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by Edna Sussman *

Introduction

"A hundred years after we are gone and forgotten, those who never heard of us will be living with the results of our actions." — Oliver Wendell Holmes, U.S. Supreme Court Justice (1841–1935)

These words by Oliver Wendell Holmes, prophetic in light of the current threat to our planet, speak to the urgency of addressing climate change risks with both mitigation and adaptation measures for the benefit of unborn generations. An aggressive planning strategy designed with a broad scope to meet the needs of this century is required. The United States has a long tradition of long range national planning harking back to the 1808 *Gallatin Plan*, which envisioned selling federal lands to produce a society of independent farmers connected to thriving cities by a federally financed system of roads and canals (and later railroads) to form the United States' productive society.[1] This vision dominated the nineteenth century. One hundred years later, in 1908, Theodore Roosevelt's great conservation initiatives followed after the continent's hasty development had laid waste to many of its natural resources. Theodore Roosevelt's *New Nationalism* established a new emphasis on the common good in planning and launched an effort to protect forests, restrain flooding, minimize soil erosion, build dams for hydro power and irrigation, and create a navigable inland waterway system.[2] His vision ultimately culminated in the New Deal programs creating rural highways, dams, electrification, and the national highway system, ultimately funded under President Eisenhower.[3]

Another hundred years later, the 2008 centennial year came and went without a new national vision of such broad scope. The Obama Administration may forge a parallel and equally powerful new national vision and implementation program, of which the stimulus package enacted by Congress in February of 2009 may play a significant part. However, faced with relative inaction at the federal level and serious concerns about the dire impacts of climate change, state, local, and municipal governments across the country have embarked upon local planning efforts to address the looming crisis without awaiting federal guidance and action. The breadth of this local undertaking is exemplified by the commitment by over 900 U.S. mayors, who represent every state in the union, to strive in their own communities to meet or beat the Kyoto Protocol greenhouse gas ("GHG") emission reduction target suggested for the United States—seven percent reduction from 1990 levels by 2012.[4]

This article will discuss concepts of adaptation to and mitigation of climate change in the context of these local initiatives. After introducing the concepts, it will focus on the adaptation initiative launched by the International Council for Local Environmental Initiatives—Local Governments for Sustainability ("ICLEI") and the implementation of that initiative by Keene, New Hampshire, the first U.S. community to engage in and complete a comprehensive adaptation planning process. This article will also provide an overview of the seminal guidebook for U.S. communities planning for adaptation.[5]

Adaptation or Mitigation?

The principal focus of these local climate change initiatives to date has been on mitigation, which is the reduction of GHGs to avoid the most extreme projected climate change impacts. Communities have been slow to address adaptation, however, which focuses on building resiliency to the impacts of climate change.[6] This is largely due to the fear that turning to adaptation measures would divert resources from the essential need to mitigate by reducing GHG emissions.[7] However, as achievement of the requisite reduction in global GHGs remains elusive and as the scientific certainty grows and provides ever more cautionary predictions as to climate change impacts, communities are beginning to address adaptation along with mitigation. Moreover, many communities have concluded that rather than discouraging a commitment to mitigation, calling attention to adaptation can actually inspire a greater commitment to mitigation as the specter of future consequences is highlighted.[8]

Despite local communities' hesitancy to embrace adaptation strategies, it has long been recognized as essential in countering the impacts of climate change and has been part of global climate commitments since the inception of the worldwide effort. For example, the 1992 United Nations Framework on Climate Change ("UNFCC"), which the United States signed, included a commitment to formulate and implement "measures to mitigate climate change by addressing anthropogenic emissions . . . of all greenhouse gases . . . and measures to facilitate adequate adaptation to climate change."[9] Despite its early inclusion, adaptation remained the stepsister to the discussions about mitigation at the

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international climate change negotiations for many years. However, discussions as to how to address adaptation, particularly with respect to assistance to developing countries, which are likely to suffer the most severe damage, have become a central and ongoing part of the Kyoto negotiations.[10]

It is critical that adaptation planning commence now, as many of the measures necessary for adaptation require numerous years of planning and implementation and call for major shifts by governments, businesses, and the population at large.[11] Moreover, many of the required measures serve both mitigation and adaptation objectives. The co-benefits of both energy and water mitigation/adaptation strategies are readily apparent. For example, energy efficiency measures both mitigate GHGs by reducing energy demands and adapt by reducing the increased demand for electricity caused by projected warmer weather. Water conservation also mitigates by reducing energy demand for the electricity generation utilized in water distribution and adapts by reducing demand for projected scarce water resources.[12] As another example, green roofs mitigate GHGs as they reduce energy demand and adapt by addressing projected increased flooding and severe storm events by absorbing more water on site. In addition, many adaptation measures can be implemented today at minimal additional expense during initial construction when those same measures will cost considerably more to retrofit in the future.[13] This is an important factor which should be considered in current decision making.

ICLEI and Keene, New Hampshire

A leader in guiding communities in their climate change efforts, ICLEI is working to foster adaptation planning. Founded in 1990, ICLEI is a membership association of local governments committed to advancing climate protection and sustainable development and includes nearly 1,000 cities world-wide, more than 500 of which are in the United States.[14] In 2006, ICLEI members unanimously resolved to expand the organization's climate protection campaign from strictly climate change mitigation to also include climate adaptation. Accordingly, ICLEI launched its Climate Resilient Communities ("CRC") Program to assist local governments in enhancing community resiliency to the impacts and costs associated with projected climate change.[15]

The framework for adaptation work established by ICLEI is set forth in its adaptation milestones, a recommended series of steps for adaptation planning. The milestones are:

1. Conduct a Climate Resiliency Study
2. Prioritize Areas for Action and Set Goals
3. Develop a Climate Resilient Action Plan
4. Implement the Plan
5. Monitor and Reevaluate[16]

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New England covered bridge.

Keene, New Hampshire was an early participant in developing a climate action plan and has committed to meeting a GHG reduction goal of ten percent from 1990 levels by 2015. Keene was invited to be the pilot community for ICLEI's CRC program and was the first ICLEI CRC community to complete Milestone 3 with the release of its adaptation plan.[17] The town of Keene was motivated to address adaptation as well as mitigation because it had been subjected to more frequent and more severe flooding and had already seen changes in annual snowfall, infestation of non-native plant and animal species, an increase in the total number of high index heat days, and more numerous poor air quality days.[18] Tourism, a major source of income in New Hampshire, relies on several sources—snow cover, fall foliage, and cold water fishing[19]—all of which would be adversely impacted by climate change. Health impact concerns were also a motivating factor.[20] Moreover, Keene was developing a new comprehensive plan and a new capital plan including stormwater and road infrastructure. The adaptation plan was to be incorporated into this planning process and used to make land use decisions to identify capital improvement projects, and to establish funding priorities.[21]

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The effort, led and supported by the dedicated town planning staff, commenced with the creation of a CRC committee. Over the course of eighteen months the CRC committee met and began the process of identifying Keene's vulnerabilities

to climate change. The committee concluded that the vulnerabilities could best be grouped into three main categories, which overlapped somewhat: (a) the built environment, which consists of man-made infrastructure such as buildings, transportation, and stormwater infrastructure; (b) the natural environment, which consists of naturally occurring resources such as wetlands, flora, and fauna; and (c) the social environment, which focuses on areas that impact human life such as the economy and public health.[22] The committee found that it had difficulty strictly separating mitigation from adaptation measures and concluded that the best approach was "to build adaptive capacity" with a "strong mitigation component."[23]

The vulnerabilities identified in Keene are illustrative of the wide ranging impacts of climate change in all of the categories. For the built environment, not only were buildings identified as being at risk from flooding, but road flooding and uneven freeze thaw cycles could cause roads to buckle and bridges to become vulnerable to failure. These failures in the transportation infrastructure could leave people stranded in the event of an extreme weather event and make delivery of emergency services difficult, if not impossible. Flooding could compromise wastewater treatment plants, leading to the possibility of health related dangers. Energy systems could be disrupted in severe storm events, and with today's reliance on cell phones, may leave members in the community without access to emergency notifications.[24]

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For the natural environment, the committee identified a number of areas that are vulnerable to the effects of climate change.[25] The committee found that wetlands are vulnerable to damage from intense storm events and drought; the degradation of wetlands would decrease the efficacy of these natural systems to assist in stormwater filtration and flood control.[26] Changes in temperature threaten the sugar maple and other species. Invasive species may drive out native plants causing dislocation of local animal species.[27] Moreover, the local food supply is threatened by drought. Accordingly, the committee advised self-reliance because other communities from which Keene imports much of its food will be affected by climate change and unable to continue supply.[28]

For the social environment, the committee identified threats to the local economy, public health, and emergency services.[29] For instance, the threat to the sugar maple endangers the fall foliage that attracts so many tourist dollars and jeopardizes the source of traditional maple syrup.[30] The increase in winter temperatures will reduce snowfall causing a reduction in the number of tourists who come to the state for skiing.[31] In addition, several public health concerns were identified resulting from: (a) the increased number of poor air quality days; (b) the increased number of excessively hot days causing heat stress; (c) the introduction of new pests to the area bearing vector born diseases; and (d) flooding, which can impair potable water sources and leave stagnant water that breeds bacteria laden runoff.[32] Climate change could also spike demands for various aspects of emergency services and overwhelm available personnel, especially when routes are blocked and communication systems compromised by extreme weather events.[33]

After identifying vulnerabilities and goals and targets for each vulnerability, the CRC committee used a set of criteria to set priorities by examining: (a) the sectors impacted—local business, environment, or community; (b) potential influence—visibility and whether it supported existing initiatives; and (c) investment—availability of funding, the ease of implementation, the time sensitivity and the cost effectiveness.[34] The Keene Adaptation Opportunities Goals and Targets, released as part of the adaptation plan, lists multiple opportunities for adaptation for each category and identifies specific goals and action items designed to capture each "opportunity."[35]

Since the completion of its climate adaptation plan, Keene has launched a broad scale public visioning effort to engage the community in the development of its new comprehensive plan. The hope is that the comprehensive plan will be informed by the work completed by the CRC committee. Examples of action items already in the process of being implemented include the revision of the building code, the commencement of a major water infrastructure project that will consider climate change science in watershed modeling and the development of a food coop by a community group which will help address food security in the wake of a changing climate.[36] Keene is well on its way to beginning to meet the threat of climate change and foster adaptation measures.

Comprehensive Adaptation Guidance

King County, Washington, long a leader in climate change mitigation and adaptation activities, spearheaded a project in association with ICLEI and released *Preparing for Climate Change: Guidebook for Local Regional and State Governments* ("The Guidebook"), a comprehensive guidebook to assist communities in planning for adaptation.[37] The Guidebook is intended to provide a road map that will enable communities to tailor their adaptation plans to their unique circumstances as the impacts of climate change vary from locale to locale. It is at the

local level that climate change impacts will be felt and at which they can be best understood. The Guidebook sets out a series of steps consistent with the ICLEI adaptation milestones and offers practical advice to maximize success in implementation.

The Guidebook identifies and offers advice on how to overcome the most common barriers to action on adaptation. Those who have attempted to launch an adaptation initiative will recognize many of these objections:

- "I don't know how climate change will affect my community."
- "Climate change action should happen at higher levels of government."
- "I'll deal with climate change when I see that it is happening."
- "My community wants to focus only on reducing greenhouse gases."
- "I'll deal with climate change when you can tell me exactly what I need to plan for."
- "I'll wait until I see other communities planning for climate change."
- "I don't have time or money to deal with climate change right now."
- "I don't have the resources or political support to act."
- "Our operations are based on historical statistics, not future modeling."[38]

The Guidebook further provides a detailed step-by-step review of the recommended process for adaptation planning:

- *Scope the Climate Change Impacts to Your Major Sectors:* This step calls for collecting information about how climate is expected to change in the region with attention to such factors as temperature, precipitation, storm events, and seasonal changes, including a range of possible scenarios and an analysis of the degree of confidence for each prediction. This effort culminates in a decision as to whether impacts are significant enough to begin preparing for climate change.[39]
- *Build and Maintain Support to Prepare for Climate Change:* This step recognizes the importance of outreach in building and supporting the planning effort and the central role of recruiting committed individuals who can also play an important role in implementation after the plan is developed. It is recommended that a "champion" in government committed to the process be identified and that the involvement of the public sector, the private sector, non-profit organizations, and the media be sought and a preparedness message developed.[40]
- *Build Your Climate Change Preparedness Team:* This step recognizes the need to coordinate activities across departments and sectors and calls for identifying leaders and a working team to spearhead the effort.[41]
- *Identify Your Planning Areas and Sectors Relevant to Climate Change:* This step calls for developing an inventory of planning areas associated with built, natural and human, systems that are of significance to the community. These could include water supply, wastewater treatment, land use planning, energy supply, public health, roads and bridges, forestry, agriculture, biodiversity, recreation, business, and emergency response.[42]
- *Conduct a Climate Change Vulnerability Assessment:* With this step the process of analyzing the sensitivity of each planning area or system to climate change begins with a determination of how significant the impact of climate change will be on each. The analysis includes, with respect to each planning area or system, an evaluation of the adaptive capacity, the ability to accommodate changes in climate with minimum disruption or minimum additional cost. This step concludes with an assessment of vulnerability, which combines the sensitivity and adaptability findings. Areas that are sensitive to climate change but less able to adapt are considered vulnerable.[43]
- *Conduct a Climate Change Risk Assessment:* With this step a traditional risk assessment analysis is performed to prioritize action steps. Using the vulnerability assessment results, an analysis is conducted of the consequence of a climate impact (such as the cost of a sea level rise). This is multiplied by the probability or likelihood that the projected impact will occur. As new data becomes available, the risk assessment may change over time, calling for a periodic reassessment.[44]
- *Set Preparedness Goals and Develop Your Preparedness Plan:* This step calls for establishing a vision for a climate resilient community and guiding principles that will inform the process of setting preparedness goals in the priority planning areas. This step includes increasing public awareness, increasing technical capacity to prepare for climate impacts, developing systematic ways to include climate change considerations in planning decisions, increasing adaptive capacity, and strengthening community partnerships. Goals are set, recognizing that regular reevaluations will be necessary, and action steps are established and prioritized.[45]
- *Implement Your Preparedness Plan:* Many action steps can be implemented through existing tools such as zoning regulations, building codes, public safety rules, taxes, and

Tourism, a major source of income in New Hampshire, relies on several sources all of which would be adversely impacted by climate change.

tax incentives, as well as permitting, infrastructure development, emergency management powers, and education. Other new tools for implementation are to be explored.[46]

- *Measure Your Progress and Update Your Plan:* The development of new resiliency measures is recommended to be used to assess progress. The results of these assessments and new information is to be used to modify assumptions and update the plan. Results should be shared in an open and transparent manner.[47]

The Guidebook includes numerous checklists and charts, examples from communities around the world, and extensive resources. It is an indispensable tool for planning for adaptation.

Conclusion

As the years left to accomplish the level of GHG mitigation the scientists advise is necessary slip away without a clear path to achieving the requisite targets and as actual conditions indicate climate changes even more rapid and of greater magnitude than predicted, adaptation efforts will become an increasingly central aspect of planning.[48] While there are gaps in the data available to individual communities which impede more precise adaptation planning, communities are nonetheless beginning to consider adaptation measures in their planning decisions. Such progress on adaptation is both essential if communities are to be protected from harm and smart government as adaptation measures provide opportunities for job creation and foster energy security for the United States.

Endnotes: Case Study

1 Donald William Meinig, The Shaping of America 317-25 (1993).

2 Robert Fishman, *1808-1908-2008: National Planning for America, in* Regional Plan Association, America 2050 at 6 (2007), *available at* http://www.rpa.org/pdf/temp/America%202050%20Website/Fishman%20National%20Planning%20Final.pdf (last visited Feb. 20, 2009).

3 *Id.* at 2.

4 Seattle Mayor Nickels, U.S. Mayors' Climate Protection Agreement, http://www.seattle.gov/Mayor/Climate/ (last visited Feb. 20, 2009).

5 *See generally* Heinz Center, A Survey of Climate Change Adaptation Planning (2007), *available at* http://www.heinzcenter.org/publications/PDF/Adaptation_Report_October_10_2007.pdf (last visited Feb. 20, 2009) (discussing the various adaptation efforts from around the world). While focused on one U.S. geographic area and one climate change impact, the recent publication by the Environmental Protection Agency, in collaboration with the U.S. Geological Survey and the National Oceanic and Atmospheric Administration, is very instructive in its discussion of the impacts of sea-level rise and the multiple opportunities for governments and coastal communities to plan for and adapt to rising sea levels. *See* U.S. Climate Change Science Program, Synthesis and Assessment Product 4.1, Coastal Sensitivity to Sea Level Rise: A Focus on the Mid-Atlantic Region (2009), *available at* http://downloads.climatescience.gov/sap/sap4-1/sap4-1-final-report-all.pdf (last visited Feb. 20, 2009). Bizikova et al., Environment Canada and University of British Columbia, Vancouver, Canadian communities' guidebook for adaptation to climate change (2008), *available at* at http://www.forestry.ubc.ca/LinkClick.aspx?fileticket=xsexCSatHjo%3d&tabid=2455&mid=5415&language=en-US (last visited Mar. 2, 2009).

6 Roger Pielke, Jr. et al., *Lifting the Tabboo on Adaptation*, 445 Nature 8 (2007).

7 A.K. Snover et al., Ctr. For Science in the Earth System, Preparing for Climate Change: Guidebook for Local Regional and State Government 10-11 (2007), *available at* http://www.icleiusa.org/action-center/planning/adaptation-guidebook/ (last visited Feb. 20, 2009).

8 *Id.* at 11.

9 United Nations Framework Convention on Climate Change, art. 4(1)(b), *opened for signature* May 9, 1992, S. Treaty Doc. No. 102-38, 1771 U.N.T.S. 164, 166, *available at* http://unfccc.int/essential_background/convention/background/items/1349.php (last visited Feb. 26, 2009).

10 UNFCC, *Bali Action Plan*, Decision 1/CP.13, FCCC/CP/2007/6/Add.1 (Dec. 2007), *available at* http://unfccc.int/resource/docs/2007/cop13/eng/06a01.pdf#page=3 (last visited Feb. 20, 2009).

11 *Id.*

12 *See generally* U.S. Dep't of Energy, Energy Demands on Water Resources, Report to Congress on the Interdependency of Energy and Water (2006), *available at* http://www.sandia.gov/energy-water/congress_report.htm (last visited Feb. 20, 2009) (discussing the linkage between energy and water); World Economic Forum, Thirsty Energy: Water and Energy in the 21st Century, http://www.weforum.org/pdf/ip/energy/energyvision2009.pdf (last visited Feb. 20, 2009).

13 For example, a municipality planning a stormwater infrastructure improvement can include a larger sized culvert at minimal additional cost that will contain extreme weather events and avoid flooding damage to the community in the future. Building a replacement stormwater infrastructure in the future to deal with such flooding would cost much more than the installation of larger culverts now. *See* City of Keene, New Hampshire, Climate Adaptation Action Plan Summary Report 8, *available at* http://www.ci.keene.nh.us/planning/Keene%20Summary_ICLEI_FINAL.pdf (last visited Feb. 20, 2009) (listing ideas to create a more sustainable stormwater infrastructure design).

14 ICLEI, About ICLEI, http://www.icleiusa.org/about-iclei (last visited Feb. 18, 2009).

15 ICLEI, Introducing ICLEI's Climate Resilient Communities Program, http://www.icleiusa.org/programs/climate/Climate_Adaptation (last visited Feb. 18, 2009).

16 ICLEI, Five Milestone for Climate Adaptation Methodology, http://www.icleiusa.org/programs/climate/Climate_Adaptation/five-milestones-for-climate-adaptation (last visited Feb. 18, 2009).

17 City of Keene, New Hampshire, Adapting to Climate Change: Planning a Climate Resilient Community (2007), *available at* http://www.ci.keene.nh.us/planning/Keene%20Report_ICLEI_FINAL_v2.pdf (last visited Feb. 20, 2009).

18 *Id.* at 6.

19 *Id.* at 19-21.

20 *See id.* at 22 (explaining that increased smog levels, poor quality air days, and high heat index days amplifies the risk cardiovascular and respiratory illnesses and vector-borne diseases).

21 *Id.* at 9.

22 *Id.* at 11.

23 *See* City of Keene, *supra* note 17, at 12.

24 *Id.* at 24-26.

25 *Id.* at 27-29.

26 *Id.* at 27.

27 *Id.* at 28.

28 *See* City of Keene, *supra* note 17, at 29.

29 *Id.* at 29-30.

30 *Id.* at 29.

31 *Id.*

Endnotes: Case Study *continued on page 71*

ENDNOTES: CASE STUDY *continued from page 35*

[32] *Id.* at 30.

[33] *See* CITY OF KEENE, *supra* note 17, at 30.

[34] *Id.* at 31-42.

[35] *Id.* at 32-42.

[36] E-mail from Mikaela Engert, City Planner, City of Keene New Hampshire (on file with author).

[37] SNOVER ET AL., *supra* note 7.

[38] *Id.* at 28-31.

[39] *Id.* at 33-45.

[40] *Id.* at 47-54.

[41] *Id.* at 55-63.

[42] SNOVER ET AL., *supra* note 7, at 65-66.

[43] *Id.* at 67-86.

[44] *Id.* at 87-91.

[45] *Id.* at 93-108.

[46] *Id.* at 109-11.

[47] SNOVER ET AL., *supra* note 7, at 112 -19.

[48] For example, on February 17, 2009, New York City released projections of the impacts of climate change in New York City to inform the City's initiative to plan for adaptation. *See* NEW YORK CITY PANEL ON CLIMATE CHANGE, CLIMATE RISK INFORMATION (2009), *available at* http://www.nyc.gov/html/om/pdf/2009/NPCC_CRI.pdf (last visited Feb. 20, 2009). The Climate Change Advisory Task Force of Miami Dade County, working as a CRC community on adaptation, released its *Second Report and Initial Recommendations* in April 2008. CLIMATE CHANGE ADVISORY TASK FORCE OF MIAMI DADE COUNTY, SECOND REPORT AND INITIAL RECOMMENDATIONS (2008), *available at* http://www.miamidade.gov/derm/library/08-10-04_CCATF_BCC_Package.pdf (last visited Feb. 20, 2009). Climate change planning at the state level is also increasingly including adaptation measures. *See, e.g.*, Florida's Energy and Climate Change Action Plan, Chapter 8, *available at* http://www.dep.state.fl.us/climatechange/actionplan_08.htm (last visited Feb. 20, 2009).