

Seattle's Community Carbon Footprint: an Update

March 2008

We have completed an update of Seattle's greenhouse gas emissions inventory – or “carbon footprint” – based on 2005 data. Overall, the community's 2005 carbon footprint was about eight percent smaller than it was in 1990. Although 2005 is just a one-year snapshot, the reduction from 1990 levels is a remarkable achievement for the community of Seattle, and one that should inspire us to further action.

This assessment is our main way of gauging progress toward the near-term and long-term goals for reducing climate pollution in Seattle. It helps us answer a series of questions: How are we doing toward our goals of reducing local greenhouse gases by 7 percent of 1990 levels by 2012? Are we on track to reduce climate pollution by 80 percent of 1990 levels by 2050? Where are we having success? Where do we need to take further action to reduce our emissions?

In addition to this carbon footprint assessment, we are following about a dozen “second-tier” indicators, all of which tell us something about how we are doing in reducing emissions from transportation and energy use in homes and businesses. Those data are included in this report as well.

The City is committed to updating this community carbon footprint assessment approximately every three years, and this is the first of those periodic updates. The highlights from this analysis are as follows:

- ***Seattle is making excellent progress:*** Overall, the community's 2005 carbon footprint was about eight percent smaller than it was in 1990, based in large part on energy conservation efforts by Seattle's households and businesses, and Seattle City Light's work to “zero out” the climate pollution associated with the development and delivery of electricity to its approximately 370,000 residential, commercial and industrial customers.
- ***We're using less power:*** Emissions from residential and commercial energy use, which together make up about 20 percent of our community's carbon footprint, were both down compared to 1990 levels. These significant reductions are mostly the result of two efforts: 1) Seattle City Light's transition to a “zero net emissions” electricity supply through investments in conservation, renewable energy sources, and carbon offsets; and 2) Seattle households and businesses converting from heating oil to natural gas, which is a less carbon-intensive fossil fuel.
- ***A greener city:*** Per capita greenhouse gas emissions in Seattle – total emissions divided by total population – were 11 percent lower in 2005 than they were in 1990. Per capita emissions in Seattle were about 11.5 tons per year. This compares favorably with per capita emissions in King County (12.8 tons per year), the central Puget Sound region (13.7 tons), Washington state (14.1 tons) and across the United States (24 tons).
- ***Transportation emissions are rising:*** Emissions from all transportation sources – road, rail, marine and air, which together make up about 60 percent of our community's carbon footprint – were up about 3 percent compared to 1990. Emissions from road transportation (trucks, buses, vans, cars, SUVs, and light-duty trucks, which together constitute about 40 percent of our overall footprint) were up about five percent, while emissions from marine, rail, and air transportation increased about three percent.

- ***Industry trends uncertain:*** Emissions from Seattle’s industry, which constitute about 20 percent of the community total, were down 16 percent in 2005, compared to 1990 levels. However, a large portion of this reduction appears to be due to lower than average 2005 cement production (which makes up 13 percent of the total), and we anticipate cement emissions will return to historical levels.
- ***An optimistic future:*** The work ahead will be to sustain our gains, build on our momentum, and redouble our efforts to reduce climate pollution in Seattle, not only by 7 percent by 2012, but by 80 percent by 2050. We must continue to reduce our greenhouse gas emissions while at the same time we absorb expected growth in people and commerce. In particular, additional action must be taken to lower the consumption of fossil fuels in our homes, businesses and cars.

Understanding Carbon Footprints

There are two main approaches to greenhouse gas assessments, also called greenhouse gas inventories: geographic and corporate. **Geographic inventories** measure greenhouse gas emissions that originate within a defined geographic boundary. A standard protocol for geographic inventories for nations has been developed as part of the United Nations Framework Convention on Climate Change, but no such standard protocol exists for geographic inventories for cities. Following the national protocol in developing local geographic inventories is difficult. It is more challenging to assess the carbon footprint for a city because the area is much smaller (Seattle’s 84 square miles compared with the United States’ roughly 4 million), and because cities function within regional and national economies. Some activities that have significant greenhouse gas emissions associated with them – such as seaports, airports, freeways, and industrial plants – may exist within city boundaries but serve a much larger area and population. Conversely, the climate pollution associated with many in-city activities, such as electricity generation and solid waste disposal, occurs outside of the city’s boundaries.

By contrast, **corporate inventories** aim to measure the greenhouse gas emissions of an organization and its facilities and operations, regardless of their geographic location. Protocols for corporate inventories were developed by the World Business Council for Sustainable Development, the World Resources Institute and the California Climate Action Registry. In addition to its community-wide inventory, the City conducts a corporate inventory of its operations, and encourages other Seattle businesses to do the same through the Seattle Climate Partnership program.

Neither of these two standard protocols -- one for nations and the other for corporate entities -- is a perfect fit for assessing the carbon footprint of a local community. A standard methodology for carbon footprint assessments on the local level is being developed by ICLEI – Local Governments for Sustainability. A concurrent partnership effort between ICLEI, the Clinton Climate Initiative and Microsoft is developing a software tool to work with this emerging protocol. The City’s Office of Sustainability & Environment is actively engaged in this process, which is slated for completion in 2008. In the meantime, we have partnered with the best available local expertise to complete this update to the Seattle community’s carbon footprint, using a hybrid methodology that combines features of the two approaches described above.

This updated community footprint is based on more accurate data and improved estimation methodologies. The most significant changes in this inventory include revised estimates of:

- Car and truck emissions based on updated models of Seattle vehicle miles traveled;
- Marine emissions based on the Port of Seattle’s recently-released emissions inventory;
- Natural gas emissions based on more accurate data coming directly from Puget Sound Energy;
- Commercial oil emissions based on new city employment data; and
- Industrial processing emissions based on more complete emissions data on Seattle’s cement production and an adjustment to the 1990 baseline to account for a temporary closure of one of Seattle’s two cement plants.

Seattle’s Community Footprint

The data presented in the tables below are drawn from the “2005 Inventory of Seattle Greenhouse Gas Emissions: Community & Corporate” (2005 Inventory), which is available at www.seattle.gov/climate. Following the standard for geographic and corporate inventories, the 2005 Inventory is organized into three scopes: direct emissions, energy imports, and other emissions. To provide a clearer overview, we display the information in tables below by major emission sectors rather than by scopes.

Table 1 below summarizes our carbon footprint by emissions sector. For a more detailed summary of emissions, see Appendix A of this report.

Table 1: Greenhouse Gas Emissions after Climate Actions & Offsets

Sector	1990	2005
Residential Energy	735,000	612,000
Commercial Energy	875,000	816,000
Industrial Energy & Processing	1,541,000	1,319,000
Transportation	3,889,000	4,010,000
Other	147,000	73,000
Sub-Total	7,187,000	6,830,000
Climate Actions/Offsets		-216,000
2005 total with actions and offsets		6,614,000
2012 goal - 7% below 1990 levels		6,680,000

Table 2 below shows the changes in both overall and per capita emissions from each sector from 1990 to 2005, on a percentage basis.

Table 2: Percentage Below (-), Above (+) 1990

Sector		2005
Residential Energy	Total	-27%
	Per capita	-29%
Commercial Energy	Total	-20%
	Per Capita	-23%
Industrial Energy & Processing	Total	-16%
	Per Capita	-19%
Transportation	Total	+3%
	Per Capita	-1%
TOTAL	Total	-8%
	Per Capita	-11%

Table 3 below, compares per capita greenhouse gas emissions in Seattle with those for the county, central Puget Sound region, state and country.

Table 3: Comparing Per Capita Emissions

	2005 Population	Estimate of Annual Greenhouse Gas Emissions (tons/year)	Per Capita Emissions (tons/person/year)
Seattle	573,911	6,600,000	11.5
King County	1,793,583	23,000,000	12.8
Central Puget Sound (King, Snohomish, Pierce and Kitsap counties)	3,460,643	47,500,000	13.7
Washington State	6,256,400	88,000,000	14.1
United States	296,410,404	7,100,000,000	24.0

Sources: King County, Puget Sound Regional Council, WA Department of Ecology, U.S. Environmental Protection Agency

Other Measures of Progress

The City has developed a three-tiered strategy for measuring our progress in implementing the Seattle Climate Action Plan and meeting our near- and long-term climate protection goals. The first tier is the community greenhouse gas inventory or carbon footprint described above. The second tier is a collection of indicators that tell us whether we're headed in the right direction, such as whether we're driving less, using less energy, and living in compact, walkable communities; they can be tracked more frequently than the carbon footprint itself, sometimes annually. The third tier of measurement consists of program-specific outputs designed to help us understand if those particular efforts are meeting their objectives.

Time-series data on the second-tier indicators appear in Table 4 below. Overall, the indicators suggest we're on the right track. We're riding transit in increasing numbers. We're consuming fewer resources like water and electricity in our homes and businesses. And we're beginning to increase the availability of alternative fuels, in no small part due to increasing demand from Seattle businesses and residents.

Table 4: Second Tier Climate Protection Indicators

Indicator	1990	1995	2000	2005
<i>Transportation Choices, Smart Growth</i>				
Per Capita Vehicle Miles Traveled ¹	6,707	N/A	6,932	6,845
Average Weekday Metro Ridership ²	N/A	210,000 (1997)	251,000	252,000
Annual Sound Transit Express Ridership – Seattle Routes ³	N/A	N/A	3,818,169	7,243,490
Annual Sounder Ridership ⁴	N/A	N/A	562,740 (2001)	1,268,291
Downtown Bicycle Commuters – One Day Count ⁵	1,104 (1992)	1,406	1,737	2,273 (2007)
Percentage of Seattle Residents Living in Urban Centers/Villages ⁶		35%		38% (2004)
<i>Clean Energy, Efficient Buildings</i>				
Residential Per Capita Electricity Use – kWh/year ⁷	11,250	10,257	10,316	9,011
Non-Residential Per Capital Electricity Use – kWh/year ⁸	159,422	177,848	191,738	157,106
Residential Per Capita Natural Gas Use – therms/year ⁹	N/A	N/A	973	821
Non-Residential Per Capita Natural Gas Use – therms/year ¹⁰	N/A	N/A	7,668	6,113
Per Capita Water Consumption – gallons/day ¹¹	152	125	120	102
Per Capita Residential Non-Recycled Waste – pounds/day ¹²	1.5	1.5	1.4	1.3
% of Waste Recycled ¹³	39%	44%	40%	44%
<i>Clean Fuel, Clean Vehicles</i>				
# of Biodiesel Stations in Seattle ¹⁴	N/A	N/A	N/A	13 (2007)

¹ Source: Seattle Department of Transportation

² Source: King County Department of Transportation

³ Source: King County Department of Transportation

⁴ Source: Sound Transit Transportation Services Department

⁵ Source: Seattle Department of Transportation

⁶ Source: Seattle Department of Planning & Development

⁷ Source: Seattle City Light

⁸ Source: Seattle City Light

⁹ Source: Puget Sound Energy; data include all PSE customers, not just those in the City of Seattle

¹⁰ Source: Puget Sound Energy; data include all PSE customers, not just those in the City of Seattle

¹¹ Source: Seattle Public Utilities

¹² Source: Seattle Public Utilities

¹³ Source: Seattle Public Utilities

¹⁴ Source: Puget Sound Clean Cities Coalition

Looking Ahead to 2012 -- and Beyond

This updated assessment of Seattle's carbon footprint, coupled with these other measures, shows we are making real progress in our effort to become a cleaner, greener, more climate-friendly city. The work ahead must build on our gains. We know challenges remain, and that we will need to redouble our efforts to meet both our near-term and long-term climate protection goals. For example, we know that more people, homes, jobs and businesses in Seattle between 2005 and 2012 will mean more demand for energy to power and heat our buildings, and demand for transportation services. We know that growth in vehicle miles traveled (and the associated global warming pollution) will continue to be our number one climate protection priority. What's more, we know our longer-term goal -- as a city and a country -- is even more ambitious than the 2012 goal: reducing emissions to 80 percent below 1990 levels by 2050.

Growth in cities and global warming

“Smart growth” -- making the policy changes and investments necessary to concentrate a high percentage of the region's expected growth into existing urban centers and villages -- is a linchpin of our local and regional climate protection strategy. Research shows that concentrating growth in existing urban areas instead of allowing sprawl is good for the climate. The carbon footprint of a typical high-density, urban-style development is 30 percent less than that of a typical lower-density, suburban-style development.¹⁵

However, while concentrating growth reduces climate pollution region-wide, it increases emissions within the City, making meeting our local reduction targets more difficult. Our work will concentrate on encouraging growth while also increasing conservation and renewable sources of energy.

A Community Commitment

Recently launched programs such as Seattle Climate Action Now and the Seattle Climate Partnership are designed to help us sustain our gains by engaging Seattle's residents, neighborhoods, businesses and other institutions.

As we implement the Climate Action Plan this year, we already are working on an update for 2009-2010, due out by the end of 2008. It will feature a revised projection of greenhouse gas emissions looking out to 2012, and the next generation of climate protection initiatives that the city and the community must take to meet our goals.

We will continue to build on our partnerships with regional entities whose policies, programs and services are critical to our success, notably the Puget Sound Clean Air Agency; Puget Sound Energy; the Port of Seattle; King County/Metro, Sound Transit and the other regional transit providers; the Puget Sound Regional Council; and the Greater Seattle Chamber of Commerce.

¹⁵ “The Role of Land Use Planning in Meeting California's Energy and Climate Goals,” California Energy Commission, 2007, Available at: <http://www.energy.ca.gov/2007publications/CEC-600-2007-008/CEC-600-2007-008-SF.PDF>; Ewing R., R. Pendall and D. Chen, “Measuring Sprawl and Its Impact,” Smart Growth America/US Environmental Protection Agency, Washington DC, 2002; Lawrence Frank & Co., Inc., et al. Travel Behavior, Environmental, & Health Impacts of Community Design and Transportation investment: A Study of Land Use, Transportation, Air Quality and Health in King County, WA. December 2005. Available at: http://www.metrokc.gov/healthscape/publications/LUTAQH_final_report.pdf.

Strong state and federal climate protection policies and programs are also essential to our success. There are many sources of climate pollution that are outside of the City's control. We will continue to actively promote strong state-wide and regional policies through our participation in the Governor's Washington Climate Change Challenge and the Western Climate Initiative, as well as through our state legislative agenda. We will continue our efforts to shape stronger federal policy through direct communications with the U.S. Congress, with the new Administration that takes office next January, and through the U.S. Mayors Climate Protection Agreement. In partnership with the U.S. Conference of Mayors, we will continue our work to grow and strengthen the network of 700-plus mayors who are working to reduce their cities' contributions to global warming.

APPENDIX A - Seattle's Community Carbon Footprint

Detailed Summary of Emissions by Sector

All figures shown are in metric tons of CO2 equivalent (tCO2e) and rounded to nearest 1,000 where possible

GHG Emissions by Sector	1990	2005
Residential	735,000	612,000
Electricity*	133,000	74,000
Direct Fuel Use*		
Natural Gas	259,000	370,000
Oil	323,000	152,000
Diesel	50	60
Gasoline	20,000	16,000
LPG	4	4
Commercial	875,000	816,000
Electricity*	169,000	113,000
Direct Fuel Use (other than Steam)*		
Natural Gas	281,000	350,000
Oil	139,000	56,000
Diesel	29,000	35,000
Gasoline	90,000	84,000
LPG	3,000	4,000
CNG	12,000	13,000
Steam plants*	152,000	161,000
Industrial	1,543,000	1,319,000
Electricity*	62,000	29,000
Direct Fuel Use*		
Natural Gas	265,000	245,000
Oil	48,000	20,000
Diesel	112,000	129,000
Gasoline	6,000	4,000
LPG	20,000	26,000
CNG	11,000	13,000
Process emissions*	11,800	8,000
Cement**	1,007,000	845,000
Transportation	3,948,000	4,062,000
Road Transportation*		
Diesel		
Truck	1,063,000	1,079,000
Bus	47,000	53,000
Gasoline		
Car & Light Duty Truck	1,329,000	1,433,000
Van	500	500
Marine Transportation*		
Pleasure Craft, diesel	800	1,000
Pleasure Craft, gasoline	5,000	5,000
Washington State Ferries	41,000	41,000
Other Ship & Boat Traffic	125,000	137,000
Cruise Ships	46,000	51,000
Rail Transportation*	60,000	65,000
SeaTac Air Travel*	1,046,000	1,067,000
King Co. Airport*	184,000	129,000
Other	177,000	97,000
Wastewater Treatment*	3,000	3,000
Closed Landfills*	174,000	93,600
Subtotal (rounded)	7,278,000	6,906,000
Reductions from Seattle City Light Offsets*		-216,000
Total Emissions after Actions/Offsets	7,278,000	6,690,000

The data for this table comes from the 2005 Inventory of Seattle Greenhouse Gas Emissions: Community and Corporate, which is available at www.seattle.gov/climate. The 2005 inventory is organized around scopes of emissions--direct, indirect and other--rather than sectors. Categories marked with a red asterisk are included in Scope 1. Emissions marked with green asterisk are included in Scope 2. Emissions marked with a blue asterisk are included in Scope 3 or optional information.