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# LOCALIZING GLOBAL CLIMATE CHANGE: CONTROLLING GREENHOUSE GAS EMISSIONS IN U.S. CITIES

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Global Environment Assessment Project

Environment and Natural Resources Program

Belfer Center for Science  
and International Affairs

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The Global Environmental Assessment project is a collaborative team study of global environmental assessment as a link between science and policy. The Team is based at Harvard University. The project has two principal objectives. The first is to develop a more realistic and synoptic model of the actual relationships among science, assessment, and management in social responses to global change, and to use that model to understand, critique, and improve current practice of assessment as a bridge between science and policy making. The second is to elucidate a strategy of adaptive assessment and policy for global environmental problems, along with the methods and institutions to implement such a strategy in the real world.

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Publication abstracts of the GEA Project can be found on the GEA Web Page at <http://environment.harvard.edu/gea>. Further information on the Global Environmental Assessment project can be obtained from the Project Associate Director, Nancy Dickson, Belfer Center for Science and International Affairs, Kennedy School of Government, Harvard University, 79 JFK Street, Cambridge, MA 02138, telephone (617) 496-9469, telefax (617) 495-8963, Email [nancy\\_dickson@harvard.edu](mailto:nancy_dickson@harvard.edu).

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## FOREWORD

This paper was written as part of the Global Environmental Assessment Project, a collaborative, interdisciplinary effort to explore how assessment activities can better link scientific understanding with effective action on issues arising in the context of global environmental change. The Project seeks to understand the special problems, challenges and opportunities that arise in efforts to develop common scientific assessments that are relevant and credible across multiple national circumstances and political cultures. It takes a long-term perspective focused on the interactions of science, assessment and management over periods of a decade or more, rather than concentrating on specific studies or negotiating sessions. Global environmental change is viewed broadly to include not only climate and other atmospheric issues, but also transboundary movements of organisms and chemical toxins. (To learn more about the GEA Project visit the web page at <http://environment.harvard.edu/gea/>.)

The Project seeks to achieve progress towards three goals: deepening the critical understanding of the relationships among research, assessment and management in the global environmental arena; enhancing the communication among scholars and practitioners of global environmental assessments; and illuminating the contemporary choices facing the designers of global environmental assessments. It pursues these goals through a three-pronged strategy of competitively awarded fellowships that bring advanced doctoral and post-doctoral students to Harvard; an interdisciplinary training and research program involving faculty and fellows; and annual meetings bringing together scholars and practitioners of assessment.

The core of the Project is its Research Fellows. Fellows spend the year working with one another and project faculty as a Research Group exploring histories, processes and effects of global environmental assessment. These papers look across a range of particular assessments to examine variation and changes in what has been assessed, explore assessment as a part of a broader pattern of communication, and focus on the dynamics of assessment. The contributions these papers provide has been fundamental to the development of the GEA venture. I look forward to seeing revised versions published in appropriate journals.

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## ABSTRACT

A growing number of municipal governments are joining efforts to mitigate global climate change. For example, 75 city and county governments in the U.S. participate in the Cities for Climate Protection (CCP) campaign sponsored by the International Council for Local Environmental Initiatives (ICLEI). Leaders in these communities have publicly recognized global climate change as a legitimate concern at the local level and committed to addressing that threat by controlling local greenhouse gas (GHG) emissions. Why do municipal governments join the CCP campaign and make these commitments, especially given that climate change is generally framed as a global issue? Why have some CCP member cities been more successful in implementing policies and programs to control GHG emissions? Of particular interest is the role of global climate change assessment in the process of reframing global warming as a local issue and in developing local policies for controlling GHG emissions.

Drawing on a comparative case study of three U.S. cities (Denver, Milwaukee and Indianapolis), I find that global climate change is most likely to be reframed as a local issue when the preferred policy response (controlling GHG emissions) can be linked to issues (e.g. air quality) already on the local agenda. In the cases examined, global climate change assessment had little effect on this reframing process, primarily because municipal officials were not linked to any mechanism by which global climate change assessment might cross the boundaries between knowledge and action, from the global to the local scale. Even when local governments recognize that they should do something to control GHG emissions, they face a number of institutional barriers that make it difficult to move from reframing to policy action.

Ironically, the findings of this study suggest that the most effective way to get municipal governments to take action on global climate change is to not talk about global climate change. If the objective is to involve cities in global efforts to control GHG emissions, the best strategy may be to "Think Locally, Act Locally."

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## ACRONYM LIST

CCP	Cities for Climate Protection campaign
CO <sub>2</sub>	Carbon dioxide
EPA	U.S. Environmental Protection Agency
GEA	Global Environmental Assessment project
GHGs	Greenhouse Gasses
ICLEI	International Council for Local Environmental Initiatives

## 1. INTRODUCTION

Municipal governments play a central role in mitigating global climate change. Although the political emphasis has primarily been on developing an international response to global warming through the negotiation of the United Nations Framework Convention on Climate Change and the Kyoto Protocol, countries will not be able to meet the commitments contained in these agreements without the assistance of city governments. As Wilbanks and Kates (1999, p. 612) have noted, "The human activities that can lead to climate change are very local." Furthermore, because city government is more closely linked to people's day-to-day lives, local officials may be more successful in prompting the behavioral changes necessary to abate the greenhouse gas (GHG) emissions that contribute to climate change.

Indeed, a growing number of municipal governments are joining global efforts to mitigate climate change through the control of GHG emissions. For example, 75 local governments in the U.S. currently participate in the Cities for Climate Protection (CCP) campaign sponsored by the International Council for Local Environmental Initiatives (ICLEI). Officials in each of these cities have publicly recognized global climate change as a legitimate local concern and have committed to addressing that threat by controlling local GHG emissions. Many of these communities have successfully developed and implemented policies and programs to reduce emissions.

The CCP communities present an interesting empirical puzzle. While there may be multiple opportunities for cities to control their GHG emissions, there are a number of reasons why we would not expect municipal governments to take any such action. In the U.S., for example, there is no broader structure prompting local officials to control their emissions. There is no federal mandate for local action and the Clinton Administration's voluntary program for controlling U.S. GHG emissions generally overlooks the role of cities, focusing instead on business and industry (Clinton and Gore 1993). If anything, many cities face constraints to local action. The U.S. Senate has prohibited the use of federal funds for activities that could be seen as implementing the Kyoto Protocol before it has been ratified, and some states (e.g. Colorado) have passed similar legislation. Why then have some U.S. cities chosen to become engaged on the issue of climate change in the face of these structural obstacles?

From a rational choice perspective, it makes little sense for a city government to expend resources to control its GHG emissions.<sup>1</sup> In many ways, the choice of whether to control emissions presents local officials with a "Prisoner's Dilemma." First, it is not at all clear that local action to control emissions will have any measurable effect on the overall threat of global climate change since emissions from any particular place account for a minuscule fraction of global GHG emissions. Moreover, controlling local emissions will do little to protect a particular community from the potentially adverse effects of climate change since "...emissions of GHGs have no direct local effects: local regions will be impacted on only through the impact of GHGs on global-scale climate" (DeAngelo and Harvey 1998, p. 115). In the absence of action by all cities to control local GHG emissions, there is little incentive for a particular municipal government to bear the economic burden of controlling its own emissions. Why have some cities decided that controlling GHG emissions is in their interest?

Finally, and perhaps most problematic, climate change is generally framed as a global problem with future impacts.<sup>2</sup> This is largely due to the fact that most scientific research on the issue has been conducted at the international level—emissions data are typically collected at highly aggregated levels (national or global-scale) and there is considerable uncertainty about the distribution, timing and magnitude of local impacts (Agyeman, Evans, and Kates 1998; Kates et al. 1998; Kates and Torrie 1998; Wilbanks and Kates 1999). As a result, city officials often have little understanding of how they contribute to the problem of global climate change and/or how they might be affected by the impacts of climate change in the future. They feel distant from the problem in both space and time and are thus unlikely to see global climate change as a legitimate local concern (Wilbanks and Kates 1999). What is going on CCP communities—have officials successfully “localized” the threat of global climate change?

This study examines a number of questions related to municipal efforts to control GHG emissions. Why do some municipal governments recognize global climate change as a local problem and commit to controlling the GHG emissions? Why are some municipalities more successful in implementing policies and programs to control GHG emissions? What is the role of global climate change assessment in municipal efforts to control GHG emissions?<sup>3</sup> Drawing on a comparative case study of three U.S. cities (Denver, Milwaukee and Indianapolis), I find that global climate change is most likely to be reframed as a local issue when the preferred policy response (controlling GHG emissions) can be linked to issues (e.g. air quality) already on the local agenda. In the cases examined, global climate change assessment had little effect on this reframing process, primarily because municipal officials were not linked to any mechanism by which global climate change assessment might cross the boundaries between knowledge and action, from the global to the local scale. Even when local governments recognize that they should do something to control GHG emissions, institutional barriers, rather than a lack of scientific and technical information, make it difficult to move from political rhetoric to policy action. The study concludes that municipal leaders should “think locally, act locally” when it comes to global climate change.

## 2. THE LOCAL DIMENSION OF GLOBAL CLIMATE CHANGE

Half the world’s population lives in urban areas and many more travel into cities to work each day (OECD 1995; O’Meara 1999; Rayner and Malone 1997). As a result, a significant portion of the human activities that lead to global climate change are concentrated in cities—it is in cities that humans produce and consume fossil fuels for manufacturing, electricity, transportation and household heating. It is also in cities that humans dispose of their waste (Kates et al. 1998; OECD 1995). Factories, businesses, vehicles and homes located in urban areas are essentially point sources for GHG emissions (Kates et al. 1998). By some estimates, cities account for 78% of global CO<sub>2</sub> emissions (O’Meara 1999).

By implication, reducing GHG emissions must involve local action. Not only is this where the majority of GHG emissions originate, but it may also be the most appropriate political jurisdiction for bringing about many of the necessary changes in human behavior. Throughout the industrialized world, there is a general trend toward decentralized control over environmental issues (Press 1998). In the U.S., states and municipal governments have considerable authority over land-use planning and waste management and can play an important role on transportation issues and energy consumption (Agyeman, Evans, and Kates 1998; Bulkeley under review;

Collier 1997; DeAngelo and Harvey 1998; Kates et al. 1998; Rayner and Malone 1997). Through zoning regulation and building permits, city governments can control local development and encourage energy efficiency measures. They can also affect transportation choices through decisions related to supply of parking spaces and investment in road construction and public transit. City officials often have free reign when it comes to developing recycling programs and managing landfills.

## **2.1 ICLEI and Global Climate Change**

Indeed, a growing number of municipal governments are recognizing that global climate change has an important local dimension. ICLEI's CCP campaign is a vivid example of this trend.<sup>4</sup> ICLEI, which was established in 1990, works "...to build and support a worldwide movement of local governments to achieve tangible improvements in global environmental conditions through the cumulative impact of local actions" (ICLEI n.d.). Its members consist of more than 300 local governments and their associations from around the world.

ICLEI began working on the issue of global climate change in 1991 when it launched the Urban CO<sub>2</sub> Reduction Project. This campaign, which ran until 1993, was designed to "develop comprehensive local strategies to reduce greenhouse gas emissions and quantification methods to support such strategies" (ICLEI 1997). Fourteen municipalities from Europe and North America participated in the Urban CO<sub>2</sub> Reduction Project: Ankara, Turkey; Bologna, Italy; Chula Vista, U.S.; Copenhagen, Denmark; Dade County, U.S.; Denver, U.S.; Hannover, Germany; Helsinki, Finland; Minneapolis, U.S.; Portland, U.S.; Saarbrücken, Germany; Saint Paul, U.S. and Toronto, Canada. This program received funding from the U.S. EPA, the City of Toronto and several private foundations.

## **2.2 Cities for Climate Protection**

Based on the success of the Urban CO<sub>2</sub> Reduction Project, ICLEI launched its Cities for Climate Protection (CCP) campaign in 1993. The CCP campaign seeks to recruit local governments representing 10% of global GHG emissions and provides technical assistance to help them control those emissions. As of September 2000, the CCP campaign had more than 380 members world-wide, including 75 in the U.S. (see Table 1). The U.S. cities, which comprise 28.5 million people, are responsible for 10% of U.S. GHG emissions (ICLEI 2000).

To become a member of the CCP campaign, local governments pass a city council resolution or other formal declaration of the city's intention to address the threat of global climate change by controlling local GHG emissions (ICLEI 2000). Members also commit to passing through a series of five "milestones" designed to help them control those emissions:

1. Conduct an emissions analysis to establish a baseline (generally 1990), identify local GHG emissions sources, and forecast future emissions using a "business as usual" scenario.
2. Select an emissions reduction target (ICLEI suggests the "Toronto Target" of 20% reductions below 1990 levels by a target year—usually 2010).
3. Develop a local action plan identifying measures to reach the reduction target.
4. Implement the local action plan.



5. Monitor and report on progress toward the achievement of the reduction target.<sup>5</sup>

ICLEI provides CCP members with technical assistance and training to help them complete these milestones, including workshops, funding to conduct emissions analyses (in the U.S., these funds typically come from the EPA), and specially-designed software to help city officials calculate past and current emissions, evaluate options for reducing emissions, and track the effects of reduction measures, both in terms of cost savings and GHG emissions.

### 2.2.1 Types of Municipal Initiatives

CCP governments use a range of policy options for controlling local GHG emissions. Many begin by looking to their own municipal operations and trying to reduce emissions generated through their day-to-day activities.<sup>6</sup> For example, in 1996, the city of Denver began installing light-emitting diodes (LEDs) in all red traffic lights and "don't walk" signs in the city's 1200 intersections. LEDs consume considerably less electricity than incandescent bulbs (6-25 watts vs. 69-150 watts) and last much longer (100,000+ hours vs. 8,000 hours). The city spent \$1.6 million dollars for the replacement project (for acquisition and labor), but has enjoyed substantial savings in terms of energy and maintenance costs (estimated at \$356,840/year) and expects to realize \$5 million in savings *after* covering its initial investment (in four years). Lower energy use translates into an annual savings of 5,300 metric tons of CO<sub>2</sub>, the equivalent of planting a 2,266 acre forest in the middle of the city or removing 1,094 cars from the road (Winer n.d.). Fourteen other CCP communities have initiated LED retrofit projects resulting in annual GHG reductions of 60,000 metric tons (ICLEI 2000).

Municipal governments can also cut GHG emissions by enhancing building energy efficiency through codes and ordinances establishing insulation and lighting standards for new construction as well as retrofits of existing structures. The city of St. Paul, Minnesota has achieved substantial CO<sub>2</sub> reductions through the development of a district heating and cooling system. In partnership with the city government, two non-profit companies—District Energy St. Paul, Inc. and District Cooling St. Paul, Inc.—pipe hot and chilled water from a central location to hundreds of office buildings and private homes throughout the city. Customers use this water for heating, air conditioning, hot water and industrial processes (Market Street Energy Co. 1999a; Market Street Energy Co. 1999b). Through conservation and efficiency measures, the district heating and cooling system has reduced the city's CO<sub>2</sub> emissions by 50% per end-use of energy; an estimated savings of 189,600 tons/year (St. Paul Energy Conservation Project n.d.).

In the transportation sector, city governments can invest in alternative transportation infrastructure such as bikeways and mass transit systems. They can also encourage people to use existing systems with bus pass programs. In addition, local officials can purchase alternative fuel vehicles for mass transit and the municipal fleet. The city of Fort Collins, Colorado reduces vehicle miles traveled by 4 million miles/year through its VanGo program. Twenty-eight vans transport 200 passengers each day between Fort Collins and surrounding communities (Blair 2000). Two of the vans use alternative fuels (propane and natural gas), reducing GHG emissions by 741 tons/year (ICLEI 2000).

Municipal governments also have significant opportunities to achieve GHG reductions through solid-waste management programs, including methane recovery and recycling. Portland, Oregon, diverts 1.5 million cubic feet of landfill gas from the St. John's landfill each year and uses the

gas as an energy source for 3,500 homes. Officials estimate that this methane recovery program reduces the city's GHG emissions by 23,000 metric tons/year (City of Portland 2000). Eleven CCP cities have implemented landfill methane recovery and use programs for a combined emissions reduction of nearly 2 million metric tons/year (ICLEI 2000).

In addition, cities can meet local energy demand using renewable energy sources, such as solar and wind power. For example, in April 2000, the Seattle City Council agreed that the city's future electricity needs would be met with no net GHG emissions.

The goal will be met through reliance on existing hydropower and development of new wind, geothermal, solar and landfill gas facilities, as well as energy conservation measures. If any fossil fuels are required to meet electricity demand, the City plans to offset the carbon emissions through other measures such as forest protection (City of Seattle 2000).

### 2.2.2 Results

ICLEI (2000) estimates that the CCP communities have reduced their annual GHG emissions by 7.5 million metric tons (an average of 100,000 tons per city). ICLEI-U.S. officials suggest that this is a conservative estimate since many of the cities do not quantify all of their activities with GHG reduction effects (ICLEI 2000; Young 2000). Some CCP cities have achieved notable emissions reductions—between 1990 and 1995, Toronto, Canada reduced its per capita CO<sub>2</sub> emissions by 7% and Saarbrücken, Germany reduced its emissions by 15% during that same period (Kates and Torrie 1998).<sup>7</sup> While not all CCP communities achieve such remarkable results, ICLEI officials emphasize that the most important measure is the *cumulative* effect of local GHG reduction measures.

In addition to the climate-related benefits of controlling local GHG emissions, CCP cities realize a number of other “co-benefits,” including considerable economic savings. In 1999, U.S. CCP members reported savings of \$70 million in energy and fuel costs (ICLEI 1998). Improving energy efficiency contributes to job creation through the use of local contractors and can also facilitate economic development. An OECD report on urban energy practices notes that local policies that “incorporate environmental objectives can improve the competitive position of cities in their challenge to attract investments, business and high-skilled workers” (OECD 1995, p. 21).

Reducing local GHG emissions can also provide cities with additional environmental benefits, including improved air quality. Many local activities that produce GHG emissions produce other pollutants that have more direct effects on local air quality, including tropospheric ozone, nitrous oxides and sulfur oxides. Thus, efforts to reduce GHG emissions also lower emissions of these substances, thereby improving local air quality (STAAPA-ALAAPCO 1999). In 1999, CCP communities reduced their emissions of other air pollutants by more than 28,000 tons (ICLEI 2000). Improving mass transit and alternative transportation opportunities also enhances local air quality while addressing the problem of traffic congestion. Finally, CCP cities report that controlling GHG emissions contributes to improved “livability” in their communities. Citizens enjoy a higher overall quality of life due to improved air quality (better health), more efficient homes and offices (thus more discretionary income). In addition, they note a strengthened sense of community as development patterns begin to place people in closer proximity with their work, schools and services (ICLEI 1998).

### 3. RESEARCH QUESTIONS, DESIGN AND METHODOLOGY

This study addresses a number of questions related to municipal efforts to control GHG emissions:

1. Why do some city governments recognize global climate change as a local concern and commit to controlling their GHG emissions? Is there something unique about the CCP communities that enables them to view GHG reductions to be in their interest? Have officials in these cities reframed global climate change as a local issue? If so, how did that process occur?
2. Why are some municipalities more successful in implementing policies and programs to control GHG emissions? What enables some CCP communities to go beyond a rhetorical commitment to global climate change? Have officials in these cities become convinced that it is in their interest to expend resources to reduce local GHG emissions?

This study uses the ICLEI CCP campaign as a site for examining these questions. It is not a study of ICLEI as an organization nor an evaluation of the CCP campaign *per se*. Rather, it seeks to draw lessons from these cities about how municipal governments might be persuaded to join global efforts to mitigate climate change by controlling local GHG emissions.

#### 3.1 Scientific Assessment, Frames and Policy Action

A particular focus of this study is the role of global climate change assessment in municipal efforts to control GHG emissions. Do officials in CCP communities have better access to mechanisms through which global climate change assessment can be made meaningful for local decision makers? Has scientific and technical information produced by global climate change assessment precipitated a reframing of climate change by highlighting the magnitude of the problem and/or its potential impacts? Does global climate change assessment information help local decision makers choose among policy options for controlling GHG emissions?

Previous GEA research has shown that scientific assessments may produce a range of effects, including changes in how issues are framed and in the behavior and strategies of actors (Clark 1999). Frames are subject to change whenever something happens to create dissatisfaction with the status quo. This disruption may be the result of an exogenous shock (such as the discovery of the ozone hole) or a more gradual process of challenging existing understandings of a particular problem through persuasion. These events create political space for new ways of viewing a situation and policy change (Kingdon 1995). Assuming that most CCP cities have not experienced an exogenous climate-related shock,<sup>8</sup> what types of information have persuaded officials in CCP communities that global climate change is a local concern?

Scientific information can be effective in changing the way decision makers frame policy problems by highlighting the magnitude of the problem, various facets of the problem, and/or potential impacts of the problem (Kingdon 1995; Sebatier and Jenkins-Smith 1998; Snow and Benford 1992; Snow et al. 1986). To convince municipal governments that climate change is a legitimate policy problem, global climate change assessment must emphasize the local dimensions. However, as Wilbanks and Kates note, "[t]here is a grave mismatch between the knowledge that is needed to act locally and what is currently being done globally to generate

knowledge about climate change, its impacts, and responses to concerns" (Wilbanks and Kates 1999, p. 616).

A NASA-funded project, "Global Change in Local Places," seeks to bridge this gap through local research initiatives designed to provide local decision makers with the kind of information they need to address climate change. "We believe that people and organisations need to know how much they are responsible for greenhouse gas emissions in order to appreciate their impact on global climate change and to understand their opportunities to reduce their impact (Kates et al. 1998, p. 280). Underlying this project is the assumption that municipal action to control GHG emissions is unlikely unless officials have a better understanding of their contribution to climate change and their vulnerability to potential impacts.

Global climate change assessment could also help local decision makers identify and choose among policy options for controlling GHG emissions. Once they identify the primary sources of local emissions, they can focus on particular sectors (e.g. transportation) and search for the most cost-effective solution for reducing those emissions (Agyeman, Evans, and Kates 1998; Kates et al. 1998). Through a better understanding of the potential impacts of climate change, city governments can also assess their vulnerability and look for ways to become less vulnerable (e.g. through building codes) and/or to adapt to potential impacts (Pielke Jr. 1998; Sarewitz and Pielke Jr. 2000).

However, since most climate change assessment is produced at the national and global levels, there must be a mechanism linking global knowledge producers with local decision makers if such information is to facilitate a localizing of global climate change and/or be useful in the process of developing policies and programs for controlling local GHG emissions. Not only must the information cross the boundaries between knowledge and action, but it must also move across the boundaries between the global and the local (Cash and Moser 2000). Along the way, the information needs to be translated so that it is more meaningful for local officials.

There are a number of possible mechanisms by which global climate change assessment might reach local decision makers. At one end of the spectrum, city officials may participate in the Intergovernmental Panel on Climate Change (IPCC) and/or have a copy of the latest IPCC report on their desk and refer to it when developing policies and programs to control GHG emissions. Another direct link to scientific assessment would be through local researchers who participate in the IPCC process and can act as translators of global climate change science for local decision makers. Alternatively, city officials may receive scientific and technical information on the problem of climate change through a local issue network or policy subsystem "consisting of those actors from a variety of public and private organizations who are actively concerned with a policy problem or issue...and who regularly seek to influence public policy in that domain (Sebatier and Jenkins-Smith 1998, p. 119). In the case of climate change, a subsystem might include local advocacy groups, researchers, business leaders, legislators and state and federal government officials. This network could facilitate the transfer and interpretation of global climate change assessment for local decision makers (Moser 1998).

The mechanism by which local officials receive scientific information on the threat of global climate change may also have implications for judgments about the credibility, legitimacy and saliency of that information and thus whether the information brings about particular effects (Clark 1999). For example, information contained in an IPCC report may not be salient for city



officials since it is likely to be highly aggregated. Similarly, city officials may view scientific information as more credible if it comes from local researchers whom they already trust rather than from an international body of researchers with whom they have no connection (Kates and Torrie 1998).

### 3.2 Comparative Case Study

This study employs a comparative case research design to address questions about why some municipal governments recognize climate change as a local concern and why some actually develop and implement policies and programs to control GHG emissions. I examine climate change politics in two CCP cities (Denver, Colorado and Milwaukee, Wisconsin) and one non-CCP city (Indianapolis, Indiana). This design enables me to consider whether there is something unique about the CCP communities that makes them more likely to view global climate change as a local problem. In particular, it will allow me to consider the possible role of global climate change assessment in the process of localizing global climate change. If global climate change assessment has facilitated a localization of this global issue, then there should be variation in access to and/or judgments of this information. Officials in Denver and Milwaukee should be linked to global climate change assessment in ways that officials in Indianapolis are not and/or officials in Denver and Milwaukee should view such information as more credible, legitimate and salient than officials in Indianapolis.

The cases of Denver and Milwaukee are also useful for examining why some communities are able to move from political rhetoric to policy action on the issue of global climate change. Although both cities are CCP members, only Denver has succeeded in developing and implementing a comprehensive set of policies and programs to reduce its GHG emissions. A comparison of Denver and Milwaukee (along with Indianapolis) may yield insight on the obstacles that city governments face when trying to mitigate global climate change.

Denver, Milwaukee and Indianapolis are similar in size as well as their vulnerability to climate change impacts and yet they have responded very differently to the threat of global warming. Looking at state responses to climate change, some analysts have linked population size with climate concern. Specifically, they note that states with low populations have been slower to respond to climate change. "Presumably, states with low population felt their relative contribution to global climate change was nil, thus justifying inaction" (Jones 1991, p. 81) Denver, Milwaukee and Indianapolis have between 500,000 and 750,000 citizens and annual GHG emissions levels between 8 and 13 million metric tons (see Table 2). Thus these cities are small enough not to be a major contributor to U.S. GHG emissions but large enough to have some effect.

These cities are also similar in that their potential vulnerability to climate change is unclear. In this sense, they differ significantly from cities along the coasts that are already vulnerable to sea-level rise and severe storms (particularly in the case of the South Atlantic states) and thus more likely to be adversely affected by future climate changes. For officials in these coastal communities, any one storm can serve as a shock and heighten local awareness of the problem of climate change.<sup>9</sup> In contrast, it is unlikely that enhanced awareness of climate change in Denver and Milwaukee compared to Indianapolis can be attributed to their greater vulnerability to impacts since the potential effects of climate change are unclear for all three cities.

### **3.3 Methodology**

Using a variety of qualitative methods, this study examines how municipal decision makers in Denver, Milwaukee and Indianapolis frame the threat of global climate change and how they develop policies and programs to control a local GHG emissions. Through process tracing, I seek to uncover how global climate change comes to be reframed as a local issue and identify the link between global climate change assessment, the local framing of climate change and the development of local policies and programs for controlling GHG emissions. If global climate change assessment was instrumental in the reframing process, then there should be several observable implications (King, Keohane, and Verba 1994). We might expect local officials to be aware of the IPCC and the global assessment process on the issue of climate change. We should also be able to identify a mechanism linking global climate change assessment with local decision making, especially in those cities where global climate change has been localized (e.g. Denver and Milwaukee). If global climate change assessment has had an impact on local policy making then we would also expect decision makers to incorporate scientific and technical information derived from global climate change assessment in the process of developing local programs. Officials might also refer to global climate change assessment when justifying local policies and programs.

The findings discussed below draw heavily on 26 semi-structured interviews conducted between October 1999 and May 2000 (see references for a list of individuals interviewed). I met with local officials responsible for air quality and energy conservation in each city (12 interviews), state environmental officials in Colorado, Wisconsin and Indiana (3 interviews), regional climate change coordinators for the EPA as well as the head of EPA's State and Local Climate Change Program (3 interviews), local environmental advocacy organizations (4 interviews), and the recruiting director for the ICLEI-US CCP campaign. I also had the opportunity to interview CCP contacts in Madison, Wisconsin and Cambridge, Massachusetts and to attend a one-day workshop on "Climate Protection: What You and U.S. Cities Can Do."<sup>10</sup> In addition, I reviewed a range of documents on local policies and programs for controlling GHG emissions produced by each city as well as by ICLEI and the EPA.

## **4. WHY TALK THE TALK?**

As stated at the outset, it is not clear why municipal leaders would even rhetorically commit to mitigating global climate change by controlling local GHG emissions. A fundamental problem is that climate change is generally framed in global terms so local decision makers do not see it as something with which they should be concerned. Yet, a growing number of cities are recognizing the local dimension of global climate change by joining initiatives such as the CCP campaign. Why do officials in some cities (e.g. Denver and Milwaukee) commit themselves to controlling local GHG emissions while officials in other cities (e.g. Indianapolis) continue to ignore the problem of global climate change?

### **4.1 Political Opportunism?**

Lending rhetorical support to the issue of global climate change could be viewed as an example of political opportunism by municipal governments. Officials in cities like Denver and

Milwaukee may wish to appeal to their green constituencies and see the CCP campaign as a relatively low-cost opportunity to enhance their environmental record by appearing to be "climate-friendly." In so doing, they can reap the political benefits of addressing climate change without having to make the real changes in behavior that will ultimately be necessary to control global GHG emissions.

It is true that Denver and Milwaukee have historically had Democratic mayors, while Indianapolis recently elected its first Democratic mayor in more than 25 years. This suggests that voters in Denver and Milwaukee are more liberal than voters in Indianapolis and may thus be more supportive of environmental initiatives. However, the search for green votes does not fully explain why Denver and Milwaukee joined the CCP campaign. If local officials hoped to use the CCP campaign as a vehicle for appealing to voters interested in environmental issues, then we would expect those officials to publicize their involvement in the program. This has not been the case in either city.

In Denver, several city officials noted that local utilities and other industry members oppose any climate-related policies. In fact, these interests were behind a provision in the state's 1999 appropriations bill forbidding the expenditure of any state funds to implement the Kyoto Protocol until the treaty has been ratified by the U.S. Senate (Colorado General Assembly 1999). As a result, city officials have kept their efforts to control municipal GHG emissions relatively quiet rather than using them for political benefit. Similarly, officials in Milwaukee report medium to low receptivity to environmental issues among its citizens, primarily due to the fact that its economy is based largely on heavy industry with a large portion of the population belonging to labor unions. Several individuals noted that climate change is a "hard sell" in this setting.

#### **4.2 Localizing Global Climate Change**

Among Denver, Milwaukee and Indianapolis, there is distinct variation in the extent to which municipal officials frame global climate change as a local issue. In Denver and to a lesser extent in Milwaukee, city officials recognize the local dimension of climate change. In contrast, government officials in Indianapolis continue to view climate change as a global issue—one that local communities need not concern themselves with until there is a state or federal mandate requiring them to do so.

The nature of the localized frames in Denver and Milwaukee is somewhat interesting. As noted above, much has been made of the need to localize global climate change in order to convince city governments to join global efforts to mitigate global warming. Conventional wisdom suggests that such a reframing is most likely to occur when municipal officials have access to better information about the nature of the problem, their contribution to global GHG emissions and/or their vulnerabilities to the potential impacts of climate change (Agyeman, Evans, and Kates 1998; Kates et al. 1998; Wilbanks and Kates 1999). However, officials in Denver and Milwaukee were not particularly concerned with where GHG emissions occur or what the local impacts of climate change might be. Rather, when speaking about climate change, they were more likely to discuss the links between GHG emissions and local issues already on their agendas.

In Denver and Milwaukee (and in most CCP cities), city officials have localized the *policy* of controlling GHG emissions (which happens to be the primary response to climate change) rather than the *problem* of climate change. Kingdon (1995) argues that many issues get on government agendas this way—by presenting preferred policy options (e.g. reducing GHG emissions) as solutions to problems the government is already addressing. In other words, it calls for a more indirect strategy that does not require “tracing a narrow line of causality from emissions to climate to impacts” for localizing global climate change (Rayner and Malone 1997).

#### **4.2.1 Local Hooks**

The ICLEI CCP campaign routinely emphasizes the relationship between GHG emissions and other local issues, such as air quality and growth. In many communities, these issues serve as “hooks” on which to hang the issue of climate change and prompt municipal officials to reframe climate change as a local issue. In Denver, the initial hook was interest in renewable energy, but climate change has also easily been linked to the city’s concern with energy conservation and air pollution. City officials recognize that actions to control GHG emissions (e.g through reduced fossil fuel combustion) will also reduce the emission of other air pollutants and lower the city’s energy demand. Similarly, officials in Milwaukee focus on the link between GHG emissions and “smart growth.”

It is notable that most CCP cities have a prior interest in environmental issues, making officials in these cities more receptive to information about what they can do to control GHG emissions (Kates and Torrie 1998; OECD 1995). For example, Cambridge, Massachusetts Mayor Anthony Galluccio noted that he found the idea of climate protection to be extremely daunting when he came to office. His view changed, however, when he discovered that addressing climate change was consistent with what the city was already doing and that measures to control GHG emissions will contribute to the community’s quality of life (Galluccio 2000).

Indianapolis has not historically given environmental and energy conservation issues high priority; the last time city officials considered energy conservation was in the context of the energy crisis in the 1970s. One possible hook is the city’s concern about local air pollution. Indianapolis is currently in danger of becoming an ozone non-attainment area (thus violating the Clean Air Act), and the city’s Air Management Office has several initiatives designed to reduce the emission of harmful air pollutants. At present, however, the issue is not high on the agenda of municipal decision makers, and officials continue view the problem of GHG emissions as an entirely separate issue to be dealt with in the future following a state and/or federal mandate.

#### **4.2.2 Political Leadership and Entrepreneurs**

In general, it appears that prior environmental concern is the key to localizing global climate change. Political leadership on environmental issues can help create opportunities for linking climate change with issues already on the local agenda. For example, Denver Mayor Wellington Webb (a Democrat in office since 1991) wishes the city to be viewed as an environmental leader. This is reflected in the 1991 city council resolution committing the city to participate in the ICLEI Urban CO<sub>2</sub> Reduction Project and in the 1995 Mayoral Declaration officially noting the city’s membership in the CCP campaign (City of Denver 1995; Denver City Council 1991).<sup>11</sup> For example, the city council resolution notes, “WHEREAS the city and county of Denver has

already aggressively committed resources and taken leadership position in passing environmental ordinances which control wood-burning, control the release of chlorofluorocarbons, limit certain uses in industrial zones, and promote alternative fuels..." Several city officials interviewed for this study explicitly noted that Mayor Webb is committed to having the city "lead by example" on environmental issues.

Mayor John Norquist of Milwaukee (a conservative Democrat in office since 1988) has also exhibited political leadership on the environment. His interest is largely personal—his wife heads Citizens for a Better Environment, the city's major environmental advocacy group. Municipal officials are well aware of this connection and often look for opportunities to link their programs to environmental protection. The Mayor also supports the idea of sustainability ("smart growth") and has a coherent philosophy regarding land use and the need to create an alternative transportation infrastructure to make the city more livable. Norquist has even expressed personal interest in the issue of climate change. The city became involved in the CCP campaign at his urging (he reportedly knew someone in ICLEI), and in 1997 he sent a letter to the state's Senate delegation urging them to support a strong U.S. position in the Kyoto Protocol negotiations. "This upcoming round of negotiations is extremely important. It could enhance air quality and reduce the long-term threat inherent in climate change to Wisconsin agriculture, tourism, health and economic development" (Norquist 1997).

In contrast, there has been no political leadership on environmental issues in Indianapolis for many years. Some people speculate that this may change with last year's election of Bart Peterson as the city's first Democratic mayor in more than 25 years. During his campaign, Peterson made clear linkages between local issues, such as transportation, and the environment. However, he did not specifically mention the problem of climate change or GHG emissions (Peterson 1999).

Political leadership on environmental issues may be a necessary but not sufficient condition for localizing global climate change. Studies in the UK, Sweden and Australia have found that local initiatives to control GHG emissions are often driven by entrepreneurial individuals within city government (Bulkeley under review; Collier and Lofstedt 1997). In the U.S., Overland Park, Kansas got involved in the CCP campaign thanks to a dedicated city council member who convinced the mayor and staff of the benefits of controlling GHG emissions. An EPA official commented that when demand for controlling emissions comes from inside city government, there are considerably fewer political obstacles.

Entrepreneurship has played a role in the localization of global climate change in both Denver and Milwaukee. In each case, individuals have taken advantage of the existence of local hooks to bring climate change to the local agenda. This is an example of what Kingdon would refer to as "coupling" (Kingdon 1995, pp. 181-182). Denver got involved in the Urban CO<sub>2</sub> Reduction Project at the urging of one individual in the Environment Department who had a background in energy issues with a particular interest in solar energy. That individual is currently the head of the Division of Environmental Protection within the city's Environment Department and is the contact person within the city for the ICLEI CCP campaign. Mayor Norquist served as an entrepreneur in the case of Milwaukee along with the city's environmental policy coordinator. Unfortunately, that position was eliminated in 1996 for political reasons and has not been reinstated. The individual that held the position has since gone to work outside of Milwaukee.

### **4.3 The Role of Global Climate Change Assessment**

This study found little evidence that global climate change assessment contributed to the reframing of climate change as a local issue in Denver and Milwaukee. In all three cities, most officials had little (if any) systematic understanding of the nature of climate change and/or how their community might be affected. The fundamental problem is that officials in these cities are not linked to any mechanism by which global climate change assessment might cross the boundaries between knowledge and action, from the global to the local scale (Cash and Moser 2000). Moreover, building bridges between global science and local decision making is not likely to enhance the effectiveness of climate change assessment at the local level.<sup>12</sup> Scientific and technical information on local contributions to and potential impacts of global climate change is not particularly useful to city officials, who are action-oriented.

#### **4.3.1 From Global Knowledge to Local Action**

Officials in Denver, Milwaukee and Indianapolis are not linked to any mechanism by which global climate change assessment might reach local decision makers. Local officials working on climate-related issues do not directly participate in the global assessment process, nor do they have the latest IPCC report sitting on their desks. In fact, most had never heard of the IPCC.<sup>13</sup> Perhaps more surprisingly, city officials do not interact with local researchers. In the case of Denver, some of the world's leading climate scientists are based at the National Center for Atmospheric Research in Boulder, Colorado, less than 30 miles away. There are also climate scientists working at the University of Colorado, Colorado State University, the National Oceanic and Atmospheric Administration in Boulder and the Natural Renewable Energy Laboratory in Golden. Denver officials report that they do not receive information from these individuals nor do they consult them when developing local policies and programs related to climate change. Interestingly, these local researchers often do interact with state-level officials as well as regional EPA officials, but as noted below, this network does not reach the municipal level.

State and federal environmental agencies produce a great deal of scientific and technical information on global climate change and could serve as a potential mechanism for translating global knowledge for local decision makers. For example, Colorado, Wisconsin and Indiana each have an environmental authority at the state level that has, at minimum, conducted a state emissions inventory with EPA funding (Colorado Department of Public Health and Environment 1998; Indiana Office of Air Management 1995; Wisconsin Department of Natural Resources 1993). Only city officials in Denver report being aware of the state inventory—they occasionally use data from the inventory but have no close linkage to state officials. In each case, city officials were not involved in the process of developing a state emissions inventory and there was no formal outreach to city officials after the inventory was completed.

Colorado and Wisconsin have both engaged in subsequent climate change activities: a technical assessment of climate change science and impacts in the case of Colorado and a statewide action plan in the case of Wisconsin. Again, city officials were not involved in the assessment process nor did state officials attempt to disseminate the assessment information at the local level. After objections from the state's fossil fuel industry threatened to derail the Colorado technical assessment, state officials abandoned efforts to involve stakeholders in the assessment process.

In the end, the assessment was conducted in-house by the Colorado Department of Public Health and Environment with virtually no outreach or follow-up. The Wisconsin action plan was developed with heavy participation from the oil, utility and transportation sectors and pays very little attention to opportunities for action at the municipal level.

City officials also have little direct contact with federal agencies working on climate change and climate-related issues. The EPA has a State and Local Climate Change program that operates out of the EPA Headquarters in Washington, DC. The program is designed to increase awareness of climate change in states and local communities and to "encourage state and local decision makers to implement voluntary measures to reduce greenhouse gas emissions and decrease their state's risks, or to help them take adaptive measures" (EPA 1998, p. 2). Each regional EPA office also has a climate change coordinator. This program produces a great deal of material on state-level emissions and impacts as well as information on policy options for local officials to control GHG emissions. However, EPA officials working on this program generally do not communicate directly with city officials. Rather, they often direct their communication through state environmental agencies (which, as noted above, have not been effective in communicating with city officials in the past). In fact, most of EPA's work with city officials is conducted through ICLEI, primarily through grants for local activities.

I also found low levels of NGO activity on climate change in these three cities. Most NGOs interested in the issue of climate change are based in Washington, DC and have historically focused their attention on national and international decision makers (Betsill 1999). Not surprisingly, local NGOs tend to focus on more "local" problems, such as air quality, energy conservation and wildlife protection and rarely link these issues to climate change or GHG emissions. In addition, some local NGOs focus their lobbying efforts on state officials, discounting the ability of city officials to make any meaningful difference.

#### **4.3.2 Problems of Saliency**

Previous GEA research suggests that the effectiveness of scientific assessment is a function of its credibility/legitimacy/saliency to decision makers (Clark 1999). However, the analytical lens of credibility/legitimacy/saliency does not adequately explain this study's finding that global climate change assessment has not been effective in the process of reframing climate change as a local issue. The fundamental problem is that city officials do not have a good supply of scientific and technical information on the issue of global climate change. Although there do appear to be some issue networks that extend below the national level of decision making, they do not reach city officials. City officials thus never have the opportunity to judge such information in terms of its credibility/legitimacy/saliency.

While there clearly is a disconnect between global science and local decision making, it is not evident that building better bridges would facilitate a reframing of global climate change as a local issue. In Denver, Milwaukee and Indianapolis as well as other CCP cities, climate change science is not a particularly important issue. Local officials are not concerned about the poor resolution of global models or about their potential vulnerability to climate change.<sup>14</sup> The primary problem is that climate change science is incompatible with the predominant decision-making framework in U.S. cities, which is heavily focused on action (Jones, Fischhoff, and Lach 1999). One official referred to city government as "crisis management;" decision makers are

always trying to respond to the latest problem—a flood, ozone non-attainment, budget cuts. They have little time to identify and evaluate the likelihood of future issues. In fact, two EPA officials reported that on the rare occasion when they speak before local decision makers, a typical response is, “Don’t tell me what the problem is. Tell me what I can *do* about it.”

The notion of saliency does help us understand this finding that building better bridges between global science and local decision makers is unlikely to enhance the effectiveness of climate change assessment in the process of reframing climate change as a local issue. Since city governments tend to be action-oriented, they need to know what they can do to address policy problems. Global assessment, however, focuses on clarifying the problem of climate change and leaves discussions about policy options to government officials. Even if city officials had better access to climate change assessment, such information would not be particularly useful to them given their emphasis on action.

#### **4.3.3 Best Practices Information**

In Denver and Milwaukee, information on “best practices” has been more effective than scientific and technical information in localizing global climate change. City officials want to learn about what other cities are doing to control GHG emissions, what results they have achieved and/or at what cost. ICLEI was the most widely cited source for best-practices information on the issue of climate change.<sup>15</sup> ICLEI has developed a number of case studies about policies and programs used in different CCP cities to control GHG emissions. It shares this information with local officials through its website and other publications, by attending national conferences of local officials, and in conjunction with the EPA State and Local Climate Change program.

ICLEI’s emphasis on quantification enhances the saliency of its best-practices information for city officials. The CCP campaign is a “performance-based initiative” and “quantification allows local governments to set priorities for action, evaluate progress, and demonstrate the significance of local governments to the global warming issue” (ICLEI 2000, p. 31). CCP members not only quantify local emissions and emissions savings, but they also quantify the economic benefits derived from actions to control GHG emissions. Through quantification, ICLEI information becomes more salient to city officials and is thus more likely to change the way local governments frame the issue of climate change. The message that controlling GHG emissions has economic benefits for local communities resonates with city officials who are always looking for ways to save money. Commenting on ICLEI’s work with Australian cities, Bulkeley (under review, p. 15) comments, “The programme’s [sic] strengths lie in translating greenhouse into a local issue in which acting for the environment need not conflict with, and in fact creates, economic benefits.”

Clearly, best-practices information will not necessarily facilitate a reframing of global climate change in all local contexts; it will only be salient in those municipalities where there are already hooks on which to attach climate change.



## **5. WHY WALK THE WALK?**

Localizing global climate change is the first step in getting cities to develop policies and programs to control their GHG emissions. When the threat of climate change is reframed as a local issue, city officials begin to change the way they think about their activities and often take the need to control GHG emissions seriously. CCP cities like Denver and Milwaukee represent a unique set of municipalities where such reframing has taken place and where there is at least some political commitment within the city government to address climate change. However, not all CCP cities have been equally successful in capitalizing on that political will. Why do some municipal governments go beyond rhetorical support and implement policies and programs for controlling GHG emissions? If controlling local emissions has "co-benefits" that help municipalities address other issues with which they are already concerned, why aren't more cities taking action?

### **5.1 Local Policies and Programs**

There is a great deal of variance in the extent to which the cities of Denver, Milwaukee and Indianapolis have developed a policy response to GHG emissions. Denver has a fairly comprehensive program that cuts across city departments (see Table 3). In Milwaukee, there are isolated examples of programs that have been linked to climate change/GHG emissions. Although Indianapolis has a few programs that have implications for GHG emissions (e.g. the Greenways program), these programs have not been linked to the issue of climate change and no effort has been made to calculate the GHG savings. Of course, the Indianapolis example can largely be explained by the fact that government officials have not reframed climate change as a local issue.

Denver's efforts to control its GHG emissions are coordinated by the Environmental Protection Division within the Department of Environmental Health. The Division currently has one full-time staff member (on loan from the city planning office) who keeps track of projects being implemented by various departments, updates the city's GHG emissions inventory and calculates emissions savings using the CCP software. City officials regularly attend ICLEI workshops and conferences. Recently, individuals from the city's Transportation Division (Department of Public Works) and Purchasing Division (General Services Department) attended an ICLEI workshop on the Green Fleets Program.

A number of divisions within the Denver city government incorporate the need to control GHG emissions into their activities. For example, the Environmental Protection Division, responsible for pollution prevention, oversees the city's Green Fleets program, which seeks to reduce automobile emissions from the municipal fleet by emphasizing alternative fuel vehicles, mass transportation alternatives and a reduction in vehicle miles traveled. Related to this, the city also has a fairly extensive bus pass subsidy program for city employees. The Utilities Division within the Department of Public Works achieves GHG emissions savings through its energy efficiency initiatives, including a retrofit of existing fixtures in more than 14 million square feet of office space. The Utilities Division has also joined forces with the Traffic Operations Division of the Department of Public Works in the LED traffic light project discussed earlier. The Department of Parks and Recreation has contributed to the city's effort to control its GHG emissions by replacing the heating system at Mile High Stadium. The city also recently incorporated climate

change concerns into its 2000 Comprehensive Plan in the context of its commitment to environmental sustainability (Denver City Council 1999).

In Milwaukee, there are some isolated instances of climate change concerns being incorporated in decision making although the issue has not been taken up in a comprehensive manner by the city government. A few city programs have been explicitly linked to climate change/GHG emissions reduction, with the city's urban forestry project being the clearest example. The Division of Forestry within the Department of Public Works coordinates the Greening Milwaukee program designed to increase the number of trees on private property in the community in an effort to reduce stormwater flow, lower energy use and improve "air quality by absorbing carbon dioxide" (City of Milwaukee 1997). A 1996 analysis conducted for the city by American Forests estimated that Milwaukee's trees sequester 1,677 tons of carbon annually, a figure that could be increased to 4,793 tons annually by increasing urban tree cover (American Forests 1996). Interestingly, those involved with this program are unaware of ICLEI and Milwaukee's involvement in the CCP campaign. The city also achieves GHG emissions reductions through its recycling program (it recycles 27% of its garbage), a street light retrofit, and energy efficiency measures at City Hall (ICLEI 1998). Some officials within the city government are beginning to address energy conservation issues, particularly in the context of municipal buildings, although they have not yet calculated the cost-savings of such measures, let alone their effect on GHG emissions. Although Milwaukee remains listed as a CCP member, it no longer sends representatives to workshops and conferences, nor does it routinely monitor its GHG emissions or report on efforts to control those emissions.

## **5.2 The Role of Global Climate Change Assessment**

Global climate change assessment has had little effect on the development of municipal policies and programs for controlling GHG emissions in Denver, Milwaukee and Indianapolis. As mentioned earlier, officials in these cities are not linked to mechanisms by which scientific and technical information on global climate change might be transferred and interpreted. In the absence of scientific and technical information on the threat of global climate change, municipal governments rely primarily on best-practices information in the development of local policies and programs to control GHG emissions. They seek to learn from the experiences of other cities who are mitigating the problem of climate change. Officials working at all levels of government identified ICLEI as the most significant source of best-practices information. The CCP campaign is explicitly designed to facilitate communication between municipal decision makers so that they can transfer policies and programs for controlling GHG emissions across local contexts.

Although building better bridges between global science and local policy is unlikely to have much effect on how climate change is framed at the municipal level, there is a potential role for global climate change assessment in the development of local climate policies and programs. Specifically, such information could help city officials identify and select policy options for controlling local GHG emissions as well as help them explore options for reducing their vulnerability to climate change impacts.

Previous GEA research suggests that the salience of assessment information may depend on the historical context (Clark 1999). Specifically, it may be important to consider the status of a particular policy problem in terms of Downs' (1973) "issue-attention cycle." Global climate

change assessment is most likely to be salient for city officials in the post-emergence phase—once global climate change has been reframed as a local issue and secured a place on the local agenda. During the pre-emergence phase, most city officials have little use for information about the nature of the problem, their contributions and/or potential impacts. While such information may suggest the need to control GHG emissions, it does not demonstrate the need for local governments to control emissions, and it rarely includes specific recommendations for how local governments might achieve that goal. However, once city officials have accepted climate change as a local issue and begun the process of developing a strategy for controlling emissions, information on the local drivers of climate change and potential impacts can help decision makers identify opportunities for action.

When municipal leaders accept the political commitment to mitigate climate change, they will eventually need to conduct an emissions inventory in order to determine the sources of local emissions and to identify opportunities for reducing emissions (Kates et al. 1998). This can be an extremely complex process and most cities do not have adequate access to the types of data they will need (Bulkeley under review; Kates et al. 1998). Furthermore, much of the data that is available is highly aggregated and it can be problematic to calculate the share of any single community. Research programs, such as the "Global Change in Local Places" project, could provide municipalities with the information they need to better understand where their emissions are coming from and to identify opportunities for reductions (Clark 1998; Kates et al. 1998; Kates and Torrie 1998; Wilbanks and Kates 1999).

City officials could also benefit from enhanced understanding of potential local impacts. Since city officials do not currently incorporate global climate change assessment into their decision making, local discussions related to climate change tend to focus entirely on GHG abatement and mitigation of climate change. However, the scientific community generally acknowledges that the earth is already committed to some degree of climate change because of the concentrations of GHGs already in the atmosphere. Even if members of the international community fulfill their commitments to reduce GHG emissions as formalized in the Framework Convention and Kyoto Protocol, atmospheric GHG concentrations will continue to increase thus disrupting the global climate system (Parry et al. 1998). Cities need to prepare for these effects by developing policies and programs for reducing their vulnerability (Pielke Jr. and Sarewitz 1999; Sarewitz and Pielke Jr. 2000).<sup>16</sup>

Global climate change assessment might be more salient for municipal decision makers once global climate change has been reframed as a local issue. However, if such information is to help city officials move from reframing to policy action, it will also have to be credible. Whether climate change assessment ultimately influences local policy making may very well depend on the channels through which city officials get that information.

### **5.3 Institutional Barriers to Municipal Action**

Information, while useful for city officials concerned with global climate change, is not the major constraint faced by municipalities when developing policies and programs to control GHG emissions. There are a number of institutional barriers that make it difficult for municipal governments to move from reframing global climate change as a local problem to concrete policy actions to address that problem. The first has to do with the way city governments are organized;

there is often no institutional home for climate change policy making. Second, many cities lack the administrative capacity to develop local policies and programs for controlling GHG emissions. They may not have the human resources available to oversee the city's climate protection program and/or personnel may lack the technical knowledge necessary to monitor and analyze local GHG emissions. Finally, many cities are not willing to invest financial resources in controlling GHG emissions since doing so often requires significant up-front costs.

### **5.3.1 Bureaucratic Structure**

Climate change, like most environmental problems, is a cross-cutting issue and does not fit the way the majority of city governments organize themselves (Nijkamp and Perrels 1994; O'Meara 1999). Most city governments are divided into a few specialized departments and divisions with very specific mandates. Officials focus on their narrow tasks, often with little interaction with individuals in other divisions or departments. In contrast, climate change can only be addressed through coordination across city government; controlling GHG emissions requires collaboration between waste management, transportation, public works, utilities, health, land-use planning, and air quality management to name a few. Officials working in these areas of city government rarely sit at the same table.

Translating political will into policy action thus requires that city governments institutionalize their efforts to control GHG emissions and designate responsibility for coordinating climate-related activities across city government. Denver has chosen to house this task in the city's environment department; the Environmental Protection Division is the institutional home for the city's climate protection program. The Division's mandate includes collecting and analyzing emissions data and facilitating communication across city departments to develop new policies and programs to control the city's GHG emissions. Neither Milwaukee nor Indianapolis has an environmental department within city government. Instead, environmental issues are addressed by various divisions, often housed in different departments. Prior to 1996, Milwaukee had an environmental policy coordinator who worked out of the Mayor's office, but that position was eliminated in 1996 due to conflicts with the city council and has not been reinstated.

In the absence of an environmental department or other position responsible for coordinating policies across departments, it is unclear where a city's climate protection program might be housed. Some cities rely on planners and engineers to coordinate the program. However, these officials are often located in public works departments, which traditionally do not view environmental protection as part of their mandate. There is thus the danger that the department will not devote the resources necessary (both human and financial) to establish an effective program for reducing the city's GHG emissions. One possible solution is to follow the City of Toronto's example and establish an entirely new institution devoted to climate protection (Harvey 1993).

Interestingly, several officials noted that the CCP campaign provides a useful framework for advancing a city's broader environmental agenda. As mentioned above, all environmental issues require some level of coordination across city departments. The CCP program helps municipal governments establish a mechanism for monitoring climate-related activities and for collecting and disseminating climate-related information. These linkages, developed in the name of climate protection, can also be used to facilitate local responses to other environmental problems.

### **5.3.2 Administrative Capacity**

Identifying institutional responsibility for a city's climate program is one hurdle to translating political will into policy action. An even greater obstacle is the human resources necessary to develop local policies and programs for control GHG emissions. Because of the coordination challenge, addressing climate change at the municipal level is extremely time consuming. Cities need to dedicate personnel to this task rather than adding it to the existing portfolio of already overworked officials. Denver has a full-time staff person in the Environmental Protection division whose entire position is devoted to climate protection. Many other cities are unable and/or unwilling to devote the resources necessary to creating such a position, particularly because there are always more pressing issues on a city's agenda. In Milwaukee, there is the added difficulty that the city government will not pay for officials to attend conferences so the city has been unable to send people to ICLEI CCP workshops where they are likely to get valuable information to help them control local GHG emissions.

Furthermore, individuals dedicated to climate protection must have the technical capacity to collect and analyze data related to local GHG emissions. This can be an extremely complex process and most cities do not have adequate access to all of the types of data they will need (Bulkeley under review; Kates et al. 1998). Once the inventory is completed, officials must continue to track local emissions and update the inventory. In the U.S., ICLEI has been successful in helping cities obtain grants (often from the EPA) to hire an intern to conduct the initial emissions analysis. However, this does not address the long-term capacity issue.

### **5.3.3 Budgetary Constraints**

City governments will ultimately need to implement new policies and programs if they are to reduce their GHG emissions. However, city budgets may constrain the flexibility of officials to invest in GHG reduction projects (Nijkamp and Perrels 1994). In many communities, environmental programs are viewed as "luxury" expenditures; these programs are often hit first when there is a budget shortfall (Press 1998). Such projects are also likely to require considerable up-front investments. Officials in Milwaukee have tried to convince the city council to invest in energy conservation technology, arguing that the money saved in energy costs can be used to recoup the initial investment and pay for additional measures in the future (an accounting procedure known as "performance contracting"). City budget officials, which tend to be short-term thinkers, are skeptical of such arguments. If they are persuaded to approve funds, they are more likely to proceed on a step-by-step basis rather than investing in a larger package that would be more cost-effective in the long run. They may also ask officials requesting new funds to cut funds for other current programs.

Cost-effectiveness is the ultimate criteria on which city councils make budget decisions. It is thus important for city officials requesting money for climate-related projects to demonstrate the economic benefits. ICLEI's CCP campaign, which encourages local governments to quantify such information, can provide information to strengthen the case. Another strategy is to use discretionary funds to develop small-scale demonstration projects within the community. For example, when Denver's Utility Director became interested in the LED project, he used funds from his own R&D budget to make the initial investment. When he approached traffic services

to enlist their help with the project, they were reluctant to divert their own resources. The utilities director assured them there would be no cost to them thus helping them buy-in to the project. When it came time to request city funds to expand the project, the director had an economic analysis available with evidence of immediate economic benefits (in terms of energy saving). Unfortunately, most city officials do not have discretionary funds at their disposal.

## **6. LOCAL CONTRIBUTIONS TO MITIGATING GLOBAL CLIMATE CHANGE**

Although a growing number of municipal governments in the U.S. are taking action to control local GHG emissions, it is clear that climate change is not the primary driver behind these initiatives. In fact, GHG reductions are often a by-product of policies and programs designed to address more pressing local problems. For example, the Denver LED project was initially developed to cut energy costs. In Denver, Milwaukee and most CCP cities, local policies and programs to control GHG emissions are motivated by the recognition that these activities contribute to other objectives, such as saving money, reducing local air pollution, enhancing alternative transportation, and increasing the "livability" of their communities. ICLEI officials have learned that the key to getting city governments to address climate change is to not talk about climate change. Rather, they link the preferred policy solution to climate change (reducing GHG emissions) to local issues that decision makers already care about. They emphasize the co-benefits of controlling local GHG emissions and often point to climate protection as a secondary consideration. Can this strategy ultimately lead to a meaningful local contribution to global efforts to mitigate climate change?

### **6.1 Business as Usual?**

Many of the GHG emissions savings reported by CCP communities are realized by calculating reductions from policies and programs that already exist. In other words, they are merely repackaging existing efforts as "climate" initiatives but in reality are not going beyond business-as-usual. Non-CCP communities may also be installing LED traffic signals but do not quantify GHG savings from those programs. Is it appropriate to say that Denver is doing more in terms of climate protection? Meaningful local action to address climate change will require that municipal governments develop *new* policies and programs to achieve *additional* emissions reductions above what would have happened anyway. Calculating savings from existing programs actually creates a disincentive to move beyond business as usual by fostering a sense of complacency. CCP cities like Denver may feel they are already doing a lot to address climate change and thus not look for ways to further decrease emissions.

Certainly, the CCP program does encourage communities to evaluate existing programs in terms of GHG reductions in order to demonstrate to local governments that addressing climate change is consistent with things they are already doing. The campaign then works with communities to identify the "low-hanging fruit" (Young 2000)—to focus on some of the easier ways city governments can achieve short-term savings while they grapple with making the long-term changes that will ultimately be necessary.

CCP staff also try to encourage cities to look for new opportunities to achieve emissions reductions through an on-going process of monitoring and reporting. City governments must submit annual reports outlining initiatives that have been developed in the past year and

estimates of GHG reductions. In developing its local action plan, the city of Fort Collins clearly identifies "new" measures "that emerged initially through Cities for Climate Protection discussions, having the primary intent to reduce greenhouse gases" (City of Fort Collins 2000, p. 41). These new measures include replacing traffic signals with LEDs, increasing renewable energy sources for electricity, and enhancing energy efficiency in government buildings. When combined with "pending" measures, which would have been proposed regardless of their GHG reducing capabilities, the city estimates that it could reduce its 2010 emissions by .5 million tons beyond business-as-usual.

Even when new local initiatives are not driven by climate change or GHG emissions concerns, it may be the case that they would not have been developed in the absence of local concern for these issues. For example, the city of Ann Arbor recently negotiated a franchise agreement with local utilities stating that any company selling electricity in the city must provide customers with a green power option (ICLEI 2000). The CCP campaign, through the local emissions inventory, raised awareness among city officials of the relationship between electricity power sources and local issues, such as air quality (including GHG emissions) (Young 2000).

## **6.2 Limits to Local Action**

Despite the progress being made in some U.S. cities, it is clear that an effective<sup>17</sup> international efforts to mitigate global climate change must ultimately involve all levels of government and society. Many GHG-producing activities are outside the jurisdiction of municipal governments. For example, cities like Denver and Indianapolis must contend with regional transportation issues; both are commercial centers for large metropolitan areas that include dozens of municipal governments. Any effort to reduce traffic congestion and/or improve alternative transportation options must be coordinated at the regional level. Similarly, municipal governments may be unable to alter the practices of local businesses headquartered in other locations (Wilbanks and Kates 1999).

Most U.S. cities also have limited control over local utilities and are thus unable to induce energy conservation and/or fuel switching by energy providers (DeAngelo and Harvey 1998; Kates and Torrie 1998). Where local utilities are municipally owned, city governments are able to influence investments in alternative energy sources as well as pricing, both of which could serve to reduce the contribution of GHGs from this sector (Collier and Lofstedt 1997; OECD 1995). For example, the cities of Seattle and Austin, both of which have municipally-owned utilities, are currently working to increase green power options in their communities (Austin Energy 2000; City of Seattle 2000). In the absence of municipal ownership, city governments can send market signals to local utilities in the form of demand for green power. Ultimately, however, national regulations will also be necessary to encourage large-scale energy conservation and fuel switching (Harvey 1993; Kates and Torrie 1998).

## **6.3 Linking the Local and the Global**

All levels of government and society must be actively involved in efforts to control GHG emissions "so that complementarity and mutually reinforcing measures are concurrently implemented" (DeAngelo and Harvey 1998, p. 134). Nevertheless, local efforts to address climate change can not only bring about emissions reductions but may also encourage action at

other levels. Since national emissions are shaped by local government decisions, municipal activities to control GHG emissions may catalyze national and international responses.

...[T]o the extent that informal and voluntary initiatives by municipalities increase the confidence of national-level governments to deliver domestic emissions reductions, national-level governments might be willing to pursue more ambitious emissions reduction targets that will get nations on course to achieving the ultimate objective of the UNFCCC of avoiding dangerous interference with the climate system (DeAngelo and Harvey 1998, p. 134).

While local GHG initiatives have the potential to influence international climate change negotiations, doing so requires that city officials mobilize on behalf of the global climate. However, municipal leaders often fail to take advantage of available avenues for communicating with the public and with national and international decision makers on the issue of climate change. As discussed above, concern for climate change in most CCP cities is based on the recognition that it has links to other local issues, such as air quality, traffic congestion, or growth. Achieving GHG reductions thus becomes an entirely local issue no longer linked to efforts to mitigate global climate change. As a result, city officials lose sight of the fact that they are engaged in a matter of foreign policy (Clarke and Gaile 1998; Hocking 1999).

Building a stronger bridge between local GHG initiatives and national/international climate change politics would require refocusing city officials' attention on the climate change aspect of local policies and programs to control GHG emissions. Doing so could remind local officials that they are involved in a foreign policy matter and motivate them to interact with government officials at other levels. A more visible and vocal domestic constituency in favor of international GHG regulations could enhance the willingness of national governments to move beyond the current impasse that has made it difficult for the international community to agree on meaningful commitments to control GHG emissions. Many local communities not currently concerned with GHG emissions are unlikely to act without a national mandate, which would be more likely with stronger international commitments for mitigating climate change.

In reality, many local officials are making efforts to communicate with decision makers at other levels of government. For example, in 1999, more than 570 individuals signed the "Mayor and Local Officials Statement on Global Warming" coordinated by ICLEI and Ozone Action (an environmental advocacy organization). The statement, which was sent to President Clinton, urged "the federal government to develop and implement domestic policies and programs that work with local communities to reduce global warming pollution" as a way of meeting U.S. commitments contained in the Kyoto Protocol (Ozone Action and ICLEI 1999). Similarly, the International City/County Management Association and the U.S. Conference of Mayors often take up the issue of global climate change. To date, however, it is questionable whether these efforts are having any measurable effect on national and international climate change debates and policy making.

Ironically, strengthening the linkage between local and global climate change politics may have the perverse effect of slowing down the process of reducing GHG emissions in the short-term as it opens up the possibility of mobilizing local resistance to action. Officials who are more than willing to spend money on energy efficiency projects in the name of reducing costs may be more reluctant to spend that same money in the name of climate change without debate over the merits of climate change science. However, as Sarawitz and Pielke argue, putting science at the center



of policy making is a prescription for political gridlock since "new findings will almost inevitably be accompanied by new uncertainties."

Linking local GHG reductions to global climate change is also likely to catch the attention of industry leaders who oppose international regulations on GHG emissions. As mentioned above, members of the fossil fuel industry have devoted considerable time and resources to stalling international climate change negotiations, primarily by challenging the scientific basis for climate change and arguing that controlling emissions will have disastrous effects on the global economy. For the most part, their efforts have not reached the local level where efforts to control GHG emissions are justified in local terms. Even so, the city of Denver has made little effort to publicize its efforts to reduce GHG emissions in order to avoid conflict with the Colorado fossil fuel industry.

Strengthening the linkage between local and global climate change politics may also have the unintended effect of making national governments *less* willing to take action to control GHG emissions. In Australia, for example, the federal government coordinates the CCP campaign. Bulkeley reports that some observers view this as an attempt "to pass the greenhouse buck"—the federal government can point to the fact that a large percentage of its local governments have committed to reducing their emissions, which "takes the heat off them" (Bulkeley under review).

## **7. CONCLUSION: "THINK LOCALLY, ACT LOCALLY"**

Ironically, the findings of this study suggest that the most effective way to get municipal governments to mitigate global climate change is by *not* talking about global climate change. If the objective is to involve cities in global efforts to control GHG emissions, the best strategy may be to "Think Locally, Act Locally." The experience of cities like Denver and Milwaukee indicates that global climate change is most likely to be reframed as a local issue when city officials recognize that actions to control GHG emissions also address other local concerns already on their agendas. Localization requires the prior existence of a local hook on which to hang the issue of global climate change.

Localizing global climate change is an important first step in developing a municipal response to global warming; it helps generate political support for reducing local GHG emissions. However, not all communities are able to move from reframing to policy action. There are several institutional barriers that make it difficult for cities to develop and implement policies and programs for mitigating climate change: the issue does not fit the way most city governments organize themselves, many city governments lack the administrative capacity to monitor their GHG emissions and there are often budgetary constraints that make it difficult to invest in emissions-reduction activities. Denver has been able to overcome these barriers more successfully than Milwaukee, thus explaining why it has been more effective in moving from reframing to policy action on the issue of climate change.

Ultimately, motivating local action to mitigate global climate change calls for an indirect strategy, focused on the ways that emissions-producing activities are embedded in broader community concerns (Rayner and Malone 1997). The primary benefit of an indirect approach is that it avoids many of the political debates about climate change science that have plagued international efforts to address this issue. Several officials noted that it really does not matter

whether global climate change science is credible. Since the emphasis is on how reducing GHG emissions can help the city address other (more pressing) problems, questions of the scientific basis for climate change rarely come up. When and if they do, city officials can easily reply that these are actions they should take anyway.

## REFERENCES

- Agyeman, Julian, Bob Evans, and Robert W. Kates. 1998. Greenhouse Gases Special: thinking locally in science, practice and policy. *Local Environment* 3 (3):382-383.
- American Forests. 1996. Urban Ecological Analysis for Milwaukee, Wisconsin. Washington, DC: American Forests.
- Austin Energy. 2000. Austin Energy Kicks off Ambitious GreenChoice Program. Austin, TX: Austin Energy.
- Betsill, Michele M. 1999. Greens in the Greenhouse: Environmental NGOs, Norms and the Politics of Global Climate Change. Ph.D. Thesis, Department of Political Science, University of Colorado, Boulder, CO.
- Blair, Anne. Coordinator, SMARTtrips Program, City of Fort Collins, Colorado. Phone conversation. 13 September 2000.
- Bulkeley, Harriet. under review. Down to Earth: Local government and greenhouse policy in Australia. *Australian Geographer*.
- Cash, David W., and Susanne C. Moser. 2000. Linking Global and Local Scales: Designing Dynamic Assessment and Management Processes. *Global Environmental Change* 10 (2).
- City of Denver. 1995. Mayoral Proclamation. Denver: City of Denver.
- City of Fort Collins. 2000. Fort Collins' Local Action Plan to Reduce Greenhouse Gases. Fort Collins, CO: Natural Resources Department.
- City of Milwaukee. 1997. Benefits of the Urban Forest: Greening Milwaukee.
- City of Portland. 2000. Carbon Dioxide Reduction Strategy: Success and Setbacks. Portland, OR: Portland Energy Office.
- City of Seattle. <http://www.ci.seattle.wa.us/news>. *Mayor Paul Schell and City Council Adopt Major Environmental Commitment to Clean Energy for Earth Day 2000* 2000 [cited 15 May 2000 <http://www.ci.seattle.wa.us/news>]. Available from <http://www.ci.seattle.wa.us/news>.
- Clark, William C. 1998. The Local Faces of Global Change. *Environment* 40 (2).
- Clark, William C. 1999. Designing Effective Assessment of Global Environmental Issues: Towards a conceptual framework of learning from experience.
- Clarke, Susan E., and Gary L. Gaile. 1998. *The Work of Cities*. Minneapolis: University of Minnesota Press.

Clinton, William J., and Albert G. Gore. 1993. The Climate Change Action Plan. Washington, DC: Office of Science and Technology Policy.

Collier, Ute. 1997. Local authorities and climate protection in the EU: putting subsidiarity into practice? *Local Environment* 2 (1):39-57.

Collier, Ute, and Ragnar Lofstedt. 1997. Think globally, act locally? Local climate change and energy policies in Sweden and the UK. *Global Environmental Change* 7 (1):25-40.

Colorado Department of Public Health and Environment. 1998. Climate Change & Colorado: A Technical Assessment. Denver, CO: Colorado Department of Public Health and Environment.

Colorado General Assembly. 1999. Colorado 1st Regular Session of the 62nd Assembly, Chapter 364, Senate Bill No. 215. Denver, CO: Colorado General Assembly.

DeAngelo, B, and L D Harvey. 1998. The jurisdictional framework for municipal action to reduce greenhouse gas emissions: case studies from Canada, USA and Germany. *Local Environment* 3 (2):111-136.

Denver City Council. 1991. City Council Resolution 28. Denver: Denver City Council.

Denver City Council. 1999. Denver Comprehensive Plan--1999. Denver, CO: Denver City Council.

Downs, Anthony. 1973. Up and Down with Ecology: The 'Issue-Attention Cycle'. *Public Interest* 32:38-50.

EPA. 1998. State and Local Climate Change Program. Washington, DC: United States Environmental Protection Agency, Office of Policy.

EPA. n.d. Indiana Greenhouse Gas Emissions and Sinks Inventory: 1990. Summary.

Galluccio, Anthony. 2000. Address to workshop. Paper read at Climate Protection: What You and U.S. Cities Can Do, 19 May 2000, at Cambridge Center for Adult Education, Cambridge, Massachusetts.

Harvey, L D Danny. 1993. Tackling Urban CO2 Emissions in Toronto. *Environment* 35 (7):16-20; 38-44.

Hocking, Brian. 1999. Patrolling the 'Frontier': Globalization, Localization and the 'Actorness' of Non-Central Governments. *Regional and Federal Studies* 9 (Spring):17-39.

ICLEI. 1997. Local Government Implementation of Climate Protection: Report to the United Nations. Toronto: International Council for Local Environmental Initiatives.

ICLEI. 1998. U.S. Communities Acting to Protect the Climate: 1998 Achievements of ICLEI's Cities for Climate Protection-U.S. Berkeley, CA: International Council for Local Environmental Initiatives.

ICLEI. 2000. U.S. Cities Acting to Protect the Climate: Achievements of ICLEI's Cities for Climate Protection--U.S. 2000. Berkeley, CA: ICLEI.

ICLEI. 2000. *The International Environmental Agency for Local Governments* n.d. [cited 21 September 2000]. Available from <http://www.iclei.org/brochure.html>.

Indiana Office of Air Management. 1995. Indiana Greenhouse Gas Emissions and Sinks: Estimates for 1990. Indianapolis, IN: Indiana Department of Environmental Management.

Jones, Bradford S. 1991. State Responses to Global Climate Change. *Policy Studies Journal* 19 (Spring):73.

Jones, Sharon A, Baruch Fischhoff, and Denise Lach. 1999. Evaluating the Science-Policy Interface for Climate Change Research. *Climatic Change* 43:581-599.

Kandlikar, Milind, and Ambuj Sagar. 1998. Climate Change Science and Policy: Lessons from India. Cambridge, MA: Harvard University, Global Environmental Assessment Project.

Kates, Robert W, Michael W Mayfield, Ralph D Torrie, and Brian Witcher. 1998. Methods for Estimating Greenhouse Gases from Local Places. *Local Environment* 3 (3):279-297.

Kates, Robert W., and Ralph D. Torrie. 1998. Global Change in Local Places. *Environment* 40 (2):39-41.

King, Gary, Robert O Keohane, and Sidney Verba. 1994. *Designing Social Inquiry: Scientific Inference in Qualitative Research*. Princeton, NJ: Princeton University Press.

Kingdon, John A. 1995. *Agendas, Alternatives and Public Policies*. 2 ed. New York: HarperCollins.

Lasswell, Harold D. 1970. The Emerging Conception of the Policy Sciences. *Policy Sciences* 1 (1):3-14.

Market Street Energy Co. 2000. *District Cooling St. Paul, Inc.: District Cooling Fact Sheet* 1999a [cited 21 September 2000]. Available from <http://www.districtenergy.com>.

Market Street Energy Co. 2000. *District Energy St. Paul, Inc.: District Heating Fact Sheet* 1999b [cited 21 September 2000]. Available from <http://www.districtenergy.com>.

Moser, Susanne. 1998. Talk Globally, Walk Locally: The Cross-Scale Influence of Global Change Information on Coastal Zone Management in Maine and Hawai'i. Cambridge, MA: Belfer Center for Science and International Affairs.

Mucciaroni, Guy. 1993. Problem Definition and Special Interest Politics in Tax Policy and Agriculture. In *The Politics of Problem Definition*, edited by D. R. a. R. W. Cobb. Lawrence, KS: University of Kansas Press.

Nijkamp, P, and A Perrels. 1994. *Sustainable Cities in Europe: A Comparative Analysis of Urban Energy-Environmental Policies*. London: Earthscan.

Norquist, John O. Letter to the Honorable Russell D. Feingold. February 18, 1997.

OECD. 1995. *Urban Energy Handbook: Good Local Practices*. Paris: Organization for Economic Cooperation and Development.

O'Meara, Molly. 1999. *Reinventing Cities for People and the Planet*. Washington, DC: Worldwatch Institute.

Ozone Action, and ICLEI. 2000. *Mayor and Local Official Statement on Global Warming 1999* [cited 13 June 2000]. Available from <http://www.ozone.org/mayorgw.html>.

Parry, Martin, Nigel Arnell, Mike Hulme, Robert Nicholls, and Matthew Livermore. 1998. Buenos Aires and Kyoto targets do little to reduce climate change impacts. *Global Environmental Change* 8:285-289.

Peterson, Bart. 1999. The Peterson Plan: Building a World-Class City Neighborhood by Neighborhood.

Pielke Jr., Roger A. 1998. Rethinking the role of adaptation in climate policy. *Global Environmental Change* 8 (July).

Pielke Jr., Roger A, and Daniel Sarewitz. 1999. Winning and Losing the Global Warming Debate.

Press, Daniel. 1998. Local Environmental Policy Capacity: A Framework for Research. *National Resources Journal* 38 (Winter):29-52.

Rayner, Steve, and Elizabeth L Malone. 1997. Zen and the art of climate maintenance. *Nature* 390 (27 November 1997):332-334.

Rocheftort, David A, and Robert W Cobb. 1993. "Problem Definition, Agenda Access and Policy Choice. *Policy Studies Journal* 21:56-71.

Sarewitz, Daniel, and Roger Pielke Jr. 2000. Breaking the Global-Warming Gridlock. *The Atlantic Monthly* (July).

Sebatier, Paul A, and Hank C Jenkins-Smith. 1998. The Advocacy Coalition Framework: An Assessment. In *Theories of the Policy Process*, edited by P. A. Sebatier. Boulder, CO: Westview Press.

Snow, David A, and Robert D Benford. 1992. Master Frames and Cycles of Protest. In *Frontiers in Social Movement Theory*, edited by A. D. M. a. C. M. Mueller. New Haven, CT: Yale University Press.

Snow, David A, Jr. Rocheford, E Burke, Steven K Worden, and Robert D Benford. 1986. Frame Alignment Processes, Micromobilization, and Movement Participation. *American Sociological Review* 51 (August):464-481.

St. Paul Energy Conservation Project. 2000. *Summary of Saint Paul Urban CO2 Emission Reduction Plan* n.d. [cited 21 September 2000]. Available from <http://www.ci.stpaul.mn.us/depts/realestate/co2rednsumy.html>.

STAAPA-ALAAPCO. 1999. Reducing Greenhouse Gases and Air Pollution: A Menu of Harmonized Options. Washington, DC: State and Territorial Air Pollution Program Administrators/Association of Local Air Pollution Control Officers.

Tarrow, Sidney. 1994. *Power in Movement: Social Movements, Collective Action and Politics*. Cambridge: Cambridge University Press.

Wilbanks, Thomas J, and Robert W Kates. 1999. Global Change in Local Places: How Scale Matters. *Climatic Change* 43:601-628.

Winer, Darryl, Ed.D. n.d. LED Traffic Signals. Denver: City of Denver.

Wisconsin Department of Natural Resources. 1993. Wisconsin Greenhouse Gas Emissions: Estimates for 1990, Report 1. Madison, WI: Department of Natural Resources.

Young, Abby. 2000. Address to workshop. Paper read at Climate Protection: What You and U.S. Cities Can Do, 19 May 2000, at Cambridge Center for Adult Education, Cambridge, Massachusetts.

#### **Individuals Interviewed**

Susan Bem, Indiana Department of Environmental Management (4/27/00).

John Bolduc, City of Cambridge, Massachusetts (11/30/00).

Preston Cole, City Forester, Forestry Division, City of Milwaukee (2/16/00).

Michael R. Dailey, P.E., Principal Engineer I, Engineering Division, City of Madison (2/14/00).

Laura Ferris, Climate Change Coordinator, EPA Region 8, Denver, Colorado (1/28/00).

Steve Foute, Ph.D., Director, Division of Environmental Protection, City of Denver (1/31/00).

Chris Giovanazzo, Recruiting Director, Cities for Climate Protection, ICLEI-US, Berkeley, CA (2/3/00; 2/9/00).

Alyssa Gutt, Program Assistant, Environmental Defense-Rocky Mountain Region, Boulder, Colorado (1/31/00).

Stephen J. Hiniker, Executive Director, Citizens' Utility Board, Madison, Wisconsin (formerly Environmental Policy Coordinator, City of Milwaukee) (2/14/00).

Ray A. Irvin, Director, Indy Greenways, City of Indianapolis (4/28/00).

William Kappel, Director, Buildings and Fleet Division, City of Milwaukee (2/15/00).

Deborah Kielian, Mobile Sources Program Manager, Division of Environmental Protection, City of Denver (1/31/00).

Steven Kreklow, City Forestry Services Manager, Forestry Division, City of Milwaukee (2/16/00).

Julie Magee, Climate Change Coordinator, EPA Region 5, Chicago, Illinois (2/11/00).

Rick Martin, Planning Manager, Environmental Resources Management Division, City of Indianapolis (4/27/00).

Eric Mosher, Climate Change Specialist, Wisconsin Department of Natural Resources (1/14/00).

Vickie Patton, Attorney, Environmental Defense-Rocky Mountain Region, Boulder, Colorado (1/31/00).

James Rowan, Deputy Director, Department of Administration, City of Milwaukee (2/15/00).

Bill Schroer, Energy Consultant, Denver, Colorado (1/27/00).

Katherine Sibold, Coordinator, EPA State and Local Climate Change Program, U.S. EPA, Washington, DC (1/18/00).

Grant Smith, Environmental Policy Coordinator, Citizens Action Coalition, Indianapolis, Indiana (4/28/00).

Jayne Sommers, Engineering Division, City of Madison (1/14/00).

Wayland Walker, Senior City Planner, Division of Environmental Protection, City of Denver (1/31/00).

Darryl Winer, Ed.D., Director of Utilities, City of Denver (1/27/00).

Phyllis Woodford, Air Quality Planning and Grant Specialist, Colorado Department of Environmental Health (1/28/00).

Sweson Yang, Chief Transportation Planner, City of Indianapolis (4/28/00).



## TABLES

**Table 1: U.S. Participants in the ICLEI Cities for Climate Protection Campaign (as of May 2000)**

Alachua County, FL	Denver, CO	Oakland, CA
Albuquerque, NM	Durham, NC	Olympia, WA
Ann Arbor, MI	Fairfax, VA	Orange County, FL
Arlington, MA	Fort Collins, CO	Overland Park, KS
Aspen, CO	Hillsborough County, FL	Philadelphia, PA
Atlanta, GA	Honolulu, HI	Portland, OR
Austin, TX	Keene, NH	Prince George's County, MD
Berkeley, CA	Little Rock, AR	Riviera Beach, FL
Boston, MA	Los Angeles, CA	Sacramento, CA
Boulder, CO	Louisville, KY	Saint Paul, MN
Bridgeport, CT	Lynn, MA	Salt Lake City, UT
Brookline, MA	Madison, WI	San Diego, CA
Broward County, FL	Maplewood, NJ	San Francisco, CA
Burien, WA	Medford, MA	San Jose, CA
Burlington, VT	Memphis, TN	Santa Cruz, CA
Cambridge, MA	Mesa, AZ	Sante Fe, NM
Chapel Hill, NC	Miami Beach, FL	Santa Monica, CA
Chicago, IL	Miami-Dade County, FL	Schenectady County, NY
Chittenden County, VT	Milwaukee, WI	Seattle, WA
Chula Vista, CA	Minneapolis, MN	Springfield, MA
Corvallis, OR	Missoula, MT	Takoma Park, MD
Dane County, FL	Mount Rainier, MD	Tampa, FL
Davis, CA	New Orleans, LA	Toledo, OH
Decatur, GA	Newark, NJ	Tucson, AZ
Delta County, MI	Newton, MA	West Hollywood, CA

**Table 2. A Comparison of Denver, Milwaukee and Indianapolis**

	<b>Denver</b>	<b>Milwaukee</b>	<b>Indianapolis</b>
<b>Population</b>	500,000	500,000	750,000
<b>1990 GHG Emissions (metric tons of CO<sub>2</sub> equivalent)</b>	12 million <sup>18</sup>	13 million <sup>19</sup>	8 million <sup>20</sup>
<b>Vulnerability to Climate Change Impacts</b>	Unclear	Unclear	Unclear
<b>ICLEI CCP participant?</b>	Yes	Yes	No
<b>Comprehensive set of policies and programs for controlling GHG emissions?</b>	Yes	No	No

**Table 3. Denver's Policies and Programs for Controlling GHG Emissions<sup>21</sup>**

<b>Program</b>	<b>Description</b>	<b>Estimated Annual GHG Savings (metric tons—CO<sub>2</sub> equivalent)<sup>22</sup></b>
LED traffic signal retrofit	Replace red lights and "don't walk" signs at 1200 intersections with LEDs; begin to install yellow and green lights	8,657
Green Fleets	Replace older vehicles in the municipal fleet with the most cost-effective and lowest-emitting vehicles possible with the objective of reducing CO <sub>2</sub> emissions 1.5%/year and fuel expenditures 1%/year over a 10-year period	83
Bus Pass Program	Provide subsidies to 1300 city employees, saving 500,000 person trips/year	1,649
Mile High Stadium Retrofit	Switched heating system from electricity to natural gas	1,600
Energy Efficiency Mortgage Program	Allow higher loans for homes meeting higher energy efficiency standards	3,324
Performing Arts Shuttle Service (PASS)	Shuttle service to provide access to downtown cultural attractions	Not calculated
Wind Purchase	Municipal government to buy 667 blocks of power (100k kwh each) from Public Service Co. of Colorado's wind farm	800
Neighborhood Electric Vehicle project	Municipal government has three electric vehicles for employee travel within the downtown area	Not calculated
Energy Efficiency in municipal buildings	City has applied window film to reduce heat entering in summer and escaping in winter	470
	City has upgraded lighting in 14 million square feet of office space	990
Tree planting	City plants 1,000 trees every year	12.5
Solar access ordinance	Protects rooftop solar access in city neighborhoods	Not calculated

## ENDNOTES

<sup>1</sup> Thanks to Ron Mitchell for raising this point.

<sup>2</sup> A frame is "an interpretive schemata that simplifies and condenses the 'world out there' by selectively punctuating and encoding objects, situations, events, experiences, and sequences of action within one's present or past environment (Snow and Benford 1992, p. 137)." In other words, frames help individuals sift through information in order to understand a particular situation. Frames contain information about the causes of a policy problem, the consequences of the problem, who is most threatened by the problem, who is to blame for the problem and what solutions exist for the problem (Lasswell 1970; Mucciaroni 1993; Rochefort and Cobb 1993; Snow and Benford 1992; Tarrow 1994).

<sup>3</sup> I view assessment as both a product (e.g. an IPCC report) and a social communication process "linking scientists, decision makers and other parties in efforts to address issues of global environmental change" (Clark 1999, pp. 2-3).

<sup>4</sup> It is important to note that this is not the only example of local concern with global climate change. A number of other national and international associations for local governments have also put climate change on their agendas. These include the International City/County Management Association, Climate Alliance (Europe), the U.S. Conference of Mayors, and the State and Territorial Air Pollution Program Administrators/Association of Local Air Pollution Control Officials (STAPPA/ALAPCO).

<sup>5</sup> As of May 2000, 44 U.S. cities had completed their GHG analyses and 23 had begun implementing their local action plans. However, only 5 municipalities had a permanent monitoring and reporting system in place (ICLEI 2000).

<sup>6</sup> ICLEI estimates that municipal operations may account for as much as 10% of a city's total GHG emissions (ICLEI 2000).

<sup>7</sup> Because most urban areas are experiencing considerable growth, emissions reduction targets and achievements are often reported on a per capita basis.

<sup>8</sup> An exception may be coastal communities, particularly in the Southeastern U.S., that have been affected by devastating hurricanes over the past decade. A likely impact of climate change for this region is more frequent and/or more severe storms. Thus, any one storm can serve as a shock and heighten local awareness of the problem of climate change.

<sup>9</sup> An interesting area of future research would be to compare the process of localizing global climate change in these communities with other communities where potential vulnerabilities are not as clear.

<sup>10</sup> This workshop was sponsored by the Cambridge (MA) Center for Adult Education and was designed to facilitate the development of the Cambridge Local Action Plan.

<sup>11</sup> Because Denver had been involved in the pilot project for the CCP campaign, it was not required to pass another city council resolution to become a member of the CCP campaign.

<sup>12</sup> For a similar finding in other GEA work, see (Kandlikar and Sagar 1998).

<sup>13</sup> The one exception was a woman who also happened to be pursuing a Ph.D. in atmospheric chemistry. However, she noted that she did not find anything in the IPCC report to be particularly useful in her position within the local government.

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<sup>14</sup> An interesting question for future research would be whether climate change science has been more effective in precipitating a local reframing in coastal communities where city officials are presumably already aware of their vulnerability to sea-level rise.

<sup>15</sup> Other professional organizations also provide best practices information, such as the Council of Mayors, an association for utility commissioners and STAAPA-ALLAPCO (association for state and local air pollution professionals). In Europe, Climate Alliance facilitates communication between its 800 municipal members.

<sup>16</sup> Again, an interesting topic of future research would be to examine those CCP communities with clear vulnerabilities to climate change (e.g. sea-level rise). Do their activities under the CCP campaign focus solely on mitigation or do they tend to focus more heavily on adaptation?

<sup>17</sup> By "effective," I mean that atmospheric GHG concentrations are stabilized.

<sup>18</sup> Denver has chosen to use 1995 as a base year for calculating emissions reductions

<sup>19</sup> Since the City of Milwaukee has not completed an emissions inventory, 1990 emissions are estimated using average per capita emissions reported by the State of Wisconsin to the EPA (ICLEI 1998).

<sup>20</sup> Calculated based on the average per capita emissions levels reported by the State of Indiana to the EPA (EPA n.d.).

<sup>21</sup> Each program has been explicitly linked to climate change either through a report to the ICLEI CCP campaign, in official program documentation or in the course of an interview.

<sup>22</sup> Estimates taken from ICLEI (2000) and derived using the CCP software developed by Torrie Associates in Toronto Canada.

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