STRATEGIC FRAMEWORK FOR QUANTIFYING, MONITORING, EVALUATING, AND REPORTING LOCAL GREENHOUSE GAS EMISSIONS REDUCTIONS

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Abstract: *The Cities for Climate Protection (CCP) Campaign offers a strategic framework for local governments to develop a broad agenda on climate change and provides the analytical methods and tools for quantifying emissions and emissions reductions, and for implementing and monitoring emission reduction goals. The CCP program follows a five-milestone process for achieving measurable reductions of local GHG emissions: conducting a greenhouse gas emissions baseline inventory and growth forecast, setting reduction target, developing and adopting a Local Action Plan, implementing the Local Action Plan, and monitoring progress and reporting results. Campaign participants are pursuing practical measures with outcomes such as money savings, quality of life improvements, and other benefits above and beyond reduced greenhouse gas emissions. Measures such as retrofitting municipal buildings, improving street lighting, and using efficient vehicles for municipal fleets can save a municipal government thousands of dollars every year, savings which can be reinvested in the community. The results of their actions demonstrate that domestic GHG emissions reductions are cost-effective and achievable.*

Introduction and background

Over the last ten years, local governments around the world have taken the lead in implementing measures to reduce greenhouse gas (GHG) emissions. After the City of Toronto in 1989 adopted the first GHG reduction target, pledging that by the year 2005 the City would achieve a reduction of 20% below the levels emitted in 1988, that action came to be known as the "Toronto target" and helped set the standard for the world debate on greenhouse gas emission reductions.

Inspired by that action, the International Council for Local Environmental Initiatives (ICLEI) in 1991 launched the Urban CO_2 Reduction Project to encourage local governments to reduce greenhouse gas emissions and to find a strategy to support them in doing that. Fourteen North American and European cities took part to develop and test methods needed for local governments to undertake emission reduction strategies. In 1993, ICLEI launched the Cities for Climate Protection (CCP) Campaign to accommodate the growing number of cities committed to GHG emissions reduction. Today there are over 350 cities from all regions of the

world participating in the CCP program. Together they account for 8% of global greenhouse gas emissions. National CCP programs are underway in Australia, Canada, Finland, Italy, the Philippines, the UK, and the USA.

There are a number of reasons why local governments are responding to the challenge of climate change:

1. **Climate change impacts local communities.** Whether rising sea level, extreme weather events, altered agricultural production affecting food and water supply, or increased air pollution caused by higher temperatures, local communities are hardest hit by climate change.

2. **Cities are part of the problem.** As the population and economic centers of the world, urban areas are major consumers of energy and thus major emitters of greenhouse gases.

3. **Cities are part of the solution**. Local governments can use their influence and their decision-making and purchasing powers to increase energy efficiency and reduce greenhouse gas emissions. Local governments often possess the regulatory and economic tools that can make communities more energy and transport efficient. Local governments can use their leadership position to educate citizens and local business on the climate issue.

4. **Cities benefit from climate protection**. Local governments have discovered that they can benefit from reducing fossil fuel consumption and increasing energy efficiency – both economically, through lower energy bills, and socially, through improved air quality and more livable communities. This is what attracts local governments - in both developed and developing countries - to climate protection efforts.

The Cities for Climate Protection Milestone Framework

The Cities for Climate Protection Campaign offers a strategic framework for local governments to develop a broad agenda on climate change and provides the analytical methods and tools for quantifying emissions and emissions reductions, and for implementing and monitoring emission reduction goals. Two fundamental criteria have been used in the design of this framework: **performance** and **practicality**. Municipalities need a greenhouse gas monitoring framework that is flexible, relatively easy to use, and which will support analysis of emission reduction scenarios. The framework must be applicable to all municipalities, whether large or small, urban or rural.

Although energy systems vary from place to place, and despite the wide differences in fuel uses and mixes, land use patterns, local climate, and energy prices, there are five straightforward steps that local governments can follow to develop a strategic initiative to reduce GHG emissions. These steps are called **"milestones"** and each local government that joins the CCP makes a political commitment to implementing them.

Milestone 1 –Conduct the greenhouse gas emissions analysis: baseline inventory and forecast of emissions growth

Milestone 2 –Set the reduction target

Milestone 3 –Develop and adopt the Local Action Plan

Milestone 4 – Implement the Local Action Plan

Milestone 5 – Monitor progress and report results

The milestone process is supported by the CCP's **Greenhouse Gas Emissions Software**, which was developed by Canadian energy analyst Ralph Torrie of Torrie Smith Associates,

Milestone 1 – Conduct the greenhouse gas emissions analysis: baseline inventory and forecast of emissions growth

The **emissions analysis** identifies the sources and quantity of GHG emissions generated by the community. The data are then converted into CO_2 and methane emissions. It consists of two parallel analyses—one for local government (Corporate) buildings, fleets and operations, and one for the community as a whole including activities in the residential, commercial, industrial, transportation and waste sectors. Greenhouse gas emissions from the Corporate inventory are embedded in the Community inventory, however the Corporate inventory provides a more detailed picture than the Community inventory, as it attributes specific amounts of GHG emissions to each municipal building, facility, and operation. This information can be used to identify and target main GHG producers within local government owned and run facilities, improve the efficiency of these buildings and operations, and set an example to the rest of the community.

The emissions analysis identifies those sectors and end uses that produce significant amounts of emissions to enable the local government to design its local action plan to target these "hot spots".

The inventory focuses on CO_2 from fossil fuel combustion (including from electricity generation associated with end use of electricity in the community) and methane from landfills, since these are by far the most significant contributors to GHG emissions in urban areas. Other sources and gases can also be included in the inventories or emission reduction strategies. Upstream emissions from electricity production are factored into the end use of electricity through the use of a CO_2 coefficient for electricity.

What emissions inventories showed:

In the US transportation is the single largest contributor to greenhouse gas emissions in most CCP communities

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CCP-Australia participants discovered that streetlights accounted for almost 50% of their Corporate emissions

The **forecast** part of the analysis is an estimation of how electricity, fuel use, and waste production are expected to grow in these sectors under a business-as-usual scenario. The growth in emissions is estimated using land use, development, traffic, and other growth projections from the local government's own, and regional, planning agencies.

Baseline: The preferred **baseline year** is 1990 and the forecast year 2010 for both municipal operations and the community. Depending on data availability, however, in some places other years are used. In general, given the CCP's priority on performance and practicality, it is more important that the baseline year be documented with sufficient detail to provide a good basis for local action planning than it is that all Campaign participants produce an inventory for 1990.

Milestone 2 –Set the reduction target

The CCP program does not "prescribe" a particular reduction target, however, the preferred target is a 20% reduction from 1990 level of emissions, achieved by 2010. Some communities adopt their target and timetable at the outset. Other communities conduct their emissions inventory and forecast and evaluate existing and potential measures before officially adopting their target.

Milestone 3 –Develop and adopt the Local Action Plan

The Local Action Plan is a strategy of the policies, programs, and measures the local government will take to meet its reduction target. It describes the entire reduction strategy from the type of approach, financing, timeline, citizens and staff involved, monitoring, and evaluation. As with the emissions analysis, the plan has two parallel parts —one to reduce greenhouse gas emissions from local government operations and one to reduce emissions from the entire community. The set of reduction actions comprises existing actions that will be continued and new or proposed actions that together will reach the reduction target. Ideally, the Plan should include public awareness and education initiatives.

Denver, Colorado, USA
Measure: replacement of incandescent bulbs with LEDs in traffic signals at 1200 city intersections
Annual results: electricity savings = 7.8 million kWh
GHG reduction = 8,894 tons
money saved = US$ 357,000 (labor and energy bill)

Milestone 4 – Implement the Local Action Plan

The final step is to implement the policies and measures identified in the local action plan. Implementation strategies include identifying costs, responsibilities, schedules, funding sources and procedure for monitoring the progress made toward the achievement of the target and the status of implementation of the reduction actions

Milestone 5 – Monitoring progress and reporting results

To make sure the Local Action Plan is implemented effectively and on schedule, formal procedures must be included for monitoring its implementation, measuring results,

incorporating the results of experience, keeping track of changing conditions, and taking advantage of new information and ideas. Key monitoring and evaluation issues include

- Tracking implementation. This requires a system in which each entity or person responsible for a certain area provides periodic progress and problem reports to the person with overall responsibility for the plan.
- Measuring results. This requires following up on the sources and the data developed in the preparing the baseline emissions analysis and the emissions projections. Are the figures changing in the way predicted? If not, is it because of inadequate program implementation, or were the measures adopted not adequate to begin with?

Tracking and measuring need to be routine activities. They need to be scheduled and performed on a regular basis so that progress or the lack thereof can be determined at any time.

Newcastle City Council, Australia
Measure: installation of Energy Star power management systems on Council's electronic office equipment
Annual results: GHG reduction 177 tonnes CO_2
Money saved = Aus$ 25,000

Quantification methodology

Through the Cities for Climate Protection Campaign, ICLEI has developed a standardized framework for local government GHG emissions quantification. To report on emissions reduction progress the data on existing and proposed measures are updated. The CCP **Greenhouse Gas Emissions Software** calculates a number of indicators – such as per capita CO_2 emissions or CO_2 emissions per commercial building square foot – which are used in monitoring and reporting broad trends in the jurisdiction's performance. There are numerous, pre-formatted, ready-to-print reports that provide both summary and detailed information about emissions and emission reductions, including comparisons of forecast emission levels and progress toward meeting targeted levels.

Having monitored and documented the emissions reductions achieved, it will be easier a local government to comply, if national governments were to eventually regulate local governments, as well as other entities, to reduce emissions in order to achieve national reduction targets.

The CCP Greenhouse Gas Emissions Software has been developed to help participants implement their local action plans for emission reductions. It draws on the pioneering quantification developed in the Urban CO_2 Reduction Project, as well as an extensive database of municipal energy use that ICLEI has accumulated over the past nine years. The tool has two pairs of modules – one for analyzing emissions and reductions in Corporate operations, and one for analyzing emissions and reductions on a community-wide basis. The software supports all the elements of the CCP local action plan – base year inventory, business as usual forecast, target setting, and emissions reduction quantification. The software is consistent with IPCC reporting protocols and uses standardized methods and conventions.

All the „Kyoto gases“ are covered, however, emphasis is placed on the GHG most important to local governments – carbon dioxide from fuel consumption and electricity production, and methane from organic waste disposal. Energy and waste inputs are automatically converted to greenhouse gas emissions using factors that are unique to the user's particular locality. ICLEI's experts research the appropriate coefficients required to reflect the electricity mix and other factors in each locality.

The CCP software is designed for users who not only need to count greenhouse gas emissions, but want to do something about them. A number of generic emissions reduction measures are defined, and calculator templates are provided for each of these that prompt the user for the local information needed to quantify the emission impact of the measure. In addition to greenhouse gas emission reductions, the software tracks the financial payback of measures, the air pollution benefits, and various other indicators.

Hanover, Germany
Measure: Energy savings in public schools (through behavior change and minor technical measures
3-year results: electricity savings = 16%, heating = 11% less
GHG reduction 7,200 tonnes CO_2
Money saved = over 2 million DEM
Additional benefits: raised awareness of climate change and energy efficiency among students

Best practice policies and measures

Greenhouse gas reduction measures selected by local governments are those which address local concerns as well as contribute to abating global climate change. Climate protection strategies that preserve green space, reduce traffic congestion, boost economic development, save costs, and cut air pollution improve the quality of life for all residents of the community.

CCP participants aim to implement practical measures that

I. promote the generation and use of renewable energy
II. increase energy efficiency, especially through district heating and cooling and cogeneration, as well as in buildings, vehicles, lighting, and electrical equipment
III. reduce the number of vehicle kilometers traveled
IV. reduce methane emissions from waste / recover and use methane from landfills

These are long-term, preventive measures that avoid the emissions resulting from carbon from dirty energy and its increased use, and increased transport and waste production, as opposed to "end of pipe" options that focus on solely on technical solutions. A strategy including such measures will also have a measurable impact on noise.

Metropolitan Toronto, Ontario, Canada
Measure: Landfill Gas to Energy (generation of 60 MW electricity in three landfill sites)
Annual Results: GHG reduction = equivalent of CO2 emissions of more than one million cars
Money saved = $2.5 million annual revenue (plus acceptable rate of return to the energy contractors)
Additional benefits: reduces odour problems, and supports waste management: reduction, reuse, recycling and recovery

Measures are preferred that represent the biggest potential for reduction, that is, those which target the "big emitters" as identified by the emissions analysis.

In evaluating the measures the following criteria are used to decide if they should be included in the Local Action Plan:

- Estimated greenhouse gas impact of the measure
- Cost or savings of the measure
- Ease of implementation
- Likely political support
- Likely public support
- Staffing requirement.
- Extra benefits—such as improving air quality, reducing traffic congestion, creating jobs and other economic opportunities, and saving money.

Conclusion and Prospects

Local governments will continue to be committed to reducing greenhouse gas emissions. Their performance, however, will depend on a number of factors. These include

- national policies that focus on **domestic** policies and measures to reduce emissions
- a significant shift from high to low carbon fuels and especially renewable energy
- policies to remove institutional and market barriers to energy efficiency, cogeneration, and renewables
- stronger efficiency standards for new and existing building stock, as well as for vehicles
- regulation to discourage inefficient energy use

And finally, concerted efforts on the part of all levels of government must be undertaken to raise the public awareness of climate change and its risks for citizens everywhere in the world.

The International Council for Local Environmental Initiatives (ICLEI) is a membership association of local governments and national and regional local government associations that have made a unique commitment to sustainable development. ICLEI's mission, as established by its membership, is to build and support a worldwide movement of local governments to achieve tangible improvements in global environmental conditions through the cumulative impact of local actions. Some 350 local governments, representing more than 250 million people worldwide, constitute the ICLEI Council. ICLEI's World Secretariat is located in Toronto, Canada. It as regional offices in Freiburg, Germany; Rio de Janeiro, Brazil; Tokyo, Japan; Harare, Zimbabwe; Berkeley, California; and Melbourne, Australia.