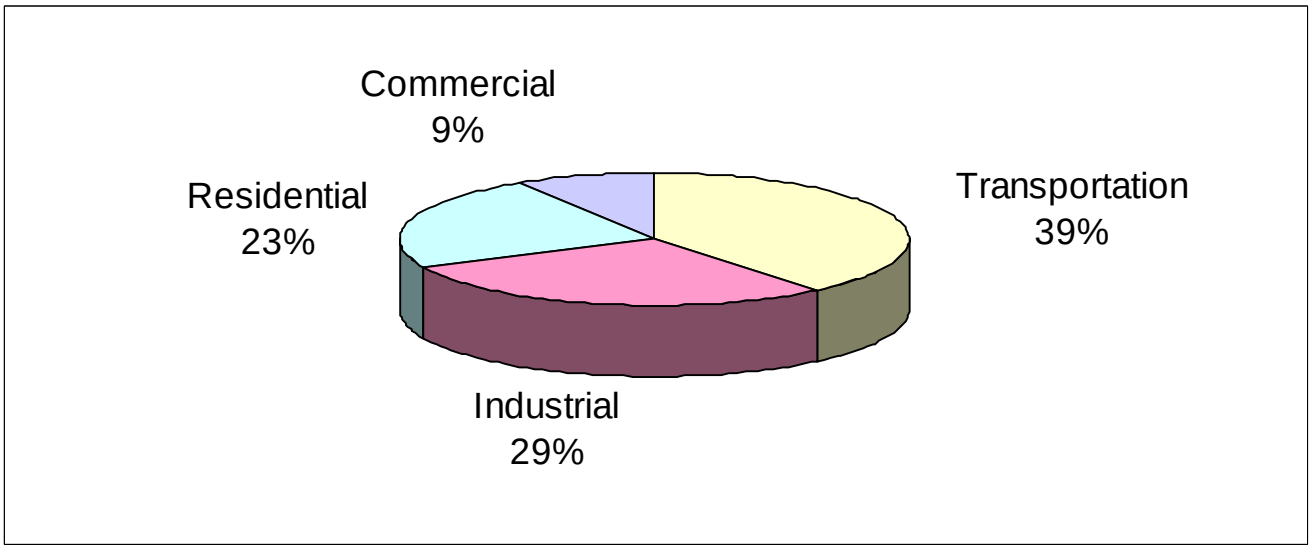

Inventory of Energy Usage and Associated Greenhouse Gas Emissions

For Jefferson County, Washington

- **Community-Wide Activities**
- **Jefferson County Government Operations**
- **Port Townsend City Government Operations**

In Base Year 2005

Recommended by Climate Action Committee, July 30, 2008, for Adoption by Board of County Commissioners and City Council

Acknowledgements

This emissions inventory was authorized by a **Joint Resolution** of the Jefferson County Board of County Commissioners (County Resolution No. 44-07 of May 29, 2007) and Port Townsend City Council (City Resolution No. 07-022 of July 9, 2007) in which they committed to:

> "Collaborating with the Climate Protection Campaign volunteers in conducting a comprehensive baseline inventory of local energy uses that contribute to greenhouse gas emissions, especially CO_2, and making estimates of current emissions and forecasts of future emissions if current practices do not change"

The data for the emissions inventory were compiled by the **Climate Protection Task Force**:
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The emissions inventory was performed with guidance from **ICLEI** – Local Governments for Sustainability (www.iclei-usa.org). Membership in this organization provided Jefferson County and the City of Port Townsend with access to ICLEI's Clean Air and Climate Protection Software, as well as helpful technical support from Amy Shatzkin and Alex Ramel of the ICLEI Pacific Northwest Regional Capacity Center (hosted by City of Seattle, WA): amy.shatzkin@iclei.org, 206-615-1696.

This report on the emissions inventory was prepared using an ICLEI template and compiled by Joanna Loehr, joannal@olympus.net, 360-385-6579.

The Climate Protection Task Force thanks the elected officials and staffs of the Jefferson County and City of Port Townsend governments for providing the opportunity to perform this inventory and for assisting in data collection. We are particularly grateful to Cathy Taylor, Renee Talley, Ann Knox, Terry Logue, Michelle Ham, and Al Cairns of Jefferson County government; Catherine McNabb and Tom Miller of the City of Port Townsend government; and Kristin Marshall of the Port Townsend Paper Corporation for their extensive efforts and helpful advice.

An electronic copy of this report is available at:
www.co.jefferson.wa.us/commdevelopment/climatechange.htm.

Inventory of Energy Usage and Greenhouse Gas Emissions
for Base Year 2005 in
Jefferson County and City of Port Townsend

Table of Contents **Page**

I. *Executive Summary*

This inventory of energy usage and greenhouse gas (GHG) emissions was performed by the Climate Protection Task Force, under the joint authorization of the Jefferson County Board of County Commissioners and the Port Townsend City Council. In the base year of 2005, Jefferson County had an estimated population of 27,600 that included 8,745 within the City of Port Townsend.[1]

Data on energy usage in base year 2005 was collected for the Jefferson County community as a whole and for the County and City government operations as subsets of the whole. Energy use and emissions were grouped into 3 different Sectors: Stationary (buildings and equipment), Transportation (on-road mobile sources), and Solid Waste. The Clean Air and Climate Protection (CACP) software provided by ICLEI-Local Governments for Sustainability converted the energy-usage data into units of MMBtu and calculated CO_2e (equivalents of CO_2 released) in tons (one ton equals 2,000 pounds).

The ***Transportation Sector*** is the greatest single contributor of GHG emissions for the entire community, accounting for 39% of the CO_2e generated in Jefferson County (Table 1, Figure 1). This calculation is based on vehicle miles traveled (VMT) information provided by the Washington State Department of Transportation. The VMT for Jefferson County in 2005 were 1.3 times greater than the Washington State average. This helps explain why the total CO_2e emissions of 19.4 tons per capita in Jefferson County were 1.2 times greater than the value for the entire state. The majority of vehicles in both cases (61% or more) are in the category of private transportation.

The ***Stationary Energy Sector*** accounts for 61% of total GHG emissions for the entire community (Table 1, Figure 1). Energy sources in this sector include the electricity, propane, fuel oil, and wood used to provide heat and power for the operation of buildings and stationary equipment. The stationary energy sector was analyzed in 3 Subsectors: Residential, Commercial and Industrial.

The ***Residential Subsector*** represents 23% of the total GHG emissions for the entire community. Electricity, for power, light, and heat, is responsible for the majority (86%) of emissions being derived from this subsector. The electricity provided by Puget Sound Energy releases 0.155 tons of CO_2 per MMBtu of energy consumed, compared to 0.07-0.09 tons of CO_2 released per MMBtu of energy consumed for fossil fuels. The wood heating used by almost 20% of Jefferson County residents is by a United Nations' international convention considered a biogenic, climate-neutral source of energy since the CO_2 released had been sequestered earlier from the environment. Thus, wood is not included as a direct CO_2 source in the software program used for this inventory.

The ***Commercial Subsector*** represents 9% of the total GHG emissions for the entire community. It includes County and City government operations as typical examples of commercial operations for which detailed data sets are available. According to ICLEI, local government emissions typically fall between 2 and 5 percent of overall community emissions. In the case of Jefferson County and the City of Port Townsend, government operations are considerably smaller, together accounting for 0.9% of the total CO_2e emissions from the community and 6% of the commercial subsector. Knowledge of detailed emissions allows municipal governments to take a leadership role in reducing emissions from the entire community.

[1] Washington State Office of Financial Management, www.ofm.wa.gov/forecasting/default.asp .

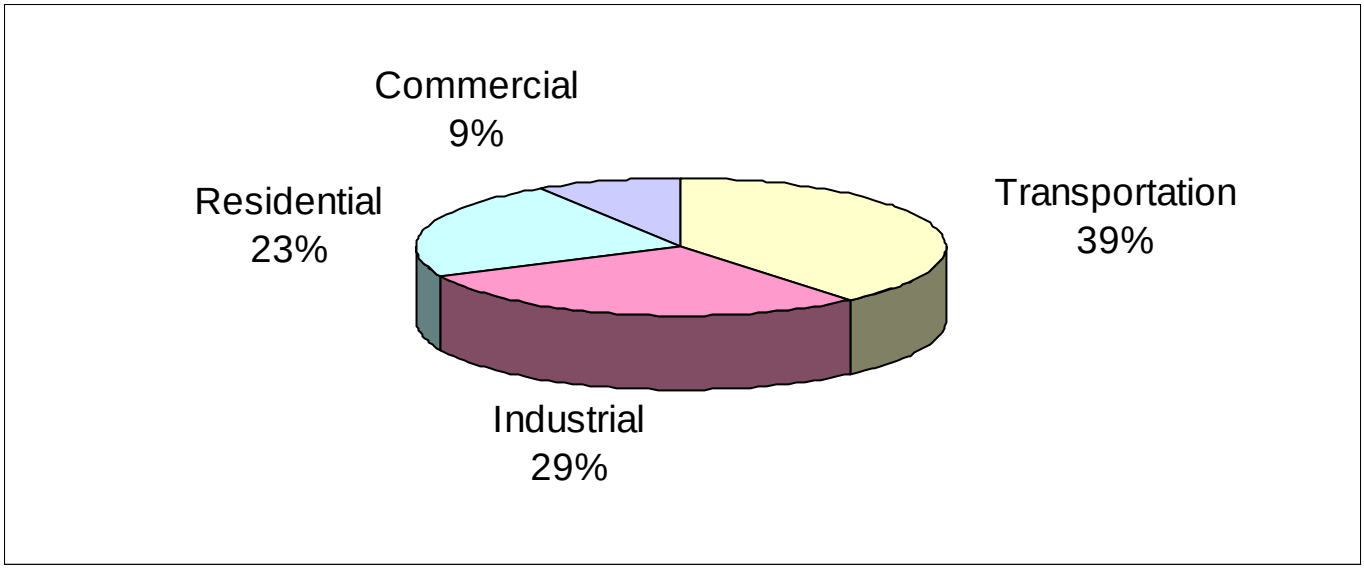
The ***Industrial Subsector*** represents 29% of the total GHG emissions for the entire community. As the largest industry in Jefferson County, the Port Townsend Paper Corporation accounts for 99% of CO_2e emissions from this subsector. The wood fuel which makes up 75% of their stationary energy use is considered climate-neutral within the CACP software and, thus, was not included as a direct source of CO_2 emissions. The large impact of PTPC is typical of the carbon cost of manufactured goods (e.g., automobiles, appliances, paper). The embedded energy in goods is only counted where the goods are produced, not where they are consumed.

Table 1. ***Community-Wide and Government Subset Emissions in 2005***

Sector or Subsector	Community-Wide[a] (tons CO_2e)	Community-Wide[a] (% CO_2e)		Jefferson County Operations (tons CO_2e)	Port Townsend City Operations (tons CO_2e)
Stationary Energy	**325,133**	**61%**		**1,443**	**1,609**
Residential	121,605	23%			
Commercial	49,017	9%		1,443	1,609
Industrial	154,511	29%			
Transportation	**209,079**	**39%**		**1,886**	**533**
Solid Waste	**2,502**	**<1%**		**35**	
Total	**536,714**	**100%**		**3,728**	**2,142**

[a] Community-wide includes County and City operations. [2] Data obtained from CACP Model output.

Figure 1. ***Community-Wide CO_2 Emissions in 2005***



Emissions are for Transportation Sector and for Residential, Commercial and Industrial Subsectors of the Stationary Energy Sector. Emissions from the Solid Waste Sector were too small to include. Data obtained from CACP Model output.

The ***Solid Waste Sector*** accounts for less than 1% of the CO_2e generated in the community (Table 1). This is because the CO_2 produced in the Roosevelt Landfill is considered biogenic and the methane produced is largely recovered as an electricity-generating feedstock. Nevertheless, solid waste materials have a far larger embedded energy whose CO_2e contribution gets attributed at the point of manufacture, not at the point of consumption or disposal.

For both ***City and County governments***, employee commuting accounts for an average of 1.9 tons of CO_2e per employee and 37% of the CO_2e generated by their transportation activities. This is likely to be typical of commercial entities. Transportation contributes over 50% of the total GHG emissions for the County government because this category includes heavy equipment for building and maintaining roads. Transportation contributes only 25% of the total GHG emissions for the City government because the City total includes contributions from treatment plants for water and sewage that represent 38% of its overall GHG emissions.

Energy Intensities for different City and County buildings were compared by calculating the energy usage (in kWh) per square foot of building per year. The median value for commercial office buildings in the Seattle area is 15 kWh per sq.ft. per year. The buildings with the lowest energy intensities in the current inventory were the City Hall Annex with a value of 11 and the County Courthouse with a value of 12. The buildings with the highest energy intensities were the County-operated Corrections Center with a value of 42 and the City-operated swimming pool with a value of 151. Energy intensity is a more specific measurement than energy efficiency, which also takes into account type of use, hours of operation, and number of people served.

Limitations of this Inventory

For a number of sources, energy use was not included in this report because they are better considered on a statewide basis and have been quantified in the Washington State Climate Action Team Greenhouse Gas Inventory. The omitted sources and their contributions to gross CO_2e emissions within Washington State in 2005 are: forestry (-29%, net sequestration), agriculture (6%, including methane from livestock), fuel for marine vessels (3%), and air travel (8%).

Conclusion

This inventory serves as a foundation for understanding our local use of energy and sources of greenhouse gas emissions. It offers a baseline from which to estimate historic 1990 levels and to make projections into the future. It will help establish targets for reduction of emissions and set priorities for taking action to reach our long-term goal of reducing our GHG emissions to levels 80% lower than 1990 levels by the year 2050. Finally, it is hoped that this inventory will motivate individuals and businesses throughout the community to evaluate their own personal energy use and emissions so that as a community we can work together to address the challenges and opportunities raised by climate change/global warming.

II. Emissions Inventory

A. Reasoning, Methodology and Model

ICLEI's Cities for Climate Protection methodology allows local governments to systematically estimate and track greenhouse gas (GHG) emissions from energy and waste related activities at the community-wide scale and those resulting directly from municipal operations. The municipal operations inventory is a subset of the community-scale inventory.

Once completed, these inventories provide the basis for creating an emissions forecast and reduction target, and enable the quantification of emissions reductions associated with proposed strategies as well as with implemented measures.

1. CACP Software and Inventory Method

To facilitate local government efforts to identify and reduce GHG emissions, ICLEI developed the Clean Air and Climate Protection (CACP) Software package with Torrie Smith Associates. The CACP software has been and continues to be used by over 350 U.S. cities and counties to reduce their GHG emissions. Although the software provides a sophisticated and useful tool, calculating emissions with precision is difficult. The model depends upon numerous assumptions, and it is limited by the quantity and quality of available data (e.g., Appendix, pages W23-24). With this in mind, it is useful to think of any specific number generated by the model as an approximation rather than an exact value.

This software estimates emissions derived from energy consumption and waste generation within a community (Table A2). The CACP software determines emissions using specific factors (or coefficients) according to the type of fuel used. Emissions are aggregated and reported in terms of equivalent carbon dioxide units, or CO_2e. Units are in tons of CO_2e (based on 1 ton = 2,000 pounds). Converting all emissions to equivalent carbon dioxide units allows for the consideration of different GHG in comparable terms. For example, methane is twenty-one times more powerful than carbon dioxide in its capacity to trap heat, so the model converts one ton of methane emissions to 21 tons of CO_2e.

The emissions coefficients and methodology employed by the software are consistent with national and international inventory standards established by the Intergovernmental Panel on Climate Change (1996 Revised IPCC Guidelines for the Preparation of National Inventories) and the U.S. Voluntary GHG Reporting Guidelines (EIA form 1605).

The inventory is composed of three **categories**, which are analyzed independently:
(1) **community-wide emissions for all sources within Jefferson County limits**
(2) **government operations emissions for Jefferson County**
(3) **government operations emissions for the City of Port Townsend**

It is important to be clear that the three categories are not cumulative. The community-wide inventory is the total, and the two municipal government inventories are specific subsets of that total. The government operations inventories include only those sources that are under the operational control or financial purview of the Jefferson County and Port Townsend municipal organizations, respectively. An inventory for the Port Townsend Paper Corporation (PTPC) was also included as a subset of community-wide emissions because it represents the single largest industrial source of GHG emissions in Jefferson County.

The **2005 calendar year** was chosen as the baseline year for both community and municipal operations inventories, as that was the earliest year for which complete, computerized data were available.

The community and municipal categories are explored independently for several reasons. The community-wide inventory explores sectors (residential, commercial, industrial, etc.), while a much finer resolution is possible in the municipal operations portion of the inventory (energy use by facility, etc.). Additionally, when attention is turned to the question of where emissions reductions are possible, there will be a different set of options for municipal facilities than for private sector emissions. For example, a county might opt to implement a procurement policy requiring that certain vehicles in the county fleet be replaced by hybrid vehicles, whereas in the private sector an education program about hybrids or an incentive program would be appropriate.

Each of these categories is further broken down by sources and sectors. **Sources** are the fuel or energy that is the basis of the emissions. In this inventory, the main sources considered are electricity, propane, fuel oil, diesel, gasoline, wood, and waste. **Sectors** are the portion of the community or government operations to which the emissions are attributable. They include stationary energy, transportation, solid waste, and water/sewage.

2. Data Sources and Inventory Process

The creation of an emissions inventory required the collection of information from a variety of sectors and data sources. The Appendix gives a complete listing of all data sources and data collected for this inventory. For the community-wide inventory, the main sources of data were Puget Sound Energy (PSE) for electricity; U.S. Census data for usage of propane, fuel oil, and wood; Washington State Department of Transportation for total vehicle miles traveled; and the Jefferson County Solid Waste Program for waste generated. For the municipal inventories, the primary data sources were PSE for electricity and municipal accounting records for propane, fuel oil, vehicle fuel usage, water/sewer usage, and waste generated. For the PTPC, energy usage data were provided by Kristin Marshall, Environmental Manager, based on PTPC records and electricity data obtained from Clallam County P.U.D. for their contract with the Bonneville Power Administration (BPA).

It should be noted that when calculating the community emissions inventory, all energy *consumed* in Jefferson County was included. This means that, even though the electricity used by residents and businesses is produced elsewhere, this energy and its associated emissions appear in the inventory. The decision to calculate emissions in this manner reflects the general philosophy that a community should take full ownership of the impacts associated with its energy consumption, regardless of whether the generation occurs within the geographical limits of the community. For the same reason, all waste generated in Jefferson County was included, even though it is deposited in the Roosevelt Landfill in Klickitat County, Washington.

Although most of the electricity produced in Washington State is hydroelectric, only 45% of the electricity consumed in Washington State is hydroelectric. The other 55% comes via the Western Electricity Coordinating Council (WECC) which covers a vast, interconnected region that includes all or portions of 14 western states (and all of Washington). The WECC emissions factor for Washington is 1.06 pounds of CO_2 per kWh consumed. The CACP software uses this WECC emissions factor for PSE customers, as does the 2008 Climate Advisory Team analysis for all of Washington State.[2] However, a much lower emissions factor of 0.114 pounds of CO_2 per kWh was used for the electricity (primarily hydroelectric) provided directly by the BPA in their contract with PTPC.[3]

[2] *Leading the Way on Climate Change: The Challenge of Our Time*, report of the Washington State Climate Advisory Team, February, 2008 (www.ecy.wa.gov/pubs/0801008b.pdf)
[3] Emissions factor provided by Ottie Nabors, Energy Efficiency Specialist, BPA, onabors@bpa.gov.

The waste sector requires additional explanation. When organic matter like food scraps, paper, yard waste, and wood decomposes deep in a landfill, anaerobic digestion by microorganisms creates methane (CH_4) which traps twenty-one times as much heat as CO_2. At Klickitat County's Roosevelt Landfill, the 85-90% of methane that is collected (75% of which is used as a fuel to generate electricity, 25% is flared) does not contribute to CO_2e emissions. Although the carbon sequestered in a landfill is considered as an offset to emissions, the Task Force chose not to use that offset, since the goal is to reduce waste. This study also analyzed the costs of collecting, transporting, and burying solid waste.

Inventory data were collected by Climate Protection Task Force volunteers as follows: Community-wide sources for buildings (William Wise), transportation and solid waste (Marion Huxtable); Jefferson County Operations (Joanna Loehr and Thomas Loehr); Port Townsend City Operations (Deborah Stinson and Kees Kolff, from data provided by Catherine McNabb, Public Works administrator); and coordination of data collection (Joanna Loehr).

For a number of sources, energy use was not included in this report because they are better considered on a statewide basis and have been quantified in the Washington State Climate Action Team Greenhouse Gas Inventory. The omitted sources and their contributions to gross CO_2e emissions within Washington State in 2005 (Table A1, Appendix) are: forestry (-29%, net sequestration), agriculture (6%, including methane from livestock), fuel for marine vessels (3%), and air travel (8%).

B. Inventory Results for Base Year 2005

1. Community-Wide Emissions Inventory

In the base year 2005, the entire Jefferson County Community emitted 537,000 tons of CO_2e (Table 2). Figure 1 (in the Executive Summary) and Table 2 below show the distribution of these emissions by sector and subsector. Dividing 537,000 tons of CO_2e by the 27,600 population[1] of Jefferson County yields 19.4 tons CO_2e per capita. The Jefferson County value is 1.2 times greater than the Washington State value of 16.4 tons CO2e per capita in 2005 (using CO2e from Table A1 and a population estimate[1] of 6,370,000). For comparison, worldwide 2004 emissions in tons of CO_2 per capita were 22 for the United States and Canada; 11-12 for Germany, Great Britain and Russia; 6-8 for Sweden, France, and Spain; and 0-6 for South America, Africa, and Asia.[4]

Table 2. ***Community-Wide Summary - 2005***

Sector or Subsector	CO_2e (tons)	CO_2e (%)	CO_2e from Electricity in tons		Energy Usage (MMBtu)
Stationary Energy	**325,133**	**61%**	**155,482**		**9,775030**
Residential	121,605	23%	104,215		1,074,017
Commercial	49,017	9%	43,478		356,470
Industrial	154,511	29%	7,789		8,344,543
Transportation	**209,079**	**39%**	**<0.01**		**2,437,102**
Solid Waste	**2,502**	**<1%**			
Total	**536,714**	**100%**	**155,482**		**12,212,132**

Source: CACP Model output

[4]U.S. Department of Energy, Carbon Dioxide Information Analysis Center.

Stationary Energy Sector Emissions, Community-Wide

Stationary sources refer to emissions generated from fixed places or objects, such as buildings and machinery. Stationary emissions include electricity, fuel oil, propane, and wood used in the Residential, Commercial, and Industrial Sectors. All values for energy usage and GHG emissions are approximate. The values for electricity are the most reliable as they are derived from the electrical utilities. Residential usage of fuel oil, propane, and wood were extrapolated from U.S. Census data and usage patterns in other communities (page W23). Commercial fuel usage was estimated as a percentage of electricity usage. Industrial fuel usage for PTPC was obtained from the corporation and non-PTPC was estimated as a percentage of electricity usage.

Stationary Sector emissions account for 61% of total GHG emissions community-wide, with approximately one-half coming from electricity usage (Table 2). Electricity is responsible for 86% of the CO_2e emissions in the ***Residential Subsector*** and 89% in the ***Commercial Subsector***. We were not able to determine gallons of diesel fuel used for heavy construction equipment, but we estimate that this equipment generates less than 2% of the CO_2e emissions for the Commercial Subsector. It is of interest to compare different fuel sources in terms of the amount of CO_2 generated per unit of energy consumed (Table 3). **Electricity** purchased from PSE generates 0.155 tons of CO_2e per MMBtu consumed. In contrast, propane and fuel oil generate 0.073 and 0.083 tons CO_2e per MMBtu consumed, respectively. In base year 2005, the costs per MMBtu were of $23.90 for electricity, $16.90 for propane and $16.10 for fuel oil.

Table 3. ***Relative CO_2e Emissions of Different Energy Sources - 2005***

Energy Source (1000 units)	Energy[a] (MMBtu)		CO_2e[a] (tons)	Tons CO_2e per MMBtu
Electricity (kWh)[b]	3.41		0.53	0.155
Propane (gal)	93.3		6.8	0.073
Fuel Oil, Lt. (gal)	140		11.6	0.083
Gasoline (gal)	126		10.7	0.085
Diesel (gal)	122		10.6	0.087

[a]Per 1000 units of energy source. [b]Based on WECC emissions factor of 1.06 lbs CO_2/ kWh. [c]Data from CACP Model output.

The CACP software ignores CO_2 emissions from the burning of **wood** because, by international convention, CO_2 from wood is considered biogenic (i.e., part of the natural cycle and not new to the cycle). In this analysis, the only CO_2e associated with wood as an energy source is from the CH_4 and N_2O that are created when wood is burned. The Washington State greenhouse gas inventory is based on the same calculation (Table A1). An estimated 8,461 cords of wood were used by the Residential sector of Jefferson County (almost 20% of households in 2005, page W23). Including the 1.42 tons CO_2 that are released per cord of wood burned[5] would increase the residential CO_2e by 12,015 tons and decrease the electricity contribution to 78% of the CO_2e from the Residential Sector.

The **Port Townsend Paper Corporation** accounts for 29% of total CO_2e emissions and for over 99% of ***Industrial Subsector*** emissions for Jefferson County (Tables 2, 4). In the base year 2005, PTPC emitted 153,496 tons of CO_2e, (Table 4). The major energy source for PTPC in 2005 was wood from hog fuel (chips) and pulping liquor, accounting for 6,243,446 MMBtu or 75% of the total energy used. Due to the convention of considering burning of biomass biogenic in nature, the 472,418 tons of dry

[5] (1.035 lbs CO_2 per lb wood) x (2,737 lbs wood per cord of Douglas fir) divided by (2,000 lbs per ton of CO_2) = 1.42 tons CO_2 per cord of wood. Data are from www.l2020.org/uploads/File/docs/energy/Carbonftprint.xls and www.consumerenergycenter.org/home/heating_cooling/firewood.html.

wood used as an energy source (Table A4) is considered to have released only 4% as much CO_2e (from CH_4 and N_2O) as was released from all the other fuels. Including the 1.035 tons of CO_2 released per ton of wood burned[5] would increase the PTPC CO_2e value by 488,952 tons.

Reprocessed fuel oil (RFO) was the second most utilized energy source by PTPC in 2005, accounting for 19% of the total energy (MMBtu) used by PTPC and 95% of the fuel oil usage by the entire community (Table 4). RFO is produced by processing used oil to remove contaminants and then blending the used oil with other feed stocks to achieve the desired fuel specifications. A PTPC hydro-turbine, driven by the Port Townsend water supply, produced 2,500,000 kWh of electricity in 2005 that was sold to PSE. The CO_2e saved by this electricity production has been subtracted from the CO_2e produced for the electricity purchased by PTPC from the Bonneville Power Administration (Table A3).

Table 4. ***Community and Port Townsend Paper Corporation Emissions in 2005***

Sectors and Sources	Community CO_2e (tons)		PTPC CO_2e (tons)[a]	PTPC CO_2e (% Community-wide Source)[b]	PTPC Energy (MMBtu)
Energy/Stationary	**325,133**		**153,496**	47%	**8,337,164**
Fuel Oil (reprocessed)	147,121		139,275	95%	1,596,913
Wood (chips, pulp liquor)	8,108		6,353	78%	6,243,446
Electricity	155,482		6,889	4%	483,276
Propane	14,421		979	7%	13,529
Transportation	**209,079**		**3,620**	2%	**41,733**
Total	**536,714**		**157,116**	29%	**8,978,897**

[a] Data from CACP model output except for electricity (calculations inTable A3) and wood (Table A4).
[b] CO_2e from a PTPC energy source relative to same energy source for whole Community.

Transportation Sector Emissions, Community-Wide

Only on-road mobile sources are included in this report. The community-wide transportation calculation is based on vehicle miles traveled (VMT) in Jefferson County, obtained from surveys by the Washington State Department of Transportation (WSDOT). The transportation sector is the largest emitter of GHG, representing 39% of community-wide emissions (Figure 1). This contribution for Jefferson County is slightly larger to the 33% transportation contribution for Whatcom County[6] and the 32% on-road-vehicles contribution for all of Washington State (Table A1).

It is of interest that the Jefferson County population, which represents 0.44% of the state's population, was responsible for 0.57% of the state's annual VMT in 2005, as expected for a rural county. The greater transportation contribution from rural populations is evident in **CO_2e per capita** which is 7.6 for on-road transportation in Jefferson County (Table 2) compared to 4.8 for Seattle-Tacoma-Bellevue.[7] The CACP software used the following vehicle composition (based on national average) for apportioning VMT in 2005: 34% light trucks, vans, and SUVs; 33% compact autos, 19% mid-sized autos; 9% full-sized autos; 5% heavy trucks; 0.4% motorcycles; and 0.2% transit.

Solid Waste Sector Emissions, Community-Wide

The calculation of CO_2e emissions from solid waste in the CACP software is based *only* on the amount of waste buried in a managed landfill and then *only* on the amount of methane which is not trapped by the landfill. All solid waste from Jefferson County goes to the Roosevelt Landfill in Klickitat County,

[6] Whatcom County *Climate Protection and Energy Conservation Action Plan*, December, 2006. (Refs are jumbled!)
[7] *Shrinking the Carbon Footprint of Metropolitan America* (Washington:Brookings Institution, 2008), www.brookings,edu/reports/2008/05_carbon_footprint-sarzynski.aspx. Per capita carbon emissions from transportation in 2005 was multiplied by 3.67 to converted C to CO_2 and by 1.1 to convert metric tons to short tons.

WA, which has a methane recovery rate of 85-90% (85% in this analysis). In 2005, the 20,800 tons of solid waste generated by the Jefferson County community resulted in CO_2e emissions of 2,502 tons (Table 5), all arising from the residual 15% of un-recovered methane. No credit was taken for carbon sequestered in the landfill. The formerly used and now-closed Jefferson County Landfill has a low level of continuing methane release that is flared to convert it to CO_2. This was assumed to be an insignificant source of GHG and, thus, was not included in inventory. Inert waste from PTPC processes is buried on their own land, has no organic content and, thus, is also not a source of GHG emissions.

Waste handling and transport are not included in the CACP software emissions calculations, and are not shown in other tables and figures in this report. The absolute amounts are relatively small but they add significantly to the CO_2e emissions associated with solid waste. Accounting for these activities adds an additional 955 tons of CO2e,, for a total CO_2e of 3,457 tons in 2005 (Table 5),. Solid waste is first delivered to the Jefferson County Transfer Station, about half by commercial haulers and half by self-delivery. The commercial haulers produce 30% less CO_2e per ton of waste than do the individual deliveries. The waste is then transported 90 miles to Tacoma via truck and from there 270 miles to the Roosevelt Landfill via rail. Despite the 3 times greater distance, **rail uses only half as much fuel** and the CO_2e per ton of waste is cut by a factor two.

Even with handling and transport included, the 3,457 tons of CO_2e from solid waste (Table 5) represents only 0.6% of the 549,058 tons of CO_2e community-wide emissions in 2005 (Table 1). Since the CACP inventory process does not include the embedded energy in consumable goods, it does not reflect any of the costs or CO2 emissions caused by generating the materials that become solid waste. These costs are included at the site of production. In Jefferson County, the best example is material produced by the PTPC and shipped elsewhere for use and eventual disposal.

Table 5. ***Community Solid Waste Emissions - 2005***

Location	Solid Waste (tons)	Electricity (kWh)	CO_2e (tons)	Tons CO_2e per Ton of Waste
Roosevelt Landfill[a]	**20,800**		**2,502**	
Commercial collection[b]	10,997		**183**	0.017
Self-delivery to Transfer Sta.[b]	9,803		**239**	0.024
Truck to Tacoma[2] (20,800 tons)			**295**	0.014
Rail to Landfill[2] (20,800 tons)			**143**	0.007
County Transfer Station[c]		60,440	**29**	
City Biosolids Composting[c]		124,350	**66**	
Total			**3,457**	

[a] From CACP Model output.[b]Emissions related to waste transport from page W25. [c]Buildings and equipment for handling waste from pages W27 and W36.

Recycling, primarily of yard debris and paper products, yielded 10,297 tons of material in 2005 (Table 6). This amount represents 33% of the total waste and about 1,200 tons of CO_2e not being released at the landfill. Recycled paper products also generate less CO_2 from transport than does paper solid waste since 844 tons of cardboard goes directly to PTPC, 274 tons of news print goes to Port Angeles, and 1,565 tons of mixed paper goes to Kent, WA (page W26). The 2,683 tons of paper products recovered by recycling represent 40% of total waste paper. Note that paper has the greatest potential for methane production (Table 6). Handling of yard waste has been extremely effective as 92% of yard waste collected is recycled. Plant debris represents only 3% of the solid waste taken to the landfill. The 28%

of waste in the wood and textiles category includes construction and renovation debris. The 34% in the "other" category includes and plastics, metal, appliances, and electronic waste.

Table 6. ***Community Solid Waste Composition - 2005***

Material	Solid Waste Composition[a]	Relative Methane Production[b]	Solid Waste (tons)		Recycled Waste[c] (tons)
Paper products	20%	2.14	4,160		2,683
Food waste	15%	1.20	3,120		
Plant debris	3%	0.69	624		6,979
Wood/textiles	28%	0.61	5,824		
Other	34%	0	7,072		635
Total	100%		**20,800**		**10,297**

[a]From page W25. [b]Emissions factor in CACP software for managed landfill. [c]From page W26.

2. Jefferson County Government - Emissions Inventory

In the base year of 2005, Jefferson County's municipal operations generated 3,728 tons of CO_2e. Stationary emissions from buildings make up the largest proportion of CO_2e emissions in the County operations, followed by fleet vehicles (Table 7 and Figure 2). If you combine employee commute data with fleet vehicle use, then 50% of the CO_2e emissions are due to transportation. When road maintenance and repair shops are also included, the transportation category far exceeds that from other sources.

Stationary Energy Sector Emissions, County Government

Stationary emissions were calculated from energy use by all buildings owned and operated by Jefferson County, as well as energy used by the County streetlights. Buildings include Corrections

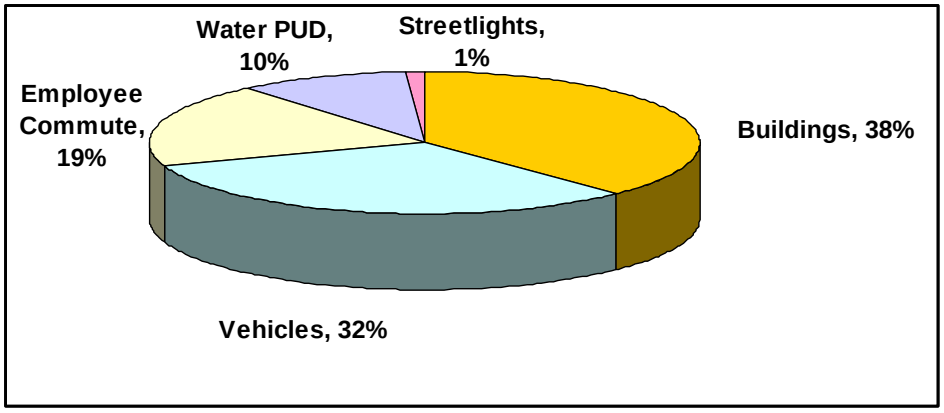
Table 7. ***Jefferson County Operations - Summary for 2005***

Sector or Subsector	CO_2e (tons)	CO_2e (%)	Energy (MMBtu)	Cost ($)
Buildings	**1,422**	**38%**	**10,616**	**$227,435**
Corrections	349	9%	2,249	$49,078
Shops	240	6%	2,017	$40,416
Courthouse	194	5%	1,638	$32,615
Community Centers	279	7%	2,168	$45,586
Castle Hill Offices	185	5%	1,337	$30,681
Sheriff Offices	93	2%	632	$14,244
Parks	31	1%	202	$6,596
Streetlights	**21**	**<1%**	**134**	**$3,221**
Vehicle Fleet	**1,186**	**32%**	**13,816**	**$257,264**
Roads – Heavy Equip.	577	15%	6,700	$126,552
Roads – Light Equip.	153	4%	1,770	$33,360
Sheriff Patrol	260	7%	2,046	$55,277
Employee Commute	**700**	**19%**	**7,930**	
Solid Waste	**35**	**<1%**		**$35,280**
[Water, PUD #1][b]	**364**	**10%**	**2,346**	**[$52,735]**
Total	**3,728**	**100%**	**34,841**	**$523,200**

[a]Source: CACP Model output. [b]Public Utility District not included in total costs, but is included in total CO_2 emissions (from electricity, only) because it covers water service to County residents.

Center, Courthouse, Sheriff Patrol offices Courthouse, Castle Hill offices, Community Centers, as well as buildings for parks and shops. According to the CACP output, the vast majority of the CO_2 emissions from these facilities comes from electricity (87%), with lesser amounts from fuel oil (9%) and propane (4%).

Figure 2. ***Jefferson County Operations – CO_2e Emissions in 2005***



Source: CACP Model output

Energy intensity in buildings is typically reported as energy use per square foot per year (in kWh/sf-yr). Energy (in MMBtu) from sources other than electricity is converted to kWh and divided by building square feet (Table 8). The median value for commercial office buildings in the Seattle area in 2007 was 15 kWh/sf-yr.[8]

The Jefferson County Castle Hill office building that houses the Department of Public Works used 16.9 kWh/sf in 2007, which is close to the median value. The historic Courthouse showed particularly good energy efficiency with a value of 12.0 kWh/sf-yr (Table 8). This compares favorably with a study of Seattle's South Downtown Historic District (158 buildings, 79% of which are 90 or more years of age), with the office buildings in the historic district exhibiting an average energy intensity of 15.6 kWh/sf-yr.[8] The surprisingly low energy intensity of the historic buildings was ascribed to:

- Low occupancy rates for some buildings
- High thermal mass of older masonry buildings requires less heating
- Large window areas minimize need for electrical lighting in daylight
- Greater tolerance by occupants for variations in temperature and lighting.

The higher energy intensity of 19.0 for the Port Townsend Community Center reflects its greater use, particularly in the evenings. The Corrections Center has an even higher energy intensity of 41.8 due to its 24-hour operation. The financial cost of $3.30/sf for the Corrections Center (compared to $0.80/sf for the Courthouse) would actually be even higher if the Corrections Center didn't get a discount from PSE for its high electricity usage. According to the U.S. Energy Information Agency, the typical distribution of energy loads includes 43% for heating and cooling, 29% for lighting, and 8% for plug loads.[8] Lighting may account for a larger portion of the energy load for the Corrections Center.

[8] Jayson Antonoff, *Energy Planning for a Sustainable Neighborhood*, M.S Thesis, Aalborg University, 2007. Median value for site energy use intensity in the Seattle region determined by EnergyStar Target Finder, using the model for a typical 10,000 sf general office building with 100 occupants; http://www.energystar.gov/index.cfm?fuseaction=target_finder; (viewed April 29, 2007).

The City Hall Annex, built to Silver LEED (Leadership in Energy and Environmental Design) standard, exhibited the lowest energy intensity for an office building with 11.0 kWh/sf-yr. It uses 73% (or less) of the energy of a standard office building. The actual intensity could be even lower as the calculation assumed the Annex uses 46% of the total propane (based on square footage) which could be an overestimate. In contrast, the largest energy intensity is found for the community swimming pool with a 14-fold higher value of 150.5 kWh/sf-yr. Larger energy intensities are an indicator of lower energy efficiencies and higher CO_2e emissions per building square foot. However, energy efficiency considerations also include type of usage and number of individuals served.

Table 8. ***Energy Intensity of Buildings***

Building	Square Feet[a]	Energy Usage (kWh)[b]	kWh per square foot per year[a]
Jefferson County			
Courthouse[c] -2005	39,953	478,296	12.0
PT Comm.Ctr. - 2005	17,708	336,676	19.0
Castle Hill-PW[d] -2007	8,000	135,498	16.9
Corrections, Jail -2005	14,856	621,360	41.8
City of Port Townsend			
City Hall Annex[e] – 2006/7	13,651	150,380	11.0
Mountain View Pool	6.485	976,156	150.5

[a]Building square foot data obtained from Renee Tally (Jefferson County) and Tom Miller (City of Port Townsend). [b]Energy usage in kWh from (energy in MMBtu x 292 kWh per MMBtu). [c]Courthouse and annex area for routine custodial maintenance is 39,953 sq. ft. This does not include the unheated attic, but does include 6,726 sq. ft. of hallways and stairways. [d]Public Works Department moved into Castle Hill Complex in January, 2007. Energy usage calculated from $12,100 expenditure for electricity in 2007 divided by PSE charge of $0.0893 per kWh in 2007. [e]City Hall Annex (11,795 sq. ft.) and Public Works portion of Historic City Hall (1,856 sq. ft.) were first occupied in January, 2006. Energy usage for these two entities includes electricity (they are on the same meter) and 46% of the propane used in 2007 for heating the 25,488 sq. ft. total area of the two buildings (on the same tank).

Transportation Sector Emissions, County Government

A voluntary **Employee Commute** survey with 29% responding showed that County staff (pro-rated to 100%) commuted an average of 14 miles round trip in 2005, resulting in a total of 1,226,000 miles traveled (page W32) and the emission of 700 tons of CO_2e (Table 7). The vehicle types were: 58% cars; 28% light trucks, vans, or SUV's; 2% high-mileage compacts or hybrids; 2% motorcycles; and 3% bicycles. Other types of transportation were: 5% carpooling; 5% walking; and 2% transit. Employee commute accounts for 19% of the GHG emissions associated with Jefferson County government operation (Figure 2) and about 2.0 tons of CO_2e per County employee per year, which is similar to the value of 1.9 tons of CO_2e per City employee per year.

The **Vehicle Fleet** includes cars used by all of the departments (Sheriff patrol, Assessor, motor pool, etc.) as well as the equipment associated with road building and maintenance. These vehicles accounted for 32% of the County government CO_2e emissions in 2005 (Table 7), with over half being due to heavy equipment for road building and maintenance. Vehicles used by the fire districts were not included in this inventory. Shops for repair and maintenance of vehicles are actually an additional cost associated with transportation. The Buildings category includes 240 tons of CO_2e and $40,416 for these County shops (Table 7). Adding these items to the Vehicle Fleet and Employee Commute contributions leads to the conclusion that **transportation represents 57% of CO_2 emissions** for Jefferson County operations.

Solid Waste Sector Emissions, County Government

In the year 2005, the total waste generation by County operations was 294 tons, where the major contributors were the Corrections Center, office buildings, and parks (page W33). Solid waste generates 35 tons of CO_2e emissions which amounts to <1% of the County total (Table 7). However, it represents 7% of the County's total financial expenditures for energy.

Water Supply Sector Emissions – County Government

The ICLEI program includes the water and wastewater treatment facilities of municipal governments. In the case of Jefferson County, a sewer system is not yet in place and septic system costs are borne by individual residents and businesses. Water supplies for the entire community are provided by either private wells or the Jefferson Public Utility District #1. Although the water PUD is not part of the Jefferson County government operation, it is a public entity with significant energy costs for pumping operations. The 364 tons of CO_2e emissions (from electricity, only) associated with the PUD in 2005, represents 10% of the total for County municipal operations (Figure 2). While these emissions are included in the total GHG emissions for the County (Table 7), the $52,735 financial expenditure was not included as it is not part of the County government budget.

2. Port Townsend - City Government Emissions

In the base year of 2005, the City of Port Townsend's municipal operations generated 2,142 tons of CO_2e. Stationary emissions from potable water delivery and wastewater treatment made up 38% of CO_2e emissions in the City's operations (Table 9 and Figure 3). This is clearly a large portion because it represents a community-scale activity. Buildings were the next largest contributor with 31% of the CO_2e. The 302 tons of CO_2e generated by the swimming pool at Mountain View School accounted for

Table 8. ***Port Townsend City Operations – Summary for 2005***

Potential Sources	CO_2e (tons)	CO_2e (%)	Energy (MMBtu)	Cost ($)
Buildings	**660**	**31%**	**5,799**	**$107,907**
Swimming Pool	302	14%	3,343	$51,885
City Hall Offices	100	5%	793	$17,730
Library	92	4%	595	$14,105
Compost Facility	66	3%	424	$9,182
Public Works Shops	44	2%	281	$6,545
Police	33	2%	213	$4,589
Parks	23	1%	151	$3,872
Streetlights	**147**	**7%**	**949**	**$22,390**
Vehicle Fleet	**330**	**15%**	**3,856**	**$69,314**
Police Patrol	110	5%	1,286	$22,897
Streets – Heavy Eqpt.	51	2%	593	$11,268
Streets – Light Eqpt.	18	1%	216	$3,785
Water Distrib.– Heavy Eqpt.	29	1%	338	$6,049
Water Distrb. – Light Eqpt.	23	1%	266	$4,658
Employee Commute	**203**	**9%**	**2,282**	
Water/Sewage	**802**	**38%**	**5,177**	**$108,513**
Wastewater Treatment	723	34%	4,656	$96,525
Water Quality, Pumping	78	4%	509	$11,578
Total	**2,142**	**100%**		**$308,124**

Source: CACP Model output

about half of the GHG emissions from the Buildings sector. Streetlights contributed another 7%, bringing the stationary source category to 76%. The remaining 24% was due to transportation: 15% for vehicle fleet and 9% for employee commute.

Stationary Energy Sector Emissions, City Government

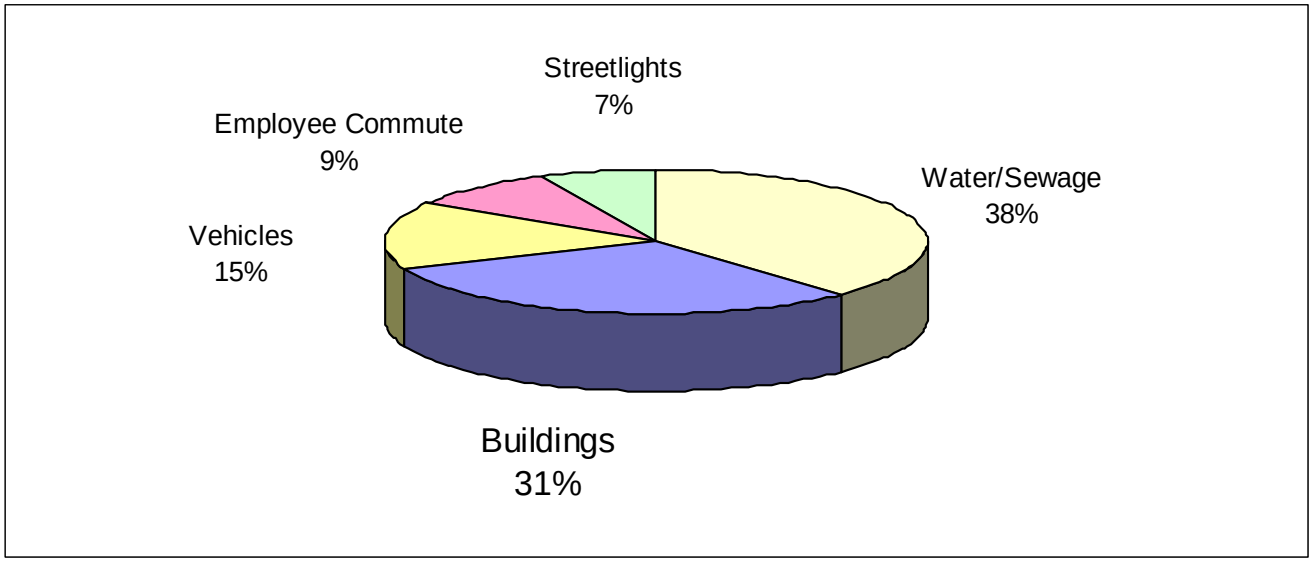
Stationary emissions were calculated from energy use by all buildings owned and operated by the City of Port Townsend, as well as energy used by the City streetlights. Buildings include City Hall offices, Library, Shops, Police offices and Parks facilities, as well as the swimming pool which the City maintains at the Mountain View School. According to the CACP output, the vast majority of the CO_2 emissions from these facilities came from electricity (84%), with lesser amounts from fuel oil (15%) and propane (1%). The newly completed City Hall Annex used 27% less energy per square foot than a standard office building (Table 9), with a comparable savings in CO_2e emissions.

Transportation Sector Emissions, City Government

A voluntary survey with 59% responding showed that City staff (pro-rated to 100%) commuted an average of 13 miles round trip in 2005, resulting in a total of 341,000 miles traveled (page W42) and the emission of 203 tons of CO_2e (Table 9). The vehicle types were: 45% cars; 42% light trucks, vans, or SUV's; 5% high-mileage compacts or hybrids; and 3% bicycles. Seven % of respondents participated in carpooling and 5% in walking but non reported transit use. Employee commute accounts for 9% of the CO_2e emissions associated with Port Townsend city government operation (Figure 3) and about 1.9 tons of CO_2e per City employee per year, which is similar to the value of 2.0 tons of CO_2e per County employee per year.

The vehicle fleet includes cars used by all of the departments (police patrol, water distribution, parks, biosolids, etc,) as well as the equipment associated with road building and maintenance. These vehicles accounted for 15% of the City government CO_2e emissions in 2005 (Table 8), with 1/3 being due to police patrol and 1/5 due to heavy equipment for road building and maintenance.

Figure 3. ***Port Townsend City Operations - CO_2e Emissions in 2005***



Source: CACP Model output

Water and Sewage-Treatment Sector Emissions, City Government

Water and wastewater treatment was the largest sector in Port Townsend city government operations in 2005, generating 38% of GHG emissions (Table 9). Although these emissions are attributed to government operations, they are due to water utilization and wastewater production by all those who use these city services.

Wastewater treatment accounted for 90% of the GHG emissions from this sector. These CO_2e emissions are from energy use for buildings and stationery equipment such as pumps and pump stations (page W43). All of the large pumps have variable frequency drives to make them more energy-efficient. The City Wastewater Treatment Facility uses an aerobic digestion process that does not generate methane. The CO_2 that is produced during waste fermentation is considered biogenic.

The City Water Treatment Plant uses a hydro-pneumatic tank on its main pump that saves energy by causing the pump to cycle less frequently. The water supply system is still functioning as it was designed in 1910. Water from the Big Quilcene River gets to Port Townsend by gravity feed, without a single pump. Upon arrival at PTPC, the pressure is still great enough to drive a hydro-turbine for generating electricity. PTPC maintains a caretaker's cottage at the Big Quilcene River source. The City maintains a caretaker's cottage at the Water Treatment Plant (page W43).

The City Vehicle Fleet includes 8 vehicles for water distribution and 2 vehicles for water quality testing, as well as 5 vehicles for wastewater treatment (page W39). These vehicles accounted for another 80 tons of CO_2e emissions in 2005 (according to the CACP software), increasing the actual impact of water and wastewater treatment to 41% of the GHG emissions for City government operations, though this is not shown in Figure 3 above.

C. Appendix: Data for Base Year 2005

Table A1. Washington Climate Advisory Team Inventory[a]

(Million Metric Tons CO_2e)	1990	2000	2005	2010	2020
Electricity, Net Consumption-based	16.9	23.3	18.9	20.2	24.9
Coal	16.8	17.4	15.2	15.9	18.4
Natural Gas	0.1	5.3	3.6	4.2	6.3
Petroleum	0.0	0.6	0.0	0.1	0.2
Biomass and Waste (CH_4 and N_2O)	0.0	0.0	0.0	0.0	0.0
Residential/Commercial/Industrial (RCI)	18.6	20.3	19.4	21.3	24.3
Coal	0.6	0.3	0.2	0.3	0.3
Natural Gas	8.6	11.4	10.3	11.0	12.7
Oil	9.1	8.4	8.5	9.7	11.0
Wood (CH_4 and N_2O)	0.2	0.2	0.3	0.4	0.4
Transportation	37.5	45.9	44.5	48.5	56.9
Onroad Gasoline	20.4	24.5	24.8	26.2	29.1
Onroad Diesel	4.1	7.6	7.5	8.8	12.0
Marine Vessels	2.6	2.9	3.0	3.3	4.1
Jet Fuel and Aviation Gasoline	9.1	10.0	7.8	8.1	8.5
Rail	0.8	0.3	0.8	0.8	0.8
Natural Gas, LPG, other	0.6	0.6	0.7	1.3	2.5
Fossil Fuel Industry	0.5	0.7	0.9	1.0	1.1
Natural Gas Industry (CH4)	0.4	0.7	0.9	0.9	1.0
Coal Mining (CH4)	0.0	0.0	0.0	0.0	0.0
Industrial Processes	7.0	6.6	3.3	4.2	6.2
Cement Manufacture (CO_2)	0.2	0.5	0.5	0.5	0.5
Aluminum Production (CO_2, PFC)	5.9	3.9	0.4	0.4	0.3
Limestone and Dolomite Use (CO_2)	0.0	0.0	0.0	0.0	0.0
Soda Ash (CO_2)	0.1	0.1	0.1	0.1	0.1
Ozone Depleting Substitutes (HFC, PFC, and SF_6)	0.0	1.6	2.1	3.0	5.1
Semiconductor Manufacturing (HFC, PFC, and SF_6)	0.0	0.1	0.0	0.0	0.0
Electric Power Transmission & Distribution (SF_6)	0.8	0.4	0.3	0.2	0.1
Waste Management	1.5	2.2	2.4	2.8	3.6
Solid Waste Management	1.0	1.5	1.8	2.0	2.7
Wastewater Management	0.5	0.6	0.7	0.8	0.9
Agriculture	6.4	6.4	5.4	5.1	4.8
Enteric Fermentation	2.0	1.8	1.6	1.5	1.3
Manure Management	0.7	0.9	0.9	1.0	1.2
Agricultural Soils	3.7	3.8	2.8	2.6	2.2
Total Gross Emissions	88.4	105.4	94.8	103.0	121.9
Increase relative to 1990		*19%*	*7%*	*17%*	*38%*
Forestry and Land Use	-28.6	-28.6	-28.6	-28.6	-28.6
Agricultural Soils	-1.4	-1.4	-1.4	-1.4	-1.4
Net Emissions (including sinks*)	58.4	75.4	64.8	73.0	91.9

[a] This table, "Table 1.Washington Historical and Reference Case GHG Emissions," was obtained from the Center for Climate Strategies, Washington Departments of Ecology and CTED. www.ecy.wa.gov/climatechange/docs/WA_GHGInventoryReferenceCaseProjections_1990-2020.pdf

Table A2. CACP Report for Community Emissions

Community Greenhouse Gas Emissions in 2005
Detailed Report, June 10, 2008

	Equiv CO_2 (tons)	Equiv CO_2 (%)	Energy (MMBtu)
Residential			
Electricity - East Jefferson County	96,945	18.2	624,191
Electricity - South Jefferson County	3,102	0.6	19,974
Electricity - West Jefferson County	4,169	0.8	26,840
Other Fuels - All Jefferson County			
Light Fuel Oil	7,846	1.5	94,917
Propane	7,788	1.5	107,602
Fuelwood (Air Dry)	1,755	0.3	200,492
Subtotal Residential	**121,605**	**22.8**	**1,074,017**
Commercial			
Electricity - East Jefferson County	42,751	8.0	275,258
Propane - East Jefferson County	5,447	1.0	75,251
Electricity - South Jefferson County	310	0.1	1,997
Propane - South Jefferson County	40	0.0	546
Electricity - West Jefferson County	417	0.1	2,684
Propane - West Jefferson County	53	0.0	734
Subtotal Commercial	**49,017**	**9.2**	**356,470**
Industrial			
East Jefferson (Non-PTPC)			
Electricity	900	0.2	5,795
Propane	115	0.0	1,584
Port Townsend Paper Corp.			
Light Fuel Oil	139,275	26.1	1,596,913
Propane	979	0.2	13,529
Electricity* (Table A3)	***6,889****		***483,276****
Fuel Wood (dry) (Table A4)	***6,353****		***6,243,446****
Subtotal Industrial	***154,511****		***8,344,543****

This report has been generated for Port Townsend & Surrounding Community, Washington using STAPPA/ALAPCO and ICLEI's Clean Air and Climate Protection Software developed by Torrie Smith Associates Inc.

***Items have been added to the CACP output from the Tables A3 and A4.**

Table A3. CO_2 Emissions from Electricity for PTPC

Source	Electricity (kWh)	Emissions Factor (lbs CO_2 per kWh)	CO_2e (tons)	Energy (MMBtu)
Power Purchased from BPA	144,100,000	0.114[a]	8,214	
Hydropower sold to PSE	2,500,000	1.06[b]	-1,325	
Net			6,889	483,276

[a]Bonneville Power Administration emissions factor obtained from Ottie Nabors, Energy Efficiency Specialist, 503-230-4002, ofnabors@bpa.gov. [b]Puget Sound Energy emissions factor for Western Electricity Coordinating Council obtained from CACP software settings.

Table A4. CO_2 Emissions from Fuel Wood for PTPC

Source	Dry Tons	MMBtu per dry ton[a]	Energy[a] (MMBtu)	Emissions Factor[a] (lbs GHG per MMBtu)		CO_2e [b] (tons)
				CH_4	N_2O	
Wood – hog fuel	112,137	16.5	1,848,018	0.027	.0.009	3,101
Pulping liquors	360,281	12.2	4,395,428	0.0055	0.0044	3,252
Net	472,418		6,243,446			6,353

[a]Data obtained from Kristin Marshall, Environmental Manager, Port Townsend Paper Corportation, 360-379-2082, kristinm2@ptpc.com . [b]Equivalents of CO_2 calculated from tons CH_4 times (21 tons CO_2e per ton of CH_4) and from tons N2O times (310 tons CO_2e per ton of N_2O).

Glossary

Base Year: The year against which future changes in emissions levels are measured.
Biogenic: Process in which the amount of CO_2 released is no greater than the amount of CO_2 sequestered.
BPA: Bonneville Power Administration.
CACP: Clean Air and Climate Protection software program used by ICLEI. Software User's Guide available at www.cacpsoftware.org.
Community: All sectors within Jefferson County.
CO_2e (Carbon Dioxide Equivalent**):** This is a common unit for combining emissions of greenhouse gases with different levels of impact on climate change. It is a measure of the impact at each gas has on climate change and is expressed in terms of the potency of carbon dioxide. For carbon dioxide itself, emissions in tons of CO_2 and tons of eCO_2 are the same, whereas for nitrous oxide and methane, stronger greenhouse gases, one ton of emissions is equal to 310 tons and 21 tons of eCO_2 respectively.
Emission Factors: A set of coefficients used to convert data provided on energy use and energy use reductions to emissions. These emission factors are the ratio of emissions of a particular pollutant (e.g., carbon dioxide) to the quantity of the fuel used (e.g., kilograms of coal). For example, when burned, 1 ton of coal = 2.071 tons of CO_2. When burned, 1 gallon of gasoline = 0.01 tons of CO_2 = 21.4 pounds of CO_2.
Greenhouse Gases: Gases that are transparent to solar (short-wave) radiation but opaque to long-wave (infrared) radiation, thus preventing long-wave radiant energy from leaving the Earth's atmosphere. The net effect is a trapping of absorbed radiation and a tendency to warm the planet's surface. The CACP Software tracks the three most common human produced greenhouse gases: carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O).
ICLEI: Organization known as Local Governments for Sustainability (www.iclei-usa.org).
kWh: KiloWatt-hour
MMBtu: Million Btu (British Thermal Unit). 1 MMBtu = 292 kWh.
PSE: Puget Sound Energy.
PTPC: Port Townsend Paper Corporation.
Sectors: For the *Community* or *Government* category, the data is organized based on the type of activity or emissions source. The sectors in each category are:
Community: Residential, Commercial, Industrial, Transportation, Waste
Government: Buildings, Vehicle Fleet, Employee Commute, Streetlights, Water/Sewage, Waste
Sequestration: Process that removes CO_2 from the atmosphere and maintains it as a form of fixed carbon.
Source: Source of energy such as electricity, fuel oil, or gasoline.
Subsector: A classification that can be used to group records within a sector. For example, the Buildings sector could be subdivided into department subsectors.
Tons: Short tons defined as 1 ton = 2,000 pounds. Tons are different from tonnes (metric tons) which are defined as 1 tonne = 2,200 pounds.
Vehicle Miles Traveled (VMT): A standard measure of vehicular traffic in a community. VMT is equivalent to a single vehicle traveling one mile (regardless of the number of passengers).
WECC: Western Electricity Coordinating Council.