Jefferson County, Washington

2018 Inventory of Greenhouse Gas Emissions

Produced By the 2018 Inventory Team for the Climate Action Committee

With Assistance from ICLEI – Local Governments for Sustainability USA

Approved by the Climate Action Committee on June 24, 2020

Acknowledgements

This emissions inventory was authorized by the City of Port Townsend and Jefferson County joint Climate Action Committee (CAC) in its February 27, 2019 meeting. (See memo in Appendix F – Authorizing Memo.) The authorization included not only completing a Community Wide inventory, but to also complete inventories of all CAC Organizations, which include the City of Port Townsend, Jefferson County, Jefferson Transit, Jefferson Healthcare, Port of Port Townsend, Jefferson PUD, and Port Townsend Paper Corporation.

The CAC partnered with the Local 20/20 Energy Action group, which recruited a set of volunteers to do the work: Bill Wise, Marion Huxtable, Karen Steinmaus, Tom Engel and Cindy Jayne (referred to below as 2018 Inventory Team). Two of the team members, Bill and Marion, were part of the 2005 inventory team (the Climate Protection Task Force).

The emissions inventory was performed with guidance from ICLEI – Local Governments for Sustainability (www.iclei-usa.org). Membership in this organization was provided by Jefferson County and the City of Port Townsend, and gave access to ICLEI's Clearpath Software, as well as helpful technical support from Hoi-Fei, Calyn Hart and Kale Roberts.

This report on the emissions inventory was compiled by the members of the inventory team above.

The Inventory Team thanks the elected officials and staff of all of the CAC organizations for providing the opportunity to perform this inventory and for assisting in data collection. We are particularly grateful to Judy Surber, Nora Mitchell, Tony Hillman, Bliss Morris and Greg Lanning of the City of Port Townsend; Tom Boatman, Laura Tucker, Monte Reinders, Philip Morley, and Kevin Holcomb of Jefferson County; Sue Nelson and Donna Frary of the Port of Port Townsend; Kevin Streett and Lori Rae of Jefferson PUD; Chad Young of Olympic/Island Disposal; and Steve Gilmore and Arthur Mains of Republic Services for their data collection efforts and helpful advice. Also, Rick Jahnke of the Local 20/20 Climate Preparedness group researched and summarized the consumption based inventory that is included in the report.

The inventory team also sincerely thanks all Climate Action Committee organizational members that helped shepherd this work through their organizations: Kate Dean (Jefferson County), Deb Stinson (City of Port Townsend), Chris O'Higgins (Jefferson Healthcare), John Bender (Jefferson Transit), Sam Jones (Port Townsend Paper Corporation), Eric Toews (Port of Port Townsend), as well as the CAC members that provided detailed review of the report (Diane McDade, Kate Chadwick, David Wilkinson, John Bender).

An electronic copy of this report will be available at: https://www.co.jefferson.wa.us/637/Climate-Action-Committee (under documents), once approved by the Climate Action Committee.

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I. Executive Summary

Overview

In 2007, the City of Port Townsend and Jefferson County committed to the goal of reducing emissions 80% lower than 1990 levels by 2050, with an interim goal to reduce emissions by 15% from 1990 levels by 2020.[1] The 2018 inventory was completed to determine the progress being made toward the emissions reduction goals for Jefferson County.

The Jefferson County Board of County Commissioners and Port Townsend City Council jointly adopted the first "Inventory of Energy Usage and Associated Greenhouse Gas Emissions" in 2009 (Co. Res. 06-09 and City Res. 09-002). It was based on 2005 data, and is referenced herein as the 2005 inventory. This is the first update since that inventory. This Jefferson County 2018 inventory selected 2005 as its base year with which to compare current emissions, since the previous inventory provided specific data for that year. The 2005 inventory also included the municipal operations for the City of Port Townsend and Jefferson County, data related to Jefferson PUD's water treatment, and data from the Port Townsend Paper Corporation, and those baselines are referenced here as well. This report also notes progress toward the goals defined in the Climate Action Plan[1].

Communities contribute to Green House Gas (GHG) emissions in many ways. Two central categorizations of emissions are used in the community inventory: 1) GHG emissions that are produced by "sources" located within the county boundary (referred to here as sector-based), and 2) GHG emissions produced as a consequence of community consumption - emissions associated with the consumption of food, goods and services within the community, regardless of if the emissions associated with them occur within the county boundary or not (referred to here as consumption-based). While the 2005 inventory only addressed sector-based sources, both sector-based and consumption-emissions are included in this inventory.

Furthermore, this report includes sector-based estimates of greenhouse gas emissions for all Climate Action Committee organizations, which include Jefferson County government operations, the City of Port Townsend government operations, the Port Townsend Paper Corporation, and Jefferson PUD (all of which were included in the 2005 report), as well as Jefferson Transit, the Port of Port Townsend, and Jefferson Healthcare. Additionally, Fort Worden Public Development Authority (PDA) participated by providing electricity data.

For the sector-based inventory, energy use and emissions were grouped into 4 different Sectors: Stationary (buildings and equipment), Transportation (on-road mobile sources), Solid Waste, and Agriculture. Forestry was also evaluated, and is documented below, but was not specifically included in the emissions results due to factors described later. The Clearpath software provided by ICLEI was utilized to convert energy use data into CO_2e (equivalents of CO_2 released) in *metric* tons. Note that the 2005 inventory was calculated in tons. (One ton equals 2,000 pounds, and one metric ton equals 2205 pounds).

2018 Community-Wide Results

In 2018, Jefferson County had an estimated population of 31,729[2] that included 9,704 within the City of Port Townsend. The total CO_2e emissions in 2018 was 275,083 metric tons, as shown in the table and figure below.

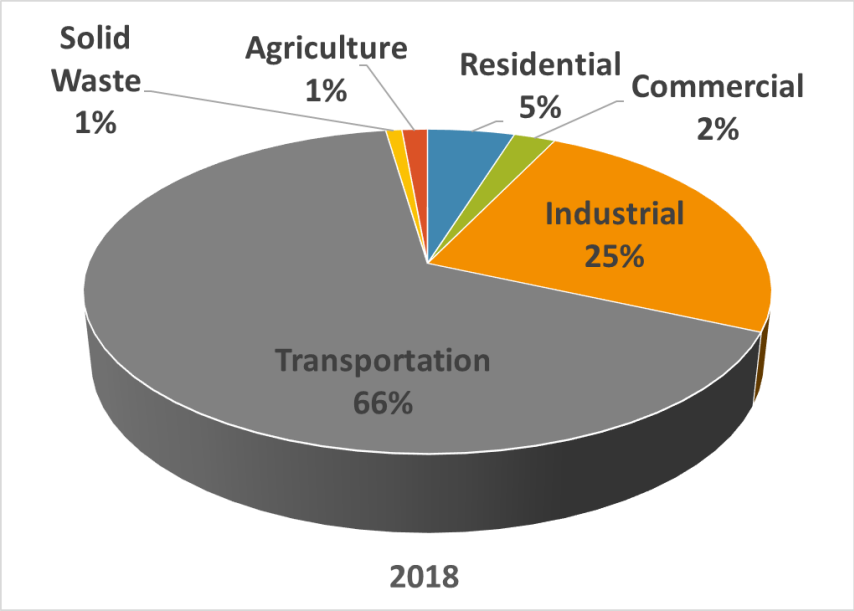
[1] The Port Townsend / Jefferson County Climate Action Plan, https://co.jefferson.wa.us/638/Documents

[2] https://www.census.gov/quickfacts/fact/table/jeffersoncountywashington/PST045219

TABLE 1: *COMMUNITY-WIDE* CO_2E *EMISSIONS IN 2018 (IPCC 5TH ASSESSMENT)*

Sector or Subsector	Community-Wide (Metric Tons CO_2e)	Community-Wide (% CO_2e)
Stationary Energy	**87,140**	**32%**
Residential	13,281	5%
Commercial	6,358	2%
Industrial	67,501	25%
Transportation	**181,588**	**66%**
Solid Waste	**2,462**	**0.9%**
Agriculture	**3,893**	**1%**
Total	**275,083**	**100%**

FIGURE 1: *COMMUNITY-WIDE* CO_2E *EMISSIONS IN 2018 AS PIE CHART*



In 2018, the ***Transportation Sector*** was the greatest single contributor of GHG emissions for the entire community (as was true in the 2005 inventory), accounting for 66% of the CO_2e generated in Jefferson County. This calculation is based on information provided by the Washington State Department of Transportation for Vehicle Miles Traveled (VMT) (ftp://ftp.wsdot.wa.gov/incoming/HPMS/JeffersonCountyRelated/). Only on-road mobile sources are included in this report.

The ***Stationary Energy Sector*** accounts for 32% 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 three Subsectors: Residential, Commercial and Industrial.

The ***Residential Subsector*** represents 5% of the total GHG emissions for the entire community. Electricity, for power, light, and heat, is responsible for only 20% of emissions being derived from this subsector, as it is primarily derived from hydropower.

The ***Commercial Subsector*** represents 2% of the total GHG emissions for the entire community, and includes all governmental and non-industrial businesses.

The ***Industrial Subsector*** represents 25% of the total GHG emissions for the entire community. As the largest industry in Jefferson County, the Port Townsend Paper Corporation (PTPC) accounts for 98% of CO_2e emissions from this subsector[3]. The impact of PTPC is typical of the carbon cost of manufactured goods (e.g., automobiles, appliances, paper). Per the sector-based roll up protocol, the embedded energy for goods is only counted where the goods are produced, not where they are consumed.

The ***Solid Waste Sector*** accounts for less than 1% of the CO_2e generated in the community. As in 2005, this is because the CO_2 produced in the Roosevelt Regional Landfill is considered biogenic and the methane produced is largely recovered as an electricity-generating feedstock. The portion of methane that is not eventually captured is used to calculate the CO_2e from the County's solid waste.

According to the EPA, approximately 24% of global emissions come from land use, including crops, livestock and forestry. Recognizing this, Agriculture and Forestry were evaluated in this 2018 inventory (and were not included in 2005.)

The ***Agricultural Sector*** accounts for 1% of the GHG emissions for Jefferson County based on emissions from livestock, with over 90% of those emissions from beef cattle and calves. [4]

The ***Forestry Sector*** plays an integral part in the carbon cycle. It can act as either a solution (by sequestering carbon, or the removal of carbon from the atmosphere), or could effectively increase emissions if there is a net loss of carbon from the forests, which could be caused by land use conversion, wildfire, harvesting, etc.

Jefferson County is comprised primarily of forest lands, with over 80% of the land being managed timberlands of Washington's Department of Natural Resources and federal lands of the Olympic National Park and Olympic National Forest. The total area of forested lands in Jefferson County is 1,085,662 total acres (Private, County, State, Tribal and Federal).

Data for county-level analysis of forestry's impact on GHG emissions was obtained for this inventory, but due to the limited sample size, the range of uncertainty was too wide to be statistically valid. For this reason, the forestry sector is not included in the Community-Wide totals presented, but is included in more detail below.

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[3] Note that the CO_2 emissions from wood fuel (biomass) used at PTPC are considered biogenic and climate-neutral within the Clearpath software and current EPA and Washington State protocols. However the methane and nitrous oxide from wood fuel are considered greenhouse gases and are included.

[4] Animal populations were obtained from the USDA 2017 Census of Agriculture. Emissions from sheep, goats, horses and swine were also included.

Note that a few sources of emissions are better considered on a statewide basis and have been quantified in the Washington State Greenhouse Gas Inventory: 1990 – 2015[5], and are not included here. The omitted sources and their contributions to gross CO_2e emissions within Washington State for the 2013-2015 average are: fuel for marine vessels (2.1%), and jet fuel and aviation gasoline (7.5%)

Community-Wide Results – 2018 Compared to 2005

TABLE 2: COMMUNITY-WIDE EMISSIONS 2005 AND 2018 (IPCC 2ND ASSESSMENT)

	2005 Metric Tons CO_2e	2018 Metric Tons CO_2e	% Change
Stationary Energy	**289,174**	**86,523**	
Residential	107,214	12,792	-88.1%
Commercial	44,066	6,286	-85.7%
Industrial	137,894	67,445	-51.1%
Transportation	**161,589**	**181,972**	+12.6%
Solid Waste	**2,271**	**1,846**	-18.7%
Total	**453,034**	**270,341**	**-40.3%**

The Community Wide Greenhouse gas inventory for Jefferson County for 2018 shows a net decrease in greenhouse gas emissions of 40% from 2005 levels. There was a 12.6% increase in emissions from transportation, and a decrease in all other emissions. The population increased 12% from 2005 to 2018[6].

The overall goal for reducing greenhouse gases established by the City of Port Townsend and Jefferson County in 2007, as documented in the Port Townsend / Jefferson County Climate Action Plan[1] was to reduce emissions 80% lower than 1990 levels by 2050. In the Climate Action Plan (CAP), it laid out a pathway to achieve that, including interim goals. The interim goal from the Climate Action Plan for 2020, the closest year to the new 2018 inventory, was 15% below the 1990 level, or 17% below the 2005 inventory level. As shown in the table above, the emissions for 2018 were 40% below 2005 levels, well ahead of the goal, but with some significant caveats noted below. And if we use the 2005 baseline above, and estimate the 1990 emissions based on it[7], then the 2018 results are 39% below the 1990 levels, on our way to the 80% below 1990 by 2050 overall goal.

One significant factor for the overall reduction in emissions is the change in East Jefferson County's Electric Utility. In 2013, the primary electricity supplier for East Jefferson County switched from Puget Sound Energy to Jefferson PUD, which began acquiring its electricity from Bonneville Power Association. This was based on a community-wide initiative, approved by county voters in 2008. With BPA electricity sourced primarily from

[5] Washington State Greenhouse Gas Inventory: 1990 – 2015, https://fortress.wa.gov/ecy/publications/SummaryPages/1802043.html

[6] Population increased from 28,356 in 2005 to 31,729 in 2017 in Jefferson County, based on census data

[7] This is done using the same ratio of 1990 and 2005 emissions as in the CAP.

hydropower, this resulted in a 97.6% reduction in the CO_2e emissions intensity of Jefferson County's power[8]. This change in electricity supplier made a significant impact in the emissions profile of the county for residential and commercial sectors, as well as for the municipal inventories. While overall emissions decreased due to the cleaner source of electricity, total community wide electricity usage increased by 34%, and residential electricity usage increased by 16%[9]. With the 12% increase in population, this amounts to a 4% increase in the per capita residential electricity.

The Vehicle Miles Traveled (VMT) in Jefferson County for 2018 is 19% higher than in 2005, and the per capita miles driven in 2018 was up 6.3%[10]. The 12.6% increase in emissions is less than the increase in VMT due to improved vehicle fuel efficiency from 2005 to 2018.

The Industrial sector achieved a 51% reduction from 2005 to 2018 of 70,449 metric tons of CO_2e, which by itself results in a 16% reduction in emissions community wide, alone almost achieving the 17% below 2005 goal for 2020[11].

Community-Wide Consumption-Based Inventory Results

A new addition to the 2018 inventory is to include emissions utilizing a consumption-based approach. While the sector-based approach presented in this report quantifies emissions within Jefferson County, the lifestyle enjoyed by residents' results in emissions in other regions. Products such as cars, appliances, computers, clothing, building supplies, most foods and many other goods are transported into Jefferson County. The greenhouse gases that were emitted in their production are not included in the sector-based, Jefferson County-bounded emissions estimate. To quantify the total impact of local residents, a consumption-based approach was used to estimate emissions. This is not additive to the sector-based emissions, but an alternative approach to estimate the total emissions of the county's residents. Based on published data, county-wide total consumption-based emissions were calculated to be 642,443 metric tons of CO_2e. This value exceeds Jefferson County's sector-based emissions estimate of 275,083 metric tons by a factor of 2.3. With an estimated population of Jefferson County of 31,729, this value implies per capita consumption-based emissions of 20.2 metric tons/person, somewhat less than the national average of 27 metric tons per person (but similar to the Oregon average of 22 metric tons per person).

Organizational Inventory Results

For the 2018 inventory, all Climate Action Committee organizations participated: Jefferson County government operations, the City of Port Townsend government operations, Jefferson Transit, the Port of Port Townsend,

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[8] BPA CO_2e emissions for 2018 of 25.8 lbs/MWh compared to 2005 factor of 1060 lbs/MWh.

[9] Community wide electricity increased from 421,924,666 kiloWatt hours (kWh) in 2005 to 564,714,629 kWh in 2018, and residential electricity usage increased from 196,604 to 228,759,157.

[10] 11,918 miles per capita compared with 11,216 in 2005; 2005 population of 28,356, updated since 2005 inventory, from https://www.co.jefferson.wa.us/DocumentCenter/View/1902/Part-I-Demographics-Socioeconomics-Community-Safety-PDF

[11] Note that the PTPC emissions reduction was slightly more, by 0.1%, as the Industrial sector includes other industrial electricity customers, which increased slightly, as detailed further in Table 9– Industrial energy emissions by fuel type.

Port Townsend Paper Corporation, Jefferson PUD, and Jefferson Healthcare. Also, the Fort Worden PDA participated with an inventory of their electricity usage.

Top level summaries are presented here. Note that given the different scopes, number of employees, etc., the organizational inventories cannot be compared to each other, but serve as a baseline for the future.

Finally, because in 2005, Jefferson County, the City of Port Townsend, Jefferson PUD, and the Port Townsend Paper Corporation provided data, comparisons to their baselines are possible and are included below.

TABLE 3: NON-INDUSTRIAL ORGANIZATIONAL EMISSIONS IN 2018

Non-Industrial Organizational Emissions in 2018 (IPCC 5th Assessment) - All in Metric Tons CO_2e							
Sector or Subsector	**Jefferson County Operations**	**Port Townsend City Operations**	**Jefferson Transit**	**Jefferson PUD**	**Port of Port Townsend**	**Jefferson Healthcare**	**Fort Worden**
Buildings & Facilities	1,289	369	3	0.4	2	767	29
Water & Wastewater Treatment	-	16		11			
Street Lights & Traffic Signals	0.1	0					
Vehicle Fleet	623	284	1,199	242	35	11	
Employee Commute	449	182	102	98	62		
Total	**2,361**	**851**	**1,304**	**351**	**99**	**778**	**29**

Jefferson County Government Operations – 2018 Compared to 2005

The 2018 emissions from Jefferson County government operations decreased 28% from 2005, ahead of the goal established in the CAP (page 32) for the county operations for 2020 of an 18% decrease in emissions from 2005 levels.

TABLE 4: JEFFERSON COUNTY GOVERNMENT EMISSIONS – 2005 AND 2018 (IPCC 2ND ASSESSMENT)

Metric Tons CO2e	2005	2018	% Change
Buildings & Facilities	1,695	1,278	-25%
Street Lights & Traffic Signals	19	0.1	-99%
Vehicle Fleet	1,046	616	-41%
Employee Commute	500	446	-11%
Total	3,260	2,340	-28%

City of Port Townsend Government Operations - 2018 Compared to 2005

The 2018 emissions from the City of Port Townsend government operations decreased 54% from 2005, well ahead of the goal for city operations for 2020 of an 18% decrease in emissions from 2005 levels, as defined in the CAP (page 32).

TABLE 5: PORT TOWNSEND CITY GOVERNMENT EMISSIONS – 2005 AND 2018 (IPCC 2ND ASSESSMENT)

City of Port Townsend - 2nd IPCC Assessment			
Metric Tons CO2e	**2005**	**2018**	**% Change**
Buildings & Facilities	579	365	-37%
Water & Wastewater Treatment	730	26	-96%
Street Lights & Traffic Signals	134	0.9	-99%
Vehicle Fleet	280	284	2%
Employee Commute	87	160	84%
Total	1,809	835	-54%

Port Townsend Paper Corporation –2018 Compared to 2005

The Port Townsend Paper Corporation emissions decreased substantially from 2005 to 2018, due to a variety of operational efficiencies implemented. Note that PTPC utilized BPA power in 2005; thus the changes are not related to changes in the electricity supplier.

TABLE 6: PORT TOWNSEND PAPER CORPORATION – 2005 AND 2018 (IPCC 2ND ASSESSMENT)

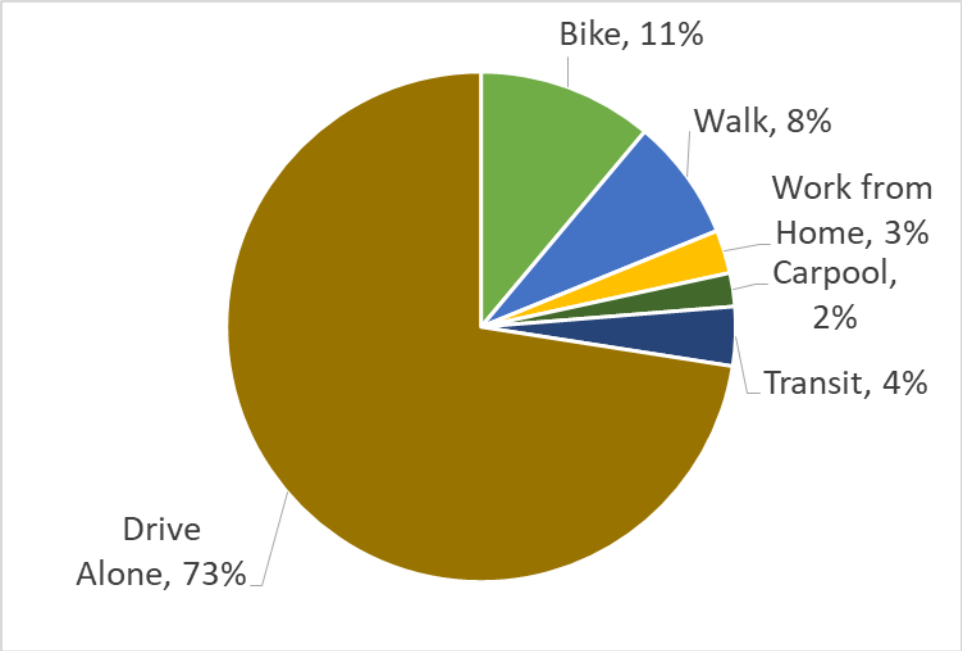
Fuel Type	2005 (CO_2e MT)	2018 (CO_2e MT)	% Change
Electricity	6,249	1,911	-69%
Propane	912	38,425	4113%
Fuel Oil	116,905	22,706	-81%
Wood	13,012	3,234	-75%
Totals	**137,078**	**66,276**	**-52%**

Commuting Survey Results

A commuting survey was done as part of the 2018 inventory, and was filled out by 174 employees across 5 different CAC organizations – the City of Port Townsend government, Jefferson County government, Jefferson PUD, the Port of Port Townsend, and Jefferson Transit. The results are part of the organizational inventories, and analyzing all commuting data received together provides a look at local commuting behaviors. Average Daily Commute: 19 miles round trip

- Fuel Type:
    - Gasoline: 90% (includes hybrids)
    - Diesel: 6%
    - Electric: 3%

FIGURE 2: HOW EMPLOYEES COMMUTE



Conclusion

This inventory serves as a foundation for understanding our local use of energy and sources of greenhouse gas emissions. It builds on the baseline inventory done in 2005, and shows changes since then. While we are on track to meet our community goals, this is largely due to two changes: the reduction in emissions from PTPC, and the change in electricity supplier. While the change in electricity supplier was a significant factor in decreasing emissions across the community as well as for the city and county organizations, the electricity usage in the county overall has increased by 34% and the vehicle miles traveled has increased by 19%, both higher than the 12% increase in population. And certainly, globally, significant improvements are needed to reduce worldwide emissions to the levels recommended by the Intergovernmental Panel on Climate Change (IPCC) to limit temperatures to 1.5°C[12].

The City of Port Townsend government operations decreased substantially, and Jefferson County operations decreased as well, with both being ahead of their goal for 2020 as defined in the Climate Action Plan. This report also establishes new baselines for five organizations in the county, plus an electricity baseline for the Fort Worden PDA.

Finally, it is hoped that this inventory will provide a foundation for effective action by organizations and individuals throughout the community to better understand their organizational and individual energy use and emissions so that as a community we can work together to address the challenges and opportunities raised by

[12] IPCC, 2018: Global Warming of 1.5°C. An IPCC Special Report, https://www.ipcc.ch/sr15/

climate change.

II. Inventory Methodology

This report presents emissions from both the Jefferson County community as a whole, and from operations of the municipal and other organizations that are part of the Jefferson County / Port Townsend Climate Action Committee.[13] This inventory uses the approach and methods provided by the Community Greenhouse Gas Emissions Protocol (Community Protocol)[14] and the Local Government Operations Protocol[15] (LGO Protocol) for the Sector Based inventories. See Appendix A – Protocols and Methodology, for details on the Community and Local Government Operations protocols, the quantification methods utilized, and the Data Sources and Inventory Process. The consumption-based inventory used a different methodology, as described below.

III. Community Emissions Inventory Results

Following the Community Protocol, this inventory report organizes emissions in two frames. Each frame includes a particular set of emissions sources and activities, and each helps to tell a different story about community emissions. This report looks at Jefferson County's community emissions through the following frames:

- Community-Wide Activities
- Household Consumption

Community Profile

To put emissions inventory data in context, it is helpful to have some basic information about community such as population and number of households.

JEFFERSON COUNTY COMMUNITY INDICATORS

Estimated 2018 Population	**31,729**[2]
Estimated 2018 Households	**15,037**[16]

Community-Wide Emissions Results

Jefferson County has chosen to look at emissions through the community-wide activities frame. This frame includes emissions that result from the use of energy, materials, and services by all members of the community. It follows the same model as the 2005 report in that it includes the emissions associated with

[13] The government operations inventory is mostly a subset of the community inventory. For example, data on commercial energy use by the community includes energy consumed by municipal buildings.

[14] http://www.icleiusa.org/tools/ghg-protocol/community-protocol

[15] Local Government Operations Protocol. http://www.icleiusa.org/programs/climate/ghg-protocol/ghg-protocol

[16] Derived from census data, utilizing 2018 population and average persons per household

electricity, even though it is produced outside the county. And it also includes the emissions of the community's solid waste, which is stored outside the county limits, as in the 2005 report.

In the year 2018, the Jefferson County community emitted 275,083 tons of CO_2e (Table 7). Dividing 275,083 tons of CO_2e by the 31,729 population of Jefferson County yields 8.7 tons CO_2e per capita.

TABLE 7: COMMUNITY-WIDE EMISSIONS IN 2018

Community-Wide Emissions in 2018 (IPCC 5th Assessment)		
Sector or Subsector	**Community-Wide (Metric Tons CO_2e)**	**Community-Wide (% CO_2e)**
Stationary Energy	**87,140**	**32%**
Residential	13,281	5%
Commercial	6,358	2%
Industrial	67,501	25%
Transportation	**181,588**	**66%**
Solid Waste	**2,462**	**0.9%**
Agriculture	**3,893**	**1%**
Total	**275,083**	**100%**

Community-Wide Emissions – Approach to Comparing 2018 to 2005

In order to compare the 2018 inventory results to the 2005 results, a number of factors must be taken into consideration. The results below utilize an approach to best show an "apples to apples" comparison between the two inventories. A different software program from ICLEI was utilized in 2005 (CACP) vs. Clearpath in 2018, and there are some small differences in emission factors between the two. In replicating the 2005 inventory, holding all other differences constant, there was a 7.5% difference between the 2005 inventory results using the different software programs. The Clearpath version of the 2005 inventory is used for all comparisons to 2018. Also note that in comparing the 2018 inventory to the 2005 inventory, a few other factors need to be considered:

1. The 2005 inventory is reported in tons, while the 2018 inventory is reported in metric tons[17]. When comparing 2005 and 2018, all data has been converted to metric tons.
2. The factors for converting methane and nitrous oxide to CO2 equivalents (CO_2e, which is how all results are expressed), have been evolving over time, and are defined by the International Panel on Climate Change (IPCC). For the 2005 inventory, the IPCC 2nd Assessment values were utilized (methane to CO_2e factor of 21, N2O factor of 310). The current recommended values for 2018 are those from the IPCC 5th Assessment, 100 year values (methane to CO_2e factor of 28, and N2O of 265). So, for example, since solid waste produces methane, the 2018 5th Assessment value is higher than

[17] 1 ton = 0.907185 metric tons.

the 2018 2nd Assessment value. In order to compare to the 2005 inventory, a 2018 (2nd Assessment) version was created of the inventory files that utilized the same IPCC 2nd Assessment value used in the original 2005 inventory.

The 2018 Community-Wide Emissions Compared to 2005

The overall comparison of the 2018 community-wide emissions to the base year of 2005 is shown in Table 2 in the Executive Summary above. Comparisons to 2005 are included in the Community-Wide results below.

Stationary Energy Sector Emissions, Community-Wide

The stationary energy sector emissions account for 32% of the community-wide total representing Residential, Commercial and Industrial Sectors. In 2018, the electricity to Jefferson County through Jefferson PUD, Mason County PUD (south county), and Greys Harbor PUD (west county), utilized electricity from Bonneville Power Association (BPA).

Residential Stationary Sector

Table below shows the breakdown of residential stationary energy by fuel type. MMBTU is Million Btu (British Thermal Unit), and is a measure of energy. The last column of the table shows how, per unit of energy, Fuel Oil has the highest GHG impact per unit of energy, and electricity the least.

TABLE 8– RESIDENTIAL STATIONARY ENERGY CO_{2E} BY FUEL TYPE

	CO2e (metric tons)	CO2e % of total	MMBTU	CO2e lbs/MMBTU
Wood	2,729	21%	273,949	22
Propane	6,117	46%	98,561	137
Fuel Oil	1,827	14%	24,888	162
Electricity	2,608	**20%**	760,654	8
Total	13,281	100%	1,158,052	

In 2018, a total of 1,939,342 Kwh of solar electricity was generated (less than 1% of residential total energy usage), and 8,139 Kwh of hydropower. There were 396 solar installations in East Jefferson County (serviced by Jefferson PUD) in 2018.

Commercial Stationary Sector

The commercial stationary energy includes that of the organizational inventories included here, except PTPC, which is listed under industrial. The electricity usage of the city, PUD, etc. is included in the total commercial electricity usage data. The fuel use (propane and fuel oil) provided by all CAC organizations except PTPC was summed together and entered as the commercial fuel usage totals. Emissions related to water and wastewater treatment are included within this commercial stationary energy.

Industrial Stationary Sector

The Industrial Stationary Sector accounts for 25% of total CO_2e emissions in Jefferson County (Table 1: *Community-Wide CO2e Emissions in 2018*). 2% of it is from non-PTPC Industrial Energy (Table 9) and the remaining 98% is from PTPC. In 2018, PTPC emitted 66,331 metric tons of CO_2e (Table 9). The 106,537 tons of dry wood used as an energy source is biogenic and considered to have released only 5% as much CO_2e (from

CH_4 and N_2O) as was released from all the other industrial fuels. Including the CO_2 released per ton of wood burned would increase the PTPC CO_2e value by 503,020 metric tons.

Note also in Table 9 that East Jefferson County Industrial (non-PTPC) electricity usage was also significant, at 99,921,282 kWh, due to the emergence of a new business sector requiring substantial electricity.

Table 9– Industrial energy emissions by fuel type

Inventory	Fuel Type	Usage	Units	CO_2e MT	CO_2e % Total
Industrial Energy PTPC	Electricity	163,321,000	kWh	1,911	3%
Industrial Energy PTPC	Propane	724,014	MMBtu	38,427	57%
Industrial Energy PTPC	Fuel Oil	2,215,290	Gallons	22,702	34%
Industrial Energy PTPC	Wood	106,537	BDT	3,292	5%
Industrial Energy East JeffCo	Electricity	99,921,282	kWh	1,169	2%
Industrial Energy PTPC Total				66,332	
Industrial Energy Total				67,501	100%

Stationary Energy Sector Emissions, Community-Wide – 2018 Compared to 2005

The table below shows the change in electricity usage, community-wide, from 2005 to 2018, by sector. As noted above, the non-PTPC industrial energy increased substantially.

TABLE 10: COMMUNITY ELECTRICITY ANALYSIS – 2005 AND 2018

Community Electricity Analysis - 2005 and 2018			
Sector or Subsector	**2005 kWh**	**2018 kWh**	**% Change**
Residential	196,604,581	228,759,157	16%
Commercial	82,022,234	72,713,190	-11%
Industrial PTPC	141,600,000	163,321,000	15%
Industrial East Jefferson	1,697,851	99,921,282	5785%
Total	421,924,666	564,714,629	34%

Transportation Sector Emissions, Community-Wide

Only on-road mobile sources are included in this report. The community-wide transportation GHG calculation is based on vehicle miles traveled (VMT) in Jefferson County, obtained from sampling of representative sections of roadway done by the Washington State Department of Transportation (WSDOT) and reported in the annual Highway Performance Monitoring System (HPMS) report (attached in Appendix G – Data Sources and Data Collected). VMT includes both State Highways and non-State Highways, such as county roads. The percentages used for apportioning VMT were the same used for 2005, with the exception of the addition of electric vehicles:

Passenger Diesel	0.3%
Passenger Gas	59.9%
Motorcycle	0.4%
Light Truck Gas	32.4%
Heavy Truck Diesel	5.2%
Light Truck Diesel	1.5%
Electric Vehicles	0.34%

Note since Clearpath did not specifically account for Electric Vehicles, the approach used here and recommended by ICLEI, was to reduce total VMT by the percentage of Electric Vehicles registered in Jefferson County, 0.34%. The electricity consumption of EVs charged in Jefferson County is included in the total electricity numbers, under residential, commercial or industrial, depending on where they are charged. The percentage of electric vehicles in Jefferson County is comparable to the 0.39% in Washington State as a whole.[18]

Transportation by air and water is not included in this inventory because they are better considered on a statewide basis and have been quantified in the Washington State Greenhouse Gas Emissions Inventory: 1990 – 2015[5] . Emissions from airport and port operations (not including marine or aviation fuel) are allocated to the Government track of this Inventory (under the Port of Port Townsend). It is worth noting that US air traffic (both international and national flights) is steadily increasing and is at an all-time high[19]. For water transport, emissions from the State Ferry route within Jefferson County are allocated to the emissions inventory of Washington State.

The transportation sector is the largest emitter of GHG, representing 66% of community-wide emissions (Table 1). The following data provides perspective and helps shed light on the emissions from transportation and the regular increase of its emissions year by year.

As noted in Table 2**: Community-wide emissions** , transportation emissions from 2005 to 2018 increased 12.6%, while Vehicle Miles Traveled (VMT) in Jefferson County increased 19%.

Various factors contribute to understanding the high level of driving in Jefferson County. Since 2005 there has been a 12% increase in population, a 19% increase in licensed drivers, 24.6% increase in registered vehicles in Jefferson County, and a 20.9% increase in the number of centerline miles of public roads (the total length of roads in Jefferson County). Jefferson County has the highest median age in the State at 58.4 years, hence a

[18] https://fortress.wa.gov/dol/vsd/vsdFeeDistribution/DisplayReport.aspx?rpt=2018C00-63.csv&countBit=1

[19] https://www.bts.gov/newsroom/2018-traffic-data-us-airlines-and-foreign-airlines-us-flights

higher percentage of people eligible for a driver's license. The most common number of motorized vehicles per household is 2 followed by 3 cars per household[20] .

Miles driven per capita is increasing in Jefferson County. In 2018 per capita miles driven was 11,918 compared with 11,216 in 2005, up 6.3%. In the US as a whole, VMT per capita is 10,065[21]. Some contributing factors for the excess VMT in Jefferson County include: more miles are driven in rural counties than in counties where the population is concentrated in large cities; Jefferson County has the oldest population in Washington State and a higher percentage of the population therefore has a driver's licenses; and tourism adds to the miles driven in Jefferson County by non-residents.

Washington State as a whole has lowered its VMT per capita to 8,272[22]. Washington State has established policies and strategies for reducing VMT (and hence GHG from transportation), and programs are in place to accomplish this. These may be a good model for Jefferson County.

Commuting in Jefferson County is estimated to contribute 21% of all VMT, based on information from the census[23] and the US Department of Transportation[24]. In the US as a whole, 60% of the population over the age of 16 is employed and 28% of all VMT is from commuting. In Jefferson County, 45% of the population over the age of 16 is employed[25] so the statistics for commuting VMT were adjusted accordingly to derive the 21% VMT figure.

Fuel efficiency has increased from 22.5 mpg to 24.2 mpg, about 10% since 2005, based on the mileage estimates for gas passenger vehicles.

Solid Waste Sector Emissions, Community-Wide

Greenhouse gas emissions from solid waste result both from transporting and processing solid waste and from the decay of organic constituents of solid waste such as food, paper and wood. All solid waste from Jefferson County is transported 360 miles by truck and rail to the Roosevelt Landfill in Klickitat County, WA. The calculation of GHG emissions from the solid waste is based only on the amount of methane that will *not* be recovered from the waste deposited in the landfill.

Roosevelt Landfill recovers methane as it is slowly released over several years, ultimately recovering 90% before the Landfill is finally covered. The methane collected is used to produce electrical power from this

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[20] https://www.census.gov/quickfacts/fact/table/jeffersoncountywashington/PST045219, HPMS data from Heath Bright, Washington State Department of Transportation Highway Performance Monitoring System & Functional Classification Manager Sep 3, 2019).

[21] https://www.enotrans.org/article/vmt-hits-nominal-high-approaches-time-per-capita-mark/).

[22] https://www.enotrans.org/article/trends-in-per-capita-vmt/

[23] https://www.census.gov/quickfacts/fact/table/jeffersoncountywashington/PST045219

[24] https://nhts.ornl.gov/assets/2017_nhts_summary_travel_trends.pdf

[25] https://datausa.io/profile/geo/jefferson-county-wa

renewable resource. An 85% methane recovery rate was utilized for calculating the CO_2e from the residual methane. In 2018, the 20,672 tons of solid waste generated by Jefferson County community resulted in 2,462 metric tons of CO_2e attributable to the 15% portion of methane that will not be recovered.

Emissions from solid waste were reduced 18.7% from 2005 levels, primarily due to a reduction in the percent of paper in the solid waste (from 19.9% to 15.5%), which has a relatively high methane production factor. The total amount of solid waste was also reduced slightly, by 0.6%.

See Appendix B – Solid Waste Handling and Methodology Details for a detailed description of solid waste handling and transportation.

Including the handling and transport, the 3553 tons of CO_2e from solid waste in the table below represents only 1.3% of the 275,083 tons of CO_2e community-wide emissions in 2018.

TABLE 11: *COMMUNITY SOLID WASTE EMISSIONS - 2018*

Location	Solid Waste (tons)	CO_2e (metric tons)	Metric Tons CO_2e per Ton of Waste
Roosevelt Landfill	20,672	**2462**	0.119
Commercial collection	11,058	**401**	0.036
Self-delivery to Transfer Station	9,615	**196**	0.020
Truck to Tacoma[2] (wet short tons)	20,672	**366**	0.018
Rail to Landfill[2] (wet short tons)	20,672	**128**	0.006
Total		**3553**	

Agriculture

In Jefferson County, emissions from the agricultural sector accounted for 1% of greenhouse gas emissions, most of which is from cattle and their byproducts. In the most recent Washington State inventory[5], emissions from the agricultural sector accounted for about 6.8% of Washington's greenhouse gases.

Livestock, especially ruminants such as cattle, produce methane (CH_4) as part of their normal digestive processes. This process is called enteric fermentation, and it represents the predominant source of emissions from the agricultural sector. Manure, the natural byproduct of livestock, creates both CH_4 and nitrous oxide (N_2O) gas emissions as it biodegrades. Livestock manure is especially conducive to methane generation because of its high organic and bacterial content. The way in which manure from livestock is managed also contributes to CH_4, and was evaluated in this inventory.

In addition, this inventory considered N_2O emissions from manure management. It includes N_2O emissions that are released directly from manure and those are that are associated with intermediary products released from the nitrification-denitrification process of nitrogen remaining in the soil and from

nitrogen lost through runoff and leaching. According to the US Community Protocol, the emission factors for pastured livestock, as is the case in Jefferson County, are zero resulting in no direct or indirect nitrous oxide emissions.

The protocol did not address, and we did not evaluate, soil management, fertilizer application or irrigation practices. As this Protocol evolves over time, these methods may be added and should be considered. Additionally, the protocol did not address aquaculture. However, the Washington State Department of Natural Resources data on aquaculture leases in 2018 is included in Appendix C – Agriculture Analysis.

The 2005 baseline greenhouse gas inventory for Jefferson County did not include agriculture as a source of emissions; accordingly, there is no comparison with baseline data.

The table below shows the methane emissions from livestock, expressed as CO_2e. Note that the over 90% of the enteric fermentation emissions were from beef cattle and calves. See Appendix C – Agriculture for the Agriculture Methodology, and for the inputs, equations, assumptions and calculations for emissions from livestock.

TABLE 12: 2018 METHANE EMISSIONS FROM LIVESTOCK

Total Methane Emissions due to Enteric Fermentation from Cows, Sheep, Goats, Horses and Swine	**3,790 Metric Tons $C0_2e$**
Total Methane Emissions from Manure for Cows, Sheep, Goats, Horses, Swine and Chicken	**90.8 Metric Tons $C0_2e$**
Total Methane Emissions for Jefferson County from Livestock	**3880.8 Metric Tons $C0_2e$**

Forestry

Jefferson County is comprised primarily of forest lands, with over 80% managed timberlands of Washington's Department of Natural Resources and federal lands of the Olympic National Park and Olympic National Forest. The majority of the forest lands in East Jefferson County are privately owned, and in West Jefferson County, publicly owned. Jefferson County has 1,085,662 total acres (or 439,352 hectares) of forest land. This includes private, county, state, tribal and federal lands. The table below shows the total acres of forest land and a breakdown of ownership. This data and information on forests were primarily acquired from the zoning layers of Jefferson County's Central Service's Geographic Information System (GIS) with the help of GIS Analysts. Information was also obtained from Washington's Department of Natural Resources, the Olympic National Park, and the 2018 Jefferson County Comprehensive Plan.

TABLE 13: FOREST ACREAGE IN JEFFERSON COUNTY

1,085,662 total acres of Forest Land in Jefferson County (Private, County, State, Tribal and Federal)	• 172,265 acres forest lands that are privately held
	• 185,683 acres forest lands owned/managed by Washington Department of Natural Resources
	• 7,744 acres forest lands in Jefferson County that are Tribal
	• 719,970 acres in Jefferson Co that are part of Olympic National Park, Olympic National Forest, Indian Island Naval Magazine and Protection Island National Wildlife Refuge.

In 2019, ICLEI updated the US Community Protocol to include Appendix J: Forest Land and Trees[26]. The document provides information on GHG impacts (emissions or sequestration) from forest land. Similarly, Clearpath added the framework for documenting forestry or forest conversion as sources (or sinks) of greenhouse gases. This provides the capability to demonstrate how land use, particularly forests, interacts with other sectors in a greenhouse gas inventory. However, as the appendix dealing with forest land and trees was only published in August of 2019, the associated guidance documents and specifically the emission factors for calculating forest carbon flux were, by the end of 2019, unpublished and unavailable. Accordingly, alternate methods were utilized to estimate GHG emissions and/or removals from forests for Jefferson County.

The inventory team was able to contact two different US Forest Service projects that were analyzing the greenhouse gas impacts of Washington State, utilizing two different approaches. In both cases, the data utilized was based on the U.S. Forest Service's Forest Inventory and Analysis Program (FIA). The FIA includes all forested lands in the US, regardless of ownership, and includes both National Forest and Non National Forest data. The FIA program defines forest land as land with at least 10 percent canopy cover of trees of any size and not currently developed for non-forest use.

FIA is based on the measurement of a fixed proportion of plots in each State, each year, known as an annual inventory. 10% of all plots are measured every year in the western states. It is important to note that the inventories are designed to yield reasonable estimates at the state level. At sub-state levels, sampling errors increase and the reliability of the estimates goes down.

In fact, the results we were provided proved that to be the case. The confidence interval, where calculated, was too wide to be statistically valid. The main conclusion to be drawn is that to calculate carbon flux at the county level more confidently, and to be able to better determine the factors driving the results, would require a larger county level database than exists in the FIA database today. Given this wide range, this data was not included in the Clearpath results. The details of the two analyses are in Appendix D – Forestry Analyses.

[26] http://www.icleiusa.org/tools/ghg-protocol/community-protocol

Household Consumption Frame

The household consumption frame helps to illustrate the full life cycle impacts of residents' activities. Household consumption includes lifecycle emissions associated with household electricity and propane use, personal vehicle transportation, use of public transportation, use of water and wastewater services, production of garbage, and use of materials and services. While many of these emissions overlap with those looked at through the communitywide activities frames, it provides an additional way to understand the County's emission profile. The household consumption frame also includes emissions that are not included in the other frames, in particular, emissions from goods and services that are produced outside the community.

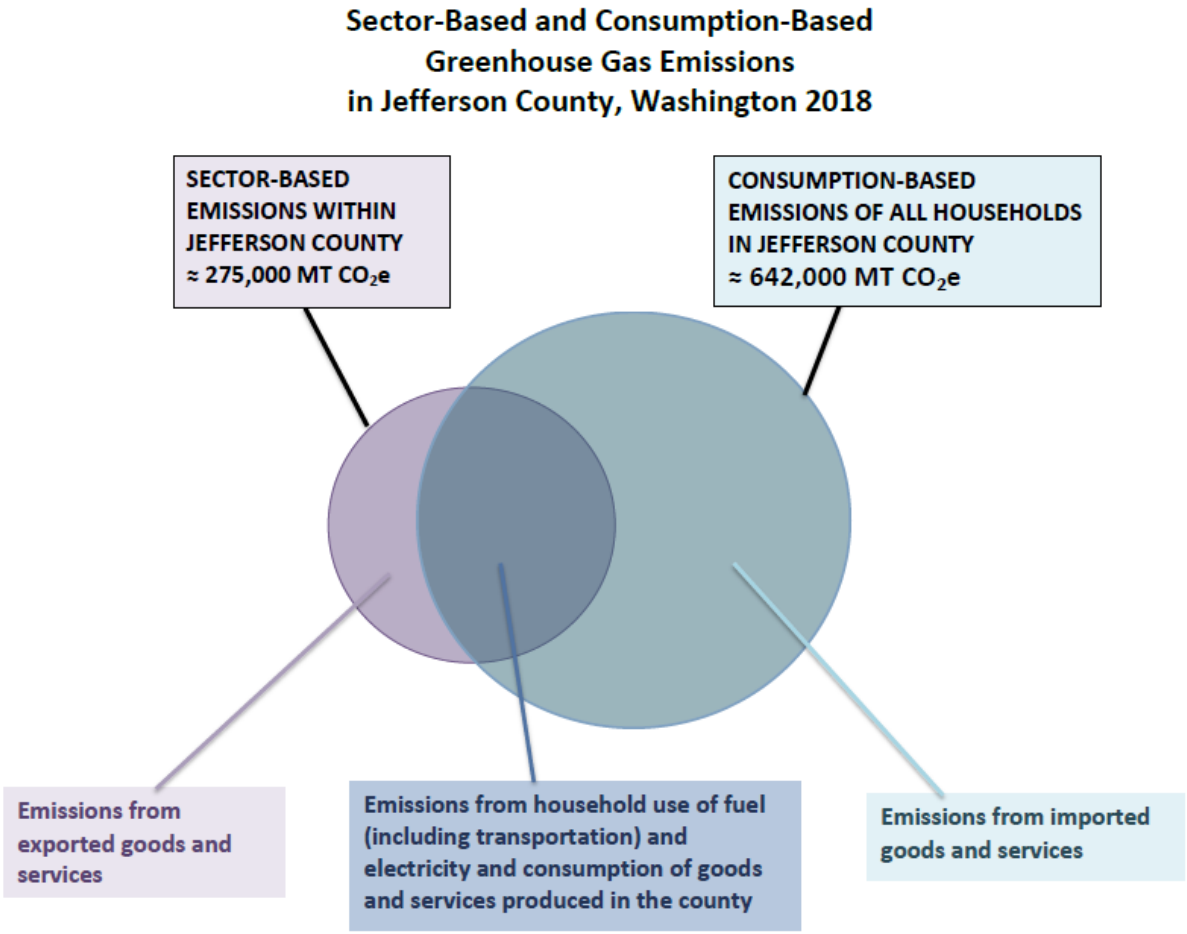
Jefferson County Consumption-based Greenhouse Gas Emission Inventory

While the sector-based approach for quantifying a region's greenhouse gas emissions inventory (and utilized above) permits the quantification of the direct emissions from within a specified region, it has limitations. Most importantly, this method excludes the greenhouse gases that are emitted during the production of goods and services that are then imported into the region. This is especially important for a county such as Jefferson County that has only a few large industrial and manufacturing activities. Products such as cars, appliances, computers, clothing, building supplies, and most foods are produced outside of Jefferson County. While these products are enjoyed by local residents, the greenhouse gases that were emitted in their production are not included in a Jefferson County-bounded inventory. To complement the sector-based inventory described elsewhere in this document, a consumption-based inventory has been estimated based on published results.

The consumption-based inventory provides the emission estimate associated with the consumption of food, goods and services within the community, regardless of where the emissions associated with them occur. For example, emissions associated with the manufacture of furniture and clothing in King County but sold and used in Port Townsend, would be included. On the other hand, food grown in Jefferson County but sold at the Pike Street Market and consumed in Seattle would not be included in a Jefferson County consumption-based inventory.

The relationship between the sector-based and the consumption-based inventories is displayed in the figure below. Sector-based emissions within Jefferson County are represented by the purple circle (left) while the consumption-based emissions associated with everything consumed within Jefferson County is the blue circle (right). The overlap between the two circles represents emissions from anything that is both produced and consumed within Jefferson County.

FIGURE 3: SCHEMATIC OF RELATIONSHIP BETWEEN THE SECTOR-BASED AND CONSUMPTION-BASED EMISSION INVENTORIES.



Consumption-based Emissions Inventory Example

While a consumption-based emissions inventory is useful in assessing the full contribution to climate change of a specific region, it is also very difficult to quantitatively assess. The data required to fully assess the consumption of a community is generally not available or must be estimated based on sales and other community statistics. This is especially true for small communities with limited resources such as Jefferson County.

Jefferson County Consumption-based Emissions Inventory Results

While the ICLEI Clearpath software has the ability to calculate a consumption-based inventory, the detailed, quantitative, county-specific consumption data required was not available. However, as an alternative,

researchers at The University of California, Berkeley CoolClimate Network have estimated the household emissions inventories for every zip code in the United States[27].

The approach the CoolClimate tool utilizes is described in their FAQ[28] as: "The CoolClimate consumption-based model uses national household energy, transportation, and consumer expenditures surveys along with local census, weather and other data –37 variables in total –to approximate greenhouse gas emissions resulting from the energy, transportation, food, goods and services consumed by average households in essentially all populated U.S. zip codes". See the reference paper[29] and online supporting materials for detailed descriptions of the methods. The paper notes that "Energy and fuel prices are from the Energy Information Administration (EIA)[30] at the level of U.S. states". That indicates that the carbon footprint of electricity utilized in the model is using the Washington statewide average, not the BPA footprint. Note that is different than the sector-based emissions presented earlier that utilized Jefferson County-specific data for much of its data.

Weighting each Jefferson County zip code by population and omitting zip codes 98382 and 98331 which largely are dominated by residents of Clallam County, including the cities of Sequim and Forks, yields a weighted mean annual household consumption-based CO_2e emissions of 42.7 metric tons/year. Total households in Jefferson County for 2018 is estimated to be 15,037 yielding a total consumption-based emissions of 642,443 metric tons as CO_2e. This value exceeds the sector-based emissions estimate of 275,083 metric tons by a factor of 2.3. With an estimated population of Jefferson County of 31,729 this value implies a per capita consumption-based emissions of 20.2 metric tons/person, somewhat less than the national average of 27 metric tons per person but similar to the Oregon average of 22 metric tons per person.

See Appendix E – Consumption-Based Emissions Inventory - Further Detail for more information on how the Jefferson County consumption numbers compare other to other areas around the world, as well as details from an Oregon consumption-based inventory as a regional example that shows the key drivers of the consumption inventory.

IV. Organizational Inventory Results

For this 2018 inventory, all Climate Action Committee organizations participated, a total of seven CAC organizations (Jefferson County government, the City of Port Townsend government, Jefferson Transit, the Port of Port Townsend, Port Townsend Paper Corporation, Jefferson PUD, and Jefferson Healthcare). Also, the Fort Worden PDA participated with an inventory of their electricity usage.

Five of the CAC organizations participated in the Commuting Survey, and the emissions resulting from that are included below. Note that all data was scaled by the number of total employees. The percentage of employees

[27] Jones and Kammen, 2014; available on interactive maps at coolclimate.org/maps

[28] https://coolclimate.org/files/coolclimate/Jones-Kammen-CarbonFootprint-FAQ-EST-1-10-2014.pdf, accessed 1/21/2020.

[29] Jones, C. and D. M. Kammen (2014) Spatial Distribution of U. S. Household Carbon Footprints

[30] U.S. Energy Information Administration (EIA). http://www.eia.gov/

that participated is listed with the organizational inventories. For a summary of the commuting survey results across all organizations, see the Executive Summary above.

Jefferson County Government - Emissions Inventory

In 2018, Jefferson County's municipal operations generated 2,361 tons of CO_2e (see table below.) Stationary emissions from buildings make up the largest proportion of CO_2e emissions in the County operations (55%), followed by fleet vehicles (26%).

TABLE 14 – JEFFERSON COUNTY GOVERNMENT – SUMMARY FOR 2018 (IPCC 5TH ASSESSMENT)

2018 (5th Assessment)	Metric Tons CO2e	% OF TOTAL
Buildings & Facilities	1,289	55%
Street Lights & Traffic Signals	0.1	0%
Vehicle Fleet	623	26%
Employee Commute	449	19%
	2,361	100%

As was noted previously, to compare the 2018 data to the 2005 data, we need to utilize the same IPCC factors, and so the 2005 IPCC 2nd Assessment factors are used for both years. A summary of the comparison follows. As can be seen, overall, the emissions decreased by 28%. Electricity usage for buildings and facilities was reduced by 26%, but propane usage increased 41%. Streetlight electricity was reduced by 70%, due to sodium vapor streetlights being replaced with LEDs. Note that the water treatment, which was included in 2005 but represented data from Jefferson PUD, is included in the Jefferson PUD rollup below. The vehicle fleet reduced its emissions significantly for both gas and diesel (23% and 61%, respectively). There was a focus on this area by the county in the 2014 timeframe as reported to the CAC in August of 2015. The employee commute decreased by 11% overall with 23% of employees responding to the survey.

TABLE 15 - JEFFERSON COUNTY GOVERNMENT – COMPARISON OF 2018 TO 2005 (IPCC 2ND ASSESSMENT)

Jefferson County		2005		2018			
Inventory	Fuel Type	Usage	CO2e MT	Usage	CO2e MT	% Change Usage	% Change CO2e
Buildings & Facilities	Electricity kWh	2,186,438	1051	1,625,228	88	-26%	-92%
Buildings & Facilities	Fuel Oil gallons	28,164	508	23,249	1,020	-17%	101%
Buildings & Facilities	Propane Gallons	21,414	136	30,194	170	41%	26%
Buildings & Facilities Subtotal			1,695		1,278		-25%
Street Lights & Traffic Signals	Electricity kWh	39,133	19	11,903	0.1	-70%	-99%
Vehicle Fleet	Gasoline Gallons	63,538	558	48,698	428	-23%	-23%
Vehicle Fleet	Diesel Gallons	47,824	488	19,368	188	-60%	-61%
Vehicle Fleet Subtotal			1,046		616		-41%
Employee Commute		1,191,034	500	1,090,441	446		-11%
	Totals		3,260		2,340		-28%

City of Port Townsend Government - Emissions Inventory

In 2018, the City of Port Townsend's municipal operations generated 851 metric tons of CO_2e. Stationary emissions from buildings make up the largest proportion of CO_2e emissions in the City operations (43%), followed by fleet vehicles (33%).

TABLE 16: CITY OF PORT TOWNSEND GOVERNMENT – SUMMARY FOR 2018 (IPCC 5TH ASSESSMENT)

2018 (5th Assessment)	Metric Tons CO2e	% OF TOTAL
Buildings & Facilities	369	43%
Water & Wastewater Treatment	16	2%
Street Lights & Traffic Signals	0.2	0%
Vehicle Fleet	284	33%
Employee Commute	182	21%
	851	100%

A summary of the comparison between the 2005 inventory and the 2018 inventory follows, both utilizing the IPCC 2nd Assessment factors. As can be seen, the buildings and facilities footprints were reduced by 37%, driven primarily by the change in electricity to BPA noted above. The actual kWh increased 47%. Fuel oil was eliminated, but propane use increased. The Water and Wastewater Treatment electricity usage decreased by 9%, and the propane usage was eliminated. The vehicle fleet emissions increased slightly (2%). The employee commute increased by 84%, with 43% of employees responding to the survey.

Note that for the Water and Wastewater Treatment category for the City, Nitrification/Denitrification is not a step in the Port Townsend wastewater treatment process which treats 10,474,000 gallons annually and serves a population of 9500. There are no wastewater treatment lagoons and no effluent is discharged to rivers or

estuaries from the wastewater treatment. Therefore the greenhouse gases related to wastewater treatment are solely due to the electricity and propane used to power the facilities.

TABLE 17: CITY OF PORT TOWNSEND GOVERNMENT – COMPARISON OF 2018 TO 2005 (IPCC 2ND ASSESSMENT)

City of Port Townsend - 2nd IPCC Assessment		2005		2018			
Inventory	Fuel Type	Usage	CO2e MT	Usage	CO2e MT	% Change Usage	% Change CO2e
Buildings & Facilities	Electricity kWh	759,342	316	1,119,595	12	47%	-96%
Buildings & Facilities	Fuel Oil gallons	24,339	236	0	0		NA
Buildings & Facilities	Propane Gallons	4723	27	62,522	353	1224%	1224%
Buildings & Facilities Subtotal			579		365		-37%
Street Lights & Traffic Signals	Electricity kWh	278,071	134	17,389	1	-94%	-99%
Vehicle Fleet	Gasoline Gallons	23,453	206	27,835	247	19%	20%
Vehicle Fleet	Diesel Gallons	7,209	74	3,657	37	-49%	-50%
Vehicle Fleet Subtotal			280		284		2%
Employee Commute	Gasoline VMT	127,675	51	367,422	137	188%	169%
Employee Commute	Diesel VMT	70,685	36	43,837	21	-38%	-42%
Employee Commute	Transit VMT	NR		27,882	2		
Employee Commute Subtotal		198,360	87	439,141	160	121%	84%
Water & Wastewater Treatment	Electricity kWh	1,509,249	729	1,369,181	26	-9%	-96%
Water & Wastewater Treatment	Propane Gallons	274	2	0	0		NA
Water & Wastewater Treatment Subtotal			730		26		-96%
Totals			1,809		835		-54%

Port Townsend Paper Corporation - Emissions Inventory

In 2018, the Port Townsend Paper Corporation (PTPC)'s emissions generated 66,331 metric tons of CO_2e, see table below. As noted in the community-wide summary above for the Industrial Sector, due to the convention of considering burning of biomass biogenic in nature, the 106,537 tons of dry wood used as an energy source is considered to have released only 5% as much CO_2e (from CH_4 and N_2O) as was released from all the other industrial fuels. Including the CO_2 released per ton of wood burned would increase the PTPC CO_2e value by 503,020 tons.

TABLE 18: PORT TOWNSEND PAPER CORPORATION – EMISSIONS SUMMARY FOR 2018

Inventory	Fuel Type	Usage	Units	CO2e MT	% Total
Industrial Energy PTPC	Electricity	163,321,000	kWh	1,911	3%
Industrial Energy PTPC	Propane	724,014	MMBtu	38,427	58%
Industrial Energy PTPC	Fuel Oil	2,215,290	Gallons	22,702	34%
Industrial Energy PTPC	Wood	106,537	BDT	3,292	5%
Industrial Energy PTPC Total				66,332	100%

Utilizing the IPCC 2nd Assessment factors for both 2005 and 2018, the PTPC emissions decreased 52% from 2005. PTPC has been working to reduce greenhouse gas emissions by reducing the use of fossil fuels, and has made a variety of efficiency improvements since 2005.

TABLE 19: PORT TOWNSEND PAPER CORPORATION – COMPARISON OF 2018 TO 2005

PTPC	2005		2018			
Fuel Type	Usage	CO2e MT	Usage	CO2e MT	% Change Usage	% Change CO2e
Electricity (KWh)	141,600,000	6,249	163,321,000	1,911	15%	-69%
Propane (Gallons)	161,978	912	724,014	38,425	347%	4113%
Fuel Oil (Gallons)	11,410,000	116,905	2,215,290	22,706	-81%	-81%
Wood (BDT)	428,575	13,012	106,537	3,234	-75%	-75%
Totals		137,078		66,276		-52%

Jefferson PUD - Emissions Inventory

In 2018, the Jefferson PUD municipal operations generated 351 metric tons of CO_2e. These emissions were dominated by the Vehicle Fleet emissions (69%), and the employee commute (28%). The commuting survey was filled out by 67% of employees.

Jefferson PUD provided water to a population of 4409 people in 2018, and provided wastewater treatment for 337 people.

TABLE 20: JEFFERSON PUD – EMISSIONS SUMMARY FOR 2018

Government Track - 2018 - Jefferson PUD			
2018	Metric Tons CO2e	% OF TOTAL	
Buildings & Facilities	0.4	0%	
Water & Wastewater Treatment	11	3%	
Vehicle Fleet	242	69%	
Employee Commute	98	28%	
	351	100%	

Note that while the Jefferson PUD did not directly participate in the 2005 inventory, the emissions from water treatment was analyzed, and was included in the Jefferson County Water and Wastewater Treatment data in 2005. It included water only, not wastewater. The chart below compares that data to 2018.

TABLE 21: JEFFERSON PUD – COMPARISON OF 2018 TO 2005 (IPCC 2ND ASSESSMENT)

Jefferson PUD		2005		2018			
Inventory	Fuel Type	Usage	CO2e MT	Usage	CO2e MT	% Change Usage	% Change CO2e
Water Facilities	Electricity kWh	687,233	327	222,215	3	-68%	-99%

Port of Port Townsend - Emissions Inventory

In 2018, the Port of Port Townsend operations generated 99 metric tons of CO_2e. These emissions were dominated by the Vehicle Fleet emissions (36%), and the employee commute (63%). The commuting survey was filled out by 53% of employees. Note that the buildings included in this inventory were the buildings utilized for Port operations, and did not include buildings that are rented.

TABLE 22: PORT OF PORT TOWNSEND – EMISSIONS SUMMARY FOR 2018

Government Track - 2018 - Port of Port Townsend		
2018	Metric Tons CO2e	% OF TOTAL
Buildings & Facilities	2	2%
Vehicle Fleet	35	36%
Employee Commute	62	63%
	99	100%

Jefferson Transit - Emissions Inventory

In 2018, the Jefferson Transit operations generated 1,304 metric tons of CO_2e. Not surprisingly, these emissions were dominated by the Vehicle Fleet emissions (92%). Jefferson Transit served the community with 5,978 passenger boardings in 2018.

The commuting survey was filled out by 67% of employees.

TABLE 23: JEFFERSON TRANSIT – EMISSIONS SUMMARY FOR 2018

Government Track - 2018 - Jefferson Transit		
2018	Metric Tons CO2e	% OF TOTAL
Buildings & Facilities	3	0.2%
Vehicle Fleet	1,199	92%
Employee Commute	102	8%
	1,304	100%

Jefferson Healthcare - Emissions Inventory

In 2018, the Jefferson Healthcare operations generated 778 metric tons of CO_2e. Buildings and Facilities dominated the emissions, at 99%. Jefferson Healthcare did not participate in the commuting survey.

TABLE 24: JEFFERSON HEALTHCARE – EMISSIONS SUMMARY FOR 2018

Government Track - 2018 - Jefferson Healthcare		
2018	**Metric Tons CO2e**	**% OF TOTAL**
Buildings & Facilities	767	99%
Vehicle Fleet	11	1%
Employee Commute	Not Recorded	
Total	778	100%

Fort Worden - Emissions Inventory

While not currently an organizational member of the Climate Action Committee, Fort Worden participated in this inventory process by providing electricity usage for its buildings. In 2018, the Fort Worden buildings and facilities generated 29 metric tons of CO_2e from 2,509,800 kWh of electricity used. Also note that Fort Worden installed 144 solar panels in 2018[31].

[31] https://www.peninsuladailynews.com/news/fort-worden-upgrades-energy-efficiency-with-solar-led-lights/

V. 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 in 2005.

Clearpath: ICLEI software used for 2018 inventory

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 CO_2e are the same, whereas for nitrous oxide and methane, stronger greenhouse gases, the relationship varies, depending on which IPCC Assessment protocol is followed.

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).

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: Founded as the **I**nternational **C**ouncil for **L**ocal **E**nvironmental **I**nitiatives Organization, now known as ICLEI - Local Governments for Sustainability (www.iclei-usa.org).

IPCC: Intergovernmental Panel on Climate Change, https://www.ipcc.ch/

kWh: KiloWatt-hour

MMBtu: Million Btu (British Thermal Unit). 1 MMBtu = 292 kWh.

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.

Tons: Short tons defined as 1 ton = 2,000 pounds. Tons are different from metric tons (tonnes), 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).

VI. Appendix A – Protocols and Methodology

Community Emissions Protocol

The Community Protocol[14] was released by ICLEI in October 2012, and represents a new national standard in guidance to help U.S. local governments develop effective community GHG emissions inventories. It establishes reporting requirements for all community GHG emissions inventories, provides detailed accounting guidance for quantifying GHG emissions associated with a range of emission sources and community activities, and provides a number of optional reporting frameworks to help local governments customize their community GHG emissions inventory reports based on their local goals and capacities.

Local Government Operations Protocol

In 2008, ICLEI, the California Air Resources Board (CARB), and the California Climate Action Registry (CCAR) released the LGO Protocol[15]. The LGO Protocol serves as the national standard for quantifying and reporting greenhouse emissions from local government operations. The purpose of the LGO Protocol is to provide the principles, approach, methodology, and procedures needed to develop a local government operations greenhouse gas emissions inventory.

Quantification Methods

Greenhouse gas emissions can be quantified in two ways:

- Measurement-based methodologies refer to the direct measurement of greenhouse gas emissions (from a monitoring system) emitted from a flue of a power plant, wastewater treatment plant, landfill, or industrial facility.
- Calculation-based methodologies calculate emissions using activity data and emission factors. To calculate emissions accordingly, the basic equation below is used: *Activity Data x Emission Factor = Emissions*

All emissions sources in the sector-based inventory are quantified using calculation-based methodologies. Activity data refer to the relevant measurement of energy use or other greenhouse gas-generating processes such as fuel consumption by fuel type, metered annual electricity consumption, and annual vehicle miles traveled.

Known emission factors are used to convert energy usage or other activity data into associated quantities of emissions. Emissions factors are usually expressed in terms of emissions per unit of activity data (e.g. lbs. CO_2/kWh of electricity). For this inventory, calculations were made using the ICLEI ClearPath tool.

Data Sources and Inventory Process

The creation of an emissions inventory required the collection of information from a variety of sectors and data sources. Appendix G – Data Sources and Data Collected 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 Jefferson PUD 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 Jefferson County for waste generated. For the organizational inventories, the primary data sources were municipal accounting records for electricity, propane, fuel oil, vehicle fuel usage, water/sewer usage, waste generated, and results from a commuting survey.

Inventory data were collected by Inventory Team volunteers as follows:

Community-wide sources for buildings (William Wise), transportation and solid waste (Marion Huxtable); Agriculture (Karen Steinmaus) and Forestry (Karen Steinmaus and Cindy Jayne); Water and Wastewater (Tom Engel) and coordination of data collection and Commuting survey (Cindy Jayne).

VII. Appendix B – Solid Waste Handling and Methodology Details

This appendix provides more detail on solid waste handling and the methodologies used.

Transportation

GHG emission from transportation of the solid waste (both within and outside of County boundaries) is given here in order to provide a more complete account of the GHG emissions associated with disposal of the County's solid waste. (They are not included in the Community-wide totals as they are either out of the county or already included in the community-wide VMT totals.) Process emissions at the landfill are allocated to Klickitat County.

The absolute amount of CO_2e from transportation is relatively small but adds significantly to the CO_2e emissions associated with solid waste. Accounting for transportation adds an additional 1091 metric tons of CO_2e, for a total CO_2e of 3,553 metric tons from solid waste in 2018 (Table 11). Solid waste is first delivered to the Jefferson County Transfer Station, about half by commercial haulers and half by self-delivery. It is estimated that the individual deliveries produces 44% less CO_2e per ton of waste than do the commercial haulers, which has shifted since the 2005 report. It was noted that commercial haulers are currently based out of Sequim. The waste is transported from the Transfer Station 113 miles to Tacoma via truck and from Tacoma 292 miles to the Roosevelt Landfill via rail. Despite the ~3 times greater distance, rail CO_2e per ton of waste is cut by more than a factor of two.

The formerly used and now-closed Jefferson County Landfill has a low level of continuing methane release. The gas is flared. The amount of methane has decreased since 2005 and the treatment will be converted to a passive treatment without flaring. The amount of methane is considered to be insignificant and is not included in this inventory.

Recycling and Composting

Residential recycling of paper products, cardboard and other materials (including glass, metals and plastic) yielded 3,888 tons of material in 2018 (Table 25.) The 1105 tons of paper products recovered by recycling represent 26% of total waste paper. Paper products still constitute 15.5% of solid waste sent to the landfill. Note that paper has the greatest potential for methane production.

In addition, 3441 tons of yard waste is composted with biosolids locally, greatly reducing the amount of landfilled waste. This is 77% of all plant debris collected. Consequently, plant debris represents only 5% of the solid waste taken to the landfill.

Of the waste accounted for in this report, including the yard waste amount with the recycled material, 26% of the community's waste is removed (through recycling and composting) from the amount sent to the landfill.

Some of the recycled materials also generate less CO_2e from transport than does solid waste sent to the landfill. For example, 1207 tons of cardboard goes directly to PTPC. Paper goes to International Paper in Kent and Spokane, container glass goes to Strategic Materials in Seattle, ferrous metals to Metals Express in Tacoma, electronics to WMMFA in Seattle and commingled recyclables go to Pioneer Recycling in Tacoma.

TABLE 25: *COMPOSITION OF COMMUNITY SOLID WASTE AND RECYCLED WASTE - 2018*[32]

Material	**Solid Waste Composition**	**Relative Methane Production**[33]	**Solid Waste (tons)**	**Recycled Waste (tons)**
Cardboard	(included with paper products)	n/a		**1,207**
Paper products	15.5	2.14	3,204	**1,105**
Food waste	13	1.2	2,687	
Plant debris	5	0.69	1,034	**3,441** (composted)
Commingled recyclables – tin, aluminum, plastic#1,#2		0		1576
Total	100%		20,672	**3,888**

[32] Percentages based on State of Washington Department of Ecology, 2015-2016 Washington Statewide Waste Characterization Study, Publication 16-07-032, https://fortress.wa.gov/ecy/publications/documents/1607032.pdf. Page 122, West WGA Overall Disposed Waste Stream. (Note that residential waste percentages are on page 124.)

[33] Emissions factors from 2005 Inventory of Energy Usage and Associated Greenhouse Gas Emissions report for Jefferson County utilized.

VIII. Appendix C – Agriculture Analysis

As noted in the Agriculture section above, methane emissions due to enteric fermentation from livestock production were calculated for beef cattle, calves, sheep, goats, horses and swine. The emissions were derived from estimates of animal populations in Jefferson Co and US Community Protocol methods adapted from the EPA's *US Inventory for Greenhouse Gas Emissions and Sinks 2011*[34] and the 2006 IPCC *Guidelines for National Greenhouse Gas Inventories.* Animal populations were obtained from the USDA 2017 Census of Agriculture. The advantage of using Census data is that it is publicly (and easily) available, a consistent source of information, and reproducible from the standpoint of updates on the county-wide inventory. Limitations or disadvantages of USDA Census data include the fact that it is for the 2017 calendar year (not 2018), and it is based on survey data, with inherent inaccuracies associated with reliability. The figure below shows the inputs, equations, assumptions and calculations for emissions from livestock.

Methane emissions from manure were derived using estimates on animal populations, animal characteristics, and manure management practices. The assumption on manure management for Jefferson Co was that the predominant practice is to pasture livestock. Methane emissions from manure were calculated to be 90.80 metric tons $C0_2e$. Over 70% of these emissions are from beef cattle and calves. Emissions from manure were separately calculated for sheep, goats, horses, swine and chickens then combined with cattle for total emissions. Animal populations were obtained from the USDA 2017 Census of Agriculture and the methods used by the Protocol were adapted from the EPA's *US Inventory for Greenhouse Gas Emissions and Sinks 2011* and the 2006 IPCC *Guidelines for National Greenhouse Gas Inventories*. The figures below show the inputs, equations, assumptions and calculations for emissions from manure.

[34] https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks

FIGURE 4: METHANE EMISSIONS FROM LIVESTOCK ENTERIC FERMENTATION

JEFFERSON COUNTY Greenhouse Gas Inventory

FOR CALENDAR YEAR 2018

Input, Equations, Assumptions and Calculations for Methane Emissions from Livestock

Livestock Type	Population[1]	CH_4 Emissions[2] (metric tons CH_4e)	Emissions Factors[3] by Animal Type (kg CH_4/head/year)	CO_2[4] Equivalents (metric tons CO_2e)
Beef Cows	851	80	94	2,240
Calves	696	45.2	65	1,267
Sheep	481	3.8	8	108
Goats	314	1.6	5	45
Horses	241	4.3	18	121
SWINE	211	0.32	1.5	9

Total Methane Emissions Due to Enteric Fermentation from Livestock Production: 3,790 MT $C0_2e$

Footnotes

1) Livestock populations from USDA 2017 Census of Agriculture at nass.usda.gov/AgCensus

2) Methane emissions calculated from US Community Protocol, Appendix G, V1.1, Equation A.1 where CH_4 Emissions = Σ (Animal Population x EF x (1/1000))$_{\text{animal type.}}$

3) Emission Factors from US Community Protocol Appendix G, V1.1, Tables A.1.1 and A.1.2

4) Based on US Community Protocol, Appendix G, Equation A.1 and using a GWP of 28 from the 2014 IPCC 5th Assessment.

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FIGURE 5: METHANE EMISSIONS FROM LIVESTOCK MANURE

JEFFERSON COUNTY Greenhouse Gas Inventory
FOR CALENDAR YEAR 2018

Input, Equations, Assumptions and Calculations for Methane Emissions from Manure

Variable	Source	COWS	CALVES	SHEEP	GOATS	HORSES	SWINE	CHICKENS
Population	USDA NASS	851	696	481	314	241	211	2242
Volitile Solids (VS) Produced	Tables A.2.3.3, A.2.3.4	2158.74	7.7	8.3	9.5	6.1	5.4	11
Waste Mgmt System(s)	Pasture (assumed)	100%	100%	100%	100%	100%	100%	100%
Bo (m3 CH4/kg VS)	Table A.2.1.1	0.17	0.17	0.19	0.17	0.33	0.48	0.39
Cool Climate MCF	Table A.2.1.2	0.01	0.01	0.01	0.01	0.01	0.01	0.01
GWP (methane)	IPCC 5th assmt	28	28	28	28	28	28	28
TAM (kg)	Table A.2.3.1	n/a	118	80	64	450	91	1.8
VS excreted (kg/yr)	calculated	1,837,087.74	230,978.84	116,655.01	69,730.61	241,629.31	37,871.10	16,214.03
Methane emissions (metric tons, CO_2e)	calculated	57.89	7.28	4.11	2.2	14.78	3.37	1.17

Total Methane Emissions from Manure, All Livestock: **90.80 MT CO_2e**

EQUATIONS from US Community Protocol, Appendix G, V1.1

CATTLE (COWS)	**VS Excreted animal,WMS = Population animal x VS x WMS**	**Equation A.2.1.1b**
ALL OTHERS	**$VS\ Excreted_{animal,WMS}$ = $Population_{animal}$ x WMS x TAM_i /1000 x VS x 365.25**	**Equation A.2.1.1a**
METHANE EMISSIONS	**CH_4 Emissions = $VS\ Excreted_{animal,WMS}$ x B_o x MCF x 0.662 x (1/1000) x GWP**	**Equation A.2.1.2**

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Aquaculture

Aquaculture is the culture or farming of fish, shellfish, and other aquatic plants and animals in fresh, brackish, or salt water areas. There is a growing global interest in aquaculture for food, fertilizers, animal feed, biofuels and other sustainable products. Macro algae, or large aquatic photosynthetic plants like kelp and seaweeds are especially important because they absorb nutrients and carbon dioxide as they grow, recycling wastes and sequestering carbon. Accordingly, there are more efforts to protect and restore carbon-rich marine ecosystems.

The Washington Department of Natural Resources (WA-DNR) reports 12 active aquaculture leases in Jefferson County in 2018. Seven of these leases were for oysters, two for mussels, one for seaweed and one for salmon. The area of the leases covered approximately 170 acres all in eastern Jefferson County. The US Department of Agriculture (USDA) National Agricultural Statistics Service (NASS) in its 2017 Census documented that aquaculture operations yielded sales of $6,222,000, which ranks 7th in the state for aquaculture products sold. Since the 2017 NASS census, the USDA has conducted a more extensive census of Aquaculture. This is expected to be published in December 2019 and may provide additional information for any updated inventories.

At this time, the US Community Protocol and Clearpath software have no capability to evaluate aquaculture as a source (or sink) for greenhouse gases. Similarly, the 2005 baseline greenhouse gas inventory for Jefferson County did not include any data on aquaculture. Accordingly, there is no comparison with baseline data. As this Protocol evolves over time, these methods may be added and should be considered.

References:

2018 Census of Aquaculture, Volume 3, Special Studies, Part 2

AC-17-SS-2. Issued December 2019. www.nass.usda.gov

Acquaculture Leases in Jefferson Co in 2018

Contract	Partner	Water body	Use	Acres
20-079543	PORT DISCOVERY SEAFARMS	DISCOVERY BAY	Ground culture - clams and oysters	7.0
20-084703	A & K SHELLFISH	DABOB BAY	Ground culture - clams and oysters	7.2
20-088832	SKOKOMISH INDIAN TRIBE DNR	QUILCENE BAY	Delayed release salmon - Coho	0.25
20-A09560	COAST SEAFOODS COMPANY	QUILCENE BAY	Floating culture - Mussels	9.3
20-A12676	TAYLOR SHELLFISH CO INC	DABOB BAY	Floating culture - Mussels	8.3
20-A12744	PORT DISCOVERY SEAFARMS	DISCOVERY BAY	Floating culture - Oysters	5.7
20-B09206	ROCK POINT OYSTER COMPANY INC	DABOB BAY	Ground culture - oysters	8.1
20-B09307	WESTERN OYSTER PROPERTIES LLC	DABOB BAY	Ground culture - clams and oysters	10.1
20-B12535	HOOD CANAL MARICULTURE INC	HC THORNDYKE BAY	Floating culture - Seaweed	5.7
20-C12355	TAYLOR SHELLFISH CO INC	HC DOSEWALLIPS	Ground culture - clams and oysters	46.5
20-B12695	PEDERSON SHELLFISH FARM	DABOB BAY	Ground culture - clams and oysters	63
			Total Acres	**171.2**

Information obtained from Sean Carlson
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Sept 2019 email exchanges

IX. Appendix D – Forestry Analyses

This Appendix summarizes the two sets of US Forest Service results on the greenhouse gas impacts of forests in Jefferson County acquired for this inventory, utilizing two different methods.

The first method was part of a current effort to complete a soon to be published Forest Carbon study for Washington State, requested by the Washington Department of Natural Resources, and following the same methodology utilized in the Oregon Forest Ecosystem Carbon Inventory: 2001 - 2016[35]. It utilized data from the Washington's Forest Resources, 2007-2016: 10-Year Forest Inventory and Analysis Report[36]. This effort was presented by Glenn Christensen, FIA Inventory Analyst, at the 2019 Carbon Friendly Forestry Conference, a West Coast Forest Carbon Conference, in November 2019[37].

Carbon Stocks for Washington State were calculated based on FIA's average annual estimate for plots measured from 2007 through 2016. The stocks include carbon stored in live trees, standing dead trees, downed woody debris, understory vegetation, the forest floor duff and litter, and soils. Carbon flux represents the amount of carbon going into a pool minus the amount going out, and is estimated from actual measurements of growth, removals and mortality. Note that carbon removed as a harvested wood product is not included. It is reported in CO2 equivalents. The annual carbon flux is based on the 10 year change between plot measurements, with initial measurements from 2002-2006 compared to 2012-2016. This is 5 years of collected re-measured plot data, or 50% of all FIA's re-measured plots. The total number of re-measured plots included in the flux estimates for Jefferson County was about 50.

Glenn Christensen analyzed the Jefferson County subset of the FIA data, and the mean flux for Jefferson County was estimated at 1.681 million metric tons of CO_2e removal from the atmosphere, i.e. sequestration. (Appendix D.) However, because the FIA database was designed for state-level analysis, not county level, the 95% confidence interval spanned -0.145 to 3.506 million metric tons, where a positive number indicates net sequestration, per the convention used in that study. In other words, there could have been or a net loss of carbon or a net sequestration of carbon or emissions of carbon. (Note that the mean result is more than six times the total CO_2e emissions from Jefferson County in 2018 of 0.28 million metric tons.) As noted above, the FIA database was designed for state level analyses; thus the confidence interval when utilized at the county level is wide.

Note that in looking at the different factors that drive the change in carbon, including changes in standing live tree mortality, cut, and gross growth, as well as changes in Foliage, Tree Roots, Standing Dead, Dead Woody Debris, and Understory Vegetation, there were two factors that achieved statistical significance from zero:

- Standing Live Tree Mortality (-2.571 Million Metric Tons, 95% Confidence interval of -1.62 to -3.521), indicating a net loss of carbon due to tree mortality

[35] https://www.oregon.gov/odf/ForestBenefits/Documents/Forest%20Carbon%20Study/OR-Forest-Ecosystem-Carbon-2001-2016-Report-FINAL.pdf

[36] https://www.fs.fed.us/pnw/pubs/pnw_gtr976.pdf

[37] https://wecprotects.org/wp-content/uploads/2019/11/Washington-Forest-Carbon-Inventory_Slides.pdf

- Gross Growth (4.407 Million Metric Tons, 95% Confidence interval of -5.453 to -3.361), indicating a net gain of carbon due to tree growth

See the "Data from Glenn Christensen" section below for the detailed data.

The second method also was based on work from the USFS, utilizing a decision support tool called the Carbon Calculation Tool[38] (CCT). CCT is a computer application that reads the same FIA data mentioned above. It then generates annualized estimates of carbon stocks and carbon flux on forest land.

Utilizing the CCT tool (v4.0) and the existing WA State forest inventories, USFS estimated forest stocks and flux for Jefferson County. As our inventory was comparing 2018 data to 2005 data, an analysis was done for Jefferson County that estimated the average annual flux for those years. Note that the convention for the CCT Tool is that net sequestration of carbon is a negative flux, which is the opposite of the first method. For consistency here, the results from CCT are reported following the same convention as in the first method (and consistent with the Washington State report to be published), where a positive flux means carbon is being sequestered. Annualized outputs of stock and flux were derived from CCT (v4.0) and provided by USFS. Results of CCT output for carbon stocks and fluxes based on FIA inventory data for Jefferson County forests are provided below, in the Data from Mike Nichols section.

The 2018 flux data is based on changes in the forest inventory between 2007 and 2018, and represents the average annual change over that time period. Utilizing the CCT tool, it was estimated by USFS to be -2.391 million metric tons CO_2e /year, which represents a loss (or emission) of carbon from forest to atmosphere.

The 2005 flux estimate is based on changes in inventory between 1995 and 2006, and represents the average annual change over that time period. Utilizing the CCT tool, it was estimated by USFS to be 10.105 million metric tons, which represents a removal (or sequestration) of carbon from atmosphere.

Note that the CCT tool does not calculate Confidence intervals, but it was noted that due to the analysis being done at the sub-state level, sampling errors increase and the reliability of the estimates goes down.

Note that the two sets of results, while using the same database, vary in calculation method as well as in the years analyzed. The above documents the results calculated, but the main conclusion to be drawn is that to calculate carbon flux at the county level more confidently, and to be able to better determine the factors driving the results, would require a larger county level database than exists in the FIA database today.

[38] https://www.nrs.fs.fed.us/pubs/gtr/gtr_nrs13R.pdf

Data from Glenn Christensen

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Table 4.12bFLUX. Annual Net Change in Carbon Stocks on Forest Land for All Pools by county, 2007-2016: COUNTY

		Jefferson County	
		Total	**SE**
		thousand metric tons CO2 equivalent per year	
Standing Live tree			
	Mortality	-2,570.7	484.8
	Cut	-1,072.4	588.6
	Gross Growth	4,406.9	533.5
	Net	763.8	721.1
Foliage		47.2	43.7
Tree Roots			
	Live	198.5	162.9
	Dead	31.1	45.0
Standing Dead		309.1	190.3
Dead Woody Debris		239.6	366.2
Understory Vegetation			
	Above Ground	-6.9	7.9
	Below Ground	-0.8	0.9
Total		1,581.6	926.8
Forest Floor		60.8	54.6
Soils		38.5	59.9
Total (including soils and forest floor)		1,680.8	931.4

Table 4.12bB. Forest land carbon stock per acre by county, 2007-2016: COUNTY		
	Jefferson County	
Carbon Pool		
	Total	**SE**
	Metric tons C per acre	
Live trees		
Aboveground	78.658	4.201
Belowground	15.590	0.841
Dead trees		
Aboveground	7.875	0.687
Belowground	2.306	0.200
Understory vegetation		
Aboveground	1.046	0.017
Belowground	0.116	0.002
Down wood	14.275	1.076
Forest Floor	6.873	0.123
Soil	65.759	0.375
Total Carbon	192.497	6.194

Table 3 (subset) From Palmer, Marin; Kuegler, Olaf; Christensen, Glenn, tech. eds. 2019. Washington's forest resources, 2007–2016: 10-year Forest Inventory and Analysis report. Gen. Tech. Rep. PNW-GTR-976. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.

Table 3—Area of forest land by county and land status, Washington, 2007–2016

	Land Status													
	Unreserved forests						Reserved forests							
	Timberland		Other forest		Total		Productive		Other forest		Total		All forest land	
County	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
	Thousand acres													
Western Washington:														
Clallam	713.2	56.7	6.5	3.7	719.7	56.7	298.7	39.0	32.2	13.4	330.9	40.5	1,050.5	69.7
Clark	198.1	33.8	3.0	3.0	201.1	33.9	2.9	3.6	--	--	2.9	3.6	204.0	34.1
Cowlitz	585.3	57.6	11.2	7.4	596.5	58.2	30.0	7.5	--	--	30.0	7.5	626.4	58.7
Grays Harbor	1,132.0	75.8	19.6	11.1	1,151.6	76.5	--	--	--	--	--	--	1,151.6	76.5
Island	47.8	16.0	--	--	47.8	16.0	4.2	3.9	--	--	4.2	3.9	52.1	16.5
Jefferson	492.3	48.5	6.3	5.1	498.6	48.8	369.5	41.8	63.9	19.8	433.4	44.9	932.0	66.3
King	687.2	56.5	21.6	8.8	708.8	57.2	154.1	32.3	13.0	10.3	167.1	33.3	875.9	65.8

Data from Mike Nichols

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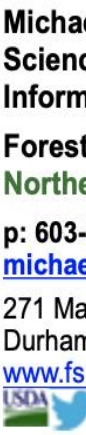

Caring for the land and serving people

Jefferson_County_WA Stocks:

STATE	COUNTY	YEAR	TREE_AG_Tg	TREE_BG_Tg	UNDERSTORY_Tg	STANDINGDEAD_Tg	DOWNDEAD_Tg	FF_Tg	SOC_Tg			FOREST_AREA_KHa
Washington	31	1990	63.719717	13.490548	1.267079	4.528217	11.709675	8.039389	57.46034	160.215		419.1982
Washington	31	1991	63.635355	13.47246	1.343413	4.530497	10.707842	8.048164	54.12936	155.8671		417.3501
Washington	31	1992	63.550994	13.454373	1.419748	4.532776	9.70601	8.05694	50.79839	151.5192		415.502
Washington	31	1993	63.466633	13.436285	1.496083	4.535055	8.704177	8.065716	47.46742	147.1714		413.6539
Washington	31	1994	63.382272	13.418198	1.572418	4.537335	7.702345	8.074491	44.13645	142.8235		411.8058
Washington	31	1995	63.515887	13.446574	1.60492	4.614557	7.237386	8.06854	42.67874	141.1666		410.0036
Washington	31	1996	64.006966	13.551149	1.56554	4.814679	7.652854	8.038438	44.29304	143.9227		408.2766
Washington	31	1997	64.498044	13.655724	1.52616	5.0148	8.068322	8.008337	45.90734	146.6787		406.5497
Washington	31	1998	64.989122	13.760298	1.48678	5.214922	8.48379	7.978235	47.52164	149.4348		404.8228
Washington	31	1999	65.4802	13.864873	1.4474	5.415044	8.899258	7.948134	49.13594	152.1908		403.0959
Washington	31	2000	65.971278	13.969447	1.40802	5.615166	9.314726	7.918032	50.75024	154.9469		401.369
Washington	31	2001	66.462356	14.074022	1.36864	5.815288	9.730194	7.88793	52.36453	157.703		399.6421
Washington	31	2002	66.953434	14.178597	1.32926	6.015409	10.145662	7.857829	53.97883	160.459		397.9152
Washington	31	2003	67.444512	14.283171	1.28988	6.215531	10.56113	7.827727	55.59313	163.2151		396.1883
Washington	31	2004	67.93559	14.387746	1.2505	6.415653	10.976598	7.797626	57.20743	165.9711		394.4613
Washington	31	2005	68.426668	14.49232	1.21112	6.615775	11.392066	7.767524	58.82173	168.7272	618.6664	392.7344
Washington	31	2006	68.917746	14.596895	1.17174	6.815897	11.807534	7.737422	60.43603	171.4833		391.0075
Washington	31	2007	69.259083	14.669628	1.139135	6.962028	12.11571	7.703057	61.5853	173.4339		389.1524
Washington	31	2008	69.116468	14.639449	1.128425	6.933668	12.077128	7.654911	61.23166	172.7817		386.883
Washington	31	2009	68.973853	14.609271	1.117714	6.905308	12.038546	7.606766	60.87801	172.1295		384.6135
Washington	31	2010	68.831239	14.579093	1.107004	6.876948	11.999963	7.55862	60.52436	171.4772		382.3441
Washington	31	2011	68.688624	14.548915	1.096294	6.848588	11.961381	7.510474	60.17072	170.825		380.0747
Washington	31	2012	68.54601	14.518737	1.085584	6.820228	11.922799	7.462329	59.81707	170.1728		377.8052
Washington	31	2013	68.403395	14.488558	1.074874	6.791868	11.884216	7.414183	59.46343	169.5205		375.5358
Washington	31	2014	68.26078	14.45838	1.064164	6.763508	11.845634	7.366038	59.10978	168.8683		373.2664
Washington	31	2015	68.118166	14.428202	1.053454	6.735148	11.807052	7.317892	58.75613	168.216		370.9969
Washington	31	2016	67.975551	14.398024	1.042744	6.706788	11.768469	7.269746	58.40249	167.5638		368.7275
Washington	31	2017	67.832937	14.367846	1.032034	6.678428	11.729887	7.221601	58.04884	166.9116		366.4581
Washington	31	2018	67.690322	14.337667	1.021324	6.650068	11.691305	7.173455	57.6952	166.2593	609.6176	364.1886
Note: The carbon fluxes in this Appendix are reported in Tg, where 1 Tg = 1 million metric tons.												

Jefferson_County_WA_Flux

STATE	COUNTY	YEAR	TREE_AG_Tg/y	TREE_BG_Tg/year	UNDERSTORY_Tg/year	STANDINGDEAD_Tg/year	DOWNDEAD_Tg/y	FF_Tg/year	SOC_Tg/year	TOTAL_Tg/year	TOTAL_Tg CO2e/year
Washington	31	1990	0.084361	0.018088	-0.076335	-0.002279	1.001832	-0.008776	3.330973	4.347864	15.942168
Washington	31	1991	0.084361	0.018088	-0.076335	-0.002279	1.001832	-0.008776	3.330973	4.347864	15.942168
Washington	31	1992	0.084361	0.018088	-0.076335	-0.002279	1.001832	-0.008776	3.330973	4.347864	15.942168
Washington	31	1993	0.084361	0.018088	-0.076335	-0.002279	1.001832	-0.008776	3.330973	4.347864	15.942168
Washington	31	1994	-0.133615	-0.028377	-0.032502	-0.077222	0.464959	0.005951	1.457704	1.656898	6.075292667
Washington	31	1995	-0.491078	-0.104575	0.03938	-0.200122	-0.415468	0.030102	-1.614299	-2.75606	-10.10555333
Washington	31	1996	-0.491078	-0.104575	0.03938	-0.200122	-0.415468	0.030102	-1.614299	-2.75606	-10.10555333
Washington	31	1997	-0.491078	-0.104575	0.03938	-0.200122	-0.415468	0.030102	-1.614299	-2.75606	-10.10555333
Washington	31	1998	-0.491078	-0.104575	0.03938	-0.200122	-0.415468	0.030102	-1.614299	-2.75606	-10.10555333
Washington	31	1999	-0.491078	-0.104575	0.03938	-0.200122	-0.415468	0.030102	-1.614299	-2.75606	-10.10555333
Washington	31	2000	-0.491078	-0.104575	0.03938	-0.200122	-0.415468	0.030102	-1.614299	-2.75606	-10.10555333
Washington	31	2001	-0.491078	-0.104575	0.03938	-0.200122	-0.415468	0.030102	-1.614299	-2.75606	-10.10555333
Washington	31	2002	-0.491078	-0.104575	0.03938	-0.200122	-0.415468	0.030102	-1.614299	-2.75606	-10.10555333
Washington	31	2003	-0.491078	-0.104575	0.03938	-0.200122	-0.415468	0.030102	-1.614299	-2.75606	-10.10555333
Washington	31	2004	-0.491078	-0.104575	0.03938	-0.200122	-0.415468	0.030102	-1.614299	-2.75606	-10.10555333
Washington	31	2005	-0.491078	-0.104575	0.03938	-0.200122	-0.415468	0.030102	-1.614299	-2.75606	-10.10555333
Washington	31	2006	-0.341336	-0.072733	0.032605	-0.146132	-0.308176	0.034365	-1.149274	-1.950681	-7.152497
Washington	31	2007	0.142615	0.030178	0.01071	0.02836	0.038582	0.048146	0.353646	0.652237	2.391535667
Washington	31	2008	0.142615	0.030178	0.01071	0.02836	0.038582	0.048146	0.353646	0.652237	2.391535667
Washington	31	2009	0.142615	0.030178	0.01071	0.02836	0.038582	0.048146	0.353646	0.652237	2.391535667
Washington	31	2010	0.142615	0.030178	0.01071	0.02836	0.038582	0.048146	0.353646	0.652237	2.391535667
Washington	31	2011	0.142615	0.030178	0.01071	0.02836	0.038582	0.048146	0.353646	0.652237	2.391535667
Washington	31	2012	0.142615	0.030178	0.01071	0.02836	0.038582	0.048146	0.353646	0.652237	2.391535667
Washington	31	2013	0.142615	0.030178	0.01071	0.02836	0.038582	0.048146	0.353646	0.652237	2.391535667
Washington	31	2014	0.142615	0.030178	0.01071	0.02836	0.038582	0.048146	0.353646	0.652237	2.391535667
Washington	31	2015	0.142615	0.030178	0.01071	0.02836	0.038582	0.048146	0.353646	0.652237	2.391535667
Washington	31	2016	0.142615	0.030178	0.01071	0.02836	0.038582	0.048146	0.353646	0.652237	2.391535667
Washington	31	2017	0.142615	0.030178	0.01071	0.02836	0.038582	0.048146	0.353646	0.652237	2.391535667

Note: The carbon fluxes in this Appendix are reported in Tg, where 1 Tg = 1 million metric tons.

Available_Inventories

INVENTORY	FOREST	COUNTY	AVGYEAR	UPDATED	STATECD	CYCLE	AREA_KHa	TMLDAREA_KHa	TREE_AG_Tg	TREE_BG_Tg	UNDERSTORY	STANDINGDEA	DOWNDEAD_Tg	FF_Tg	SOC_Tg	STATE
IDB____WA____1993	NatlFor West	31	1995.514		53	0	64.56205	46.308583	9.948734	2.114134	0.192295	1.02028	1.556265	1.285764	10.05568	Washingt
FIADBLT_WA____2011	NatlFor West	31	2007.363	20170808	53	5.0594	59.275534	40.477841	9.367131	1.991964	0.160459	0.763893	1.573788	1.181951	9.309773	Washingt
FIADBLT_WA____2015	NatlFor West	31	2011.147	20170808	53	5.4322	59.510687	40.618983	9.902616	2.105623	0.162499	0.697891	1.628851	1.142645	9.409002	Washingt
FIADBLT_WA____2016	NatlFor West	31	2011.835	20170808	53	5.5006	59.157776	40.564394	9.797119	2.083128	0.162587	0.783267	1.613298	1.13711	9.35914	Washingt
IDB____WA____1993	nonNatlFor West	31	1990.051		53	0	352.735134	162.892284	53.716024	11.365133	1.068658	3.428731	10.122405	6.704314	47.00501	Washingt
FIADBWW_WA____1991	nonNatlFor West	31	1994.623		53	0	345.800668	155.307192	53.372857	11.291135	1.425921	3.505533	5.526855	6.786064	31.97355	Washingt
FIADBLT_WA____2011	nonNatlFor West	31	2006.765	20170808	53	5	328.8523	163.769548	59.448571	12.584	0.969851	6.111845	10.529244	6.531151	52.09338	Washingt
FIADBLT_WA____2015	nonNatlFor West	31	2011.132	20170808	53	5.4115	315.212169	156.594642	58.476126	12.378852	0.908117	6.214213	10.278923	6.265821	49.88431	Washingt
FIADBLT_WA____2016	nonNatlFor West	31	2012.354	20170808	53	5.5293	318.020057	158.66782	58.703484	12.425966	0.92017	6.034511	10.294098	6.31299	50.35553	Washingt

Note: The carbon fluxes in this Appendix are reported in Tg, where 1 Tg = 1 million metric tons.

X. Appendix E – Consumption-Based Emissions Inventory - Further Detail

More detail is included here about the consumption-based inventory, and how Jefferson County results compare to the consumption-based emissions of other areas, as well as details from an Oregon consumption-based inventory.

C40 Consumption Emissions

The C40 group (a network of the world's megacities committed to addressing climate change, c40.org) has compared sector-based and consumption-based emissions inventories for 79 of the world's largest cities[39]. The sector-based emissions exceed the consumption-based emissions in approximately 20% of the cities studied. These are cities with large industrial bases such as oil refineries and smelters that emit large amounts of greenhouse gases and export much of their products for consumption outside the city boundaries. These are identified as 'producer cities'.

The remaining 80% of cities studied are identified as 'consumer cities', with consumption-based emissions exceeding sector-based estimates, generally by a factor of 2 - 3 but for a few by as much as a factor of 9. These cities import the majority of products that support the residents' life-style while the emissions occur elsewhere.

Since Jefferson County has only a few major industries that export products to be consumed elsewhere but rather imports most of its goods and food, it is expected to be similar to a 'consumer city' with consumption-based emissions exceeding the sector-based emissions estimate. A consumption-based emissions that exceeds the sector-based estimate by a factor of 2.3 for Jefferson County seems in line with the C40 study. This and the reasonable agreement between the per capita consumption-based emissions estimates, implies that the estimated consumption-based emissions value of 642,443 metric tons CO_2e for Jefferson county is a reasonable measure of the total emissions supporting the life style of it residents.

Oregon Consumption Inventor as an Example

Oregon performed a detailed consumption-based emissions inventory for the state[40], the results of which are included here.

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[39] Consumption-Based GHG Emissions of C40 Cities (2018) C40 Cities Climate Leadership Group 21p. (https://c40-production-images.s3.amazonaws.com/researches/images/68_C40_GHGE-Report_040518.original.pdf?1529597233).

[40] Oregon's Greenhouse Gas Emissions through 2015: Sector and Consumption-Based Inventories (2018) Department of Environmental Quality, 700NE Multnomah Street, Suite 600, Portland OR 97232.

The figure below displays the breakdown of consumption-based emissions for the state of Oregon. In 2015, total consumption-based emissions was estimated to be 88.7 million metric tons of CO_2e. At the reported population of 4.02 million, this represents an emissions of 22 metric tons/person.

FIGURE 6: DETAIL OF EMISSIONS CATEGORIES OF OREGON CONSUMPTION-BASED EMISSIONS INVENTORY FOR 2015. REPRODUCED FROM OREGON'S GREENHOUSE GAS EMISSIONS THROUGH 2015: SECTOR AND CONSUMPTION-BASED INVENTORIES (2018).

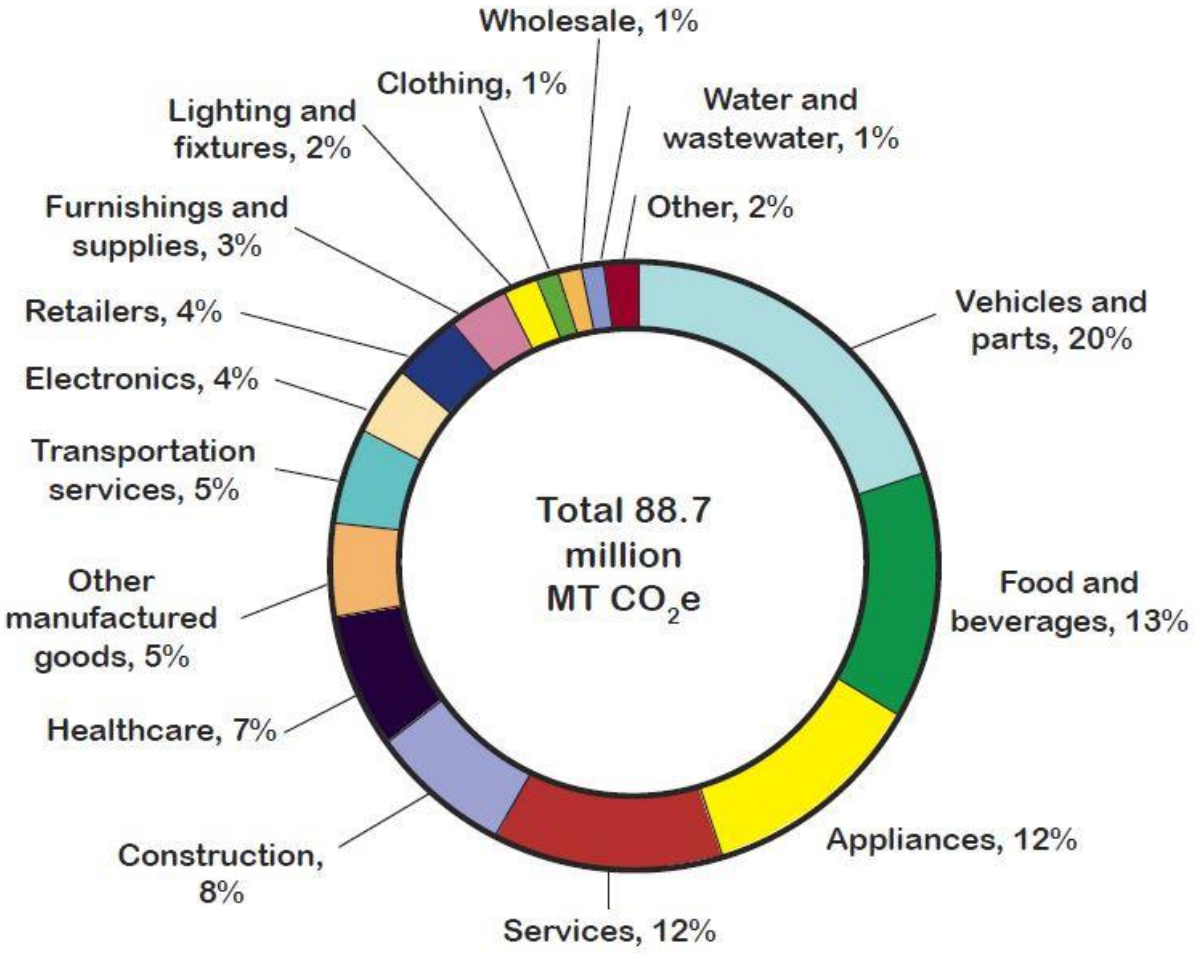
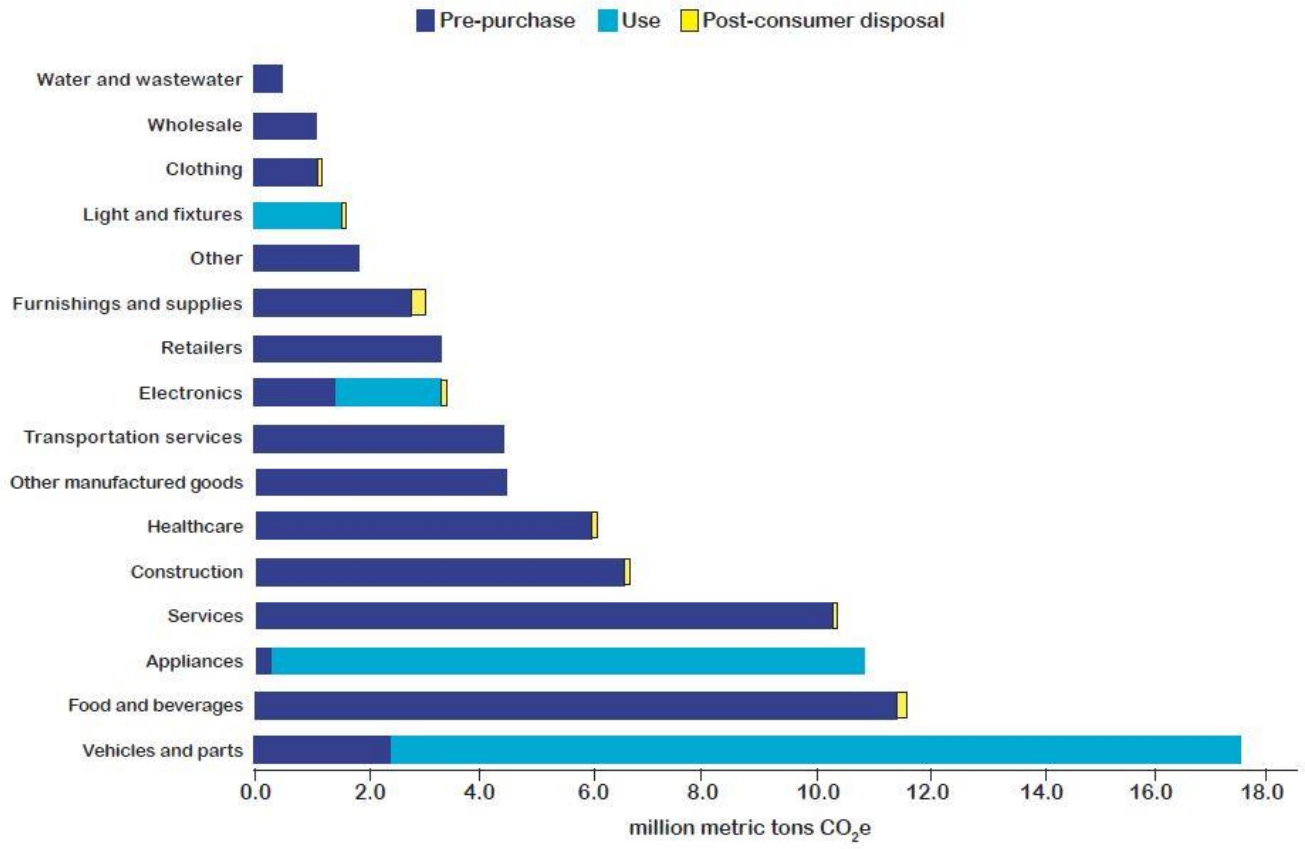


FIGURE 7: DETAIL OF EMISSIONS CATEGORIES OF OREGON CONSUMPTION-BASED EMISSIONS INVENTORY FOR 2015. REPRODUCED FROM OREGON'S GREENHOUSE GAS EMISSIONS THROUGH 2015: SECTOR AND CONSUMPTION-BASED INVENTORIES (2018).



The activities, services and product categories that comprise this consumption-based emission rate is shown in the pie chart. With the inclusion of other emissions, the contribution from personal transportation, cars and the fuels to operate them, comprises 20% of the total. Food and beverages, appliances, and services are the next three largest sources of greenhouse gases at 13%, 12% and 12% of the total, respectively. Note that emissions from other modes of transportation such as bus, train or air travel are included under the transportation services category.

This figure also clarifies the distinction between consumption-based emissions associated with the manufacture and purchase of an item or service versus those associated with its use. The horizontal histograms on the figure differentiate between pre-purchase and use greenhouse gas emissions. For some items, such as light and fixtures or appliances, emissions are overwhelmingly associated with their use and only a very small amount occurs pre-purchase. On-the-other-hand, manufacturing and distribution dominates the emissions for many of the other categories such as food and beverages, construction, manufactured goods, and clothing, and there is very little contribution associated with their use. Finally, for a few items such as electronics and vehicles and parts, there are significant contributions from both pre-purchase activities and through use. Note that for electric vehicles utilizing renewable sources of electricity, nearly all of the emissions would be considered pre-purchase.

When viewed from a consumption-based perspective, it is obvious how many different ways humans contribute greenhouse gases to the atmosphere and how connected these pathways are to current life styles. Furthermore, it is important to note that emissions that occur pre-purchase account for the majority of emissions.

XI. Appendix F – Authorizing Memo

Jefferson County/City of Port Townsend

Climate Action Committee

April 25, 2019

To: Staff of CAC Organizations, WSDOT, WSU Jefferson County, Mason and Grays Harbor PUDs, Republic Services, and Other Relevant Organizations

RE: Support for County-wide Greenhouse Gas Inventory

The Jefferson County / Port Townsend Climate Action Committee (CAC) has committed to updating the county wide greenhouse gas inventory by the end of 2019 in order to have an up to date understanding of our current contributions to global climate change. The CAC has partnered with a group of volunteers that have committed to doing the work, as part of the Local 20/20 Energy Action group. The list of volunteers include: Bill Wise, Marion Huxtable, Karen Steinmaus, Tom Engel and Cindy Jayne.

Jefferson County and the City of Port Townsend have committed the necessary funds to join ICLEI, the leading global network of local governments dedicated to sustainability, resilience and climate action. ICLEI provides members with access to the ClearPath software that is the standard tool for doing municipal level greenhouse gas inventories.

The Jefferson County wide inventory was last done based on 2005 data. The plan for this new roll up is to use 2018 as the base.

The Climate Action Committee, at its 2/27/19 meeting, committed to not only do a community-wide inventory, but to do a more detailed roll up of greenhouse gas emissions for all Climate Action Committee organizations, which includes the City of Port Townsend, Jefferson County, Port of Port Townsend, Jefferson PUD, Jefferson Transit, Jefferson Healthcare, and the Port Townsend Paper Company. Additionally, the CAC committed to adding to this inventory agricultural and forestry emissions where possible.

In order to support the inventory work, below is an outline of the type of data that will be needed. Note that this list is not comprehensive. All data requested will be for the time period of 1/1/2018 – 12/31/2018.

Community wide data:

- Electricity use broken down into residential, commercial and industrial
- Fossil fuel usage (gasoline, diesel, fuel oil, propane, etc.)
- Information regarding total waste generated and characterization, and details related to the landfill methane capture and handling, etc.
- Details of electricity and fossil fuels used and generated in the handling of wastewater.
- Vehicle Miles Traveled and on-road emissions factors
- Electricity used by water agencies in Jefferson County, and population served, related to extraction, treatment and distribution of potable water
- Agricultural data including acres cultivated, livestock type and numbers, and value of production

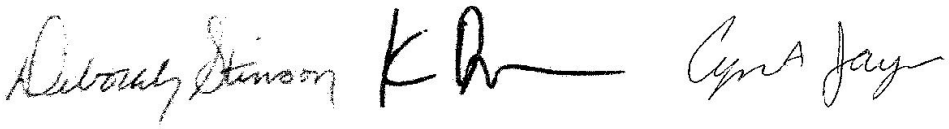
Organization specific data:

- Electricity use, per building (can be obtained from JPUD with your approval)
- Gasoline, diesel, propane, biodiesel, ethanol, natural gas or other fuel types, usage by your organization
- Fleet vehicle information (types of vehicles, fuel types and quantities used, miles traveled)
- Employee commute information (total vehicle miles traveled, fuel type, and car/light truck/truck)

This letter is to kindly request that you support the volunteers listed above with acquiring the necessary data. They will contact you with a more complete list of exactly what data they require from your organization. As the goal is to complete this inventory by the end of 2019, they will be following up with you shortly for that data, and we request that you provide it in a timely fashion.

If you have any questions regarding this letter, feel free to contact your Climate Action Committee organizational representative (listed below), or myself.

Thank you for your assistance.



Mayor Deb Stinson, Commissioner Kate Dean, and Cindy Jayne, CAC Chair, and the CAC Organizational Representatives listed below

On behalf of the Climate Action Committee

Climate Action Organizational Representatives:

City of Port Townsend: Mayor Deborah Stinson

Jefferson County: Commissioner Kate Dean, and Laura Tucker for Public Health

Jefferson PUD: Commissioner Jeff Randall

Jefferson Healthcare: Chris O'Higgins

Jefferson Transit: John Bender, and Tammi Rubert

Port of Port Townsend: Eric Toews and Jim Pivarnik

Port Townsend Paper Company: Darren Wilson

XII. Appendix G – Data Sources and Data Collected

The data received worksheets and data calculation worksheets, as well as the Clearpath Software output reports, will be archived with the Climate Action Committee files.