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Symbolic or substantive policy? Measuring the extent of local commitment to climate protection

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Abstract. Over 1000 US municipalities have formally committed to reduce their local greenhouse gas (GHG) emissions through participation in one of several climate-protection networks. This has attracted the attention of researchers interested in theories of free riding and local political decision making who question why municipalities become engaged in this global effort. However, whereas joining a climate-protection network or adopting an emissions-reduction goal are relatively low-cost acts, the *implementation* of such policies entails higher costs. This raises legitimate questions about the extent and type of follow-through made on municipal climate-protection commitments. With this paper I begin to fill in the data gap around municipal climate-protection initiatives and construct an index that quantifies the GHG-reduction policies implemented by local governments. Data informing the index are collected on municipalities in the US state of Indiana and are used to test theories of local political decision making. Findings point to the important role that policy entrepreneurs play in advancing local climate protection as well as to the potential inadequacy of membership in climate-protection organizations as an indicator of increased implementation of GHG-reducing activities.

Introduction

As growing proportions of the global population live in urban areas and exert increasing pressures on the environment, cities are emerging as key "battlegrounds for global sustainability" (Clark, 2003). Climate change is the dominant sustainability issue of our time, and cities are conservatively estimated as releasing between 30% and 40% of anthropogenic greenhouse gas (GHG) emissions worldwide (IPCC, 2007a; Satterthwaite, 2008). Partly in response to the realization of their impact, municipal governments around the world are becoming involved in the effort to mitigate climate change.

This trend is particularly significant in the United States which, due to its lack of comprehensive national legislation, has enabled state and local governments to act as the de facto climate-protection leaders. Over 1000 US municipalities, representing approximately 30% of the country's population, have formally committed to reduce local GHG emissions through their participation in one of several climate-protection networks (US Conference of Mayors, 2009). In doing so these cities appear to have circumvented the oft-held belief that global issues are outside municipalities' spheres of influence and concern—what Bai (2007) more precisely describes as spatial, temporal, and institutional scale arguments. These scale arguments are perspective-based obstacles to municipal involvement in climate protection and suggest that: (1) the issue is beyond local government's physical boundary of concern; (2) the issue is beyond the time horizon relevant to urban political contexts where leaders, funding, and hot-button issues are subject to frequent and rapid change; and (3) it simply is not local government's 'business' to address transboundary environmental concerns.

That large numbers of cities are making GHG-reduction pledges also stands in apparent contraction to theory on free riding and the underproduction of public goods, which suggests that local governments would be reluctant to voluntarily pursue policy which creates global benefits but entails local costs. Carbon dioxide dissipates

globally, so the environmental benefits of its reduced atmospheric concentration are the same no matter where in the world emissions are abated. Each abating entity receives only minimal direct benefit from its GHG-reduction efforts, yet bears the full burden of the cost. As such, in a noncoercive environment the incentive to free ride would theoretically block the involvement of subnational governments in efforts to produce public goods, such as increased climate protection (Olson, 1965).

Whereas joining a climate-protection network and/or adopting official emissions-reduction policy are relatively low-cost acts, the *implementation* of such policies entails higher costs. This raises legitimate questions about the extent and type of follow-through made on municipal climate-protection commitments, ranging from whether implementation can generally be assumed to whether the commitments themselves are more appropriately viewed as acts of symbolic policy, adopted without the intent of being fully implemented. A lack of comparable data on municipal efforts has prevented research from providing systematic and generalizable answers to these and related questions regarding the local climate-protection dynamic. Nonetheless, the large number of cities and the variation that exists between them offers fertile ground for testing theories about policy innovation and local decision making regarding sustainability.

This research represents an effort to fill in the data, and corresponding knowledge, gap around municipal climate initiatives. I develop an index, composed of GHG-reducing actions identified as within most local governments' jurisdictions, and use it to quantify the extent of municipal climate protection and to test theories of local decision making. Data informing the index were gathered on cities and towns in the US state of Indiana.

Relevant literature and background

This research contributes to and bridges two distinct strands of literature. First, it builds upon the relatively new subfield of research that looks explicitly at subnational climate-protection activities and adds insight based on increased information and quantitative analysis. Second, it draws from the established literature on municipal political decision making to develop models that test several theories about the drivers and obstacles to local sustainability policy. Both areas of literature are reviewed below.

Local climate protection

Organized local-level involvement on climate protection in the US began in the early 1990s with the encouragement of ICLEI,[1] an international network promoting local sustainability (Betsill, 2001). The 2005 launch of the Mayors' Climate Protection Agreement (MCPA) accelerated local activity around this issue. Sponsored by the US Conference of Mayors, the MCPA reflects the pledge of signatory cities to reduce their GHG emissions by 7% below their 1990 levels—that is, the Kyoto Protocol's goal amount for the US. Most local climate-protection activity in the US falls under the umbrella of these two affiliated organizations. As of October 2009, 1004 US cities had signed the MCPA and over 500 had joined ICLEI. This equates to approximately 5% of all US municipalities, covering nearly 30% of the population, having an explicit and formal objective to mitigate GHGs (US Conference of Mayors, 2009).

Climate change mitigation and adaptation

GHG mitigation along with efforts to reduce vulnerabilities to climate change (ie adaptation) comprise the component parts of local climate governance. Although attention to adaptation is growing, it has been a secondary concern to mitigation, and the

[1] ICLEI originally stood for the International Council of Local Environmental Initiatives; however, now the organization's full name is simply ICLEI—Local Governments for Sustainability.

number of cities formally engaged in adaptation planning remains quite small (Sippel and Jenssen, 2009). Compared with mitigation, adaptation efforts are more varied and involve a larger number of actors. The nature of climate-induced threats varies by geography—often including increased risk of floods, hurricanes, wildfires, drought, or extreme heat—and, for each relevant threat, adaptation requires the cooperation of diverse sets of actors with objectives that range from immediate disaster relief to long-term prevention planning (Bulkeley et al, 2009). Previous research suggests that climate change adaptation and mitigation efforts are subject to different sets of motivators and obstacles (Bulkeley et al, 2009; Sippel and Jenssen, 2009). One important difference is rooted in the fact that adaptation provides local benefits, and, as such, should not be hindered by 'collective-action'-induced barriers.

In the remainder of this paper I focus on mitigation. Adaptation is excluded from the subsequent analysis to avoid conflating the effects of its potentially different drivers and obstacles with those of mitigation. However, the execution of a separate similarly designed study on adaptation and its comparison with the current one provides an interesting avenue for future research.

The value of local GHG mitigation

Climate change is almost universally framed as a global issue; however, although the concentration of GHGs, is clearly a global phenomenon, many of its impacts and driving forces are local in nature (Association of American Geographers, 2003; Kates and Wilbanks, 2003). The value of local involvement in GHG-abatement efforts remains subject to considerable debate. On a conceptual level, some suggest that subnational governments in general, and local governments in particular, are wholly inappropriate units to undertake this task. The first strand of criticism rests on the premise that subnational governments are simply too small to enact policy able to result in any meaningful emissions reduction. The second strand is tied to skepticism that many subnational climate-protection policies are symbolic in nature, adopted with little intent of being fully implemented (Aall et al, 2007). Finally, there is a concern that reliance on subnational policies will result in emissions leakage, or the movement of emission-generating activities from regulated areas to unregulated ones (Adelman and Engel, 2008; Wiener, 2007). It is conceptually possible for leakage to exceed 100%, creating a situation where subnational GHG-abatement efforts actually result in an increase of emissions (Wiener, 2007).

On the other hand, proponents of local action point to the nature of climate change as a multilevel issue, with causes and effects that are both global and local. As such, they argue, the development of a multilevel system of governance, in which local policy plays a role, is important to effectively address the problem (Aall et al, 2007; Bai, 2007; Bulkeley and Betsill, 2003; Koehn, 2008). Municipal governments are frequently in charge of local land-use and transport planning, the operation of public buildings and vehicle fleets, waste disposal, and urban forestry efforts, all of which contribute to an area's net GHG emissions. They are also the level of government closest to the citizen and many of the behaviors that result in GHG emissions (Bai, 2007; Coenen and Menkveld, 2003). This suggests that municipal efforts may result in significant abatement and could potentially help meet the oft-stated goal of a 50% to 85% reduction in worldwide anthropogenic GHG emissions below 2000 levels by 2050 (IPCC, 2007b).

Insufficient empirical information is available to help inform this debate. Studies conducted on local climate-protection initiatives up to this point can be placed into one of four research design categories: case studies, small-*n* evaluations of active cities' policies, large-*n* dichotomous variable studies, and surveys of member cities by climate-protection networks. As is common in new areas of study, case-study research has played a large role in establishing the issue's parameters. These studies provide

in-depth descriptions of the dynamic surrounding the climate-protection efforts of a small number of (typically) best-practice cities (Bulkeley and Betsill, 2003) or focus on the operation of a specific climate-protection network (Betsill and Bulkeley, 2004; Lindseth, 2004). As with all case-study research, the ability to generalize findings is limited. A second generation of studies qualitatively evaluates the ways in which small samples of cities, with explicit climate-protection commitments, implement their plans. Via interviews and document analysis, the strengths and weaknesses of between twenty and thirty-five cities' climate-protection plans are assessed (Aall et al, 2007; Kousky and Schneider, 2003; Wheeler, 2008). These studies generally find that low-hanging fruits are targeted by policy and that implementation is often lacking. Cities also emphasize the cobenefits of their GHG-reducing activities.

A few quantitative large-*n* studies have been conducted, which focus on the factors that influence cities to make explicit climate-protection commitments (Krause, 2010; Zahran et al, 2008a; 2008b). However, they are limited in their ability to consider the depth or extent of follow-through to these cities' expressed commitments. Finally, the organizations sponsoring climate-protection networks, notably ICLEI and the US Conference of Mayors, have themselves conducted research on their member cities' activities. Publications which highlight member cities' best practices and provide the aggregate results of member surveys are available on both groups' websites.

This review reveals several gaps in the research conducted on this issue. First, a majority of studies look exclusively at municipalities that have made an *explicit* commitment to reduce GHG emissions. More common, however, is *implicit* climate protection which is included in local land-use, energy-use, and transport policies. Moreover, little is known about the climate-relevant activities of cities that have not joined a climate-protection network. The focus on explicitly committed municipalities results in an undercount and potential mischaracterization of total local GHG activities. It also limits analysis on the effectiveness of climate-protection networks as this requires information on both members and nonmembers. Second, large-*n* studies that consider the depth of a locale's commitment are lacking. It is not clear whether the factors influencing commitment making also influence the actual implementation of GHG-mitigating policy, or whether the commitments themselves affect implementation activity.

Local policy decision making

Several theories exist in the economics and urban politics literature regarding the dynamics of local policy making and are useful to identify variables that may act as drivers or obstacles to municipal engagement in sustainability and climate protection (Lubell et al, 2009). The first relevant theory describing how municipalities make political decisions is expressed by the interest group and growth machine model. It posits that political decision makers construct policy to meet the demands of the groups with the greatest resources and power. In municipalities, these groups are typically developers and/or other interests promoting economic growth (Molotch, 1976). Generally, these interests oppose environmental initiatives. However, proponents of municipal climate protection regularly cast modern 'green' leadership as providing opportunities for growth, and the actual position of progrowth groups on this issue is unclear (Bulkeley and Betsill, 2003; Lubell et al, 2009).

A second theory of local policy making is one of fiscal constraints and a third, related, is one of institutional capacity. Together they form a 'supply-side' theory of public goods provision which suggests that the financial and technical capacity of local governments is a key determinant of their policy decisions. Local governments that are

capable of responding to the demands of the public will supply more public goods (Ziblatt, 2008). Policy entrepreneurs—that is, specific individuals within a government who actively promote certain policy innovations either because of personal commitment or in pursuit of political gain—likewise contribute to supply-side theories of local policy making. They have been shown to play a key role in development of state climate policy (Rabe, 2004), and likely have a role in the formation of municipal policy as well (Bulkeley and Betsill, 2003). The population of potential policy entrepreneurs has an unobservable distribution across local governments, with the number in any specific locale theorized as a function of its demographic characteristics. Certain conditions, like healthy municipal finances, make entrepreneurs more likely to emerge and be successful (Schneider and Teske, 1992).

Finally, a risk-based theory of decision making may be relevant to examining municipal climate-protection decisions. Research suggests that the public perception of risk is a significant driver of policy (Correia et al, 1998; Tierney et al, 2001). Demographic, social, and attitudinal characteristics influence how people perceive risk, as do geographic variables: people who live near an environmental risk tend to have a higher perception of the severity of that risk (Brody et al, 2008). The impacts of climate change are predicted to vary regionally and across demographic groups. This theory suggests that the reality and/or perception of a heightened risk of climate-induced disaster will influence cities' propensity to pursue climate-protection policy. This idea remains relevant despite the reality that, because carbon dioxide dissipates globally, a city can eliminate 100% of its emissions and have virtually no impact on its climate-related risks. Thus, the theory that higher risk leads to an increased likelihood of engagement in GHG mitigation must either be premised upon an assumed misunderstanding by the public and/or decision makers regarding how climate change works or rest on the more altruistic idea that being at greater risk simply heightens awareness about the issue and leads to increased local action, separate from any belief that those actions alone will significantly alter local risk. Both mechanisms are reasonable and research has found that cities at greater risk of experiencing negative impacts are significantly more likely to increase participation in climate-protection efforts (Zahran et al, 2008a). Notably, unlike with mitigation, a direct relationship does exist between perceived vulnerability to climate change and adaptation planning, as the latter can effectively target and ameliorate specific climate-induced local threats.

Measuring municipal climate protection

A primary objective of this paper is to design an approach able to quantify the extent of municipal climate protection. Currently, there is not a single comparable measure that adequately indicates the extent of local GHG-reduction efforts taking place within a large number of municipalities. The municipal climate-protection index (MCPI) is presented as a means to remedy this. The MCPI is loosely based on urban sustainability indices developed by Portney (2003) and Lubell et al (2009). The basic approach of these indices involves identifying the possible sustainability policies that cities could have in place, and forming a composite variable by counting and summing the number of those policies that exist in each city. The MCPI likewise follows this approach, although its indicators are specific to climate protection.

Local climate protection can be viewed in two distinct ways: via an explicit perspective, which considers only those efforts motivated by and framed as part of a stated climate-protection objective, and an implicit perspective, which considers all GHG-mitigating actions regardless of how they are framed (Aall et al, 2007). This index utilizes the second, broader understanding. Many of the GHG-reducing actions

or policies that municipalities undertake generate important cobenefits, such as energy savings and decreased congestion, which may provide the dominant motivation for their implementation. The index does not differentiate amongst actions based on whether or not their primary motivation is climate protection.

Indicator selection

Multiple sources were consulted to determine the variety of ways local governments can reduce area GHGs. Publications from the US Conference of Mayors' Climate Protection Center and ICLEI were reviewed as a first step in the index formulation process. Both organizations offer regular summaries of current best practices and recommendations for local action. A review of the relevant academic literature and consultation with local government employees active in urban sustainability shaped the final MCPI. The result is a comprehensive twenty-four-item index that captures the variety of ways municipal governments can influence GHG emissions (see box 1).

Box 1. Municipal climate-protection index.

Institutionalization component

(1) City-wide greenhouse gas (GHG) inventory completed;
(2) GHG-reduction goal formally adopted;
(3) Comprehensive plan to achieve reduction goal developed/formally adopted;
(4) Responsibility for managing city's climate-protection activities designated to city employee/department/volunteer committee;
(5) Funding for climate protection designated in city budget.

Action component—city operations[a]

(6) Efficient lighting installed in city buildings;
(7) EnergyStar-only purchase policy for city equipment and appliances adopted;
(8) Conversion to 'green' city vehicle fleet underway;
(9) Efficiency standards [such as Leadership in Energy and Environmental Design (LEED)] adopted for all new and retrofit city buildings;
(10) Incentive programs in place encouraging city employees to travel to work using means other than a single occupancy vehicle;
(11) City purchases and/or produces alternative energy for its own operations;
(12) Methane recovery system installed in city-operated wastewater treatment plant;
(13) City spends at least US $2 per capita annually on public tree planting and maintenance.

Action component—broader community

(14) City provides information about how to increase energy efficiency to its residents;
(15) City provides financial incentives to the public and/or developers to encourage energy-efficient new construction or improvements to existing buildings;
(16) City requires efficiency standards (such as LEED) be met in new commercial and/or residential construction;
(17) Outreach and education provided to residents regarding privately owned trees;
(18) Municipal ordinances in place that dictate tree planting and/or removal specifications for developers;
(19) Public transportation services provided to city residents;
(20) Incentives offered for residents to take public transit (ie free days, reduced fares);
(21) Bike lanes and/or hike and bike trails provided;
(22) Planning and zoning decisions involve explicit considerations of the effect they will have on GHG emissions and/or sprawl;
(23) Separated yard waste is composted or mulched instead of taken to landfill;
(24) Curbside recycling is provided to city residents.

[a] Indicators regarding the installation of methane capture systems in landfills and energy efficiency/demand-side management practices in municipally owned utilities are additional relevant indicators. They are excluded from the MCPI because a large portion of municipalities do not own or operate their own landfills and utilities.

Distinct categories of indicators emerged during the formation of the MCPI, enabling the index to be organized into three parts. The first, termed the 'institutionalization component', involves the extent that the explicit objective of climate protection has been institutionalized within the city government's planning and financial structure. Component indicators signify substantive follow-through to what might otherwise be little more than a symbolic policy goal. They also indicate permanence: the turnover of staff and elected officials is less likely to result in the ending of climate-protection efforts if they are institutionalized within the city government structure. In and of themselves, however, these indicators do not signify a reduction in GHG emissions.

Two additional sections make up the index's 'action components' and consider the extent to which activities that result in GHG reduction have already been implemented, either within local governments' own operations or as part of a broader strategy to reduce community-wide emissions. Local governments often target their own carbon footprints by enacting policy to increase the efficiency of their buildings, vehicle fleet, and purchases. The reduction in overall emissions that policies targeting government operations can achieve is limited in magnitude. However, because they have direct control over behavior, the certainty that such policies will achieve intended emissions reduction is relatively high. A different dynamic exists with policies aimed at reducing community-wide emissions: the size of the total possible reduction is large, but enabling policies often lack direct control over GHG-relevant behavior. Indicators in this section are policies which attempt to change the GHG-emitting behaviors of residents and businesses, via information, incentives, or requirements.

Any GHG-reducing policy that a municipality could undertake has three dimensions: an emissions sector, a target population, and a policy instrument. These dimensions can be considered to assess the comprehensiveness of the MCPI. A municipality can focus its GHG-reduction efforts on multiple different emissions-related sectors (ie transportation, energy use, urban canopy cover, or waste management), by attempting to change the behavior of different target groups (ie city government or residents), through the use of multiple different policy instruments (ie service provision, incentives, information, mandate, or internal/administrative ordinance). Although not all combinations are feasible for cities to pursue, they provide a lens by which to assess the spread of the index's coverage.[2]

Aggregation of index scores

Individual indicators are scored on a scale of 0 to 1. If a municipality has implemented the program or policy described by the indicator, it receives a score of 1. If it has not, it receives a score of 0.[3] Possible index scores range from 0 to 24.

As aggregated, the MCPI treats each indicator as equivalent. This is despite the fact that the activities they represent likely vary both in terms of impact on GHG emissions and effort on the part of the municipality. Given the lack of local-level emissions data

[2] In terms of target group, thirteen MCPI indicators target local government actions and eleven target the community at large. In terms of policy instrument, ten MCPI indicators utilize administrative procedures, seven utilize service provision, two utilize information provision, two utilize financial incentives, and two utilize regulations. In terms of emission-related sectors, seven MCPI indicators target energy use in buildings, six target GHG emissions directly, four target transportation, four target tree coverage, and three target waste management.

[3] Indicators 3, 4, 5, and 8 also allow for a score of 0.5, indicating partial implementation. For example, indicator 3 asks if a city has developed and adopted a plan specifying how it will reach its emissions-reduction goal. A score of 0 is assigned if no plan has been made, a 1 if a plan has been developed and formally adopted as part of city policy, and 0.5 is assigned if a plan has been completed but serves to provide only informal recommendations.

and the range in the size, scope, and investment associated with similar activities between cities, trying to account for the impact of specific policies would likely lead to a net increase in error. As such, an unweighted index of activities is necessarily most appropriate.

Data collection and research design

Sample and MCPI data collection

Data from municipalities in the state of Indiana were collected to inform the MCPI via a survey designed and administered specifically for this project. Web-based questionnaires were sent directly to the city employee identified as in charge of environmental and/or sustainability programs in all Indiana cities and towns with populations greater than 10 000. An initial phone call was made to each municipality to obtain the identity and contact information for the appropriate individual. The job title of the individual contacted varied from city to city, but the majority of surveys were answered by an individual holding a leadership position in one of the following: department of planning, building, and/or community development; and mayor or town manager's office; department of environment or sustainability; or department of public works. Surveys were sent to representatives from sixty-nine cities and, after follow-up phone calls, fifty-three useable surveys were received. This equates to a response rate of 77%.

In terms of size and location within the Chicago or Indianapolis metropolitan statistical areas, the profile of respondent municipalities closely matches that of the total sample surveyed. Relevant demographics of responding cities vary more noticeably from the total sample surveyed and, on average, the residents of cities that completed the survey have a higher median household income, higher levels of education, and are more frequently represented by local elected leaders affiliated with the Democratic political party. Nonetheless, as table 1 shows, the sample of municipalities that will be subject to analysis adequately reflects the cities and towns in the state of Indiana.

Common methods variance, or variance attributable to the measurement instrument rather than the constructs themselves, is a frequently cited source of bias in the social and behavioral sciences when survey data are utilized (Podsakoff et al, 2003). However, the factual nature of the questions asked and the use of external independent variables minimizes the threat of common methods bias in this research

Table 1. Comparison of survey respondents with all Indiana cities and towns with populations larger than 10 000.

	All cities/towns receiving survey (n = 69)	Responding cities/towns (n = 53)
Population over 100 000 (%)	7.25	7.54
Population 50 000 – 100 000 (%)	10.01	9.43
Population 25 000 – 49 999 (%)	28.99	28.30
Population 10 000 – 24 999 (%)	53.62	54.72
Cities/towns within Chicago or Indianapolis metropolitan statistical area	46.38	45.28
Political leaning (Democratic mayors/state representatives) (%)	47.83	50.94
Per capita city budget (general fund) (mean)	550	527
Median household income	40 048	41 446
Education (% bachelor's degree or higher) (mean)	19.90	21.20

(Podsakoff and Organ, 1986). The factual information collected by the questionnaire is, in principle, verifiable and, while respondents may report incorrect information, error is unlikely to be systematic and unlikely to offset the economy of this type of data collection (Gupta and Beehr, 1982).

Rationale for Indiana sample

A variety of factors motivated the selection of cities and towns in the state of Indiana for this study. In a number of ways Indiana is a 'typical' US state, falling near the middle of national rankings on measures of income, poverty, and population growth (US Census Bureau, 2009). Politically, it tends to be conservative, but currently has a US senator from each party and was a swing state in the 2008 presidential elections. At the same time, many characteristics of the state of Indiana present a particularly unwelcoming atmosphere for climate-protection initiatives on any level. Indiana is among the minority of states that have not participated in any climate-related initiatives (Pew Center on Global Climate Change, 2009), its popular governor has become a national voice in opposition to proposed cap-and-trade bills (Daniels, 2009), its economy is heavily dependent on manufacturing (US Census Bureau, 2009), and its renewable energy potential is among the lowest in the country (Energy Information Administration, 2005). To the extent possible, the potential interaction between state and municipal climate policies is minimized in Indiana. Any municipal climate activity is a direct result of local dynamics and not a response to encouraging state policy.

Independent variables and hypothesis

Theories of local political decision making have been condensed to form general supply-side and demand-side models, which will be tested to determine their relative ability to explain the performance of Indiana municipalities on the MCPI. The supply-side model includes components of the fiscal constraints, institutional capacity, and policy entrepreneur theories of local policy making and suggests that the level of resources and expertise held by municipalities is a primary determinant of MCPI performance. Those with greater overall administrative and financial capabilities are likely to engage in more climate-protecting activities. Larger municipalities tend to have more resources and professional staff, making city and town 'population' a key variable. Resources and fiscal health are represented by the variables 'per capita general fund' and the 'percentage of general fund from property taxes'. Because other funds within a municipal budget have dedicated uses, such as for pensions, the money within a city's general fund indicates resource flexibility. The percentage of general funds sourced from property taxes also indicates municipalities' fiscal health. Property taxes are a main stream of independent revenue for Indiana municipalities, and cities and towns with higher portions of their budgets from property taxes are less dependent on intergovernmental revenue and have more flexibility over how money is spent. The supply model also suggests that city governments with professional staff are more likely to pursue innovative policies. The independent variable 'staff professionalism' represents the level of education held by the individual in charge of local environmental programs and acts as a proxy for this concept. Finally, survey respondents were asked if any members of the local government (elected or staff) played an identifiable role in effectively pushing for climate-protection policies. The presence of an internal 'policy champion' has been identified as important to the formation of state-level policy and is captured in the 'policy entrepreneur' variable (Rabe, 2004).

The demand-side model combines interest group, growth machine, and risk-based theories and suggests that the type and extent of climate-protection activities implemented by municipalities reflect the demands of the local public. Several community demographic characteristics may be associated with overall demand for local climate-protection efforts.

Table 2. Independent variables in municipal decision-making models.

Variable	Description	Source
Supply-side model variables		
Population (log)	The log of the number of people living in each municipality in 2000.	US Census Bureau (2000)
Policy entrepreneur	A dichotomous variable indicating if a city has an identifiable policy entrepreneur (elected or on staff) working to advance climate protection.	Municipal climate protection survey (in 2009)
Staff expertise/ professionalism	A multinominal variable (1 – 8) indicating the level of education held by the individual in charge of a municipality's environmental programs.	Municipal climate protection survey (in 2009)
Per capita budget (general fund)	Amount in US $100 allocated to the 'general fund' in municipalities' 2007 budget, standardized by population.	Indiana Department of Local Government Finance (2007)
Percentage general fund from property tax	Percentage of money in municipalities' general funds coming from local property tax.	Indiana Department of Local Government Finance (2007)
Demand-side model variables		
Educational attainment	The percentage of adults in each municipality, 25 or older, who have a bachelor's degree or higher.	US Census Bureau (2000)
Household income	The median household income, in thousands, for each municipality.	US Census Bureau (2000)
Political representation	Dichotomous variable indicating the political affiliation of the city's current mayor. For the seven municipalities without mayors, political leaning is indicated by the party of the state representative whose district includes majority of municipality. Democratic (1); Republican (0).	Indiana Democratic Party (2009) Indiana General Assembly (2009)
Environmental nonprofits	Number of environmental nonprofits headquartered in each municipality, as registered with the Internal Revenue Service or the Indiana Secretary of State. Number standardized by population and interpreted as environmental nonprofits per 10 000 people.	The Center on Philanthropy at Indiana University (2004)
Manufacturing jobs	Percentage of jobs in each county that a city or town is located in that are in manufacturing.	STATSIndiana (2008)
Federal disaster area	The number of times since 2000 that each county that a city or town is located in has been designated a federal disaster area for a weather-related event.	US FEMA (2009)

Higher 'median household income' and average 'educational attainment' can be viewed as motivations for relevant local government action, as both environmental concern and civic engagement are correlated with these attributes (Rothenberg, 2002; Verba et al, 1993). Climate initiatives in the United States have been characterized by partisanship: Democrats are generally more in favor of such efforts, whereas Republicans have more often been opposed. As such, local 'political representation' is a proxy for the level of political support or opposition that may accompany the adoption of a local climate change initiative. The number of 'environmental nonprofit groups' in a city also indicates the extent and organization of local support around this issue. Finally, the decline of manufacturing in the US has been pointed to as a factor enabling local governments to become engaged in planning efforts that explicitly include sustainability as an objective (Portney, 2003). It follows that cities where manufacturing remains economically important may be less inclined to adopt GHG-reducing initiatives than those which have a service or technology-based economy. The relative importance of manufacturing in the local economy is captured in the 'manufacturing jobs' variable. Finally, experiencing weather-related disasters may result in an increased perception of risk from climate change and likewise increased demand for its mitigation. This is captured in a count variable representing the number of times each Indiana county has been declared a federal disaster area since 2000. See table 2 for independent variables' descriptions and sources.

Results

Descriptive finding: what are cities doing?

All fifty-three of the cities and towns which responded to the survey have activities or policies in place that reduce GHGs.[4] Their MCPI scores ranged from 2.5 to 17.5, out of a possible 24, meaning that Indiana municipalities are engaged in between 10% and 73% of the GHG-mitigating activities identified. As shown in figure 1, the distribution of index scores resembles a normal distribution with a right skew, and would likely normalize further with an increased sample size.

There is considerable variation in the frequency at which the activities specified in the MCPI have been implemented. On the high end, over 65% of cities have implemented curb-side recycling and yard waste composting, and have bike lanes or hike and bike trails in place. In addition to reducing GHG emissions, these services offer

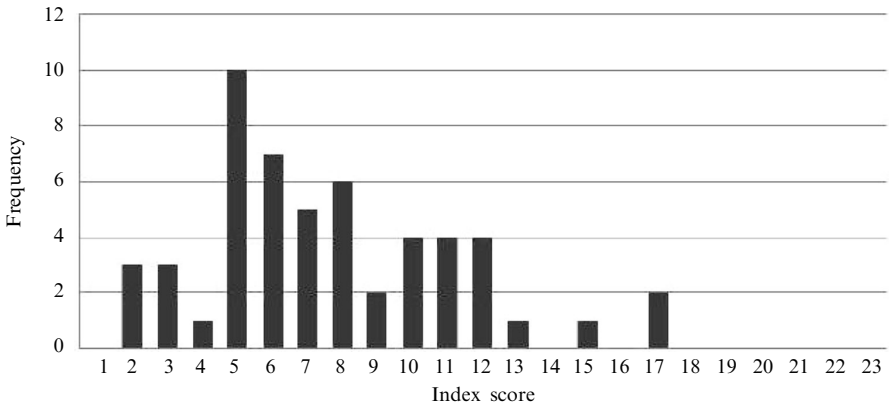

Figure 1. Distribution of municipal climate-protection index scores for fifty-three Indiana cities and towns.

[4] Forty-six cities and seven towns responded to the survey. They will all be referred to as 'municipalities' or 'cities' in the rest of the analysis.

visible, and often dominant, cobenefits. On the low end, fewer than 10% of cities have institutionalized GHG-reduction efforts within their governance structure. Although 20% have a stated reduction goal, fewer than 5% have performed a GHG inventory, developed a reduction plan, or given climate-protection efforts a designated budget. Cities also infrequently employ financial incentives to encourage GHG-reducing behavior among community businesses, residents, or their own staff.

Seventeen of the fifty-three cities in the sample, or 32%, are engaged in some sort of explicit climate-protection effort. Notably, approximately 40% (seven out of seventeen) of the cities that stated they are engaged in explicit climate-protection efforts are not members of a climate-protection network (ie MCPA or ICLEI). At the same time, in 40% of the ten sample cities that are MCPA signatories, the individual in charge of environmental programs answered 'no' to the question 'is your city engaged in any sort of explicit climate-protection effort?'. This implies one of two things: either the respondent is unaware of the mayor's commitment to reduce GHGs via the MCPA or the respondent is aware of this commitment but feels that follow-up to it is nonexistent. Either way, this suggests that MCPA membership often functions as a symbolic policy and explicit follow-up efforts can quickly be lost. A key conclusion from these observations is that membership in climate-protection networks is often a poor indicator for municipalities' actual commitment to climate protection.

A majority of Indiana cities do not use climate protection as an explicit frame, yet all are involved in some GHG-mitigating activities. Given this, does having an explicit commitment, expressed through either membership in a climate-protection network or as a part of internal city policy, have any relationship to the number of GHG-mitigating activities actually employed? An examination of summary statistics suggests that using an explicit climate-protection frame matters, but how that commitment is expressed does not (see table 3). The mean action index score, which includes only those indicators able to actually reduce GHGs and not those that indicate the institutionalization of climate protection within city governance, is 9.7 for cities with an explicit frame and 6.3 for cities without one. This difference is statistically significant at $\alpha = 0.001$. However the difference in the mean action index score for explicit cities is not statistically different depending on whether or not they are members of the MCPA.[5]

Table 3. Municipal climate-protection (CP) Index (MCPI) scores for cities with different expressions of CP.

	Cities with and without an explicit CP focus		Explicit CP cities, with and without MCPA membership	
	explicit CP focus ($n = 17$)	no CP focus ($n = 36$)	MCPA member ($n = 10$)	no MCPA ($n = 7$)
Action index (mean score)	9.7	6.3	9.5	10.0
Full index (mean score)	11.3	6.3	11.3	11.4

[5] The difference in the mean action index score for cities with and without explicit commitment equates to a t-score of 5.8 and 51 degrees of freedom. The difference in mean score for MCPA member and nonmember committed cities equates to a t-score of 0.48 and 15 degrees of freedom. Membership to ICLEI is not considered here as only three Indiana cities are current members.

Regression results: why are they doing it?

Table 4 presents the results of three regression analyses that test the ability of supply-side and demand-side models of local policy-making to predict cities' involvement in GHG-mitigating activities, as represented by their MCPI scores. As previously described, the supply model draws from theories of capacity, fiscal constraints, and political entrepreneurship, and posits that municipalities with greater resources and professional abilities are more likely to provide innovative policies, including climate protection. The demand-side model suggests that local policy is responsive to public interests and will provide climate and other policies consistent with expressed demands. The results of the separate supply and demand models receive focus, as they maximize degrees of freedom.

Table 4. Regression results predicting municipalities' scores on the municipal climate-protection index.

	Supply model		Demand model		Full model	
Population (log)	1.86***	(0.53)	–		1.31**	(0.59)
Staff professionalism	−0.18	(0.35)	–		−0.19	(0.35)
Policy entrepreneur	5.63***	(1.54)	–		4.28**	(1.78)
Percentage general fund	0.20	(0.21)	–		0.32	(0.22)
Percentage property tax	3.31	(2.90)	–		2.83	(3.23)
Education	–		0.13***	(0.04)	0.07*	(0.04)
Median household income	–		−0.10**	(0.04)	−0.08*	(0.05)
Political representation	–		2.48***	(0.91)	1.46	(0.97)
Environmental nonprofits	–		−0.49	(2.21)	−0.18	(2.74)
Manufacturing jobs	–		−0.05	(0.52)	−0.02	(0.05)
Disaster area	–		0.05	(0.29)	−0.06	(0.28)
Constant	−13.56**	(5.31)	8.94***	(2.62)	−6.21	(6.62)
	$n = 52$		$n = 53$[a]		$n = 52$	
	$F = 6.02$	(0.000)	$F = 3.60$	(0.005)	$F = 3.58$	(0.002)
	$R^2 = 0.40$		$R^2 = 0.32$		$R^2 = 0.50$	
	Adjusted $R^2 = 0.33$		Adjusted $R^2 = 0.23$		Adjusted $R^2 = 0.36$	

***$p < 0.01$; **$p < 0.05$; *$p < 0.1$. Note: Standard errors in parentheses.

[a] One respondent did not provide the information necessary for the construction of the 'staff professionalism' variable, leading to the dropping of that observation for the supply and full models.

Both models are significant and explain a reasonable amount of variance in MCPI score. In the supply model, city population size and the presence of policy entrepreneurs are significantly associated with a higher MCPI, as predicted by theory. Also consistent with theoretical predictions, the demand model shows that cities with higher mean levels of educational attainment and local elected leaders affiliated with the Democratic political party are associated with higher MCPI scores. Surprisingly, cities with higher median household incomes are significantly associated with lower MCPI values. When the models are combined into the full model, the significance of all variables decreases and political representation loses significance altogether.

Some of the variables which lack significance are worthy of note. On the supply side, measures of staff professionalism and indicators of cities' financial health are insignificant. On the demand side, neither the influence of manufacturing on the local economy nor the presence of organized environmental groups significantly affects the MCPI, suggesting that local climate protection may not be motivated or inhibited by the same interests often pointed to as influential for and against the adoption of

general environmental policies. Risk from climate-related disasters, which has been shown to influence membership in climate-protection networks (Zahran et al, 2008a), appears insignificant in its influence on the implementation of GHG-reducing actions in Indiana municipalities. This may be because perceived risk does not sufficiently vary within the state's relatively small geographic area, or because the factors that lead to the adoption and implementation of climate-protection initiatives differ.

Policy implications and implications for future research

The development of ambitious national climate-protection plans would benefit from considering the potential contributions of local governments. However, the dearth of widespread information about the type and effectiveness of relevant policies that local governments are implementing limits this ability. This is particularly true in the case of municipalities that do not present their actions under an explicit 'climate/protection' frame.

The results of the Indiana survey highlight the need for an improved measure of municipal climate protection beyond the commonly used dichotomous measures of membership in climate-protection networks. While such measures adequately represent formal policy adoption, they do little to capture follow-through and have been shown to systematically overcount some types of involvement and undercount others. On its own, membership in the MCPA does not serve as a reliable proxy for actual climate protection as measured by the execution of GHG-reducing policies. Specifically, the easy membership requirements (ie the submission of a pledge form signed by the acting mayor) and lack of monitoring on cities' follow-up to commitments may cause the MCPA to act primarily as a forum for symbolic policy, with little influence on substantive local GHG-abatement activities.[6]

The results of this survey demonstrate that, although many Indiana municipalities do not acknowledge any sort of climate-protection policy, all are in fact engaged in some GHG-reducing activities. At the same time framing does appear to matter, and municipalities that state they are engaged in climate protection consistently implement a higher number of GHG-reducing activities. However, determining the framing strategies employed by individual municipalities often must be done on a case-by-case basis. The easiest approach to indicate framing (reliance on network membership) was shown to exclude approximately 40% of Indiana municipalities that claim explicit engagement in climate protection.

Local government capacity and citizen demands both appear to influence the extent of municipal climate-protection activity. Although factors like city size, political leaning, income, and education rate do not offer reasonable levers by which to directly influence local climate policy, the apparent importance of policy entrepreneurs may do so. In Indiana municipalities the presence of identifiable staff person(s) or elected leader(s) who effectively champion climate initiatives is associated with a five-point increase in MCPI score. This supports findings at the state level about the important role policy entrepreneurs play in designing approaches to climate protection that are tailored to the state's specific needs and opportunities (Rabe, 2004). It is possible that local governments, much like state governments, provide 'fertile ground' for policy entrepreneurs who then push for the development of in-house capacity for addressing climate and energy issues.

[6] A similar evaluation cannot be made about ICLEI, as, at the time of this writing, only three Indiana municipalities are members. ICLEI has more significant membership requirements, including the payment of an annual fee. As such, when compared with the MCPA, a greater portion of its municipal members may be active in climate protection. At the same time, however, the fee requirements may result in ICLEI's exclusion of a larger number of climate-committed cities. The latter is a concern if ICLEI membership is used as a proxy for local climate protection.

Conclusion

Sweeping policy changes will need to occur in the United States (and in most other countries) if GHG emissions are to be reduced quickly and sufficiently enough to forestall major human-induced climatic change. International cooperation at the nation-state level will be essential to this achievement. However, the nature of the problem and the magnitude of the necessary solution suggest the benefit of a multilevel policy approach. Moreover, in the US, subnational governments have become the de facto climate-protection leaders in the face of insufficient national initiative. On the one hand, these efforts are receiving increasing attention and support, while, on the other, relatively little is known about their potential scope or ultimate effectiveness. This is particularly true of municipal GHG-mitigation actions where a lack of widespread data has had the effect of focusing attention on a handful of largely unrepresentative cities. Indeed, the gap between 'world class' cities and all others is observed as growing, as those in the former category are provided with exclusive opportunities and resources by which to further demonstrate their commitment to climate protection (Engel, 2009).

This research begins to fill the data gap regarding municipal climate-protection initiatives. By collecting information on GHG-reducing activities from cities and towns in the state of Indiana, a more accurate picture is developed about the type and extent of municipal climate-protection activities being implemented, and the factors that drive or hinder them. Some of the more notable findings include that, despite the fact that only a minority of cities are explicitly undertaking climate-protection efforts, all are engaged in GHG-reducing activities. The most common of these are services, provisioned to the local public, which have important cobenefits (such as curb-side recycling and public transportation). Conversely, very few Indiana municipalities have taken steps to institutionalize climate protection as a formal and explicit policy issue. A second key finding emphasizes the importance of policy entrepreneurs in climate protection. Whether or not local actions are explicitly framed as climate protection, cities having an identifiable policy entrepreneur in this issue area have significantly more GHG-reducing activities in place.

Finally, findings suggest that membership in climate-protection organizations, specifically the MCPA, is an inadequate indicator of the extent of climate-protection measures that cities have actually implemented. If a research objective is to examine why local governments *adopt* GHG-reducing goals (ie symbolic policy), then using a dichotomous dependent variable of network membership, such as the MCPA or ICLEI, is appropriate. However, if the research goal is to examine why cities actually *implement* GHG-reducing programs or policies (ie substantive policy), then a deeper look at what local governments are actually doing is necessary.

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