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Chapter 3: **Conduct a Baseline Inventory**

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Baseline Emissions Inventory

There are many different ways that a community can undertake to reduce its risks, save energy and contribute to climate protection. This manual suggests that you follow the approach laid out by ICLEI – Local Governments for Sustainability. This sets out five milestones that cities should meet.

The first step of ICLEI's five milestones is to establish a baseline for citywide greenhouse gas (GHG) emissions. This is an important first step for many reasons.

It creates a database of the city's emissions that can be used to track growth and change in the city. It will also create a procedure for tracking city emissions in the future.

It allows cities to hone in on sectors that emit the most GHGs within their territories. The identification of principal sources of emissions shows where reduction measures can have the most impact. This enables cities to prioritize actions to curtail emissions.

It allows cities to take first actions within their own municipal operations or to create an action plan to deal with the community as a whole. Cities do not have to choose one or the other, but by establishing a baseline for both, cities can prioritize crucial areas to address both in municipal operations and community wide.

As a city begins the process of conducting a baseline emission inventory, it should consider not only what data to collect and for what purposes, but also how to collect and evaluate the data to make them most useful.

In order to complete any baseline emission inventory, required inputs will include and not be limited to:

Energy and natural gas consumption in residential, commercial and industrial sectors

Transportation consumption, to include type of vehicle, average miles traveled per vehicle, and type and amount of fuel used

Waste generation to include waste (per/ton) sent to landfill and methane captured

Renewable Energy Credit (REC) Inputs and offsets

Agriculture emissions

Streetlighting, etc.

Consider End-Use Analysis

When doing a baseline analysis, it is most effective to break out energy usage by "end-use," rather than only by sector. For example, if a city can determine how much energy is used to provide lighting, refrigeration, cooking, electric motor power, etc. the resulting data are much more useful than if broken out by sector -- residential, commercial and/or industrial. Evaluating end-use information will better prepare cities to identify which programs will have the most impact on their GHG emission reductions. The following figure is an example of the city of Arcata, California's, breakdown of GHG emissions:

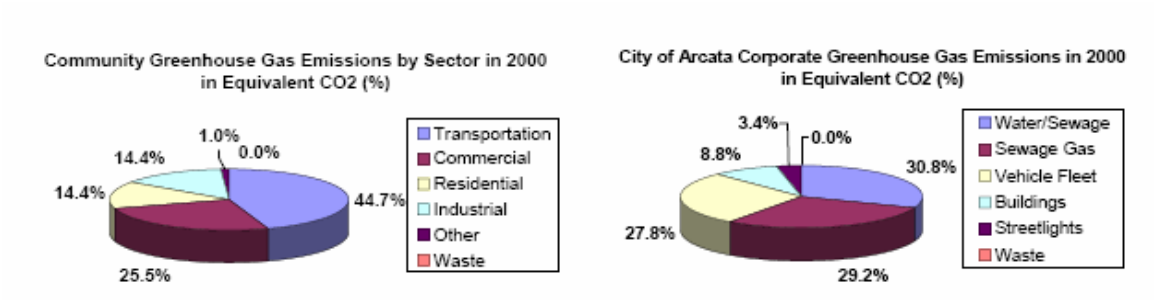


Figure: Arcata, California's GHG emission breakdown

The city of Arcata's Corporate Greenhouse Gas Emissions (Chart 2 of the above figure) makes it easier to transition to reduction goals and program initiatives. The majority of the city's emissions come from water/sewage and sewage gas. Knowing this allows the city to first focus on projects that reduce these emissions. The sector graphs (Chart 1 of the above figure) show the commercial breakdown, but it does not indicate if the main usage in the commercial sector is from electricity, lighting or if it is largely from transportation or motor usage.

Baseline Standards

Baseline emission calculators apply emission coefficients (a value determined from various studies to provide a standard way to assess greenhouse gas emissions) to energy consumption to compute greenhouse gas emissions. At least three organizations have set emissions coefficients, including the Intergovernmental Panel on Climate Change (IPCC)[1], the Energy Information Administration (EIA)[2] and the World Resources Institute/ World Business Council on Sustainable Development (WRI/WBCSD[3]). The differences between most standards are minimal.

Chicago Climate Exchange[4] (CCX)

Cities that are considering joining CCX in the future might take the CCX requirements into consideration at the data gathering stage of the Climate Action Plan. CCX is the world's first and North America's only voluntary, legally binding rules-based GHG emission reduction and trading system. CCX uses

[1] IPCC standards, www.ipcc.ch/, 14 September 2006.
[2] Energy Information Administration "Guidelines for Voluntary Reporting of Greenhouse Gases, www.pi.energy.gov/enhancingGHGregistry/technicalguidelines.html, also archived at, www.natcapsolutions.org//ClimateManual/Cities/Chapter3/TechnicalGuidelines_March2006.pdf, 30 October 2006
EIA coefficients, www.eia.doe.gov/oiaf/1605/factors.html, 21 September 2006.
[3] WRI/ WBCSD Corporate GHG reporting protocols, pubs.wri.org/pubs_description.cfm?PubID=3872, also archived at, www.natcapsolutions.org//ClimateManual/Cities/Chapter3/WRI_ghg_protocol_2004.pdf, 14 September 2006.
[4] Chicago Climate Exchange, www.chicagoclimatex.com, 14 September 2006.

World Resources Institute (WRI) coefficients, but state that converting from other standards (ie IPCC or EIA) is not difficult. CCX only considers municipal operations for a city baseline. Therefore if a city is considering joining CCX, it should make sure that the tools it uses distinguish between municipal operations and citywide emissions. For more information about CCX and the reasons to join refer to Chapter 2, and 5, Reducing Impact of Continued Emissions Section.

Tools & Resources for Baseline Inventory

There are several options to consider in deciding how to conduct a baseline emissions inventory. All will provide the information needed to move forward in developing a Local Climate Action Plan. The primary options are outlined next; but the decision will depend on city staff support, budget allocated to climate action, time available to create the baseline, etc.

ICLEI's Clean Air and Climate Protection Software

Independent Consultants

Self-Inventory, including Public Domain tools

ICLEI's Clean Air and Climate Protection Software

The first option is to use ICLEI's Clean Air and Climate Protection Software. This tool is available to members only[5]. The tool allows staff to input all information dating back to a desired baseline year. It also enables cities to create reports around future projections. ICLEI's tool looks at citywide emissions, enabling municipal operations to be separated out if desired. ICLEI provides training software to accompany the tool. Support also can be requested from ICLEI's staff. The tool requires an individual's time and expertise to submit inputs and create reports, so a city that does not have a staff member dedicated to compiling information may find this tool too time and training intensive. ICLEI provides cities the option of hiring their organization as a consultant to create a baseline report.

ICLEI's Clean Air and Climate Protection Software was developed by Torrie Smith Associates.[6] A snapshot of the software follows.

To view baseline reports generated by this software, check the cities listed next. Each has used ICLEI's tool and has made its information available to the public.

Arcata, CA, GHG Inventory report, Arcata hired a consultant to use ICLEI's tool[7]

Duluth, MN, GHG Inventory report using ICLEI tool and prepared by city staff[8]

Sommerville, MA, GHG Inventory report, done by city staff using ICLEI tool[9]

Independent Consultants

Another option is to hire one of the growing number of consultants to conduct a baseline emissions report and create a tool specifically for an individual city. Many cities have chosen this option, because it does not require as much staff involvement, and does not involve as many inputs because it matches the city's emissions by sector. The GHG inventory tool then can be used to track future emissions. For example, Boulder County used an outside consultant to create a greenhouse emission inventory tool that calculated all cities within the county.[10] The following snapshot shows how tools

[5] The benefits of ICLEI membership is posted at www.iclei.org/index.php?id=771, 19 September 2006.
[6] A demonstration of the tool is available on this website: www.torriesmith.com/.
[7] Arcata's GHG Inventory, www.arcatacityhall.org/energy/ghg_app_a.pdf, also archived at, www.natcapsolutions.org/ClimateManual/Cities/Chapter3/Arcata_baseline_14vii06.pdf, 21 September 2006.
[8] Duluth's GHG Inventory, www.ci.duluth.mn.us/city/information/ccp/GHGEmissions.pdf, also archived at, www.natcapsolutions.org/ClimateManual/Cities/Chapter3/Duluth_baseline_14vii06.pdf, 21 September 2006.
[9] Sommerville GHG Inventory, www.ci.somerville.ma.us/CoS_Content/documents/Somerville_GHG_Inventory%20Report.pdf, also archived at, www.natcapsolutions.org/ClimateManual/Cities/Chapter3/Somerville_baseline_14vii06.pdf, 21 September 2006.
[10] It is not the purpose of this manual to advertise for consultants. However the authors thought it was important to include an example of an individual consultant's baseline emission assessment with a city or county. Boulder County used Econergy. www.econergy.com/, 19 September 2006.

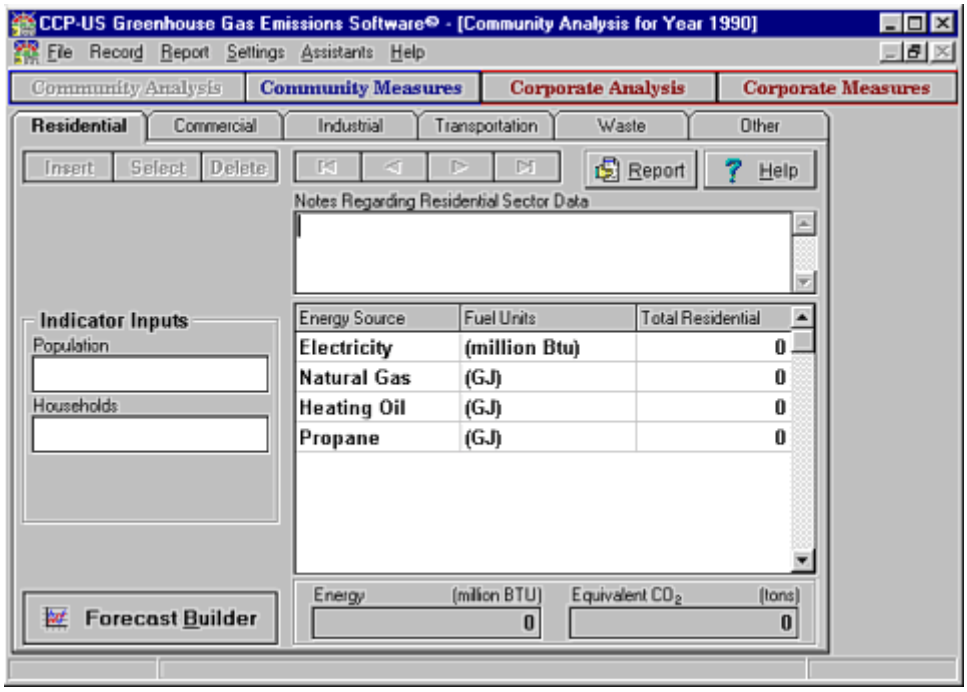
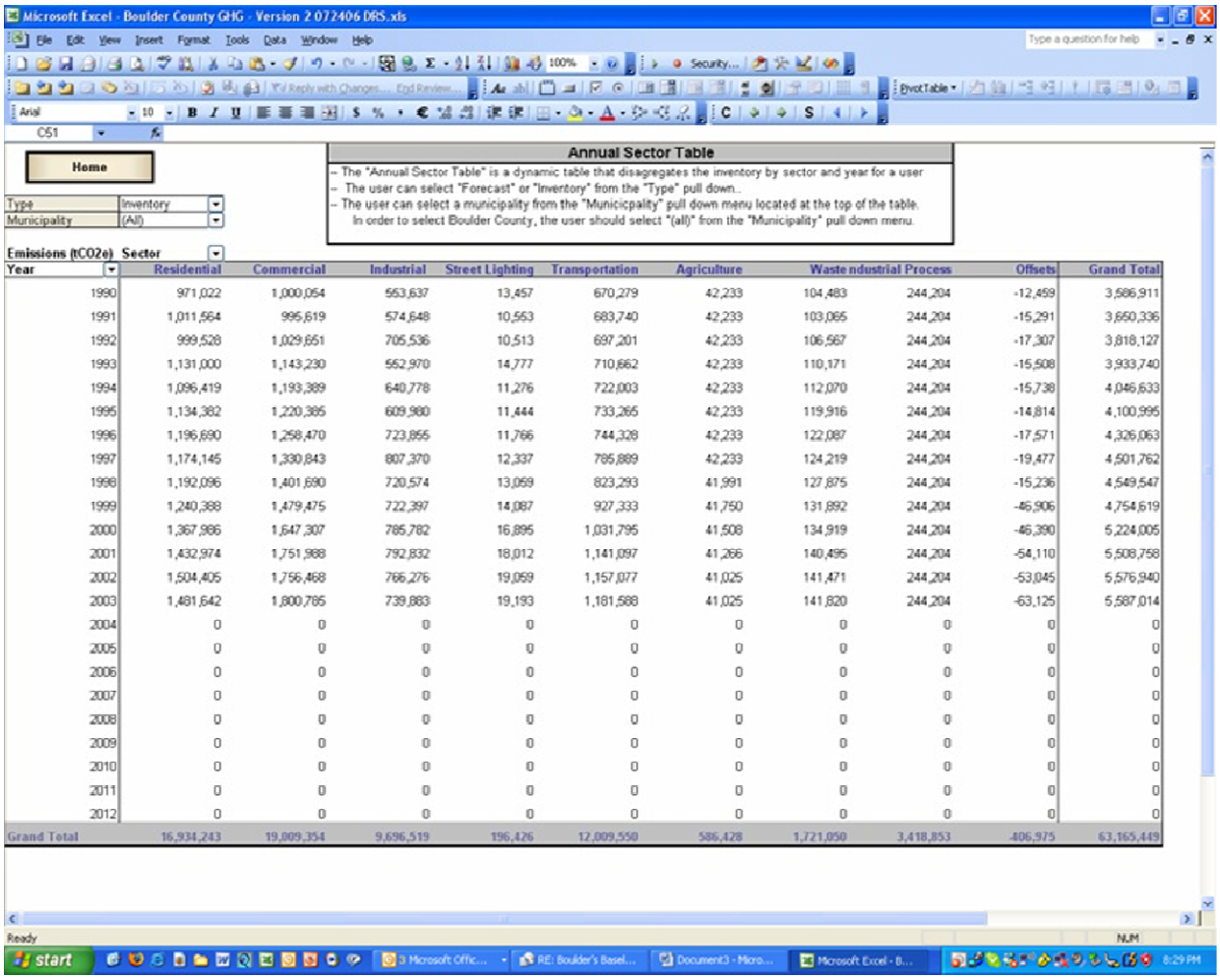


Figure: Torrie Smith Software Snapshot



Year	Residential	Commercial	Industrial	Street Lighting	Transportation	Agriculture	Waste ndustrial Process		Offsets	Grand Total
1990	971,022	1,000,054	563,637	13,457	670,279	42,233	104,483	244,204	-12,459	3,586,911
1991	1,011,564	996,619	574,648	10,553	683,740	42,233	103,095	244,204	-15,291	3,650,336
1992	999,528	1,029,651	705,536	10,513	697,201	42,233	106,567	244,204	-17,307	3,818,127
1993	1,131,000	1,143,230	552,970	14,777	710,662	42,233	110,171	244,204	-15,608	3,933,740
1994	1,096,419	1,193,389	640,778	11,276	722,003	42,233	112,070	244,204	-15,738	4,046,633
1995	1,134,382	1,220,385	609,980	11,444	733,265	42,233	119,916	244,204	-14,814	4,100,995
1996	1,196,690	1,258,470	723,855	11,766	744,328	42,233	122,087	244,204	-17,571	4,326,063
1997	1,174,145	1,330,843	807,370	12,337	785,889	42,233	124,219	244,204	-19,477	4,501,762
1998	1,192,096	1,401,690	720,574	13,059	823,293	41,991	127,875	244,204	-15,236	4,549,547
1999	1,240,388	1,479,475	722,397	14,087	927,333	41,750	131,892	244,204	-46,906	4,754,619
2000	1,367,986	1,647,307	785,782	16,895	1,031,795	41,508	134,919	244,204	-46,390	5,224,005
2001	1,432,974	1,751,988	792,832	18,012	1,141,097	41,266	140,495	244,204	-54,110	5,508,758
2002	1,504,405	1,756,468	766,276	19,059	1,157,077	41,025	141,471	244,204	-53,045	5,576,940
2003	1,481,642	1,800,785	739,883	19,193	1,181,588	41,025	141,820	244,204	-63,125	5,587,014
2004	0	0	0	0	0	0	0	0	0	0
2005	0	0	0	0	0	0	0	0	0	0
2006	0	0	0	0	0	0	0	0	0	0
2007	0	0	0	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0	0	0	0
2010	0	0	0	0	0	0	0	0	0	0
2011	0	0	0	0	0	0	0	0	0	0
2012	0	0	0	0	0	0	0	0	0	0
Grand Total	16,934,243	19,009,354	9,696,519	196,426	12,009,550	586,428	1,721,050	3,418,853	-406,975	63,165,449

Figure: Econergy's Baseline Assessment Tool Snapshot

separate emissions by sector and source.

Other cities use consultants to create a new tool for their staff to use. This requires staff time to get the correct inputs for the emission tool, but does not require them to customize the tool. The tool is shaped to a city's own inputs and emissions, and the city staff are more involved in the development.

Self Inventory

Some cities – typically those that have large staffs -- have the expertise to inventory and track their emissions on their own.

If cities choose to do a self-inventory, there are many free/open-source tools that allow companies, communities and individuals to track their own emissions. Two are listed.

1. The International City/County Management Association developed and maintains a very useful web site, www.USAEnergy.org which among other resources has links to numerous (more than 10) on-line tools[11] that assist local officials and others in assessing their baseline emissions, improving energy efficiency, harnessing renewable energy, and addressing the problems and concerns associated with climate change.

2. U.S. Environmental Protection Agency (EPA). GHG emissions calculators are available online from EPA[12]. These interactive calculators help estimate the greenhouse gas emissions of human activities, convert carbon emissions to equivalent units, and identify and compare emissions reduction options. The calculators vary greatly in complexity, scope, and intent. EPA's web site provides a brief description of each to help you choose one or more that best meet your needs.

Once a city has completed its baseline emissions inventory, it can set its reduction goals (described next in chapter 4), and develop a local action plan (chapter 5).

[11] USAEnergy, www.usaenergy.org/tools.cfm, 19 September 2006.
[12] EPA Resource Center, yosemite.epa.gov/oar/globalwarming.nsf/content/ResourceCenterToolsCalculators.html, 19 September 2006.