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Global climate policy: will cities lead the way?

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Abstract

While the Conference of the Parties wrangle at an international scale with climate policy, a quiet and effective set of policies and measures is being implemented at a local scale by municipalities across the globe. This study examines the motivation municipalities have for undertaking policies to reduce their greenhouse gas emissions, when the theory of free-riding would predict that local administrations should find it difficult to unilaterally reduce their emissions for the benefit of the global climate. Through interviews with officials and/or staff in 23 municipalities in the United States enacting climate policy, data are gathered that suggest local government abatement policies are primarily a top–down decision based on what officials or staff members believe to be "good business" or rational policy choices. They are primarily driven by the potential for cost savings and other realized or perceived co-benefits rather than by public pressure. Economic data from some dozen municipal projects are analyzed, finding justification for the often-disputed claim that at least initial reductions in emissions can be made at cost savings.

Keywords: Climate policy; Local government; Abatement strategies; Free-rider theory; Co-benefits of climate policy

1. Can cities overcome "free-rider" obstacles?

As nations have debated details of the Kyoto Protocol, the first government to actually adopt an emissions reduction target was a city: Toronto, Canada (Young, 1995). In 1990, 7 years before the Kyoto Protocol targets were established, the city council unanimously passed a resolution setting a target to reduce Toronto's carbon dioxide emissions to 20% below 1988 levels by the year 2005 (Harvey, 1993). Worldwide, municipalities have followed with their own targets. This study examines the motivation behind such municipal action on climate change in the United States, and performs a brief analysis of the extent to which their perceptions of savings were valid.

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Currently, there are 140 cities and counties in the US, and over 560 worldwide, that have set greenhouse gas (GHG) emission reduction targets and are developing local action plans to reduce their emissions. (The term ‘city’ here will be used interchangeably with ‘municipality’ and ‘climate policy’ will be synonymous with abatement, as adaptation will not be discussed.) These cities are part of the International Council for Local Environmental Initiatives’ (ICLEI) Cities for Climate Protection (CCP) campaign. The CCP campaign, begun in 1992, encourages local governments to implement mitigation policies. To join the campaign, each city must pass a resolution indicating its intent to reduce GHG emissions. The city then agrees to follow the CCP 5-milestone framework, which consists of calculating a base-year emissions analysis, forecasting emissions growth, adopting an emissions target, completing an action plan of how to reach that target and then implementing the plan (ICLEI, 2002). As far as our research indicates, all of the municipalities in the US that are enacting climate policy are members of ICLEI’s CCP campaign. There are non-CCP municipalities that have undertaken policies that result in some abatement, but not within a framework of climate policy and, therefore, these cities were not entered in our database.

This trend seemingly contradicts economic theory when climate change is viewed as a global public good. Public goods are non-excludable; it is impossible to prevent an individual from partaking of the public good or of benefits the good provides or produces. When it is impossible to solely capture the benefits of a good and policy action has a positive cost, it is rational to not pay any such costs and “free ride” on the provision of others. If all entities followed this reasoning, no entity would contribute, none of the good would be provided and thus, no one would benefit (Varian, 1999). Although individually optimal, this may not be efficient for society. When even at the international level it is impossible to prevent free-riding (Goodstein, 1999), it is presumably just, if not more, problematic at the local level to convince municipalities to unilaterally reduce their GHG emissions.

Yet, the large number of cities involved with the CCP campaign demonstrates that at the local level, free-riding has been much less of an impediment than theorized. At a minimum, free riding has not prevented action for initial levels of abatement. Four possible explanations are hypothesized: (1) mitigation activities do not necessarily—or are not perceived to—entail positive costs; (2) additional benefits can be captured locally even when the larger scale climate benefits are shared; (3) municipalities are altruistic and are reducing GHG emissions even when to do so is not “economically rational”; (4) local officials respond to citizen pressure to undertake policy action, thereby realizing political, if not economic, benefits.

2. Interview results

Local officials and staff members from 23 CCP municipalities around the country, varying in location and population size, were interviewed. Interview questions addressed what the decision-making process and motivation had been when each city decided to join the CCP. Although each municipality had its own particular circumstances and each was at a different stage in the process, several factors were repeated by many people.

Fig. 1 shows the results of the interviews. Open-ended questions were asked deliberately so the interviewee could relate what he or she believed most important—freeing them from having to make constrained responses from a limited set of options. Each bar represents the number of interviewees who indicated that factor as influencing the decision of city officials to join the CCP and enact abatement policies. When two or more factors were identified by the interviewee, those cities were counted in more than one category.

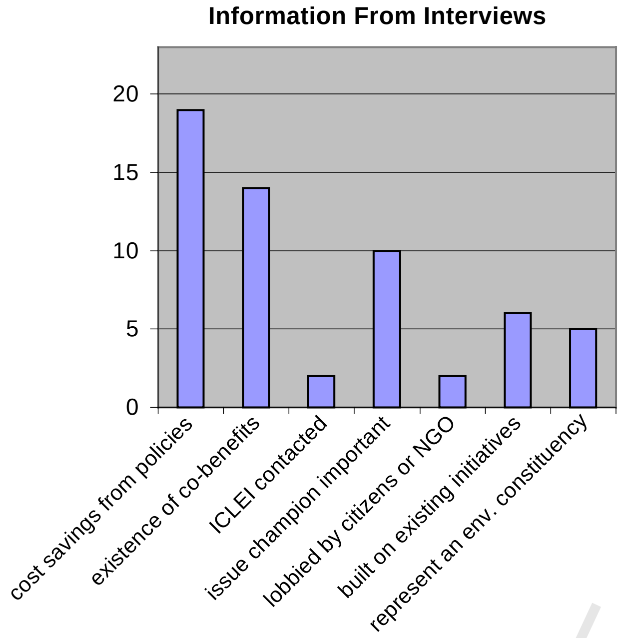

Fig. 1. Information from interviews. Graph represents the number of interviewees responding positively to factor listed on horizontal axis. Total number of municipalities represented: 23. Respondents could be counted in more than one category when more than one factor was identified.

Two major findings from the interviews to be explored in more detail in Sections 3 and 4, respectively, are: (1) a large majority of cities claimed to be pursuing climate protection policies that generated, or could generate, cost savings; and (2) the perceived existence of other local benefits stemming from many mitigation projects influenced policy development. It was also found that: (1) in some cities the existence of an issue “champion” was essential to initiating climate policy (although, it was frequently stated that even when the champion was responsible for initiating mitigation policies, arguments invoking negative cost options and co-benefits were needed to convince others); (2) a handful of city officials perceived the public as having environmental leanings and, therefore, assumed political support existed; (3) in only two cities did direct political pressure from citizens or an NGO (aside from ICLEI) convince the municipality to address climate change; (4) only two cities mentioned direct contact from ICLEI as influencing their decision; and (5) about a quarter of city representatives said their climate policy built on already existing initiatives. Climate policy could be built on existing initiatives to take advantage of the structure, support and funding of other programs or because officials found climate change to be linked to issues already on the city’s agenda. Many of these same motivations were also found in a comparison study of Toronto and Chicago by Lambright et al. (1996). In these two cities the authors found that the existence of an issue champion, environmental consciousness in the city and recognition of co-benefits and economic benefits were all influential in the development of municipal climate policy.

The interviews suggest that local mitigation policy is predominantly a top–down decision based on what officials or staff members believe to be “good business” or rational economic and political choices. In the majority of cities, policy is not driven primarily by widespread public pressure, nor wholly for climate protection, but instead, justified by cost savings and other perceived co-benefits.

3. Negative cost municipal climate policy: perception or reality?

Although a majority of city representatives interviewed mentioned the importance of negative or zero cost options when formulating their climate policy, it was unclear whether this indicated true cost savings or simply a perception. The interviews also did not reveal how much reduction is possible at cost savings. To address this, data was gathered from a representative set of policies of which the needed figures were available, which was not always the case.

By way of clarification, the term "negative cost" could refer to policies where the private benefits outweigh private costs or policies where social benefits outweigh social costs. Municipalities, as far as our research indicates, do not value societal benefits and costs or non-monetary private benefits. So, for the majority of municipalities, negative cost policies are those in which the savings or other payments to the city are greater than the upfront costs. Municipalities also often fail to discount future payments, basing their decision on simple payback period calculations.

Clearly, by failing to quantify societal and non-monetary benefits, municipalities could be missing many win–win policies for the community as a whole. However, as Section 4 discusses, even without valuation, co-benefits do sometimes encourage municipal spending. And since municipalities must have political support for their policies, this often weighs in as a crude estimate of societal benefits, motivating municipalities to spend money on those policies for which there is widespread support.

The prevalent use of energy efficiency improvements by municipalities from retrofits to purchasing policies, cannot help but place this discussion within the controversy over whether or not energy efficiency must come at a trade-off with economic efficiency (Jaffe et al., 1999). There has been much empirical and theoretical evidence of practices or technologies that can increase energy efficiency at cost savings (as a start, see references in DeCanio, 1993; Koomey et al., 1998). Yet, there has also been substantial evidence that all cost savings opportunities are not exploited across the economy (see, among others, Interlaboratory Working Group, 2000; National Academy of Sciences et al., 1992; Koomey et al., 1998).

While a number of barriers have been identified to explain this perceived "efficiency gap," debate has also raged as to how many are true market failures for which low-cost remedying policies exist that can justify government intervention. Not all of the discussion in the literature is relevant to local governments and a review of all findings is not within the scope of this paper. However, a brief discussion of how market barriers to energy efficiency effect local governments is warranted. Additionally, municipalities have undertaken a few policies that could potentially lessen the impact of certain barriers for their constituencies.

Some of the barriers (and market failures) relevant to local governments include (Metz et al., 2001; Brown, 2001; Howarth and Anderson, 1993; Interlaboratory Working Group, 2000):

- hidden costs (such as maintenance);
- preference of consumers for certain non-efficient technologies or resistance to change;
- principal-agent problems;
- negative externalities;
- insufficient information/uncertainty;
- capital market barriers.

Negative externalities are the one barrier that local governments are largely not equipped to overcome on their own and which could impede larger amounts of abatement. However, Aspen and Pitkin County have developed a defacto tax on GHG emissions. The Renewable Energy Mitigation Program (REMP) assesses a fee on new homes that exceed an energy budget. These fees are then used to finance energy efficiency and renewable energy projects through a partnership with the Community Office for Resource Efficiency (CORE, 2002). Hidden costs, such as operation costs, are actually lower for several policies, such as changing streetlights to light emitting diodes (LEDs). A preference for non-efficient technologies among municipal employees could manifest itself, but many municipalities adopt policies such as energy efficient purchasing and no city representative interviewed mentioned complaints from workers. Principal-agent problems, which arise when the person making the investment decision is not the one paying the bills, could plague energy efficiency projects in cities without a climate action plan, but once a decision to undertake retrofits is made, this appears to be overcome. Since ICLEI provides an array of services, including information, case studies, resolution language, training, conferences, networking, occasional small grants and technical services, working with them minimizes information and uncertainty barriers and often financial barriers as well. Other methods to overcome funding problems include revenue bonds (Vote Solar, 2001; Sten and Anderson, 2000), revolving loan funds, group purchasing, negotiating 0% loans (examples of previous three in ICLEI, 2000), grants and performance contracting. Local governments can be biased against projects with a long payback period. There are, however, some factors that can overcome this barrier, which are discussed below.

Cities in the CCP campaign have also developed several policies to help lower these barriers for their constituencies. Many cities have enacted varying education campaigns, from outreach to curriculum to guidebooks, that can minimize information and uncertainty barriers (for example, Benzschawel, 2002; Sten and Anderson, 2000; Energy Management Team, 2001; City of Medford, 2001). DeCanio (1993) notes that governments publicizing the results of an energy savings investment could reduce the perceived risk of such investments by firms (or residents). He also mentions that government priority to a particular externality (such as climate change damages) can make it more rational for a firm to enact relevant policies than it would were it acting alone. These statements could equally apply to local governments and their businesses. Although not a US city, the Toronto Better Buildings Partnership (BBP) is an example of how local governments can address information barriers through an awareness raising program and also capital market barriers through a loan recourse fund (for more information see City of Toronto, 2003). The Residential Energy Efficiency Project in Ontario, Canada provides an example of how residential barriers to energy evaluations can be addressed through the use of social marketing (Kennedy et al., 2000).

As local governments have found ways around many market barriers and have also enacted policies that lower these barriers for their constituencies, it could be said that they are in a unique place to set examples and experiment with abatement policies.

3.1. The data

Municipalities unfortunately define, and therefore, calculate municipal emissions in varying ways. The least controversial approach, which many cities follow, is to differentiate community emissions from municipal emissions. This approach also allows for differing reductions targets, as demonstrated by the Medford, MA, action plan which strategically set a higher reduction target for municipal emissions over which the municipality has direct control (City of Medford, 2001).

This strategy of dividing emissions is facilitated by the software that many CCP municipalities use to estimate their GHG emissions, developed for this purpose by Torrie Smith Associates, Inc. (the information on the software in the following paragraphs is taken from the help files of the software itself, available online at http://www.torriesmith.com). The software has separate modules for calculating community and municipal (or corporate) emissions. Corporate emissions are those from buildings, fleets, lighting and any facilities the city owns or operates, with the exception of public transit which is included in the community emissions (but if municipally owned, emissions from the buildings, etc. of the transit authority can be included in the municipal emissions). Municipalities have the option of including emissions from employee commutes. Community emissions are divided into six sectors: residential, commercial, industry, transportation, waste and other.

Emissions and reductions are calculated by way of emission factors. The software contains electricity coefficients for each state for the years 1990–1997, relating carbon dioxide emissions to kilowatt-hours of electricity, based on the Energy Information Administration (DOE) database. The coefficients were developed using an average annual kilowatt-hour method and annual carbon dioxide emissions from power production and then adjusted for net interstate flows. Other fuels and waste factors have only one default setting for the US users do have the option of defining coefficients instead of using the averages. Included in the software are also coefficients for criteria pollutants based on data compiled by the EPA.

The analysis of communitywide emissions is largely based on fuel and electricity consumption. The help files suggest that relevant data can usually be obtained from local fuel and electricity providers based on total sales by different customer classes. Waste is estimated from the amount hauled to the landfill and an estimate of the percent of methane recovered. Transportation emissions are calculated from vehicle miles traveled by different vehicle types (the software provides default fuel economy values). It is suggested that this data can be obtained from the transportation planning or traffic management department. The software also has a VMT calculator to estimate emissions from traffic statistics if data is not otherwise available.

The software is used to develop a business-as-usual forecast for the target year of emissions reductions. The forecast is developed by applying growth multipliers to the emissions analysis of the reference year. This requires that the user estimate growth in fuel and electricity use for each sector, which could be based on a forecast of increases in households, commercial floor area and industrial sector employment. Transportation and waste increases can be based on population growth if more accurate forecasts are not available. The software thus allows cities to track their progress and compare it to a business-as-usual scenario.

While the software only provides estimates and does not address all the complications inherent in accurately measuring emissions, the cities do not seem to need more accurate methods to chart their progress or inspire emission reductions.

3.2. The policies

Table 1 presents the cost, savings per year, simple payback and the amount of carbon dioxide reduced for several types of municipal projects. These are a representative sample, not necessarily the projects with the largest reductions. Unfortunately, for the majority of data we received from local governments, it was impossible or impractical to verify the numbers—thus our analysis presumes the data presented by cities are correct. Even so, it is worth examining their data and the perceptions they engender, as they influence the policy process. The first five entries concern building retrofit projects. The next three policies are the replacement of traffic lights with LEDs. LEDs use significantly less energy and reduce maintenance costs since they last longer and fail less often than traditional traffic lights. They can also be powered by batteries in the event of a power outage, providing a safety and traffic flow co-benefit. The next item

Table 1
Summary of projects

City, project	Cost (US$)	Savings (US$ per year)	Simple payback (years)	CO_2 reduced (tonnes per year)
Minneapolis, retrofits	4.7 million	752,000	6.25	11500
St. Paul, retrofits	3.1 million	500,000	6	7300
Cambridge, lighting retrofits	2,472,156	470,850	5.25	3921
Burlington, retrofits		311,000		2202
Denver, retrofits	123,993	29,680	4.2	430
Overland Park, LEDs in exit signs	9,600[a]	2750	3–4	36
Boulder, LEDs in traffic lights	40,000[a]	11,500	3.5	180[c]
Philadelphia, LEDs in traffic lights	3 million[a]	800,000	4	42160
Brookline, Prius	5,640 per car[b]	509.5 per car	11	4 per car
Arlington, garage fan sensor	3,000	550 per month	6 months	98[c]
Maryland Heights, methane recovery	170,000	About 40,000	5 or less	2000
San Francisco, bond	100 million plus 6.5% interest	At least the cost of the bond	Around 25	40000–45000

Sources in order of project: (US EPA, 1998; Energy Star Buildings, 2002; US EPA, 1998; Burlington Electric, 1999; John Bolduc (personal communication, April, 2002); ICLEI, 2000; Business Report Staff, 1997; ICLEI, 2000; Brookline Conservation Commission, 2002; Morrill, 2002; Pew Center on Global Climate Change, 2001; Adam Browning (personal communication, May, 2002)). *Note*: Significant figures cited are from the data sources and not necessarily endorsed by the authors.

[a] Calculated from their savings and estimated payback period (for 3–4 years a value of 3.5 was used).

[b] This is the price differential between the Prius and the cost of the non-hybrid cars in the fleet.

[c] Calculated using kWh reductions multiplied by the national average emissions factor for electricity from the EPA's Personal GHG Calculator Assumptions and References (US EPA, 2002b).

in the table is the purchase of the more efficient Toyota Prius—a hybrid gasoline–electric vehicle—to replace other vehicles in the municipal fleet. The 10th entry is a conservation project from Arlington, Virginia, in which the city wired the ventilation fans in a library garage to turn on only when activated by a carbon monoxide concentration that was still well below exposure guidelines (Morrill, 2002). The second to last entry is a project in Maryland Heights, Missouri (not a city whose officials were interviewed here, but the data are included since several CCP cities have done similar projects) which used recovered methane from a landfill to power a school's boilers (Pew Center on Global Climate Change, 2001). The final project is a US$ 100 million bond initiative passed in San Francisco in November, 2001, to finance solar, wind and energy efficiency projects. The bond will be paid for entirely from energy savings from the projects themselves (Vote Solar, 2001).

Most projects listed in Table 1 have simple payback periods of around or under 5 years. Municipalities are sometimes willing to look at time horizons beyond this; the city of Portland supported energy efficiency projects with a simple payback of 10 years or less (Sten and Anderson, 2000). Brookline's purchase of the Prius car is an interesting exception. It is probable that the city will replace the car before realizing any financial savings. Its purchase could instead be explained by the observation of John Morrill of Arlington, Virginia, that the results of economic analyses may be superceded or "trumped" by human preferences such as the preference for highly visible projects. However, it is worth remembering that if there were a way to internalize the externalities associated with burning the fuel, the pay back would drop. For example, at a carbon shadow price of US$ 100/t, the payback is between 6 and 7 years. The San Francisco revenue bond is also an exception. This Proposition was successful since the city did

Table 2
Further economic calculations for municipal efficiency projects

City, project	Internal rate of return (%)	Net present value (US$; 4% discount rate)	Net present value (US$; 8% discount rate)
Minneapolis, retrofits	10	1400000	346000
St. Paul, retrofits	10	960000	260000
Cambridge, retrofits	14	1346900	687290
Denver, retrofits	20	116700	75160
Overland Park, LEDs	28	20000	13000
Boulder, LEDs	28	88000	58000
Philadelphia, LEDs	24	6000000	4000000

The internal rate of return (IRR) is the maximum discount rate for which the project will generate positive net benefits. This table shows that most of the projects, even at high discount rates, will produce net benefits over the life of the project.

not have to shoulder any debt, nor did it cost taxpayers money—or at least the perception of no cost is clear.

There are several policies that can be done at negative or zero cost which are not presented in the table since data were unavailable (Kousky, 2002). These include transit policies, focused on reducing the use of vehicles (STAPPA and ALAPCO, 1999). Policies in this category can include a tax on sprawl developments that reflects the city's cost of expanding infrastructure, such as that done by Lancaster, California (ICLEI, 2000) or charging solo drivers parking fees, such as in Los Angeles, California, where fees go into an interest-earning Rideshare Trust Fund (ICLEI, 2000). Aspen's REMP is another example of a policy that is privately negative cost.

Table 2 shows the internal rate of return (IRR) and the net present value (NPV) for a few of the projects from Table 1 for which enough data are available to estimate the lifetime of the project. As said earlier, municipalities did not undertake these calculations but they are presented here for examination. LEDs last approximately 15 years before failing (Hoyle, 1998), and the lifetime of the retrofit projects was estimated at 10 years. Clearly, changes in these estimates would alter the NPV. The IRR equals the percentage that net benefits must be discounted for them to equal initial costs. The table shows that, for most of the projects, even at high discount rates, they will produce net benefits over the life of the project. And in this analysis, the only benefit quantified is cost-savings. The two NPV calculations give an indication of how sensitive the magnitude of the benefits is to the discount rate. The calculations show that even though municipalities do not use economic tools such as these, they appear to be making sound economic decisions nonetheless.

These few examples demonstrate that cities do indeed achieve GHG reductions at no cost, and often cost savings, but appear, from examining their action plans, rarely to be attempting extremely large reductions. Most municipalities have set goals to reduce emissions to around 10% of 1997 or 1998 levels by 2010 (see, for example, City of Medford, 2001). Others have more stringent targets, such as the city of Portland and Multnomah County, Oregon, which have set a greenhouse gas emission reduction goal of 10% below 1990 levels by 2010, which is a reduction of 26% below projected 2010 values (Sten et al., 2001). Without complete data from every city, it is impossible to determine how much of these goals can be completed at cost savings, but from this analysis, it is reasonable to expect the majority of the goals could be achieved at zero to negative cost or could generate co-benefits, as discussed next.

4. The role of co-benefits in local mitigation policy

The results of the interviews suggest that local governments believe that a municipal focus on climate policy can provide additional benefits–co-benefits, to the community. Co-benefits are produced from policies that are developed to achieve both climatic and other environmental goals simultaneously (Metz et al., 2001; Schneider et al., 2001). These are distinct in the literature from ancillary benefits, which are a beneficial side product, but not a goal of, mitigation policies. In both cases, however, these additional benefits can be captured directly by the community in the immediate to near-term. There is a wide array of benefits considered and they are often specific to the community or policy. Local governments discuss these benefits in their action plans, in their resolutions and on their web pages. A sample of co-benefits local governments consider can be found in Table 3. Local officials identify the importance of these co-benefits, but often fail to quantify or weigh them.

4.1. How are co-benefits used by the local government?

Co-benefits can be used in several ways by local governments. They can:

1. localize climate issue for citizens;
2. justify climate policies to the public;
3. justify spending public money;
4. provide an opportunity to address multiple issues simultaneously.

Local governments, by publicizing the co-benefits of their climate policies, can localize a global issue for their constituents. For example, on Seattle, Washington's city website, it is noted that "local climate solutions are also about responding to our own most pressing local challenges", such as reducing traffic and increasing affordable housing in the city to curb urban sprawl (Office of Sustainability and the Environment, 2002). Michele Betsill also found in a case study that cities were able to localize the policy of climate change through publicizing the existence of co-benefits, but that in a couple cities, this occurred instead of a localization of the actual problem of climate change (Betsill, 2000). The interviews suggest, though, that several cities have also attempted to localize the problem of climate change through outreach and educational efforts that focus on the predicted impacts of global climate change on the local region (for example, Brookline Conservation Commission, 2002; Saint Paul Energy Conservation Project, 2000, Benzschawel, 2002).

Table 3
Perceived municipal co-benefits to reducing GHG emissions

Reductions in traffic that save people time on congested roadways and reduce accident related injuries.
Reductions in on-going maintenance and future operating costs derived from the use of energy efficient technologies.
Reductions in air pollution, and the resulting health and ecological improvements.
Decreases in municipal solid waste.
Creating new market opportunities and enhancing the local economy.
Creating a city environment that draws people and business.
Creating partnerships across government departments that might not have worked together before the climate policy was enacted.
Avoided costs (as in complying by default with other regulations or avoiding damages).

Saint Paul Energy Conservation Project, 2000; Brookline Conservation Commission, 2002.

When the public does not necessarily respond to global concerns, justifying climate policy by discussing co-benefits can be effective. A city representative from Portland, Oregon, noted in an interview that the city found most of its programs were succeeding, not because of public understanding and support for mitigation efforts, but because of the co-benefits those same policies offered. However, he went on to say that the city is adding a public outreach component to help inform residents that climate change is an important issue in and of itself.

The existence of co-benefits realized by the community can also justify the spending of city money on policies that reduce GHG emissions. The city of San Diego, for example, is undertaking renewable energy projects using photovoltaics on buildings. While the payback period is about 15 years, the deciding factor for the projects is meeting the mayor's goal of energy independence, and that commitment includes clean energy. San Diego also installed a liquefied natural gas fueling station, an expenditure that was primarily motivated by a general concern about the health effects of diesel fuel. Liquefied natural gas also emits less GHGs than gasoline, so this health policy is a climate change policy as well.

City officials have found that policies to address climate change are often linked to other environmental issues. In Chicago, for example, city representatives found that since many pollutants were emitted from the same sources, they had to address them all simultaneously. In the interviews, many local representatives, such as those in Olympia, Washington and Philadelphia, Pennsylvania, were concerned with improving the quality of life in their municipalities and used their climate policy to achieve both goals simultaneously. In another example, a city council resolution from Seattle calling for a plan to meet a GHG emission reduction target, stated that mitigation policies "contribute substantially" to realizing some of the city's top priorities, including energy security and lowered energy costs, affordable housing, mobility, salmon recovery and sustainable economic development (Seattle City Council, 2001).

4.2. Are there measurable co-benefits to the community or are they largely just a perception?

Many studies have been conducted to estimate the value of ancillary benefits to various nations enacting a possible mitigation policy, usually a carbon tax (Metz et al., 2001). The results of most are reported as a dollar value per ton of carbon abated. They largely focus on the health benefits from reduced air pollution associated with less energy or cleaner energy used. Although these studies have produced a large range of estimates and contain much uncertainty (see Burtraw and Toman, 2000; Metz et al., 2001), they have called attention to the existence of measurable benefits associated with mitigating GHG emissions.

One study done at the local level to quantify certain co-benefits (although not value) was conducted by Cifuentes et al. (2001). This study estimated the cumulative public health impacts from a baseline change in air pollutants due to energy efficiency abatement policies in four major cities: Santiago, Chile; Sao Paulo, Brazil; Mexico City, Mexico and New York City, New York. The Cifuentes et al. study only estimated effects from a 10% reduction in ground-level ozone and particulate matter (PM)10, but nonetheless found that illness and lost work days, among other variables, could be decreased from the mitigation policy. This study demonstrates the existence of ancillary health benefits, but local governments consider many other co-benefits as well. This creates the possibility that the value of co-benefits at the local level is even larger than this study, or national health-focused studies, estimate.

A couple of cities have quantified the reductions of pollutants that a mitigation policy will generate (for example, see Saint Paul Energy Conservation Project, 2000). This is possible to do with the Torrie Smith software, but not all municipalities make use of this capability. There are also a small handful of cities that are in touch with some nationally-conducted estimates of benefits. For example, a Seattle webpage cites EPA data demonstrating that the high level of air toxins in the city and county is projected to result in 1400 additional cancer deaths above the stated goal of the Clean Air Act. From this information, the city is working on reducing emissions from vehicles (Office of Sustainability and the Environment, 2002). Also, Madison, Wisconsin's action plan sites Department of Energy information that certain climate policies create jobs and increase disposable income (Benzschawel, 2002).

Even when municipalities have data, however, they do not take the next step of valuing co-benefits. Indeed, such valuation procedures still generate debate among economists and often would involve controversial undertakings, such as willingness-to-pay studies, for which local governments may not have the money, time or expertise to perform or interpret. The interviews indicate as well that local governments rarely use a full cost-benefit analysis (CBA) for decision-making and so may not have the desire or ability to estimate the magnitude of co-benefits.

Whether the recognition of co-benefits encourages higher levels of abatement or just allows cities to claim climate benefits for policies that would have been undertaken for the co-benefits alone is difficult to judge. It does appear that most cities, even if only slightly, are moving beyond business-as-usual and using co-benefits to gain support for abatement policies or considering the climatic effects of policies they might not have otherwise. Portland Oregon's Local Action Plan, while clearly more of an exception than a rule, states that despite the city's aggressive GHG emission reduction programs, such actions must be viewed as a first step; stabilizing GHG concentrations will require much more substantial reductions below typical baseline projections at a planetary scale-on the order of 60–70% below 1990 levels (Sten et al., 2001; Schneider and Kuntz-Duriseti, 2002).

5. Policy implications and discussion

The EPA has reported, using ICLEI estimations, that as of 2000, the 68 cities and counties in the CCP campaign (by 2003, the number had grown to over 140) were eliminating 7.6 million tonnes of GHG emissions annually, saving US$ 70 million per year due to reduced fuel and energy costs and preventing, each year, 28,000 t of emissions of criteria air pollutants (US EPA, 2002a). Their actions are not insubstantial. What motivates municipalities to undertake mitigation efforts in the first place, and the methods they have used to do so, has implications for the development of climate policy at multiple levels of scale. Yet, most reduction targets are actually fairly modest. For cities justifying their mitigation policies on private cost-savings alone, the free-riding problem might re-emerge and inhibit mitigation action at higher levels of abatement—i.e. after cities have successfully picked the proverbial "low hanging fruit". Of course, incentives created at a higher level of government, especially internationally, could relieve the free-rider disincentives.

The existence of a myriad of local co-benefits gives rise to the opportunity to craft policy that addresses multiple concerns simultaneously. More abatement could potentially be encouraged if the climatic consequences of policies were considered when they previously would not have been. This approach could also apply at other levels of scale. Most notably, integrating climate considerations into other policy objectives of developing countries could be a successful way to encourage mitigation efforts (Schneider and Kuntz-Duriseti, 2002).

The interviews (Kousky, 2002) suggest that local governments do not operate at the same level of economic sophistication as higher levels of government or as business. It appears that, for local governments, the perception of cost-savings or local co-benefits can be as important a motivating factor as actually realizing them. This is especially true for co-benefits, as local governments do not typically attempt to value or quantify them. Local governments appear to be more focused on demonstrable action instead of explicit quantification and cost-benefit analysis.

Once mitigation options have been demonstrated as effective at the local level, such demonstrations could make it more feasible for higher levels of government to adopt similar policies, and could make international actions more attractive. An ICLEI staff member stated that there is a history of local governments demonstrating the effectiveness of certain policies, which are then adopted at other levels of government. By way of example, she noted that recycling started as a community program pushed by the Council of Mayors and has now become a widespread practice at all levels of government.

Local mitigation policies could also influence decisions at even smaller levels of scale, such as businesses or residents. Since local governments are in closer touch with their constituencies, their empirical experience claiming some level of abatement at a negative cost can motivate residents and businesses to strive for similar results. Municipal outreach and education efforts could also make more people knowledgeable about climate change and its causes and consequences. This increase in awareness might motivate not just individual action, but could potentially influence state and national policy makers if citizens became more politically active and aware of climate policy.

This is important since local governments have stated the need for federal involvement in climate policy for more significant abatement to occur. An ICLEI representative noted that several local governments are frustrated because they are enacting many emission reduction measures, but their GHG emissions keep increasing due to a huge rise in the number of SUVs on the roads. Because of this, several cities have included in their action plans lobbying Congress to alter the Corporate Average Fuel Economy (CAFE) standards (Sten and Anderson, 2000; Energy Management Team, 2001; Brookline Conservation Commission, 2002). Municipalities are taking a powerful first step, but due to their constraints, they must be mirrored in their efforts by top–down incentives from higher scales for larger reductions to occur. Regional, and not just federal, coordination could also lead to more substantial reductions (Betsill, 2000). For example, Portland, Oregon, was able to improve public transit between urban centers: a high-speed rail line now connects Portland and Eugene (Sten and Anderson, 2000). This allows for fewer single occupancy vehicle trips between the two cities, and thus a reduction in GHG emissions that could not have occurred without a regional focus.

When municipalities make the decision to implement climate policy, they have many tools at their disposal. This is because local governments control many of the factors related to GHG emissions, such as land use decisions, residential and commercial regulations, transit options and solid waste disposal. It is clear from this research that local governments have been taking advantage of these options to address what most policymakers consider to be an international scale problem. By educating citizens and implementing mitigation policies, many local governments have achieved a success that has eluded international policy-makers. It is only a first step toward decreases in the growth of worldwide fossil fuel consumption, but it is a significant one that will need to be supported by action at other levels of scale for abatement to continue. Individuals, businesses and all scales of government should scrutinize municipal policies that have reduced GHG emissions—often at cost savings and the realization of quality of life improvements to their communities. Perhaps that awareness might just spur actions a few levels up.

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