LESSONS LEARNED ON LOCAL CLIMATE ADAPTATION FROM THE URBAN LEADERS ADAPTATION INITIATIVE

The Center for Clean Air Policy
February 2011

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Center for Clean Air Policy
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About CCAP

Since 1985, CCAP has been a recognized world leader in climate and air quality policy and is the only independent, non-profit think-tank working exclusively on those issues at the local, national and international levels. Headquartered in Washington, D.C., CCAP helps policymakers around the world to develop, promote and implement innovative, market-based solutions to major climate, air quality and energy problems that balance both environmental and economic interests. For more information about CCAP, please visit www.ccap.org.

Acknowledgements

CCAP applauds the vision, leadership, and effort of our ten partners in the Urban Leaders Adaptation Initiative: Chicago, King County, Los Angeles, Miami-Dade County, Milwaukee, Nassau County, New York City, Phoenix, San Francisco, and Toronto. Over the last few years we have been impressed with the partners' commitment to climate adaptation, progress in adaptation planning, and their development and implementation of best practices for managing emerging and future climate change impacts. This report was made possible by support from the Rockefeller Foundation and the Surdna Foundation.

In the Beginning

In partnership with government leaders from ten large counties and cities, CCAP launched the Urban Leaders Adaptation Initiative to serve as a resource for local governments as they face important infrastructure and land-use decisions that affect local climate adaptation efforts and empower local communities to develop and implement climate resilient strategies. Urban Leaders partners included: Chicago; King County (Washington); City of Los Angeles, Miami-Dade County (Florida); City of Milwaukee; Nassau County (New York); New York City; Phoenix; San Francisco; and Toronto. The goals of the project were exploring and catalyzing adaptation to climate change at the local level, spreading adaptation best practices from partners to other local and professional communities, and influencing national and state climate adaptation policies. This report provides an assessment of general lessons learned over the course of the project and thoughts about future directions for local climate adaptation.

INTRODUCTION TO LESSONS LEARNED: A BASIC FRAMEWORK

What we have learned that local governments want to know about climate adaptation can be encapsulated in the following five questions:

- What will climate change impacts generally mean for city and county activities and citizens, particularly those who are most vulnerable?
- What are some adaptive solutions to managing impacts?
- How should local governments implement these solutions?
- Have other local governments tried these solutions?
- Have they been successful and how has success been measured?

In unpacking these questions, a number of lessons can be drawn. First, scientific uncertainty is not necessarily a barrier to action on adaption planning. Once local governments have accepted the inevitability of climate change, they initially want a sense of the science: the implications of their vulnerabilities to impacts and local impact scenarios for different levels of greenhouse gas emissions. Next, they want estimates of the risks from climate change impacts across different sectors, such as infrastructure, public health, or storm-water management to help in developing response strategies and other solutions. Because local governments make decisions every day under conditions of uncertainty they accept that climate information is currently imperfect, especially at local scales, and that decisions must be made because some choices cannot afford to wait. Generally, they turn to the best available local sources of actionable science and information (university researchers, consultants) to guide them in climate adaptation planning processes.

Because Urban Leaders partners do not have the luxury of ignoring climate change impacts or waiting for greater certainty, they have been quick to embrace adaptive solutions that enhance protection of life, health, and property while also increasing overall community resilience. Climate adaptation solutions and best practices have been focused on planning, risk assessment, and sustainability (New York City's PlaNYC or Chicago's Climate Action Plan). King County, Washington added climate adaptation considerations when implementing projects on water reclamation, flood control, and protection of transportation infrastructure to showcase the additional benefits of sustainable development. Other local governments have approached adaptation without necessarily labeling it as such, focusing instead on water management, hazard mitigation, preparing for sea level rise hazards, or "green" practices for managing storm-water and reducing urban heat island effects.

Local governments see prioritizing adaptive action as a challenge in times of scarce resources, but are willing to work adaptively to address "must do" risks first, especially using "no-regrets" or "win-win" strategies. Other problems can continue to be monitored or researched, putting off solutions until further scientific information or resources are available. Local governments are aware that "Asking the Climate Question", or preparing to act in the future and to spend money when impacts arise or become worse may be as important as investing in adaptation in

the present. This concept of "mainstreaming" adaptation into policy is gaining currency among local governments because it allows solutions to be integrated incrementally over time into planning and management, increasing both the acceptability and feasibility of adaptation measures. Incremental implementation allows efficient balancing of costs and benefits as new information becomes available and practices mature. Additionally, mainstreaming incrementally may help to recognize and avoid mal-adaptive policies before they become established.

Local governments often already have the necessary skills, expertise, and experiences to manage climate impacts and increase resilience (water conservation, flood control, urban forestry, green roofs, etc.), but what they may need is additional information and technical assistance on understanding, applying, and incorporating new information into practice to improve planning and preparedness. Acceptance by community leadership of the need to adapt is a key ingredient but they also may simply need additional funding to act beyond implementing the no- or low-cost solutions. Finally, managers want metrics and benchmarks for evaluating "how adapted are we?" so that they can demonstrate progress over time to leaders and citizens. Peer influence and learning have proven to be powerful motivators for local governments tackling climate adaptation. Besides a certain desire to be leaders on cutting edge policy issues, local governments also compete with or pursue the examples of other cities and counties that have recognized the risks from climate change. Leading local governments have already won support, developed a plan, started implementing solutions, and are perceived as being successful over time.

"Local governments often already have the necessary skills, expertise and experiences..."

One of the accomplishments of the Urban Leaders Adaptation Initiative has been in fostering interactions among the partners to share best practices so that they advance together. Most partners over the course of the project have moved from climate vulnerability assessment to department-wide planning to prioritization of risks and strategies and in some cases, to adaptation implementation. Additionally, some partners have been able to spread what they have learned to local governments outside of the Urban Leaders network and have also influenced Federal adaptation programs and policies by joining the current Administration in Washington, DC. Nancy Sutley, from Los Angeles, is head of the White House Council on Environmental Quality. Ron Sims, former King County Executive, is now Deputy Secretary of the Department of Housing and Urban Development (HUD). Jim Lopez, from King County, is Director of Sustainability at HUD.[1]

The remainder of this report distills lessons learned from the Urban Leaders project updating the report "Ask the Climate Question: Adapting to Climate Change Impacts in Urban Regions" with some concluding thoughts about unfinished business.

[1]Although not an Urban Leader local government partner, Maria Blair, from the Rockefeller Foundation, was Associate Director for Climate Adaptation at the White House Council on Environmental Quality, and lead for the White House Climate Change Adaptation Task Force

INITIAL LESSONS LEARNED FROM THE URBAN LEADERS ADAPTATION INITIAITIVE --
ASK THE CLIMATE QUESTION: ADAPTING TO CLIMATE CHANGE IMPACTS IN URBAN REGIONS

A Recipe for Local Governments "Getting Started" with Adaptation Planning:[2]

- The effective use of "triggering events," such as, floods, droughts, hurricanes, or storms to focus government and public attention on the imperatives of adaptation
- The presence of a "champion" in top level elected leadership or heading a city department to motivate action
- Early departmental "buy-in" and organization for adaptation planning
- Sources of "actionable science" accessible, accurate, and understandable for adaptation decision making at the local level
- "Down-scaled" climate information at high-enough resolution for assessing local climate impacts and risks to infrastructure and economy created in collaboration with trusted local experts (universities, consultants)
- Engaging experts and stakeholders (private sector) to become involved and to motivate adaptation planning processes and also including outreach to build public awareness and support
- Using existing administrative, legal, and financial mechanisms to motivate adaptive behavior including federal, state and local laws and regulations
- Peer-learning from other local governments working on climate adaptation
- Treating mitigation and adaptation as complementary measures in terms of funding appropriation, allocation and targeting of strategies that accomplish both (tree planting for storm-water management, cooling, and carbon storage)
- Leveraging funding for adaptation planning via philanthropic sources, pro bono work, or as embedded in existing budgets for planning, public works and transportation
- Regional engagement on adaptation planning to address issues outside of local jurisdictions at the municipal, watershed, or state level

[2]Covered in CCAP's Report: "Ask the Climate Question: Adaptation to Climate Change Impacts in Urban Regions" (June 2009). http://www.ccap.org/index.php?component=news&id=223

NEW WAYS OF THINKING ABOUT ADAPTATION

Not Gloom and Doom

The importance of changing how adaptation is perceived has been one of the primary lessons learned (and accomplishments) from the Urban Leaders Adaptation Initiative—particularly in the context of creating greater community resilience. Adaptation, if it is considered at all, often has been seen as an excuse to avoid mitigating greenhouse gas emissions. In other words, why prevent a problem if we can just adjust to a new reality by adapting? Because adaptation is about managing climate change impacts it has also been used to convey the consequences of not mitigating emissions—that we will suffer more fires, floods, droughts, and polar bears dying, etc. Consequently, CCAP has encouraged its partners to "**Ask the Climate Question**", examining how planning, policy, funding, infrastructure and land development decisions affect GHG emissions and local vulnerability or resilience to the impacts of climate change. CCAP sought to reframe perceptions of adaptation positively, asserting that it produces economic opportunities and benefits via greater cost savings or overall resilience. CCAP asserts that climate change is no longer about distant polar bears dying, but more about that inconvenient sewer-overflow down the block after an intense rainstorm, what to do about it, and the local economic, social, and environmental benefits that will result. Adaptation should highlight the potentially severe costs of inaction to compel a greater focus on what happens if GHG emissions are not reduced.

Mainstreaming

Fundamentally, the Urban Leaders project sought to advance the important goal of "mainstreaming" climate change thinking into daily decisions made by elected officials, city managers, businesses, and citizens. CCAP expected that once local communities realized there were incremental options that could be implemented at low or no cost, and that all parts of society could be part of solutions to climate change that innovation would follow. Because different sectors are simultaneously under threat from climate change and face similar problems, CCAP expected that this approach would incentivize more integrated impacts management and show that solutions can have multiple benefits.

Sustainability

Urban Leaders partners also experimented with linking climate adaptation and sustainability as a means of advancing adaptive policies and actions, especially when many of the solutions are similar (conserving water, managing storm-water, planting trees). This framing allows local governments to define adaptive solutions flexibly to fit local circumstances, embed climate policies within a larger environmental policy context, enhancing climate policies with notions of equity, community participation, and quality of life. A sustainability focus also motivates a more comprehensive, integrated, system-wide, and risk-based approach to adaptation, bringing considerations other than climate into play. For example, sustainability-based actions more effectively accommodate increasing community resilience via a range of actions: vulnerability assessments, maximization of infrastructure and resource efficiency, establishment of "green" infrastructure (urban forestry, green roofs), smart growth, integrated and comprehensive urban planning, design, and land-use, and protection of vulnerable populations.

RISK MANAGEMENT AND SCENARIO ANALYSIS

Urban Leaders partners generally chose a risk assessment and management framework as the preferred approach for climate change adaptation planning. The Urban Leaders project encouraged the interaction of university and federal climate scientists or consultants with partners via scenario analysis—helping them to better understand their current climate conditions and future vulnerabilities in terms of the magnitude and timing of climate change impacts and then identify some of their options for adaptive strategies. Risk assessment lends itself to scenario analysis which allows decision makers to "virtually" evaluate different courses of action and consequent outcomes in advance based on different projections of climate change, helping them to determine which actions are preferable. Not only did this approach allow partners to evaluate acceptable levels of risk, but it also freed them from needing absolute certainty about projections, allowing them to use information on what is most *likely* instead. Working with scientists, partners accomplished assessments of climate vulnerabilities to impact and in some cases, evaluation of economic risks across a range of high and low GHG emission scenarios. Assessments generally indentified extremes of temperature and precipitation, or sea level rise—as primary threats. These impacts will damage buildings, infrastructure, and urban ecosystems. Scenarios and outcomes were then used to develop lists of response strategies and solutions that could be planned or implemented to mitigate these risks.

CLIMATE ADAPTATION: WE'RE ALREADY DOING IT…BUT WHAT ELSE?

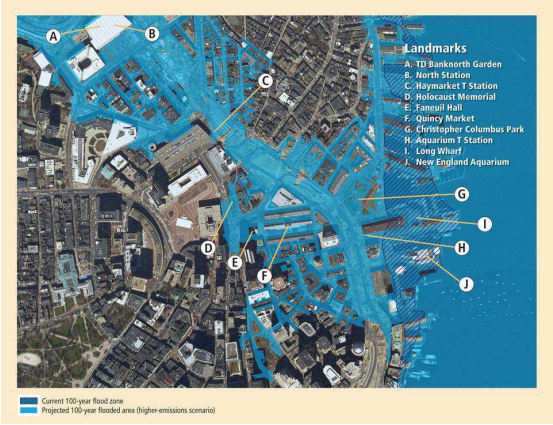
Human beings have been adapting to climate change for thousands of years—agriculture being one of the best examples. Although, the rate of modern climate change will provide additional stresses and challenges, local governments already have much of the relevant experience and skills needed to plan for and respond to climate change impacts through their experience in hazard mitigation, emergency response, flood management, water conservation, and land use planning. Smart growth and green infrastructure approaches if implemented with climate change in mind also will contribute to resilient communities. For example, smart growth can help by avoiding building in locations vulnerable to climate impacts, or allowing more flexible and beneficial practices for managing storm-water and heat events. However, with all of these activities additional research and experimentation will be needed on how practices should be changed, refined, or enhanced to achieve adaptation successes.

Green Infrastructure

"Green infrastructure" at the household, neighborhood, city, and even regional level is emerging as a key adaptive solution. Practices include green vegetated roofs, rain-gardens, urban forestry, wetlands, and greenbelts. Green infrastructure not only provides multiple benefits at lower cost for managing storm-water, reducing heat island effects, storing carbon,

and cleaning the air, but it also leads to greater climate resilience.[3] Green infrastructure is adaptable and scalable as climate conditions change, and can be implemented by individual property owners or city governments alike. The concept of ecosystem services in urban environments as a means to adapt to climate impacts is an emerging interest area needing further research and promotion.

A Continuing Need for Science



Key challenges for climate adaptation will include the need for improved climate science and information, additional resources, and capacity. One challenge is the need for more refined climate change information relevant for local adaptation planning that is not yet available at local scales. Climate scientists and local governments will need to continue to work to incorporate the best available information about current conditions and extremes into local planning and implementation while leaving space to incorporate new scientific information as it becomes available. This collaboration will require further data collection, refinement of down-scaled climate models, development of risk scenarios, and climate decision-support tools.

Stretching Budgets

Acquiring and prioritizing scarce resources to implement climate adaptation practices will be another challenge. As noted above, the mainstreaming of adaptation decisions into all dimensions of government will allow implementation to occur over time using existing budgets and balancing incremental costs with the economic, environmental, and social values produced. Risk management and scenario approaches also offer means for prioritizing adaptation strategies. However, quantifying climate risks is only just emerging, mostly from the insurance industry or from firms evaluating risks to infrastructure. Instituting Federal and state policies and funding programs that are directed at climate adaptation or mainstreaming will help to further support local adaptive action.

Refining Mainstreaming

Further research is needed about to how engage key local government sectors that climate change will impact, such as public health, emergency management, and transportation so that they can most effectively incorporate, or mainstream, climate change into their planning, design, response, operations, and maintenance. Given the current politics of climate change, a useful approach may not be to focus on climate change per se but rather on improving preparedness, robustness of decision making, and overall resilience. Risk management approaches along with economic analysis will help to target specific strategies to the most urgent, cheapest, or highest net-benefit activities.

[3]See forthcoming report from CCAP: "The Value of Green Infrastructure to Urban Climate Adaptation." http://www.ccap.org/adaptation.html

Benchmarking Success

Measuring progress made towards adapting over time is still a major outstanding need. Managers need suitable performance metrics to show their elected leaders and citizens "how adapted" their cities and counties are at any given time, demonstrating that risks have been reduced at the greatest net-benefit while also keeping expectations realistic. An adaptation performance framework could measure input, output, impact, and benefit. A practical example for adaptation in response to heat wave increases would be: cost of cooling centers (input), number of cooling centers available (output), people served during annual heat waves (impact), and lives saved or lowered mortality during heat waves (benefit). The key message with measuring progress in climate adaptation planning and implementation is that it is an ongoing process. Simply put, even as risks are reduced as a result of actions, adaptation is a goal that is never completely finished and must be managed adaptively to ensure that community resiliency efforts continue to match the changing strength and scope of climate impacts.

Many Ways to Get There From Here

Another way to improve the cost profile of adaptation planning and implementation is to focus on solutions with multiple benefits in reducing carbon emissions or achieving several adaption goals at once. At the start of the Urban Leaders project, few city and county governments were focused on the inevitable need to adapt, even if they had already established climate change mitigation programs. Adaptation was also still seen as an undesirable alternative to mitigation or an excuse to avoid it altogether. Others saw adaptation in a 'zero-sum' game competing for resources with mitigation. As the inevitability of climate change has become more certain and US domestic and global action on climate mitigation have become less certain, the acceptability of and interest in the multiple benefits of adaptation has grown.

Greater awareness of adaptation has drawn local governments to solutions that simultaneously help to adapt to impacts and mitigate GHG emissions. Water conservation, green roofs and infrastructure, and urban forestry alleviate drought, help to more effectively manage storm-water flows, or mitigate heat waves.[4] At the same time, these practices store carbon or reduce electricity used for heating, cooling, and pumping, thus reducing GHG emissions. Other benefits of these practices include fewer combined-sewer overflows that impair water quality, less overall urban heat island effects or flooding, and improved air and water quality. Arguably, smart-growth has adaptation-mitigation co-benefits if designed to be resilient to climate change impacts while also reducing GHGs from vehicle miles traveled (VMT). Savings or avoided future costs of all of these practices are additional benefits.

[4]See forthcoming report from CCAP: "The Value of Green Infrastructure to Urban Climate Adaptation." http://www.ccap.org/adaptation.html

TIMING OF DECISIONS AND PLANNING FOR THE FUTURE

Timing is Everything

Preparing to act or react in the future may be as important to climate adaptation as acting in the present. Planning ahead for climate change or adapting in the present may allow local governments to avoid higher cost from responding to impacts in the future (avoided cost of inaction). Consequently, their communities will be better prepared for climate impacts in the future whether leaders have actually implemented concrete actions in the present or not. In practice, this means taking "no regrets" actions or "building with the future in mind" toward avoiding future costs generating greater local resilience to impacts. For example, bridges can be built higher now to avoid washouts from more frequent and intense storms and floods in the future, often at only marginal additional costs. Before they are constructed, buildings can be sited outside of areas in which current floodplains are expected to expand under climate change conditions or away from the coastal zones to avoid sea level rise.

Local governments also can organize solutions based on shorter or longer lead times, working backwards from when they want to be adapted and planning accordingly. Lead-times for infrastructure development require long planning horizons, but buying insurance can be done as required. As mentioned earlier, adaptation actions can also be implemented in stages as circumstances change. For example, a dyke construction project to protect a community from coastal flooding could start permitting and land acquisition well in advance of sea level rise, with construction beginning as ocean encroachment or storm surge becomes a problem. Once established, the dyke then can be raised if sea level rise increases. Local governments can also wait and choose to relocate facilities if and when flooding, sea level rise, and more frequent storm surges become a problem by preparing contingencies in advance for retreat. Additional stresses from smaller but more frequent or intense storms will increase operations and maintenance costs for storm-water management and transportation systems, so planning ahead for these events will be as important as anticipating big, worst-case disasters.

"Behind-the-scenes" activities for a number of arenas could all be part of adaptive solutions, including activities related to planning, development, finance, urban design, building and zoning codes, insurance, taxation, regulation, and property valuation.

Levers of Change

Framing climate change adaptation as having economic benefits when compared to the cost of inaction should be a powerful motivator for adaptive action at the local level. It's cheaper to pay now to plan ahead and prepare in advance for climate change impacts than to pay more later in reaction to a disaster striking. As noted above, sustainability approaches can help to affect adaptive behavior as long as incentives are provided. One way to incentivize adaptive behavior is through using the underlying levers of influence that drive the creation of wealth,

daily decision-making, and management of our cities and counties. "Behind-the-scenes" activities for a number of arenas could all be part of adaptive solutions, including activities related to planning, development, finance, urban design, building and zoning codes, insurance, taxation, regulation, and property valuation. Similarly, the professional class of developers, planners, financiers, insurers, and lawyers who work with elected leaders and the city or county managers need to be engaged as prime motivators of adaptation because of their influence on those who drive local decisions. In turn, these professionals need to integrate with experts on water, transportation, emergency preparedness, public health, building, public works and infrastructure to ensure the basis for mainstreaming into these sectors.

Institutional approaches, such as reserving funds in anticipation of climate related disasters, buying insurance, or creating contingency contracts to spend money in the future in the event of climate changes are also important. These actions may have the added benefit of lowering insurance premiums or capital loan rates, or increasing property values, thus increasing tax revenues. Similar to business continuity planning, the key point of these examples is that timing of local public policy decisions is paramount for climate adaptation.

There are often good reasons for local governments not to act prematurely in the face of climate change impacts but preparing ahead to act in the future is a robust risk management strategy offering "no-regrets" for a range of future conditions. A key barrier, to this kind of action, however, is the distribution of benefits and costs of adaptive action over time. For example, developers can reap the short-term benefits of building in areas that are vulnerable to future climate impacts while local governments and building owners assume the liability for future damage to their properties and infrastructure from flooding if and when it occurs.

A key question is how future liabilities can be made to have a greater influence on present-day decisions? As noted earlier, calculating avoided future costs or current costs savings from adaptation are one way that this can be accomplished. Other ways are to pay for future costs up-front, increase the costs of current actions, or provide incentives for adaptive behavior. Examples include: (1) assessing climate adaptation impact fees during development; (2) rebate programs, tax credits, or fee waivers for green infrastructure; or (3) providing loans attached to the property for improvements that enhance resilience (green infrastructure, hurricane roofs). The latter approach is similar to those provided for energy efficiency or renewable energy improvements under the Property Assessed Clean Energy (PACE) Loan programs. Another barrier is high social discount rates that preference current benefits over future liabilities—so lower discount rates would increase the attractiveness of adaptation projects with longer-term paybacks. Social discounting is an abstract concept—but providing lower interest rates or longer repayment schedules for adaptation-oriented projects would be one way to implement it in practice.

CAPACITY BUILDING[5]

Climate Extension Services and Networks

To make climate impacts information useful it must be packaged and presented in ways that are relevant to problems in neighborhoods, businesses, towns, or watersheds. Many elected officials, urban managers, and citizens want to play an active role in local solutions to climate challenges but may not have the climate information, data, or knowledge sufficient to solve their specific climate adaptation problems. Recent federal actions have established the basis for a National Climate Service (NCS) to produce and deliver authoritative, timely, and useful information to decision makers and the public enabling effective management of weather and climate-related risks. However, there is a need to enable translation and integration of available information into effective local adaptation planning and implementation—covering that last ten-yards to transfer innovations from providers of information to users.

A concept that CCAP has helped to pioneer and promote is that of climate extension services and networks. Climate extension could build on a 150-year old agricultural extension model of federal-state-university partnerships for research and training operating through local networks of practitioners embedded in communities. Climate extension would be a means to customize and deliver adaptation information as well as to provide technical assistance and capacity to meet specific local adaptation needs. Urban Leaders partners also demonstrated a need for developing and operating these networks in urban settings.

Practical advice could be brought to bear from university "climate extension specialists" or research centers on such urban adaptation needs as building materials to mitigate urban heat island effects, changes to building codes and zoning to reduce vulnerability from floods, best practices on emergency response, urban forestry, geospatial mapping and insurance planning, "green" infrastructure, and water conservation. The "co-production" of adaptive knowledge and solutions among scientists, experts, decision makers, and citizens is the essence of the extension process. Consequently, these networks also will provide a means to bring practical insights to shape and direct future adaptation research within the climate sciences and applications communities.

[5]GAO-10-113 CLIMATE CHANGE ADAPTATION: Strategic Federal Planning Could Help Government Officials Make More Informed Decisions (October 2009): http://www.gao.gov/products/GAO-10-113: Federal training and education initiatives could help government officials to develop more effective and better coordinated adaptation programs. Training efforts could help officials collaborate and share insights for developing and implementing adaptation initiatives. Respondents rated the "development of regional or local educational workshops for relevant officials that are tailored to their responsibilities" as the most useful potential federal government action related to awareness and priorities.

SOCIAL EQUITY AND CLIMATE ADAPTATION

One of the stated goals of the Urban Leaders Adaptation Initiative was to help local urban adaptation improve the plight of those most likely to be impacted. Although, Urban Leaders partners did not necessarily have climate equity programs or document lessons learned on climate justice they were to varying degrees aware of the importance of protecting most vulnerable populations. Chicago made the clearest link on this issue with a project on urban "hotspots" and tree planting (see below). Every UL partner made concerted efforts to engage the public to educate and build support for climate adaptation no doubt including climate disadvantaged communities. This section draws some general lessons on social equity and climate adaptation as part of a full lessons learned analysis from the project.

Inequities in Vulnerability to Climate Impacts

In the same way that climate impacts are expected to increase the severity and frequency of events and circumstances that communities already experience (floods, heat waves), climate impacts will also accentuate and compound the hazards and obstacles that vulnerable populations already face as a result of historical social and economic inequities. Therefore, instead of focusing solely on the environmental impacts likely to be faced by vulnerable communities, it is important to understand the external factors that cause vulnerable communities to bear an inequitable burden from these impacts. Only by addressing these inequities in adaptation planning can we begin to close the climate resilience gap. Populations identified as especially vulnerable to climate change impacts include the elderly, the very young, low-income, and those with pre-existing medical conditions. Poor and minority populations' increased vulnerability to the impacts of climate change stem from a number of historical and socioeconomic factors:

Geographical Distribution—People with the fewest resources tend to be located in marginal areas (river floodplains or low-lying coastal areas) that are the most vulnerable to climate impacts. In Louisiana, for instance, the poorest/most disenfranchised communities live furthest south and at the lowest elevations. In Chicago, GIS mapping coupled with socioeconomic data showed that the areas at highest risk for crippling heat waves coincided with the location of poor and minority communities. Research in California has resulted in the same conclusions, showing in four major cities that poor urban areas are more likely to have higher concentrations of heat-trapping concrete and lower concentrations of tree cover than more affluent ones.

Lack of Financial Resources—Lack of access to financial resources significantly reduces a community's resilience, or ability to bounce back, from severe weather events. Without renter's or home insurance, many residents may spend their entire lives struggling to recover from damage caused by an extreme weather event. Coupled with a lack of financial safety nets like personal savings and emergency access to credit, permanent displacement can be the ultimate result which, at a larger scale, contributes to the degradation of local culture and heritage (e.g. New Orleans after Hurricane Katrina).

Lack of Access to Health Care or Insurance—These communities are less able to cope with the additional health impacts associated with climate change, such as increases in respiratory illness and trips to the ER as a result of heat-related medical problems because they often lack access to health insurance (not provided as an employment benefit and unable to afford individually). Lack of transportation to medical facilities can be an additional burden to accessing health care for these populations.

In most cases, a number of pre-existing factors combine to create the inequitable burden for vulnerable populations. For instance, increasing urban temperatures as a result of climate change will also increase air pollution impacts such as smog which in turn exacerbate existing respiratory illnesses. And because low-income residents are often segregated in the inner city where the temperatures are highest, these impacts will pose a greater burden on those with the least ability to cope due to lack of access to health insurance or health care. In California, the five highest smog cities also have the highest concentrations of minority and low-income populations. To further compound the situation, lack of access to transportation makes escaping to cooler climates more difficult in the event of a heat wave.

Climate Equity Goes Beyond Katrina:

The unequal impacts to socially vulnerable populations extend beyond higher risks to life and property during extreme weather events. Vulnerable communities face a number of economic risks that often take a back seat to health impacts when adaptation is discussed.

Impacts to cost of living—Poor communities spend a larger proportion of their income on basic necessities than other groups (nearly a three fold difference in water expenditures between the lowest and highest income brackets).[6] Because of this imbalance, increases in food and energy prices as a result of climate impacts will affect them disproportionately.

Job Loss Risks— adverse climate impacts may cause major employment shifts in sectors that employ predominantly low-income and minority communities. In many cases, the livelihoods of these individuals are more dependent on the health of ecosystems than those of their white collar peers. For instance, changes in climate may shift the geographic viability of certain agricultural crops, or necessitate an increase in pesticide use. Because the agriculture sector is a large employer of minority and disenfranchised populations, the former circumstance could result in lost jobs for already vulnerable communities while the latter would contribute significantly to health risks among workers.

[6] Morello-Frosch, Rachel et. al. "The Climate Gap: Inequalities in How Climate Change Hurts Americans & How to Close the Gap." The Annerberg Foundation, the Energy Foundation and the William and Flora Hewlett Foundation.

Addressing Inequities while Planning Adaptation Measures

There are two types of equity to consider in terms of environmental justice in climate adaptation[7]:

1. Distributive—The distribution of adverse and beneficial impacts as a result of climate change. As discussed above, these are often skewed against vulnerable populations.

2. Procedural—How adaptation measures are decided. Who has a voice in the decision making process and how equally this is power distributed? Because marginalized groups are often excluded from the decision making process, adaptation strategies may be skewed towards the interests of wealthier populations and may not take into account the special challenges faced by vulnerable communities.

The first step to addressing distributive equity in adaptation is to identify the geographical location of vulnerable communities and their specific challenges and needs in a changing climate. Using GIS technology to map the location of vulnerable populations in relation to projected impacts is an extremely helpful tool for planning the most effective and equitable adaptation strategies. GIS can be overlaid with vulnerability models, racial and cultural dispersions to get a more comprehensive understanding of the real impacts of climate change. This analysis has been accomplished in Chicago to help decision makers target the most important locations to focus their urban forestry efforts to reduce heat impacts in the inner city.

Additionally, adaptation policies must be tailored to the specific characteristics of the different populations involved; a one-size-fits-all approach often will not accommodate the most marginalized communities. For instance, public policies to reduce deaths from extreme heat waves often instruct communities to stay indoors and avoid outdoor air pollution exposures, but such a policy does not take into account individuals without access to air conditioning at home. Likewise, when siting the location of cooling centers within a city, it is important to take into account their potential accessibility to communities with less access to transportation. Understanding how socioeconomic factors will compound climate impacts on vulnerable communities will be an important tool in designing adequate adaptation policies.

[7] Adger, Neil "Justice in Adaptation to Climate Change," Tyndall Centre for Climate Change Research, University of East Anglia, Norwich, UK.

Lastly, because the geographical distribution of communities has such a high impact on their burden of vulnerability to climate impacts, urban planning will be an important aspect of equitable adaptation. Because reactive adaptation measures tend to favor wealthier communities, proactive planning *in advance* of climate impacts will better help to prepare vulnerable communities. In King County, WA, for example, planners have taken decisive actions to relocate vulnerable communities living in floodplains that are at high risk of increased flooding due to climate change. By relocating these communities out of the high risk areas, planners have changed the distributive equity of climate risks faced in the region.

Procedural Issues

Currently, federal policies and programs rarely address climate change and its impact on socially vulnerable populations.[8] While social science research has been assessing these issues for a while, federal policy tends to lag behind academic research. To advance equity issues in climate adaptation strategies, communication between policymakers and the scientific community must be strengthened. Programs such as NOAA's Climate Service can be an important link in closing the gap between the academic foundations on climate equity and on-the-ground implementation of strategies that incorporate these concepts in urban communities. In the absence of federal policies explicitly addressing equity, some have suggested that certain federal agencies, such as FEMA, are beginning to use existing laws more liberally in order to help socially vulnerable communities.[9] Because climate impacts will occur in areas that federal and local policies are already set up to manage, using existing policies in new and creative ways is a viable strategy to address social equity in climate adaptation. Moving forward, mainstreaming equity and adaptation into existing official policies will ensure that these issues are adequately addressed by more than just today's championing cities.

The top-down nature of many decision-making processes makes it difficult to fully incorporate and utilize the social capital of vulnerable populations to create adaptation policies that are effective to marginalized communities in addition to the general population. The planning process for exploring adaptation strategies should include a robust process for stakeholder input that also takes into account the obstacles faced by marginalized communities to participate. For instance, stakeholder meetings should not be scheduled in the middle of a work day because this would pose a greater obstacle for low-income individuals to participate than those who can afford to miss a work day or leave early. Some federal agencies are beginning to experience a procedural shift (EPA, NOAA) by addressing climate change and social vulnerability and expressing more willingness to include local communities and nonprofits in dialogue on these issues. At the local level, this type of openness is just as important to ensure that adaptation policies are crafted with equity issues in mind.

[8] Cooper, John, and Jasmine Waddell, "Impact of Climate Change on Response Providers and Socially Vulnerable Communities in the US," Oxfam America Research Backgrounder series (2010): oxfamamerica.org/publications/us-climate-change-impact.

[9] *Ibid.*

FINAL THOUGHTS ON LESSONS LEARNED – What's Left to Do? Communication, Policy, Practice

More recent lessons garnered from the Urban Leaders project illustrate topics needing further research or concerted action. Topics include how to define and communicate adaptation to create greater receptivity at the local level, how to create Federal and state policies more conducive to local adaptation, and some final thoughts on adaptation practice. Climate adaptation is finally coming into its own as an issue on the national, state, and local policy agendas. The failure of global and federal climate legislation and increasing awareness of the inevitability of change despite best efforts to mitigate has piqued curiosity about adaptation, particularly at the local level. A recent adaptation workshop entitled "Planning for North Carolina's Future: Ask the Climate Question," drew hundreds of local planners, managers, and decision makers.[10] Because local governments are the first responders to climate change impacts and adaptation is fundamentally a local problem with local solutions, they want to know what they can do to plan, prepare, and protect the life and property of their communities. Local governments want to know how to hedge their bets or at least explore their options when they see a threat coming because they are so directly accountable to their citizens.

Communicating Adaptation

Making Normal Sexy

As noted above, adaptation is no longer perceived as much about exotic impacts that happen in the distant wilderness but rather as the more frequent occurrence of local weather events and impacts their associated costs to public health, water quality, property values, and overall quality of life. These small scale and more frequent impacts will accompany more newsworthy and catastrophic weather, leading to steady but exponentially accumulating costs to citizens, businesses, and local governments. These mundane events will be at the heart of the climate change story in the 21st Century because everyone will suffer in some manner unless action is taken. Solutions will need to be about planning and preparing, greater efficiency and savings, avoiding future costs, and increasing prosperity via adaptive management.

Growing interest in the green economy and jobs has spurred parallel attention to the opportunities that adaptation may present. A recent study estimates that there are 2 million jobs in the adaptation economy in helping people to cope with climate change and that there is a significant opportunity for growth.[11] Above all, the adaptation story will need to be a local one that is told locally with actions undertaken neighborhood by neighborhood.

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[10] http://www.onencnaturally.org/pages/ClimateChange/CC_ClimateWorkshop.htm

[11] A fresh look at the green economy: Jobs that build resilience to climate change, OXFAM, November 17, 2010. http://www.oxfamamerica.org/publications/a-fresh-look-at-the-green-economy

Mainstreaming the Positive

Communicating climate adaptation to the public and decision makers has been a challenge from the beginning of the global climate debate more than 20 years ago. As noted above, adaptation has been thought of as another word for giving up on preventing global warming via GHG emissions reductions. Additionally, adaption has been seen as a reactive rather than proactive solution to the climate change problem. Finally, adaptation is something that human beings do naturally and incrementally—so it is difficult to differentiate adaptation practices from policies local governments already may be planning and implementing to become more sustainable or resilient. Is an entire levee system built to prevent flooding an "adaptation" project, or just the added height and cost to cope with greater flood extremes? In other words, is there any such thing as an "adaptation best practice"? The inevitability of at least some climate change has made adaptation a necessity and no longer a luxury that can be put off—so there is a much greater receptivity and curiosity about it among local governments.

The Urban Leaders Adaptation Initiative has sought to achieve a more positive and proactive framing of adaptation. Economic benefits and competitiveness have been a principal framing from the initiative. Adaptation has also been touted as a means to achieve greater resilience—meaning building greater capacity to adapt based upon an ability to plan, prepare, learn, and adjust practices over time. As noted, adaptation has been embedded in sustainability to emphasize environmental, economic, and social aspect of adaptation beyond just climate. Further research is needed, however, on defining resilience, sustainability, and adaptation best practices in the context of climate adaptation, particularly to find the most effective means to communicate and influence adaptive behavior. The multiple benefits of adaptive (and mitigation) action need to be more thoroughly quantified to demonstrate viability as an alternative to business-as-usual. Mainstreaming is another important message that conveys that there are practical solutions.

Mainstreaming Adaptation into Federal and State Policies

The Federal Story

National legislative action on climate change has been disappointing with the failure of various bills this year. Domestic climate adaptation struggled for recognition and funds within the larger bills. Proposed adaptation language focused on support for natural resources and wildlife along with public health. Other legislative proposals focused on development and coordination of federal adaptation research and climate services policies and programs. A few stand-alone climate adaptation bills were presented but did not advance. Absent for most of the debate was language connecting adaptation and mitigation or supporting the human and infrastructure dimensions of local adaptation. Adaptation language was inserted eventually on a few new sectors related to water supply, wildfire management, and local governments but these sections went down along with the remainder of the Senate climate bill. Likewise, the Federal economic stimulus package lost an opportunity to address adaptation except indirectly through support for water infrastructure upgrades.

Funding allocations proposed in Congressional climate bills over the last two years have been inadequate to support mainstreaming of adaptation into Federal, state, and local policies for planning and implementation. The Waxman-Markey bill passed in the House in 2009 initially allocated about $1 billion to adaptation per year across 50 states, equaling about $20 million per state for implementation projects only. To qualify for these funds, each state still would need to develop an adaptation plan without Federal support. If passed, the $1 billion would have paled in comparison to the costs of adaptation, estimated at 1.5-2% of GDP over the next century equal to about $150 billion in 2008.[12] In fact, these amounts would be insufficient to cover state feasibility study costs let alone actual implementation of adaptation projects.

One solution could be to mainstream adaptation into existing national legislative authorities and Federal funding programs on transportation, coastal zone management, water, agriculture, etc. For example, projections for upgrading U.S. water supply and wastewater infrastructure estimate a financial need of $500 billion for current upgrades, and with another $500 billion needed to handle additional impacts from climate change, for a total of $1 trillion. Allocating even a portion of annual Energy and Water Development Appropriations or State Revolving Funds for drinking and wastewater quality for climate adaptation would begin to pay the massive incremental costs of managing climate change while providing associated benefits. Including climate adaptation in FEMA's Pre-Disaster Mitigation Program or as part of national flood map revisions would be another effective means of national and state mainstreaming.

"Funding allocations proposed in Congressional climate bills over the last two years have been inadequate to support mainstreaming of adaptation into Federal, state, and local policies..."

A bright spot in mainstreaming adaptation policy over the last two years has been the work of the White House Climate Adaptation Task Force.[13] The goals of the Task Force are making adaptation a standard part of federal agency planning and so that they are more responsive to state, local, and tribal governments. The Task Force solicited input from various constituencies including from Urban Leaders partners and CCAP. Representatives from Chicago, Los Angeles, New York City, and San Francisco participated in a national adaptation summit that helped to shape the recommendations of the Task Force. As note above, two former King County officials, now at the Housing and Urban Development Administration, served on the Task Force. Overall, the good news policy-wise is that the mainstreaming of climate adaptation is indeed catching on at the state and local levels, or at least local governments are beginning to Ask the Climate Question about it. This trend bodes well for continuing engagement between local governments and federal agencies on defining funding and technical assistance priorities.

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[12] 2% of US GDP ($14.6 T) was about $300B in 2008 (statistics from Union of Concerned Scientists (UCS) Overview of adaption).

[13] http://www.whitehouse.gov/administration/eop/ceq/initiatives/adaptation

Implementation of the Task Force's recommendations will provide a continuing opportunity for local governments to shape development of federal agency adaptation policies and programs if they are supported to do so.

A Society for Adaptation Professionals

Building a cadre of adaptation professionals who can serve local governments and speak for adaptation at the local level is another need. There are still few organizations at the interface of Federal policy and local action on adaptation, except a few that are sector-focused (water utilities) or that promote sustainability (ICLEI). Political associations, such as the Conference of Mayors or National Associations of Counties (NACo) are just beginning to consider adaptation, but their efforts are now caught up in economic concerns, and uncertainty about the future of Federal climate policies. Additionally, national policy efforts to adapt infrastructure and the built environment at the state and local levels need to "catch-up" with already well organized efforts to adapt natural resources and wildlife.

Cross-Jurisdictional Resolution

Adaptation policies may lead to conflict among Federal, state, and local laws and policy that will need to be reconciled. Legal, financial, regulatory, and administrative incentives will need to be carefully designed or revised across these already well-established jurisdictional boundaries to catalyze and achieve adaptation goals or simply to avoid mal-adaptation. For example, building dams to increase the availability of clean hydro-power and water supplies may impact in-stream flows preserving endangered species. Repeatedly rebuilding local communities in floodplains using National Flood Insurance Program funding is another such mal-adaptation.

Regional governance at the local level is a new model of adaptation activity to explore and potentially emulate. The Southeast Florida Regional Climate Change Compact is a first ever agreement among four counties in south Florida on climate mitigation and adaptation: Broward, Monroe, Miami-Dade, and Palm Beach.[14] The Compact committed to four types of activities:

1. Coordination in development and advocacy of climate legislation at the state and federal level;
2. Dedicating staff for a Regional Climate Team that would develop a Southeast Florida Regional Climate Action Plan;
3. Developing a regional strategy for climate mitigation and adaptation; and
4. Hosting a summit annually to document progress and coordinate future activities.

[14] Southeast Florida Regional Climate Change Initiative, CASE STUDY: CROSS-JURISDICTIONAL COLLABORATION, in Promising Practices in Adaptation & Resilience, A Resource Guide for Local Leaders, Institute for Sustainable Communities, CLIMATE LEADERSHIP ACADEMY, Boston, September 20-22, 2010 http://www.iscvt.org/how_weve_helped/adaptation_cla/

Friends Overseas

Finally, what can the US learn from other developed and developing countries about adaptation in urban regions? Likely quite a lot given the extensive adaptation efforts of countries like the Netherlands and the United Kingdom. Also, it may be worth examining lessons learned from work in developing countries that has been bolstered by the UN Framework Convention on Climate Change and recent fast start funding and adaptation funding pledges.

Practice

Final Thoughts on Science

In the coming years, advances in climate adaptation only will be made through closer collaborations between scientists and decision makers incorporating existing and emerging climate science into adaptation planning and practice. The technical details of mainstreaming adaptation will need to accelerate across different sectors (public health, disaster management, water, etc.), perhaps without an explicit focus on climate, but with greater understanding of how the Climate Question really needs to be asked. Scaling-up and spreading adaptation practices across multiple communities and sectors is another challenge that the scientific community will need to address. Finally, the role of the private sector in assisting local governments with adaptation measures needs to be better defined. Adaptation should be a public sector responsibility to ensure that life and property are protected from extremes, but it should not be determined by the ability of local governments to pay for technical support. State and national extension services are one possible remedy. Additionally, information and adaptation practices developed in cooperation with the private sector needs to be publically available, at least to a degree, so that all can benefit equally. The propagation and use of on-line and cell phone web applications have opened nearly infinite possibilities for value-added information to be provided at the local levels in ways that are useful, accessible, and financially viable.

Photograph Sources:

1.) Map of Boston Coastal Flooding Projections--Watson, Chris "Coastal Flood Inundation Mapping and Climate Change." UMass Boston, Fall 2009. PowerPoint Presentation.
2.) Green Infrastructure--http://www.actgreenblog.com/category/construct-green/page/2/
3.) Agricultural Workers-- http://bigteaparty.com/farm-workers-in-the-us/
4.) Chicago '95 Heat Wave --http://www.justonebadcentury.com/chicago_cubs_history_30.asp

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