2056 will be in vehicles not yet designed, most of the buildings that will be around then are not yet built, [and] the locations of many of the communities that will contain these buildings and determine their inhabitants' commuting patterns have not yet been chosen . . . .").

Frequent Questions: Carbon Sequestration in Agriculture and Forestry, EPA.GOV, http://www.epa.gov/sequestration/faq.html#6 (last updated June 22, 2010).

James Joshi Wynn, Open Space Cluster Developments to Conservation Subdivisions: Standards and Management Plans Influencing Conservation Goals 1, 103–04 (Aug. 2008) (unpublished thesis, Ohio University), *available at* http://etd.ohiolink.edu/send-pdf.cgi/Wynn%20James%20Joshi.pdf?ohiou1219345472 (CO_2 Sequestration gains from cluster development and conservation subdivisions can be dramatic.

Clustering requires developers to preserve a percentage of the development parcel for open space and requires that it be left in its natural condition and be carefully managed to preserve community benefits of open land. Conservation subdivisions go farther and require more aggressive conservation practices on both the preserved and developed portions of the land. In areas experiencing rapid growth where thousands of acres are proposed for subdivision development, these techniques can promote practices that preserve the absorptive qualities of natural landscapes and prevent the release of stored CO_2).

4. Demographics, Economics, and Trends Toward City Center Living

Despite historic patterns of sprawl and suburban living, demographic and economic projections show trends toward city center living and a strong future market for more compact and mixed land uses with reduced GHG emissions. Already, baby boomers and millennials show strong preferences for higher density, mixed uses, and walkable environments.

Sources

Richard Florida, *How the Crash Will Reshape America*, ATLANTIC MONTHLY, Mar. 2009, at 44, 55, *available at* http://www.theatlantic.com/magazine/archive/2009/03/how-the-crash-will-reshape-america/7293/.

Christopher B. Leinberger, *The Next Slum?*, ATLANTIC MONTHLY, Mar. 2008, *available at* http://www.theatlantic.com/magazine/archive/2008/03/the-next-slum/6653/ ("Yet recent consumer research by Jonathan Levine of the University of Michigan and Lawrence Frank of the University of British Columbia suggests that roughly one in three homeowners would prefer to live in [walkable urban places]." The demand for "attached, small lots, cluster, and other high-density options" is increasing, pushed by the desirability of in-town, walkable neighborhoods, transportation oriented developments, downtown amenities, and a greater stability of housing prices).

Arthur C. Nelson, Presentation at the University of Pennsylvania, Mega Trends: Thinking Beyond the Crisis 9–10 (Mar. 12, 2009).

Arthur C. Nelson & Robert Lang, *The Next 100 Million* (Am. Plan. Assoc., Wash. D.C.), Jan. 2007.

III. CLIMATE CHANGE MITIGATION TOOLS FOR MUNICIPALITIES

Municipalities regulate land use and buildings through zoning, building codes and other local regulations. Thus, municipalities already have within their power the tools to mitigate and adapt to the consequences of climate change. These tools include:

1) Transportation and Sustainable Land Use Development Patterns
   - Enhanced Transit Oriented Development
   - Transportation Efficient Development
   - Street Design for Livable Communities and Sustainability
2) Green Infrastructure
3) Energy Efficiency in Buildings
   - Energy Code Enforcement
   - Energy Code Enhancements to Achieve Carbon Neutrality
   - Retrofitting Existing Buildings for Energy Efficiency
4) Permitting Renewable Energy
   - Individual Building Solar
   - Individual Building Wind
5) Sustainable Buildings
   - Sustainable Enhancement of Existing Buildings
   - Sustainable Development Standards for New Construction
6) Sustainable Sites
7) Conditioning Development to Mitigate Climate Change
8) Sustainable Neighborhoods
   - Sustainable Development Standards for Neighborhoods
   - Urban Canopy Expansion
   - Urban Agriculture
9) Biological Sequestration and Open Space Preservation
   - Forest Preservation and Stewardship Ordinances
   - Land Acquisition by Land Trusts and Public Land Use Planning
10) Adaptation to Climate Change
   - Adaptation to Sea Level Rise
   - Wetlands Preservation

11) Community Resiliency
12) Large-scale high energy technologies
    - Large-scale Solar Facilities
    - Large-scale Wind Farms
    - Distributed Energy Systems—Energy Districts

A. Transportation and Sustainable Land Use Patterns

Municipalities can help control transportation-related GHG emissions by shaping land use patterns through planning and zoning. In cities served by transit, local governments can facilitate compact, mixed-use development adjacent to transit stations. In rural areas, municipalities can create town centers with mixed uses that are transit ready. Additionally, all localities can create design standards for streetscapes that encourage pedestrian use.

1. Enhanced Transit Oriented Development

Automobile traffic contributes significantly to green house gas emissions, but communities that facilitate alternate forms of transportation help reduce these emissions. Developments located near transit stations provide residents with the option to use transit in lieu of cars, but proximity to transit alone is insufficient. In order to transform itself into a transit-dominant area, a locality must implement enhanced transit oriented development ("ETOD"). ETOD exists in "neighborhoods that provide high-quality transit, a mix of uses, and pedestrian-friendly design . . . . Other critical factors include net residential density, transit frequency and quality, access to community amenities, and a good quality pedestrian environment (good sidewalks, safety, reasonable topography)."[1] Successful ETOD also is associated with value recapture of decreased transportation costs, increased livability or quality of life, and a diversity of housing and transportation choices.

1. DENA BELZER & GERALD AUTLER, TRANSIT ORIENTED DEVELOPMENT: MOVING FROM RHETORIC TO REALITY 9 (2002), *available at* http://www.brookings.edu/es/urban/publications/belzertod.pdf.

Land use tools available for local governments to encourage or mandate ETOD include station area planning, right-sized and shared parking policies, TOD and aesthetic zoning, inclusionary housing ordinances, joint development, and land assembly. ETOD best practices comprise vision planning that integrates transit and land use; high quality pedestrian and bicycle facilities around transit stations; minimized parking; facilitation of car sharing; zoning for compact and mixed uses dense enough to support transit; and the incorporation of design standards to create complete neighborhoods "with shops, schools and other services within convenient walking distances."[2]

Because a significant number of rider serving transit stations are located in older industrial areas, a special need exists for station area planning and zoning at transit stations containing or close to industrial neighborhoods. In these locations, cities must facilitate the co-existence of compact, mixed-use neighborhoods, including residences, retail and services, with modern industrial uses, such as green technology businesses and light industry. Cities must balance the need for uses that generate tax revenue and jobs with mixed use/residential neighborhoods located next to transit.

Sources

Dena Belzer & Gerald Autler, Transit Oriented Development: Moving from Rhetoric to Reality 9 (2002), *available at* http://www.brookings.edu/es/urban/publications/belzertod.pdf.

ROBERT CERVERO ET AL., TCRP REPORT 102: TRANSIT-ORIENTED DEVELOPMENT IN THE UNITED STATES: EXPERIENCE, CHALLENGES, AND PROSPECTS (2004), *available at* http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_102.pdf.

THE NEW TRANSIT TOWN: BEST PRACTICES IN TRANSIT-ORIENTED DEVELOPMENT (Hank Ditmar & Gloria Ohland eds., 2009).

Federal Transit Administration, *Transit-Oriented Development & Joint Development*, www.fta.dot.gov/planning/programs/planning_

2. VICTORIA TRANSP. POLICY INST., ONLINE TRANSPORTATION DEMAND MANAGEMENT (TDM) ENCYCLOPEDIA, http://www.vtpi.org/tdm/tdm12.htm (last updated Feb. 17, 2010).

environment_6932.html (last visited Mar. 8, 2011) (includes a link to multiple TOD resources).

N.H. DEP'T OF ENVTL. SERVS., INNOVATIVE LAND USE PLANNING TECHNIQUES: A HANDBOOK FOR SUSTAINABLE DEVELOPMENT 307 (2008), *available at* http://des.nh.gov/organization/divisions/water/wmb/repp/documents/ilupt_chpt_3.1.pdf.

RECONNECTING AMERICA, CASE STUDIES FOR TRANSIT ORIENTED DEVELOPMENT (2009), *available at* http://www.lisc.org/content/publications/detail/8185.

John L. Renne, Transit-Oriented Development: Measuring Benefits, Analyzing Trends, and Evaluating Policy (2005) (dissertation, Rutgers University), *available at* http://gradworks.umi.com/31/95/3195744.html.

John L. Renne, *From Transit-Adjacent to Transit-Oriented Development*, 14 LOCAL ENV'T 1 (2009).

Jeffrey Tumlin & Adam Millard-Ball, *How to Make Transit-Oriented Development Work*, PLAN. MAG., May 2009.

VICTORIA TRANSP. POLICY INST., ONLINE TRANSPORTATION DEMAND MANAGEMENT (TDM) ENCYCLOPEDIA, http://www.vtpi.org/tdm/tdm12.htm (last updated Feb. 17, 2010).

Example

City of Bloomington, Minnesota, High Intensity Mixed Use With Residential District.[3] The Bloomington City Code provides for an "HX-R" zoning district (high intensity mixed use with residential) that aims to reduce vehicle trips and vehicle miles traveled by maximizing high-intensity development in close proximity to transit. The ordinance prohibits drive-through and other car-oriented uses. It requires a minimum density for residential development to support neighborhood-oriented retail, services, and transit (thereby reducing car-dependence). The HX-R zone offers density bonuses for retail and services, below grade parking, development of plazas or parks, affordable housing, public art, and sustainable design. The ordinance restricts parking but requires bicycle parking facilities, as well as sidewalk

3. BLOOMINGTON, MINN., CODE §19.29 (2010).

and bikeway connections between the transit station, buildings on site, and adjacent sites.

2. Transportation Efficient Development

Commuter lines are planned and expanded at the regional level. Typically, they serve more urbanized places with sufficient ridership already in place. As other population centers grow, the rail lines are expanded to serve these growth centers. It is important for emerging growth centers, including older suburban areas currently without transit, to see themselves as part of a transit-shed and to plan and zone accordingly. This is what transportation efficient development ("TED") plans and zoning districts do. They employ ETOD strategies in emerging growth centers to ensure that new development builds livable, walkable neighborhoods that will connect to future transit stations.

Example

Town of Malta, New York, Downtown Overlay District.[4] Malta's Downtown Overlay District is intended to concentrate new development within easy reach of existing and future transportation, and to incorporate traditional neighborhood design principles to create a pedestrian-friendly mixed-use town center. The ordinance encourages new residential development within a five-minute or quarter-mile walk of the town center and aims to develop compact, defined urban neighborhoods and to facilitate convenient and safe movement throughout the community for all modes of transportation.

3. Street Design for Livable Communities and Sustainability

Proponents of the complete streets movement aim to convert street systems designed to serve only adult car drivers into a system of streets for pedestrians, bicyclists, disabled persons, and mass transit users of all ages. Different streets serve different

4. MALTA, N.Y., CODE ch. 167, art. XIV (2005).

functions, and street design and appointments on pedestrian-intensive streets can create the sense of place needed to attract and retain residents, workers, and visitors. To accomplish these goals, local governments should adopt complete streets plans and policies that "restructure procedures to accommodate all users on every project, re-write design manuals to include the safety of all users, provide training for planners and engineers in balancing the needs of diverse users, and establish performance measures to gauge how well the streets are serving all users."[5] Complete streets guidelines include minimum sidewalk and paved shoulder widths; landscaped strips; stormwater planters and tree belts; enhanced transit stops; a system of wide bike lanes; traffic calming measures; enhanced lighting and utilities; and various measures to aesthetically improve streetscape to attract pedestrians.

Sources

JINWOO KWON, TRANSPORTATION AND FAMILY-FRIENDLY COMMUNITIES (2009), *available at* http://government.cce.cornell.edu/doc/pdf/issue_transportation1.pdf.

Judi Brawer & Matthew Vespa, *Thinking Globally, Acting Locally: The Role of Local Government in Minimizing Greenhouse Gas Emissions from New Development*, 44 IDAHO L. REV. 589 (2008).

Barbara McCann, Complete the Streets!, J. Am. Plan. Assn. 18 (2005).

FED. HIGHWAY ADMIN., DEPARTMENT OF TRANSPORTATION POLICY STATEMENTS, DESIGN GUIDANCE – ACCOMMODATING BICYCLE AND

PEDESTRIAN TRAVEL: A RECOMMENDED APPROACH (2000), *available at* http://www.fhwa.dot.gov/environment/bikeped/design.htm.

Resources, NAT'L COMPLETE STREETS COAL., http://www.completestreets.org/complete-streets-fundamentals/resources/ (last visited Mar. 7, 2011).

5. *Complete the Streets Policy and Implementation*, COMPLETE THE STREETS BROCHURE (Nat'l Complete Streets Coal., Wash., D.C.), *available at* http://www.completestreets.org/webdocs/cs-brochure-policy.pdf (last visited Mar. 8. 2011).

Examples

Town of Garner, North Carolina, Transportation Plan and Streetscape Design.[6] The Town of Garner, North Carolina, used a collaborative process to create a new transportation plan and streetscape design for its downtown area. Garner's transportation plan recommends "new and expanded roadways, public transportation options, new sidewalk and pedestrian facilities and improvements for bicyclists." The streetscape design plan makes detailed street design recommendations for the historic downtown area, supplementing existing revitalization plans.

City of Seattle, Washington, Seattle Pedestrian Master Plan.[7] Seattle's Pedestrian Master Plan aims to create walkable streets throughout the city, complete with pedestrian facilities, destinations within walking distance, walkable connections to transit, and open space for both rest and play. The online plan provides a "toolbox of strategies" to help accomplish this goal. Tools include design, engineering, and universal access strategies; planning documents and zoning regulations; and enforcement mechanisms. The plan organizes its design and engineering strategies by right-of-way zones: the Frontage Zone tools include signage and weather protection, the Walkable Zone tools include sidewalks and shared use trails, the Landscape/Furniture Zone tools include lighting, public art, street furniture and vegetation, and the Travelway Zone tools include pedestrian passes, intersection geometry and traffic management. In addition, Seattle's zoning regulations contain a Pedestrian Zone designation that requires the location of certain commercial and institutional uses at ground floor, waives some parking requirements, and restricts driveway intersections with sidewalks on principal pedestrian streets.

6. *See* GARNER TRANSP. PLAN, http://www.garnernc.gov/plan/plandept.htm (last visited Mar. 31, 2011); GARNER DOWNTOWN STREETSCAPE, http://www.gogarner.org/streetscape/index.html (last visited Mar. 31, 2011).

7. *Seattle Pedestrian Master Plan*, SEATTLE.GOV, http://www.seattle.gov/transportation/pedestrian_masterplan/default.htm (last visited Mar. 25, 2011).

B. Green Infrastructure

Green Infrastructure includes a wide array of practices at multiple scales that manages and treats stormwater, as well as maintains and restores natural hydrology through infiltration, evapotranspiration, and stormwater capture. On a regional scale, green infrastructure involves the preservation and restoration of natural landscape features, such as forests, floodplains and wetlands, coupled with infill and redevelopment policies that reduce overall imperviousness in a watershed. On the local scale green infrastructure consists of site- and neighborhood-specific practices, such as bioretention, trees, green roofs, porous pavements, and cisterns. In the urban neighborhood, it isn't possible to cluster development to preserve unfragmented environments. Thus, in the urban context, local governments can adopt plans, laws, protocols, or programs that create green urban amenities in denser neighborhoods. To promote green infrastructure in urban areas, zoning and building codes may require or incentivize vest pocket parks, trees in urban sites, canopy expansion, vegetated swales, rain gardens, vegetated walking paths or seating areas, and roof or site vegetation, among other options. Techniques like this help create a livable, walkable environment in denser urban areas.

Sources

The Fund and Green Infrastructure, THE CONSERVATION FUND, http://www.conservationfund.org/green_infrastructure (last visited Mar. 22, 2011).

Green Infrastructure: Types, Applications, and Design Approaches to Manage Wet Weather, EPA, http://cfpub.epa.gov/npdes/greeninfrastructure/technology.cfm (last updated Nov. 4, 2010).

S.E. Gill et al., *Adapting Cities for Climate Change: The Role of the Green Infrastructure*, 33 BUILT ENV'T. 115 (2007), *available at* http://www.fs.fed.us/ccrc/topics/urban-forests/docs/Gill_Adapting_Cities.pdf.

LiveScience Staff, *Asphalt Could Go Green*, LIVESCIENCE, (May 29, 2008, 8:10 AM), http://www.livescience.com/environment/080529-green-asphalt.html.

SUSAN RUTHERFORD, THE GREEN INFRASTRUCTURE GUIDE: ISSUES, IMPLEMENTATION STRATEGIES, AND SUCCESS STORIES (2007), *available at* http://wcel.org/sites/default/files/publications/The%20Green%20Infrastructure%20Guide%20-%20Issues,%20Implementation%20Strategies,%20and%20Success%20Stories.pdf.

Nancy Stoner & Alexandra Dunn, *From Rooftops to Rivers: Green Infrastructure Yields Economic and Environmental Benefits*, AM. PUB. WORKS ASS'N REPORTER, Feb. 2008, *available at* http://www.apwa.net/publications/reporter/reporteronline/index.asp?DISPLAY=ISSUE&ISSUE_DATE=022008&ARTICLE_NUMBER=1691.

Issue: Green Infrastructure, STATE ENVTL. RES. CTR., http://www.serconline.org/grInfrastructure/stateactivity.html (last updated Sep. 22, 2004).

Steve Wise, *Green Infrastructure Rising: Best Practices in Stormwater Management,* PLAN. MAG. Aug./Sept. 2008, *available at* http://www.cnt.org/repository/APA-article.greeninfrastructure.080108.pdf.

Examples

City of Chicago, Illinois, Green Alley Initiative.[8] Prior to 2007, Chicago contained throughout the city over two thousand miles of impervious alleys that citizens used for garbage collection and garages. Susceptible to flooding, Chicago's alley system significantly contributed to its stormwater runoff problem. Through its Green Alley Initiative, Chicago began retrofitting its alley system with sustainable road-building materials consisting of porous asphalt. The new alleys prevent stormwater runoff because water permeates their concrete surfaces and filters through stone beds to recharge the underground water table. In addition, Chicago's green alleys reflect solar radiation instead of absorbing it.

City of Charlottesville, Virginia, incorporated green infrastructure language into comprehensive plan.[9]

8. Susan Saulny, *In Miles of Alleys, Chicago Finds Its Next Environmental Frontier*, N.Y. TIMES, Nov. 25, 2007, http://www.nytimes.com/2007/11/26/us/26chicago.html.

9. CITY OF CHARLOTTESVILLE, VA, COMPREHENSIVE PLAN 2007, *available at* http://www.charlottesville.org/Index.aspx?page=1745 (last visited Mar. 8 2011).

Charlottesville's 2007 comprehensive plan praises the contributions of its existing green infrastructure and calls for effective management of green infrastructure in the future. The environment chapter of its plan lists major water quality, stormwater, and watershed goals and objectives. It also lists many urban forest management goals.

City of Indianapolis, Indiana, Sustainable Infrastructure Initiative.[10] Indianapolis' Sustainable Infrastructure Initiative encourages the use of green infrastructure through an expedited permit review process at the Department of Code Enforcement. The initiative's Green Supplemental Document ("GSD") provides green infrastructure guidance to the design community for stormwater management. The Office of Code Enforcement will immediately process and approve submitted project plans and designs that use GSD green infrastructure techniques to meet the city's stormwater requirements. A green infrastructure checklist must accompany every submitted "green project." The Green Supplemental Document includes guidelines for green roofs, permeable pavement, cisterns and rain barrels, filter strips, bioretention, swales, filters, and detention basins.

C. Energy Efficiency in Buildings

Through regulation, cities can ensure buildings are built, renovated, and retrofitted into more energy efficient structures. Municipalities can enforce and enhance energy codes to ensure energy conservation, as well as create incentives to achieve more efficient use of electricity.

1. Energy Code Enforcement and Enhancements

State and local governments can mandate energy efficiency measures through energy codes. Most states have adopted the model ICC Energy Conservation Code, which addresses both small residential buildings and larger residential and commercial

10. City of Indianapolis, *Sustainable Infrastructure Initiative*, SUSTAININDY, http://www.sustainindy.org/sustainable-infrastructur.cfm (last visited Mar. 8 2011).

buildings. These states require local governments to enforce this code through their building permit and inspection processes. Most states also allow local governments to require energy conservation measures in excess of the basic ICC code. These extra requirements include both cost effective measures and more costly measures that achieve significant energy conservation. Local energy code initiatives include code enforcement provisions, code amendments, and provision of incentives.

Sources

Jessica Bacher & Jennie C. Nolon, *Energy Codes, Green Buildings Initiatives, and Beyond*, REAL EST. L.J., Summer 2009.

ONLINE CODE ENV'T & ADVOC. NETWORK (OCEAN), http://bcap-ocean.org/ (last visited Mar. 8, 2011).

John R. Nolon, *Climate Change and Sustainable Development: The Quest for Green Communities – Part II*, 61 PLAN. & ENVTL. LAW 3 (2009).

Building Energy Codes Program, U.S. DEP'T OF ENERGY, http://www.energycodes.gov/ (last visited Mar. 8, 2011).

U.S. DEP'T OF ENERGY, BUILDING ENERGY CODES 101: AN INTRODUCTION (2010), *available at* http://www.energycodes.gov/training/pdfs/codes_101.pdf.

Examples

City of Cambridge, Massachusetts, adoption of stretch code.[11] The city of Cambridge adopted the State of Massachusetts' "Stretch Code," optional Appendix 120AA from the Massachusetts building energy code, which allows cities and towns to require more stringent energy efficiency requirements. Cambridge's adoption of the stretch code mandates a 20% reduction in energy use from ASHRAE 90.1-2007 for buildings greater than one hundred thousand square feet and specialty buildings greater than forty thousand square feet. The stretch code exempts renovations, commercial buildings that are five thousand square feet or less, and "specialty buildings" less than

11. *Stretch Energy Code*, DEP'T OF CAMBRIDGE CMTY. DEV., http://www.cambridgema.gov/CDD/et/stretchcode/index.html (last visited Mar. 22, 2011).

forty thousand square feet. The city will use the HERS rating system to monitor compliance, requiring a HERS score of seventy for new residential construction three thousand square feet or larger and sixty-five for smaller homes. The City of Cambridge chose to adopt the stretch code in order to meet their climate protection plan goals.

Town of Brookhaven, New York, adoption of NY Energy Star Homes Program.[12] The Town of Brookhaven adopted the Long Island Power Authority ("LIPA") NY ENERGY STAR Labeled Homes program, a voluntary, third party, certified program that contains more stringent energy efficiency requirements than the base energy code. Brookhaven code requires that new single-family and multiple family homes; planned retirement communities; and planned retirement congregate housing communities comply with the program. Energy star program requirements include 500-kWh of electricity savings per dwelling unit and automatically controlled mechanical ventilation. To obtain a certificate of occupancy, projects must pass a compliance test administered by the Building Performance Institute or a LIPA official. Building permits issue only after certified compliance with the program through proof of various energy benchmarks or through a HERS score of eighty-four or higher.

City of Seattle, Washington, code enforcement program.[13] The Seattle Department of Planning and Development ("DPD") ensures energy code compliance through a plan review process and a technical assistance program that combats code ignorance and misinterpretation among builders. After determining that self-certification provides inadequate energy code enforcement, DPD created a plan review and inspection process that consists of a voluntary pre-submittal code interpretation conference for project design teams, a preliminary application screening, an examination by energy code plan reviewers that results in a correction list, and on-site inspections

12. BROOKHAVEN, N.Y., CODE, ch. 16, §§ 16-4.1 to 4.3 (2010).

13. Kym Carey & Eric Plunkett, *Seattle: Setting the Standard, An Overview of the Seattle Code Enforcement Project*, ONLINE CODE ENV'T & ADVOC. NETWORK (Aug. 31, 2009), http://bcap-ocean.org/resource/seattle-setting-standard-code-enforcement.

to verify compliance. DPD's proactive approach also includes Client Assistance Memos, handouts in multiple languages, a technical hotline for code requirement clarifications, and training sessions for code updates.

2. Retrofitting Existing Buildings for Energy Efficiency

Most existing buildings are not energy efficient. To remedy this, local governments can adopt laws that require or incentivize energy retrofits in existing buildings. Energy retrofits include the installation and use of energy-efficient appliances; programmable thermostats; alternative energy sources; more efficient technology for lighting, heating upgrades and insulation; and lighting retrofits, including light emitting diode ("LED") lighting. Municipalities may provide incentives for private building owners to achieve green building certifications. In addition, local governments may require energy audits in many private and public buildings and mandate the implementation of recommendations contained in the auditing reports.

Sources

Jessica Bacher & Jennie C. Nolon, *Energy Codes, Green Buildings Initiatives, and Beyond*, REAL EST. L.J., Summer 2009.

Breeam: The Environmental Assessment Method for Buildings Around the World, BREEAM, http://www.breeam.org/index.jsp (last visited Mar. 8, 2011).

MIDDLE CLASS TASK FORCE COUNCIL ON ENVIRONMENTAL QUALITY, RECOVERY THROUGH RETROFIT (2009), *available at* http://www.whitehouse.gov/assets/documents/Recovery_Through_Retrofit_Final_Report.pdf.

ENERGY STAR, BUILDING UPGRADE MANUAL (2008), *available at* http://www.energystar.gov/ia/business/EPA_BUM_Full.pdf.

Green Globes, GREEN BLDG. INITIATIVE, http://www.thegbi.org/green-globes (last visited Mar. 8, 2011).

Joel Rogers, *Seizing the Opportunity (For Climate, Jobs, and Equity) in Building Energy Efficiency*, *in* INNOVATION AND EQUITY TRANSFORM AMERICA 91-108 (MIT Community Innovators Lab 2008), *available at* http://www.cows.org/joel/pdf/a_167.pdf.

LEED for Existing Buildings, U.S. GREEN BLDG. COUNCIL, http://www.usgbc.org/DisplayPage.aspx?CMSPageID=221 (last visited Mar. 8, 2011).

Examples

Baltimore County, Maryland, Property Tax Credit for High Performance Buildings.[14] Baltimore County created tax credits for certain "high performance" commercial and residential buildings that achieve LEED-Existing Building certification. Commercial buildings that meet this certification are eligible to receive a county real property tax credit of 10% to 50% depending on certification level. Residential buildings that attain LEED-EB certification are eligible to receive a similar tax credit between 40% and 100%. The tax credit lasts for three years, with a maximum aggregate amount of $5,000,000 for commercial buildings and a cap of $1,000,000 per fiscal year for residential buildings. To obtain the tax credit, LEED-EB building owners must apply to the Director of Budget and Finance and submit proof of compliance with the high performance standard. Buildings must maintain LEED-EB certification during the three-year period to retain the tax credits, which may transfer to subsequent building owners.

New York City, New York, energy audit policy.[15] Beginning in 2013, New York City will require whole-building energy audits every ten years for all buildings over fifty thousand gross square feet. Through the auditing process, a certified energy auditor will identify all "reasonable" non-capital (repair and maintenance) and capital alterations (retrofits) that would improve energy efficiency and calculate the payback period for each measure. Building owners must adhere to the auditor's recommendations for any non-capital project with a payback period of seven years or less. Non-capital repair and maintenance projects include HVAC sensor calibration, lighting

14. BALTIMORE CNTY., MD., CODE §§ 11-2-203.1 to 203.2 (2009).

15. N.Y.C., LAW REQUIRING ENERGY AUDITS AND RETRO-COMMISSIONING OF BASE BUILDING SYSTEMS OF CERTAIN BUILDINGS AND RETRO-FITTING OF CERTAIN CITY-OWNED BUILDINGS art. 308 (Dec. 28, 2009), *available at* http://legistar.council.nyc.gov/LegislationDetail.aspx?ID=452543&GUID=AF748A00-A263-4200-A91E-316346690D2A&Options=ID|Text|&Search=967-A.

adjustments, and filter cleaning. NYC's audit policy exempts buildings from compliance if actual costs exceed estimates by 20% or more or if a building meets high performance standards.

D. Permitting Renewable Energy

Zoning can further or frustrate wind and solar energy generation on individual buildings. Current land use restrictions on building heights and setbacks, secondary structure placement, and vegetation sometimes inhibit renewable energy generation associated with individual buildings. Using the same land use tools and other policies, however, municipalities can facilitate and encourage wind turbines, solar panels, and combined heat and power in both commercial and residential buildings. Municipalities accomplish this through restriction exemptions, permitting these uses through zoning, providing density bonuses or incentives, overlay zoning, reducing property taxes, or channeling state and federal tax breaks to developers.

1. Individual Building Solar

Local governments can encourage solar energy systems through land use regulations. Municipalities facilitate solar energy systems through local zoning codes when they include solar energy usage in the purpose and definition sections; eliminate height and setback restrictions for solar energy systems; include solar energy usage in their site plan and subdivision regulations; allow solar energy systems through special permits or accessory uses standards; create solar access requirements; regulate trees to avoid interference with solar energy systems; and provide exemptions and waivers for these systems. Many other legal tools exist for facilitating solar energy system installation, including exemptions from fees and provision of property tax rebates.

Sources

John Nolon & Jessica Bacher, *Local Power Over Solar Energy: Its Use and Abuse*, N.Y. L.J., Aug. 20, 2008.

DAMIAN PITT, THE NETWORK FOR NEW ENERGY CHOICES, TAKING THE RED TAPE OUT OF GREEN POWER: HOW TO OVERCOME PERMITTING OBSTACLES TO SMALL-SCALE DISTRIBUTED RENEWABLE ENERGY (2008), *available at* http://www.newenergychoices.org/uploads/redTape-rep.pdf.

About: Solar America Communities, U.S. DEP'T OF ENERGY, http://www.solaramericacities.energy.gov/about/ (last visited Mar. 8, 2011).

U.S. DEP'T OF ENERGY, SOLAR POWERING YOUR COMMUNITY: A GUIDE FOR LOCAL GOVERNMENTS (2d ed. 2011), *available at* http://www.solaramericacities.energy.gov/pdfs/Solar-Powering-Your-Community-Guide-For-Local-Governments.pdf.

Examples

San Francisco, California, Height Limitation Exemption in Zoning Code.[16] San Francisco exempts solar energy collection equipment from height limitations required in its Mission Bay Districts. The horizontal area of solar energy collection equipment may not exceed 20% of horizontal roof area, and the height exemption is limited to the top ten feet when the height limit is sixty-five feet or less and the top sixteen feet when the height limit is greater than sixty-five feet. The height limitation exemption allows solar access without sacrificing development space.

Village of Briarcliff Manor, New York, Regulation of Solar Energy Collectors.[17]

Briarcliff Manor permits solar energy collectors as an accessory use in any single-family residential, multi-family or commercial zoning district if they adhere to required standards. Collectors mounted to a single-family residence must not exceed the lesser of nine hundred square feet in area or 33% of the entire roof area, must be mounted no more than twelve inches above the surface, and must be installed to minimize visibility, not extending beyond the highest point of a pitched roof or any roof cornice on a flat roof. Freestanding solar energy collectors installed at single-family residences must comply with rear and

16. S.F., CAL., CODE § 933.1 (1991).
17. BRIARCLIFF MANOR, N.Y., CODE § 220-9.1 (2010).

sideline setback requirements and be at least fifteen feet from every rear and side line, must comply with all front and side yard setback requirements, are subject to site plan approval, must be screened when possible, and may not exceed the lesser of one thousand square feet in area or 5% of the area of the lot on which it is located. Architectural Review Advisory Committee review and comment on freestanding solar energy collector plans may not limit Building Inspector authority to issue building permits. Solar energy collectors attached to multi-family or commercial buildings may not exceed the lesser of either one thousand square feet in area or 33% of the area where it is mounted.

2. Individual Building Wind

Wind generated power is renewable and clean, reducing carbon dioxide emissions from fossil fuel usage in traditional methods of energy production. Municipalities are able to encourage wind generation through several methods. Local governments may purchase wind farm electricity to run their utilities or to heat and cool town buildings. Local governments may also facilitate wind generation by town residents through permitting the installation of individual wind energy conversion systems. These systems consist of backyard wind turbines on towers fifty to seventy feet high and generate enough power for household use. To regulate these individual wind energy conversion systems, local governments are adopting comprehensive plan components that express local energy and environmental policies; moratoriums that prevent wind facilities until they can be properly regulated; and a number of zoning, subdivision, site plan, special use permit, and environmental review mechanisms to balance the benefits of wind generated power and the detrimental effects such facilities can have on the community.

Source

John Nolon & Jessica Bacher, *Wind Power Regulation and Litigation: Trends Explored*, N.Y. L.J., Feb. 20, 2007.

E. Sustainable Buildings

Sustainable buildings include more than enhanced energy efficiency. Sustainable buildings are water efficient, built of reused and recycled materials and/or sustainably harvested wood. They are well ventilated, contain few pollution emitting materials, and maximize inside exposure to daylight. In addition, they are built on previously used sites or brownfields, maximize open space, minimize stormwater runoff, and provide alternative transportation facilities. Sustainable buildings include these and many other "sustainable" characteristics. At the local level, municipalities can encourage sustainable enhancement of existing buildings and sustainable development standards for new buildings through incentive programs, as well as planning and zoning techniques.

1. Sustainable Enhancement of Existing Buildings

Municipalities may offer incentives to encourage the sustainable enhancement of existing buildings. These policies include tax incentives and rebate programs.

Sources

Green Globes, GREEN BUILDING INITIATIVE, http://www.thegbi.org/green-globes (last visited Mar. 8 2011).

Andrew Stern, *FACTBOX: Incentives to Retrofit Buildings*, REUTERS, Sept. 2, 2009, *available at* http://www.reuters.com/article/idUSTRE5817F220090902 (discussing tax incentives and rebate programs to encourage retrofitting of buildings).

LEED for Existing Buildings, U.S. GREEN BUILDING COUNCIL, http://www.usgbc.org/DisplayPage.aspx?CMSPageID=221 (last visited Mar. 8, 2011).

Example

Charlotte County, Florida, Green Building Ordinance.[18] The Charlotte County Green Building Ordinance

18. CHARLOTTE CNTY., FLA., CODE §§ 3-2-80 to 88 (2009).

regulates new residential and commercial buildings. It is a voluntary program for all private projects but mandatory for any new county buildings. In addition, the ordinance creates incentives for retrofitting projects in existing buildings. Residential buildings qualify for incentives if they are certified by USGBC's LEED for Homes, NAHB's National Green Home, GBI's Green Globes, or the Florida Green Building Coalition's ("FGBC") Green Home Designation Standard. Existing commercial buildings qualify if they meet LEED-Existing Building ("LEED-EB") or other applicable LEED standard, Green Globes for existing designs, or the FGBC's Green Commercial Designation Standard. Green building incentives in the ordinance include expedited permitting, parking requirement reductions, technical support, special recognition, and possible monetary incentives.

2. Sustainable Development Standards for New Buildings

Sustainable development standards for buildings go beyond energy efficiency in facilitating the creation of buildings that lower the occupants' carbon footprints. Such sustainable development standards for buildings include compact, mixed-use development standards; reduced parking; inclusion of mixed income residents; incorporation of bicycles into building design; access to services and public spaces; visitability and design; existing building reuse; wastewater management; solid waste management; and light pollution reduction, etc. Local governments can encourage or require developers to incorporate features of sustainability into building design and development through local land use plans, regulations, and initiatives. Among other strategies, regulations can mandate that new buildings be certifiable under the LEED or an equivalent program; incentivize sustainable building standards through tax credits and abatements or bonus zoning; or award expedited review to buildings meeting sustainability standards.

Sources

CONGRESS FOR THE NEW URBANISM, http://www.cnu.org/ (last visited Mar. 14, 2011).

INT'L CODE COUNCIL, INC., INTERNATIONAL GREEN CONSTRUCTION CODE PUBLIC VERSION 2.0 (2010), *available at* http://www.iccsafe.org/cs/igcc/pages/default.aspx.

N.Y.C. CLIMATE ADAPTATION COMM., PROPOSALS FOR THE ADMINISTRATIVE CODE OF THE CITY OF NEW YORK, *available at* http://www.urbangreencouncil.org/greencodes/full-proposals.pdf.

Environment, SMART GROWTH AM., http://www.smartgrowthamerica.org/issues/environment/ (last visited Mar. 14, 2011).

URBAN LAND INST., http://www.uli.org/ (last visited Mar. 14 2011).

LEED for New Construction, U.S. GREEN BUILDING COUNCIL, http://www.leedbuilding.org/DisplayPage.aspx?CMSPageID=220 (last visited Mar. 14 2011).

Examples

City of Boston, Massachusetts, Green Building Ordinance requiring LEED certifiable development.[19] The city of Boston's green building ordinance mandates conformance with LEED standards but does not require actual certification. The ordinance applies to private sector projects over fifty thousand square feet. Developers of these projects must submit their plans to the Redevelopment Authority for approval. The ordinance also prescribes several Boston Green Building Credits that count toward the determination that a building is "certifiable" under the regulation. Projects are eligible to receive Boston Green Building Credits for distributed generation/combined heat and power, historic preservation, groundwater recharge, and "transportation demand management." Applicants must submit to the Redevelopment Authority a LEED scorecard and documentation from a LEED AP or recognized expert verifying that the project is LEED certifiable. Building or use permits issue only after the Redevelopment Authority certifies that a building complies with the ordinance.

19. BOS., MASS., CODE art. 37 (2007).

City of Seattle, Washington, green building density bonus.[20] Seattle's green building ordinance offers a density bonus incentive for buildings that achieve LEED Silver certification. In order to earn bonus density, developers must submit a letter of intent and documentation demonstrating certification within ninety days of the building's completion. The city will assess a penalty for any buildings that fail to achieve certification, and penalty payments will benefit a green building fund that supports market adoption of green buildings.

City of San Francisco, California, electric car charger building code requirement.[21] San Francisco's new building code amendments require developers to wire all new homes and offices for electric car chargers.

F. Sustainable Sites

In addition, cities can require proper building site location to promote sustainability. Developers can enhance sustainability at development sites through addressing retention and detention; changing elevations and contours; using impermeable surfaces; requiring the retention of existing vegetation and trees or the replacement or addition of vegetation and trees; protecting habitat; avoiding floodplains; protecting steep slopes; and conserving wetlands. Local laws and initiatives can facilitate these practices by encouraging or requiring the adoption of sustainable site standards into the development process through comprehensive plans; zoning code; site plan and/or subdivision regulations; or stand alone local environmental laws. Through these laws, a local government ensures that the local planning board or commission will require developers to adhere to sustainable site standards when developing a site.

20. SEATTLE, WASH., CODE § 23.49.020 (2011).

21. Todd Woody & Clifford Krauss, *Cities Prepare for Life with the Electric Car*, N.Y. TIMES, Feb. 14, 2010, http://www.nytimes.com/2010/02/15/business/15electric.html?_r=1&scp=1&sq=Cities%20Prepare%20for%20Life%20with%20Electric%20Car&st=cse.

Sources

THE SUSTAINABLE SITES INITIATIVE, GUIDELINES AND PERFORMANCE BENCHMARKS (2009), *available at* http://www.sustainablesites.org/report/Guidelines%20and%20Performance%20Benchmarks_2009.pdf.

THE SUSTAINABLE SITES INITIATIVE, THE CASE FOR SUSTAINABLE LANDSCAPES (2009), *available at* http://www.sustainablesites.org/report/The%20Case%20for%20Sustainable%20Landscapes_2009.pdf.

LEED Rating Systems, U.S. GREEN BUILDING COUNCIL, http://www.usgbc.org/DisplayPage.aspx?CMSPageID=222 (last visited Mar. 14, 2011).

Cf. EPA, GROWING TOWARD MORE EFFICIENT WATER USE: LINKING DEVELOPMENT, INFRASTRUCTURE, AND DRINKING WATER POLICIES 3 (2006), *available at* http://www.epa.gov/dced/pdf/growing_water_use_efficiency.pdf (discussing how surface transportation infrastructure construction costs and efficiency can be optimized by higher-density land development).

Examples

The City of Raleigh, North Carolina, Comprehensive Plan.[22] The city of Raleigh's comprehensive plan encourages sustainable site planning and landscape design through a series of principles that create a "benchmark for sustainable land design, construction, and maintenance practices in the future." The comprehensive plan aims to decrease erosion, reduce stormwater runoff, improve water quality and provide buffers between land uses through the reduction of excessive cut and fill grading and a reduction in tree and vegetation destruction. The plan calls for an improvement in water quality through public education programs, monitoring programs, and receiving lands that absorb storm surge overflows. The plan also aspires to prevent soil erosion by limiting disturbance and restricting mass grading. Further, the plan proposes an incentive-based low impact development ordinance to encourage on-site rainwater retention and absorption. Lastly, the plan calls for

22. RALEIGH, N.C., COMPREHENSIVE PLAN FOR THE CITY OF RALEIGH (2009), *available at* http://raleigh-consult.limehouse.com/portal/planning/comprehensive_plan/comp_plan-final_version?pointId=35835#document-35835.

demonstration projects that incorporate sustainable site designs and encourage the development of grants, fee waivers, tax breaks, and/or density bonus or transfer provision for demonstration participants.

The City of Seattle, Washington, Stormwater Code.[23] The City of Seattle adopted a stormwater code that requires erosion and sedimentation controls beyond sustainable sites requirements in the USGBC's LEED rating systems. Seattle requires certain erosion and sedimentation controls for all projects that disturb the land but more stringent review and requirements for larger projects. Seattle's Stormwater Code mandates that stormwater leave sites free of sediment and other pollutants; sets minimum water quality requirements for all construction and grading activities; and creates standards for flow control and stormwater treatment.

G. Sustainable Neighborhoods

Neighborhood development provides municipalities with another way to lessen GHG production while providing citizens with a healthy, sustainable lifestyle and environment. Localities can encourage the development of compact, mixed-use walkable neighborhoods that provide housing, office, services, open space, alternative transportation, and recreational opportunities all within walking distance of one another. Sustainable neighborhoods also include cooling and carbon sequestering urban trees, as well as access to local food sources and urban agriculture opportunities.

1. Sustainable Development Standards for Neighborhoods

Sustainable neighborhood design incorporates the principles of smart growth, new urbanism, and green building. Sustainable neighborhoods reduce sprawl, facilitate infill, and create livable places where people walk from home to services on a scale that allows them to interact daily with their neighbors. Additionally, neighborhood development enables residents to live comfortably

23. SEATTLE, WASH., SEATTLE MUN. CODE §§ 22.800-22.808 (2009).

in compact, mixed-use developments where their housing and transportation choices lower their carbon footprints. To facilitate sustainable neighborhood development, local governments can engage in citizen participatory neighborhood planning. Municipalities then can implement planning strategies through zoning regulations.

Sources

LEED for Neighborhood Development, U.S. GREEN BUILDING COUNCIL, http://www.usgbc.org/DisplayPage.aspx?CMSPageID=148 (last visited Mar. 14, 2011).

U.S. GREEN BUILDING COUNCIL, A LOCAL GOVERNMENT GUIDE TO LEED FOR NEIGHBORHOOD DEVELOPMENT (2010), *available at* http://www.usgbc.org/ShowFile.aspx?DocumentID=6131.

M. Landman Communications & Consulting, *The Green Spotlight, Sustainable Neighborhoods and Communities: Certifications, Developments, Organizations, and Websites*, THE GREEN SPOTLIGHT, http://www.thegreenspotlight.com/2010/02/sustainable-neighborhoods-communities/ (last updated Feb. 22, 2010).

William Rohe, *From Local to Global: 100 Years of Neighborhood Planning*, 75 J. AM. PLAN. ASSN. 209 (2009).

Nicole Sanders, LEED-ND as a New Urbanist Metric (2009) (M.A. of Planning thesis, University of Washington), *available at* http://martinandsanders.com/uploads/LEED_ND_New_Urbanist_Final.pdf.

Example

City of Grand Rapids, Michigan, Great Neighborhoods chapter in master plan.[24] Grand Rapids' developed the Great Neighborhoods section of its master plan through citizen participation. Through this process, Grand Rapids determined that their neighborhoods should provide a variety of housing,

24. CITY OF GRAND RAPIDS, MICH., MASTER PLAN (2002), *available at* http://www.grand-rapids.mi.us/index.pl?page_id=632; Grand Rapids, Mich., Zoning Ordinance (Sept. 16, 2008), *available at* http://www.grand-rapids.mi.us/download_upload/binary_object_cache/planning_ZONING%20ORDINANCE%20TEXT%20last%20amended%20September%2028,%202010%20FOR%20WEB.pdf.

preserve urban heritage in older neighborhoods, and offer people-friendly, tree-lined streets. Grand Rapids' master plan recommends that the city provide a range of neighborhood and housing types, coordinate high density housing and transit, and improve walkability between home, office, and services. Following this plan, Grand Rapids adopted the Zone Grand Rapids ("Zone GR") Ordinance, implementing these strategies.

2. Urban Canopy Expansion

American Forests recommends that tree canopies provide shade for 40% of the area east of the Mississippi River and in the Pacific Northwest in order to manage air and water resources and maintain environmental quality. Extensive tree canopies also sequester atmospheric carbon. Despite these benefits and American Forests' recommendation, urban tree cover in the east has declined by 30% in the past twenty years. To reverse this trend, local governments can use planning, legislative and policy tools to facilitate tree plantings, green roofs, and any kind of vegetation use in the urban landscape. These urban canopy methods help mitigate the effects of climate change and the heat island effect; make cities aesthetic and livable; and attract residents. Urban canopy tools include sustainability and climate protection plans; tree management and care ordinances; and tree canopy enlargement and inventory policies. Tree management and care ordinances may, for new development projects, require tree retention on site, new tree plantings, or contribution to a tree mitigation fund. These ordinances may also regulate removal of trees from private property and utility tree management practices regarding trees; facilitate public trees on private property; and/or create enforcement provisions that impose replacement costs or fines. Development planning can incorporate trees at the site level to provide shade and lower cooling expenses in the summer.

Sources

E. Gregory McPherson, Center for Urban Forest Research, Pacific Southwest Research Station & USDA Forest Service, *A Functional Approach to Urban Forest Planning and Management*, U.S. FOREST

SERVICE (2004), *available at* http://www.fs.fed.us/psw/programs/cufr/products/powerpoint/cufr_530.swf.

MCPHERSON ET AL., NORTHEAST COMMUNITY TREE GUIDE: BENEFITS, COSTS & STRATEGIC PLANTING (2007), *available at* http://www.fs.fed.us/psw/publications/documents/psw_gtr202/psw_gtr202.pdf.

STEVE RACITI ET AL., URBAN TREE CANOPY GOAL SETTING: A GUIDE FOR CHESAPEAKE BAY COMMUNITIES (2006), *available at* http://www.jmorgangrove.net/Morgan/UTC-FOS_files/UTC_Guide_Final_DRAFT.pdf.

URB. FORESTRY S. EXPO, http://www.urbanforestrysouth.org/ (last visited Mar. 14, 2011).

U.S. CONFERENCE OF MAYORS, PROTECTING AND DEVELOPING THE URBAN TREE CANOPY: A 135-CITY SURVEY (2008), *available at* http://www.usmayors.org/trees/treefinalreport2008.pdf.

Examples

New York City, New York, MillionTreesNYC.[25] In order to improve air quality, NYC launched MillionTreesNYC, a component of PlaNYC. Through this program, NYC will partner with community, corporate and nonprofit groups to plant one million new trees in NYC by 2017, a ten-year goal. The groups will focus their planting efforts in neglected areas with little open green space.

The City of Sacramento, California, Tree Shading Requirements for Parking Lots.[26] Sacramento amended its Landscaping and Paving Regulations to require that parking facility owners plant and maintain trees in order to shade 50% of the parking facility within fifteen years of the parking lot's establishment. Parking facility owners must calculate shading by

25. *PlaNYC Increase Tree Plantings on Lots*, NYC.GOV, http://www.nyc.gov/html/planyc2030/html/plan/air_tree-plantings.shtml (last visited Mar. 14, 2011); *see also* MILLIONTREESNYC.ORG, http://www.milliontreesnyc.org/html/home/home.shtml (last visited Mar. 14, 2011).

26. SACRAMENTO, CAL., CODE ch. 17.68.040, http://www.qcode.us/codes/sacramento/view.php?topic=17-iii-17_68-17_68_040&frames=on (last visited Mar. 25, 2011); CITY OF SACRAMENTO, PARKING LOT TREE SHADING DESIGN AND MAINTENANCE GUIDELINES (2003), http://www.cityofsacramento.org/parksandrecreation/ppdd/pdf/SHADING_GUIDELINES_06-05-03.pdf.

using the expected diameter of the tree crown at fifteen years, provide adequately sized planting beds and irrigation, and use tree species from an approved list. They also must submit landscape and shading plans with their building permit application. A landscape designer must certify that the shading complies with all requirements by completing a landscape certificate, and parking facilities must maintain all trees and associated landscaping for the life of the facility. Sacramento created Parking Lot Tree Shading Design and Maintenance Guidelines with which parking facilities must comply. The guidelines provide information about shading calculations, tree planting practices, drainage and water quality options, shading plan requirements, and tree selection.

3. Urban Agriculture

Communities are beginning to plan and regulate land use to encourage local food production for local and regional markets. Encouraging, protecting, and planning for urban agriculture is important for relieving hunger; eliminating food deserts; combating rising obesity rates; shoring up local and regional economies; protecting scarce green space in urban areas for land-intensive food production; and reducing fossil fuel usage and GHG emissions associated with producing, processing, transporting, and disposing of food. Many land use planning and regulation tools are available to help local governments accomplish these goals. When engaging in comprehensive and neighborhood planning, communities can include desirable uses such as community gardens, urban agriculture systems, farm/garden stands, and farmers' markets. These plans can also "provide sufficient space, infrastructure, and inter-modal transportation access for such uses."[27] Further, local governments can remove zoning barriers to urban food systems, as well as use zoning regulations to actively encourage these uses. Zoning techniques for facilitating urban agriculture include agricultural land preservation zoning; mixed use zoning that includes small and mid-size grocery stores; and zoning that

27. AM. PLANNING ASS'N, POLICY GUIDE ON COMMUNITY AND REGIONAL FOOD PLANNING (2007), http://www.planning.org/policy/guides/adopted/food.htm.

permits seasonal farmers markets and community vegetable gardens.

Sources

AM. PLANNING ASS'N, POLICY GUIDE ON COMMUNITY AND REGIONAL FOOD PLANNING (2007), http://www.planning.org/policy/guides/adopted/food.htm.

OFFICE OF MANHATTAN BOROUGH PRESIDENT SCOTT M. STRINGER, FOODNYC: A BLUEPRINT FOR A SUSTAINABLE FOOD SYSTEM (2010), http://urbanomnibus.net/main/wp-content/uploads/2010/02/foodnyc.pdf.

LIVEWELL COLO., FOOD POLICY BLUEPRINT (2010), http://www.livewellcolorado.org/assets/pdf/resources/blueprints/final-food-policy-blueprint.pdf.

N. Mukherji & A. Morales, *Zoning for Urban Agriculture*, 3 ZONING PRACTICE 1, 1-7 (2010).

C. SHENOT & E. SALOMON, COMMUNITY HEALTH AND FOOD ACCESS: THE LOCAL GOVERNMENT ROLE (2006), http://bookstore.icma.org/freedocs/E43398.pdf.

Examples

City of Portland, Oregon, Community Garden Program.[28] Portland Parks and Recreation administers a Community Garden Program that created thirty-five community gardens throughout the city to give citizens urban gardening opportunities. A citizen interested in becoming a community gardener must submit a Garden Plot Request Form indicating her garden preferences. In addition, Portland allows private parties to obtain special permits to utilize unused parkland for urban agriculture or gardening purposes.

City of Cleveland, Ohio, farm animal and bee keeping regulations.[29] Cleveland permits urban farming for property owners within city limits but places restrictions on animal husbandry activities to prevent nuisance conditions. To keep

28. *Community Garden Program*, PORTLAND PARKS & RECREATION, http://www.portlandonline.com/parks/index.cfm?c=39846 (last visited Mar. 3, 2011); PORTLAND, OR., CODE § 3.80.020 (2011).

29. CLEVELAND, OHIO, ZONING CODE §§ 205.04, 347.02 (2010).

farm animals or bees, Cleveland residents must submit to the Cleveland Department of Public Health an application for a two-year license including descriptions of the proposed number of animals and enclosures, as well as waste management plans. In addition, residents must submit a similar application to the Department of Building and Housing, which ensures compliance with enclosure construction regulations. Additional building permits are required for fences and stables. The regulation specifies the type and number of permitted animals, setback lengths, and enclosure requirements in both residential and non-residential areas. Cleveland allows slaughtering on premises only for consumption purposes and forbids nuisance conditions associated with farm animals.

H. Biological Sequestration

Regulations that preserve open space protect and enhance the carbon-sequestering environment. In order to accomplish this, municipalities can create policies, plans and regulations that preserve urban parks and vegetation, as well as green space beyond the urban boundary.

1. Forest Preservation and Stewardship Ordinances

Municipal regulations to protect forests are critical because forests comprise 95% of our sequestering environment and account for the storage of roughly 15% of the CO_2 emitted in the United States. Forest preservation and stewardship ordinances protect a town's nearby forests by prescribing certain stewardship practices regarding clear cutting, wood camp road construction, onsite streams and wetlands preservation, tree processing, and felling and transportation methods. To achieve these goals, local governments may adopt subdivision and site plan ordinances, overlay zones, or timber harvesting ordinances that regulate both commercial operations and land development.

Sources

Craig R. Nitschke & John L. Innes, *The Application of Forest Zoning as an Alternative to Multiple-use Forestry, in* FORESTRY AND

ENVIRONMENTAL CHANGE: SOCIOECONOMIC AND POLITICAL DIMENSIONS 97 (John L. Innes et al. eds., 2005).

JOHN R. NOLON, OPEN GROUND: EFFECTIVE LOCAL STRATEGIES FOR PROTECTING NATURAL RESOURCES 179-81 (2003).

John R. Nolon, *Land Preservation, in* 1 ENVIRONMENTAL LAW PRACTICE GUIDE: STATE AND FEDERAL LAW 3-1 (Michael B. Gerrard ed., 1992 & Supp. 2010).

V. ALARIC SAMPLE & ANTHONY S. CHENG, FOREST CONSERVATION POLICY: A REFERENCE HANDBOOK (2004).

Examples

Town of Pawling, New York, Timber Harvesting Ordinance.[30] The Town of Pawling's timber harvesting ordinance regulates tree clearing and harvesting to prevent erosion, sedimentation, and drainage problems. To clear or harvest, timber harvesters must apply for a harvesting permit that includes a sketch of the area's wetland boundaries and watercourses, a description of the proposed timber harvest, a reclamation plan and proof of insurance. In order to obtain a permit, timber harvesters must meet detailed requirements in the review process and comply with performance standards that protect streams, prevent erosion, and minimize visual impacts. These standards are detailed both in the ordinance and a manual outlining best practices for silviculture.

Charles County, Maryland, Forest Conservation Ordinance.[31] In compliance with the Forest Conservation Act of Maryland, Charles County adopted a Forest Conservation Ordinance, which requires developers of subdivisions greater than forty thousand square feet to submit a Forest Stand Delineation and a Forest Conservation Plan with their application for subdivision plan approval. The Forest Stand Delineation must describe the proposed site's streams, soils, tree species, stand dynamics, floodplains, conservation easements, wetlands, and habitat. The Forest Conservation Plan must demonstrate plans to retain existing forest or

30. PAWLING, N.Y., CODE ch. 187 (1993).
31. CHARLES CNTY., MD., CODE ch. 298 (2004).

afforestation/reforestation plans; tree protection methods to deploy during construction; and easements, deed restrictions and/or covenants. To protect trees during construction, developers must use construction methods outlined in the Maryland Forest Conservation Technical Manual and approved by the Maryland Department of Natural Resources.

2. Land Acquisition by Land Trusts and Public Land Use Planning

To improve the protection of open and carbon sequestering green space, local governments can partner with land trusts to identify land with important ecosystem services to conserve and to ensure that protections placed on land are permanent. Through these partnerships, land trusts participate in local greenprint planning to ensure local governments identify critical environmental areas for preservation. This helps secure the designation of proper land for preservation in comprehensive plans, zoning and land use approvals. Further, local land use boards can partner with land trusts when they require the creation and recording of conservation easements when imposing conservation conditions on building projects. Land trusts can hold and manage such easements, ensuring that environmental conditions placed on development are monitored and enforced over time. Additionally, the recorded easement notifies future purchasers of the restrictions during the title search stage of the real estate transaction, and such arrangements prevent the local land use board from undoing an easement.

Example

Town of Mendon, New York, conservation easement condition.[32] The Town of Mendon conditioned the site plan approval for a single-family home development on the owner's acceptance of a conservation easement on other environmentally sensitive areas of the property. The town's zoning code

32. *See* MENDON, N.Y., CODE ch. 200, art. VI, § 200-21 (2007); *see generally* In re Smith v. Town of Mendon, 822 N.E.2d 1214 (N.Y. 2004).

designated the owner's area part of an environmental overlay district subject to special development requirements.

I. Land Use Adaptation to the Effects of Climate Change

Climate change results in sea level rise that impacts coastal communities. To protect their coastal environment, these communities must plan and regulate for receding shorelines and wetlands. Municipalities have at their disposal planning and regulatory tools to help them control development at shorelines and wetlands.

1. Adaptation to Sea Level Rise

The effects of sea level rise include beach erosion; loss of wetlands; "damage [to] barrier islands, habitat, and ecological processes; . . . saline intrusion into freshwater ecosystems and groundwater[;] flooding or inundation of low-lying areas[;] and damage to private and public property and infrastructure."[33] Through their land use powers and their first-hand knowledge of local ecosystems, local governments can address sea level rise adaptation through planning and zoning. Planning and legal tools available to municipalities for mitigating the effects of sea level rise include comprehensive planning, shoreline management planning, post-storm redevelopment planning, special area ordinances, coastal wetland regulations, and coastal infrastructure regulation.

Sources

Jessica Bacher, *Zoning and Land Use Planning Yielding to the Rising Sea: The Land Use Challenge*, 38 REAL EST. L.J. 93 (2009).

BARBARA J. LAUSCHE, MARINE POLICY INST. AT MOTE MARINE LAB., TECHNICAL REPORT NO. 1419, SYNOPSIS OF AN ASSESSMENT: POLICY TOOLS FOR LOCAL ADAPTATION TO SEA LEVEL RISE (2009), *available at*

33. LAND USE LAW CTR., PACE UNIV. SCH. OF LAW, LOCAL LAND USE RESPONSE TO SEA LEVEL 4 (2009) (prepared for The Nature Conservancy on Long Island).

http://www.mote.org/clientuploads/MPI/Synopsis-Policy%20Tools%20for%20Local%20Adaptation%20to%20Sea%20Level%20Rise(fin).pdf.

LAND USE LAW CTR., PACE UNIV. SCH. OF LAW, LOCAL LAND USE RESPONSE TO SEA LEVEL (2009) (prepared for The Nature Conservancy on Long Island).

Preparing For Sea Level Rise in the Bay Area—A Local Government Forum, S.F. BAY CONSERVATION & DEV. COMM'N, http://www.bcdc.ca.gov/planning/climate_change/2008-04-16_forum.shtml (last visited Mar. 1, 2011).

J.G. Titus et al., *State and Local Governments Plan for Development of Most Land Vulnerable to Rising Sea Level Along the US Atlantic Coast*, ENVTL. RESEARCH LETTERS (2009), *available at* http://iopscience.iop.org/1748-9326/4/4/044008/pdf/1748-9326_4_4_044008.pdf.

U. S. CLIMATE CHANGE SCI. PROGRAM, EPA, COASTAL SENSITIVITY TO SEA LEVEL RISE: A FOCUS ON THE MID-ATLANTIC REGION (2009), *available at* http://www.epa.gov/climatechange/effects/coastal/pdfs/SAP_4-1_SynthesisandAssessmentProduct.pdf.

Examples

City of Bainbridge Island, Washington: Shoreline Management Master Program.[34] The City of Bainbridge established its Shoreline Management Master Program pursuant to the State of Washington's Shoreline Management Act. The program regulates all new shoreline uses and modification activities and requires minimal interference with natural processes, including water circulation, sand and gravel movement, and erosion. To minimize environmental impacts, the program establishes general regulations for all environments that include requirements for clearing and grading, environmentally sensitive areas, a native vegetation zone, parking, utilities, and water quality. The program regulates development intensity according to environment designations, precluding intense development in rural and environmentally sensitive areas where it would interfere with natural processes or damage resources. Further, the program contains Flood Hazard and Stormwater

34. BAINBRIDGE ISLAND, WASH., CODE ch. 16.12 (2010), *available at* http://www.ci.bainbridge-isl.wa.us/shoreline_master_program.aspx.

provisions that prohibit or severely restrict channelization of normal stream flows, beach scouring, shoreline stabilization structures, beach enhancement, and shoreline hardening. Instead, these provisions encourage natural berms and vegetated stabilization methods.

Town of Orland, Maine, Shoreland and Zoning Ordinance.[35] The Town of Orland adopted a Shoreland and Zoning Ordinance pursuant to Maine's Shoreland Management Act. This ordinance applies to areas within a certain distance from the high-water line of any great pond, river, or saltwater body; the upland edge of a coastal or freshwater wetland; and the normal high-water line of a stream. For these buffer areas, the ordinance regulates timber harvesting; the clearing of vegetation for development; erosion and sedimentation control; mineral exploration and extraction; and storm water runoff. The ordinance establishes shoreland districts for Resource Protection, Limited Residential and Commercial Use, General Development, Commercial Fisheries/Maritime Activities and Stream Protection.

2. Wetlands Preservation

Without intervention, rising sea levels will destroy coastal wetlands in areas where current or future development prevents wetland migration. Wetland preservation is critical for mitigating the effects of sea level rise because wetlands help absorb influxes of storm and floodwater. Local governments can design plans and laws to address the significant risk of both tidal and fresh water wetland loss due to sea level rise. Specifically, communities can use land use plans and regulations that control shoreline development to address wetland loss and obstacles to wetland migration. Plans and regulations can create buffers to protect the area surrounding wetlands, allowing wetlands and beaches to migrate inland and protecting the wetlands' ability to control storm and floodwater.

35. ORLAND, ME., SHORELAND ZONING ORDINANCE § 3 (1993), *available at* http://www.orlandme.org/images/shore.pdf.

Sources

MANAGEMENT, POLICY, SCIENCE, AND ENGINEERING OF NONSTRUCTURAL EROSION CONTROL IN THE CHESAPEAKE BAY: PROCEEDINGS OF THE 2006 LIVING SHORELINE SUMMIT (Sandra Y. Erdle et al. eds., 2006), *available at* http://www.dnr.state.md.us/irc/docs/00013969.pdf.

JOHN S. JACOB & STEPHANIE SHOWALTER, THE RESILIENT COAST: POLICY FRAMEWORKS FOR ADAPTING THE WETLANDS TO CLIMATE CHANGE AND GROWTH IN COASTAL AREAS OF THE U.S. GULF OF MEXICO (2007), *available at* http://www.urban-nature.org/publications/documents/ResilentCoastWetlands-sm.pdf.

LAND USE LAW CTR., PACE UNIV. SCH. OF LAW, LOCAL LAND USE RESPONSE TO SEA LEVEL 61-4 (2009) (prepared for The Nature Conservancy on Long Island).

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. 4 (1998).

Examples

Town of Barnstable, Massachusetts, Wetland Buffer Regulations.[36] The Town of Barnstable's Wetlands Protection Ordinance forbids, without permit, removal, filling, dredging and alterations within one hundred feet of any vegetated or unvegetated wetland, coastal area, floodplain, or surface water body. In addition, Barnstable's Wetlands Buffer Zone Activity Ordinance requires fifty foot undisturbed buffer zones between wetland resource areas. The ordinance further recommends "that proposed structures within the buffer zone be located no closer than 20 feet to the landward limit of the buffer, so that attendant construction, landscaping, and maintenance activities may ensue without buffer zone insult." If an undisturbed buffer zone is less than fifty feet in width, any work within this zone is subject to planting mitigation requirements.

Town of East Hampton, New York, Natural Resource Protection Ordinance.[37] **Wetland Setback Provisions.** The

36. BARNSTABLE, MASS., CODE ch. 237, 704 (2006).
37. EAST HAMPTON, N.Y., CODE § 255-4-30 (2007).

Wetland Setbacks Provisions in East Hampton's Protection of Natural Resources Ordinance prohibit construction within wetlands and create buffers around the town's wetlands through minimum development setbacks. The ordinance forbids the construction of both sewage disposal devices within one hundred and fifty feet of a wetland's upland boundary and any other structure within one hundred feet of a wetland's upland boundary. Additionally, vegetation clearing, turf, lawn and landscaping may not occur within fifty feet of a wetland's upland boundary.

J. Community Resiliency

Depending on their location, communities face and must endure natural disasters, such as hurricanes, floods, wildfires, earthquakes, landslides, and tornadoes. Scientists predict many of these hazards may increase in frequency in certain areas as our climate changes. To achieve community resiliency against these disasters, local governments must prepare themselves to mitigate the effects of short-term, sudden hazards through disaster management planning that facilitates preparedness, response efforts, and recovery. Appropriate disaster planning occurs before and after disasters and involves locating and constructing buildings and infrastructure appropriately. Resilient communities are those that engage in flood planning and control; create no build zones and strengthen buildings to withstand hurricanes; require defensible space landscaping to combat wildfires; build to survive earthquakes and minimize shaking; regulate ridgeline development to prevent landslides; and facilitate safe room and storm shelter development in anticipation of tornadoes. Land use planning and regulatory tools available for resilient communities include comprehensive plans, floodplain regulations, zoning, building codes, overlay zones, and stormwater regulations.

Sources

JAMES C. SCHWAB, HAZARD MITIGATION: INTEGRATING BEST PRACTICES INTO PLANNING (2010), *available at* http://www.planning.org/research/hazards/index.htm.

TIMOTHY BEATLEY, PLANNING FOR COASTAL RESILIENCE: BEST PRACTICES FOR CALAMITOUS TIMES (2009).

David R. Godschalk, *Safe Growth Audits*, 10 ZONING PRACTICE, no. 10, Oct. 2009, *available at* http://www.planning.org/zoningpractice/open/pdf/oct09.pdf.

David R. Godschalk, *Buildout Analysis: A Valuable Planning and Hazard Mitigation Tool*, 3 ZONING PRACTICE (2006), *available at* http://www.planning.org/zoningpractice/2006/pdf/mar.pdf.

PETER NEWMAN ET AL., RESILIENT CITIES: RESPONDING TO PEAK OIL AND CLIMATE CHANGE (2009).

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

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

John R. Nolon & Kristin M. Grzan, *Rising Tides-Changing Title: Walton County v. Stop the Beach Renourishment*, 38 REAL EST. L.J. 392 (2009).

Jim C. Schwab, *Making Hazards a Planning Priority*, PAS MEMO (Am. Planning Ass'n, Wash. D.C.) July/Aug. 2009.

LAWRENCE J. VALE & THOMAS J. CAMPANELLA, THE RESILIENT CITY: HOW MODERN CITIES RECOVER FROM DISASTER (2005).

Alex Wilson, *Passive Survivability: A New Design Criterion for Buildings*, 14 ENVTL. BUILDING NEWS 12 (2005), *available at* http://www.buildinggreen.com/auth/article.cfm/2005/12/1/Passive-Survivability/.

Examples

Town of Bowers, Delaware, developing storm resiliency plan.[38] Together with the Delaware Department of Natural Resources and Environmental Control and the National Oceanic and Atmospheric Administration, the Town of Bowers is developing a Storm Resiliency Plan to evaluate its vulnerabilities and ability to recover from a major storm event. Through this process the town will assess potential impacts of sea level rise, increased storm frequencies and intensities, increased rates of

38. *Storm Resiliency*, TOWN OF BOWERS BEACH.ORG, http://www.townofbowersbeach.org/11.html (last visited Mar. 1, 2011).

erosion, salt water intrusion, wetland loss, and other impacts. The plan will identify ways the town can increase its resiliency and mitigate the effects of climate change.

Iowa City, Iowa, relocation of water supply facility.[39] Iowa City relocated its water supply facility to higher ground following severe floods in 1993. This prevented another disruption in the city's drinking water during serious flooding in 2008.

Mecklenburg County, North Carolina, Community Floodplain Maps.[40] In 1999, Mecklenburg County created Community Floodplain Maps showing areas likely to flood after future development occurs. The Community Floodplain is based one hundred-year flood discharge and future land use conditions. Most jurisdictions within Mecklenburg County use Community Floodplain information to regulate development. Within the Community Floodplain area, Mecklenburg County's Floodplain Regulations restrict dangerous or damaging uses that could increase erosion, flood heights or velocities; regulate changes to natural features that accommodate flood water; and control filling, grading, dredging, and flood barriers.

K. Large-scale, High-energy Technologies: Reducing Energy Consumption and Promoting Renewables

Obstacles to renewable energy facility siting include land use regulations; building codes; and covenants, restrictions and conditions placed on planned communities. Local governments have the power to eliminate these barriers. In particular, municipalities can use zoning regulations to facilitate and promote large-scale high-energy technologies like wind farms, solar panel fields, and district energy systems.

39. *See PBS NewsHour: Iowa Reels From Bout of Severe Flooding* (PBS television broadcast June 16, 2008), *available at* http://www.pbs.org/newshour/bb/weather/jan-june08/flooding_06-16.html.

40. *Charlotte-Mecklenburg Floodplain Mapping*, CHARLOTTE-MECKLENBURG STORM WATER SERVS., http://charmeck.org/stormwater/StormWaterAgencies/Pages/FloodplainMapping.aspx (last visited Mar. 5, 2011); MECKLENBURG CNTY., FLOODPLAIN REGS., amend. no. 2000-2(c) (2000), *available at* ftp://ftp1.co.mecklenburg.nc.us/luesa/stormwater/Floodplain%20Regulations/Meck%20Flood%20Regs%20Adopted%20121900.pdf.

1. Large-scale Wind Farms

Municipalities have many legal tools available to them to facilitate large-scale wind farms. After determining whether its location is suitable for wind farms, a local government can encourage wind farm development through comprehensive plan language; amendments to zoning code that permit wind farms as of right or by special permit; issuance of licenses to operate; and creation of overlay or incentive zoning. Although important sources of renewable energy, wind farms also can create problems for neighbors. Local governments regulating wind farms must seek ways to ensure benefit to the entire community and not just the property owner. In permitting large-scale wind farms, local governments must buffer to reduce noise, require compliance testing over the course of a project, facilitate local road use agreements, and develop decommissioning requirements for wind turbines.

Sources

AM. PLANNING ASS'N, PAS EIP-18, PLANNING AND ZONING FOR RENEWABLE ENERGY (2008), *available at* http://www.planning.org/pas/infopackets/subscribers/pdf/EIP-18.pdf.

AM. PLANNING ASS'N, POLICY GUIDE ON ENERGY (2004), *available at* http://www.planning.org/policy/guides/pdf/energy.pdf.

KATHERINE DANIELS, WIND ENERGY DEVELOPMENT AND THE COMPREHENSIVE PLAN (2005), *available at* http://www.powernaturally.org/programs/wind/toolkit/1_windenergydevplan.pdf.

KATHERINE DANIELS, WIND ENERGY: MODEL ORDINANCE OPTIONS (2005), *available at* http://www.powernaturally.org/programs/wind/toolkit/2_windenergymodel.pdf.

Andrew B. Wilson & Keith H. Hirokawa, *Local Planning for Wind Power: Using Programmatic Environmental Impact Review to Facilitate Development*, 33 ZONING & PLAN. L. REP. 1 (2010).

CATHARINE M. LAWTON, COMMERCIAL WIND ENERGY FACILITY AND WIND ACCESS MODEL ORDINANCE (2002), *available at* http://www.wind-watch.org/documents/wp-content/uploads/wind-energy-model-ord.doc.

KATE MCCARTHY & ERIC VANDERMAAS, WHAT LOCAL OFFICIALS NEED TO KNOW ABOUT WIND POWER IN THEIR COMMUNITIES (2010),

available at http://ecommons.cornell.edu/handle/1813/14285 (last visited Mar. 3, 2011).

PIONEER VALLEY PLANNING COMM'N, A LOCAL OFFICIAL'S GUIDE TO ZONING AND LAND USE FOR RENEWABLE ENERGY, *available at* http://www.mvcommission.org/doc.php/PVPC%20renewables%20guide.pdf?id=878.

Patricia Salkin & Michael Donohue, *Planning and Zoning for Wind Power in New York*, GOVERNMENT LAW ONLINE, Sept./Oct. 2005, *available at* http://www.governmentlaw.org/files/ZLPR-Planning_Zoning_windpower.pdf.

Daniel A. Spitzer et al., *Host Community Agreements for Wind Farm Development*, 9 N.Y. ZONING L. & PRACTICE REP. 5 (2009).

Examples

Town of Vernon, New York, Comprehensive Plan.[41] After identifying feasible locations for wind energy generation within its borders, the Town of Vernon addressed wind generating facilities within its comprehensive plan in Planning Component Six, Transportation and Infrastructure. This component encourages the town to pursue wind energy development in appropriate areas of town that benefits local and regional residents without disrupting farming activities. During site plan review of potential wind energy projects, the Town must consider noise levels associated with generators and turbine blades, setback and operation, potential loss of farmland, affects on natural resources and wildlife, interference with broadcast transmissions, and municipal boundaries. The plan calls for the adoption of wind power project review guidelines to protect area farms that are developed by the New York State Department of Agriculture and Markets.

Town of Hamlin, New York, Wind Energy Overlay Zone.[42] The Town of Hamlin adopted a Wind Energy Overlay Zone to encourage and regulate wind energy conversion systems ("WECS"). The ordinance controls wind energy facility, WECS,

41. TOWN OF VERNON, N.Y., COMMUNITY COMPREHENSIVE PLAN (2005), *available at* http://www.townofvernon.com/?q=node/15.

42. HAMLIN, N.Y., CODE § 125.45 (2001), *available at* http://www.hamlinny.org/pdf/wind-tower/Wind_Energy_LL-2008.pdf.

and wind measurement tower construction and operation and permits the Town Board to create a Wind Energy Overlay District ("WEOD") only in the Residential-Very Low zoning district. A developer may request a WEOD only when he or she submits an application for a WECS Special Use Permit. The joint application for a WEOD and WECS Special Use Permit must include a decommissioning plan and a proposed complaint resolution process. Additionally, the joint application or Draft Environmental Impact Statement must include studies and analysis of potential shadow flickers, visual impacts, associated noise, effects on water wells, and impacts on wildlife. The ordinance also includes standards for WECS, required safety measures, traffic route requirements, and setbacks, as well as separate requirements for wind measurement towers and small WECS.

2. Large-scale Solar Facilities

Municipalities can adopt local laws that encourage, permit, and regulate utility-scale solar facilities, as well as smaller solar arrays that operate as stand alone, commercially viable solar generation facilities. Local governments can facilitate these projects through simplified or expedited permitting standards, zoning solar facilities as an accessory or as of right use in zoning code, and ensuring a system owner's access to sunlight through solar access ordinances.

Sources

AM. PLANNING ASS'N, PLANNING AND ZONING FOR RENEWABLE ENERGY (2008), *available at* http://www.planning.org/pas/infopackets/subscribers/pdf/EIP-18.pdf.

LARRY SHERWOOD, INTERSTATE RENEWABLE ENERGY COUNCIL, U.S. SOLAR MARKET TRENDS 2008 (2009), *available at* http://irecusa.org/fileadmin/user_upload/NationalOutreachDocs/SolarTrendsReports/IREC_Solar_Market_Trends_Report_2008.pdf.

INTERSTATE RENEWABLE ENERGY COUNCIL, 2009 UPDATES AND TRENDS (2009), *available at* http://irecusa.org/wp-content/uploads/2009/10/IREC-2009-Annual-ReportFinal.pdf.

PIONEER VALLEY PLANNING COMM'N, A LOCAL OFFICIAL'S GUIDE TO ZONING AND LAND USE FOR RENEWABLE ENERGY, *available at* http://www.mvcommission.org/doc.php/PVPC%20renewables%20guide.pdf?id=878.

SOLAR ENERGY INDUS. ASS'N, US SOLAR INDUSTRY YEAR IN REVIEW 2008 (2009), *available at* http://www.seia.org/galleries/pdf/2008_Year_in_Review-small.pdf.

SOLAR POWER ROCKS!, http://solarpowerrocks.com (last visited Mar. 1, 2011).

Examples

City of Erie, Pennsylvania, accessory and conditionally permitted uses.[43] The City of Erie amended its zoning to allow solar collection systems as an accessory use in all zoning districts as long as the systems do not exceed yard requirements, height limits, setback requirements, and coverage maximums. Additionally, applicants must submit design review information, install warning signage, inform the electric utility company if on grid, and adhere to the Bureau of Code Enforcement's Solar Photovoltaic Installation Guidelines. The zoning permits urban solar farms (larger solar energy generation facilities) as a conditional use in light manufacturing, heavy manufacturing and industrial park zones. Urban farms must be enclosed by perimeter fencing; contain warning signage; place most on-site power lines underground; adhere to setback, coverage and height requirements; and conform to decommissioning requirements.

Town of Lincoln, Massachusetts, Solar Photovoltaic Facilities Overlay District.[44] The Town of Lincoln adopted a Solar Photovoltaic Facilities Overlay District to encourage new large-scale (nameplate capacity of 250 kW DC or greater) ground-mounted solar photovoltaic facilities ("SPFs"). The overlay district establishes areas where SPFs may locate and provides

43. ERIE, PA., CODE §§ 305.54-.55 (2010), *available at* http://www.erie.pa.us/pdf/ordinances/ord.4-2010.urban.solar.farm.pdf.

44. LINCOLN, MASS., ZONING BY-LAW § 12.8 (2010), *available at* http://www.lincolntown.org/Adobe%20Acrobat%20Files/Planning/2010%20zoning%20bylaw.pdf.

SPF placement, design, construction, operation, monitoring, modification and removal standards. These standards ensure public safety and reduce impacts on scenic, natural and historic resources. In addition, the overlay district provides financial assurance for decommissioning. Building permits for SPFs issue only after the Planning Board approves the facility's site plan.

3. Distributed Energy Systems—Energy Districts

The most efficient way to distribute and use electricity is at the neighborhood or district level where buildings with various peak loads and energy needs exist. Connecting the buildings within a neighborhood or district to high technology facilities allows them to capitalize on these efficiencies. Similar to combined heat and power within a single building, district energy systems create a scale of operations among buildings that are not under the same ownership and management. District energy systems work by replacing conventional energy sources with hot water. They "produce hot water, steam or chilled water at a central plant and then distribute the energy through underground pipes to buildings connected to the system. . . . Once used . . . the water return[s] to the central plant to be reheated and rechilled and then recirculated through the closed-loop piping system."[45]

Cities in states with Energy Improvement District ("EID") enabling legislation can create EIDs by ordinance. EIDs may issue bonds secured by municipal tax revenues to support distributed energy projects. Similarly, some municipalities may create PACE Districts that allow blanket tax assessment of property owners within a district to fund energy efficiency retrofits and small-scale residential/commercial energy projects, as well as district energy systems. Municipalities also can expressly allow district energy systems by-right or conditionally in some or all zoning districts in order to streamline permitting and installation. Further, zoning ordinances may exempt district

45. *See What is District Energy?*, DIST. ENERGY ST. PAUL, http://www.districtenergy.com/services/districtenergy.html (last visited Mar. 3, 2011).

energy systems from regulation as a "manufacturing" or "industrial" facility to avoid certain reviews and restrictions.

Sources

Jayson Antonoff, *Scandinavia Taps Power of District Energy Systems*, SEATTLE DAILY J. OF COM., May 26, 2004, *available at* http://www.i-sustain.com/index.php?option=com_content&view=article&id=3071:district-energy-systems&catid=74:energy ("District energy systems have proven to be the most efficient model for generation and distribution of electrical and thermal energy in urban environments.").

Property Assessed Clean Energy (PACE) Programs, CTR. FOR SUSTAINABLE ENERGY – CAL., http://energycenter.org/index.php/public-affairs/property-assessed-clean-energy-pace (last visited Mar. 3, 2011).

What is District Energy?, DIST. ENERGY ST. PAUL, http://www.districtenergy.com/services/districtenergy.html (last visited Mar. 3, 2011).

Incentives/Policies for Renewable Energy, DATABASE OF STATE INCENTIVES FOR RENEWABLES & ENERGY, http://www.dsireusa.org/incentives/index.cfm?EE=0&RE=1&SPV=0&ST=0&technology=combined_heat_power&sh=1 (last visited Mar. 24, 2011).

RUSTY HAYNES, CONNECTING TO THE GRID: A GUIDE TO DISTRIBUTED GENERATION INTERCONNECTION ISSUES (5th ed. 2007), *available at* http://www.okcommerce.gov/Libraries/Documents/Connecting_to_the_Grid_A_Guide_to_Distributed_Generation_Int_2008072240.pdf.

MERRIAN C. FULLER ET AL., GUIDE TO ENERGY EFFICIENCY AND RENEWABLE ENERGY FINANCING DISTRICTS FOR LOCAL GOVERNMENTS (2009), *available at* http://erg.berkeley.edu/news/2009news/FullerKunkelKammen-MunicipalEnergyFinancing2009.pdf.

Industrial Distributed Energy, U.S. DEP'T OF ENERGY, http://www1.eere.energy.gov/industry/distributedenergy/ (last visited Mar. 3, 2011).

Vermont's Property Assessed Clean Energy (PACE) Program, VT. ENERGY INV. CORP., http://www.veic.org/resourcelibrary/PACE.aspx (last visited Mar. 3, 2011).

N. ZHOU ET AL., ERNEST ORLANDO LAWRENCE BERKELEY NAT'L LAB., LBNL-60494, ASSESSMENT OF DISTRIBUTED ENERGY ADOPTION IN COMMERCIAL BUILDINGS (2005), *available at* http://eetd.lbl.gov/ea/ems/reports/60494.pdf.

Example

City of Burlington, Vermont, Municipal Development Plan.[46] In 2006, the City of Burlington, Vermont revised its Municipal Development Plan and included in its Energy Plan a policy to "aggressively pursue the transition to renewable sources, cogeneration, and district heating." Burlington's municipally-owned and operated electric company, Burlington Electric ("BED"), is working with the City's Department of Public Works to determine whether developing district heating and cooling within areas of the city is feasible. Burlington's Energy Action Plan includes an action item that calls for the Establishment of "an energy district if justified by the positive result of BED's feasibility study of district heating and cooling."

46. CITY OF BURLINGTON, VT., 2006 BURLINGTON MUNICIPAL DEVELOPMENT PLAN (2006), *available at* http://www.ci.burlington.vt.us/planning/mdp/2006/index.html.