Snohomish County

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2014 Greenhouse Gas Emissions Inventory of County Government Operations

Office of Energy and Sustainability
Revised 5/31/2018

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Executive Summary

A significant rise in greenhouse gas emissions (GHGs) over the last century has resulted in a warming planet, among other environmental impacts, as well as risks to human safety, health, and the economy. Global and national scientific agencies that study climate change, including the National Aeronautics and Space Administration (NASA), the National Oceanic and Atmospheric Administration (NOAA) and the Intergovernmental Panel on Climate Change (IGCC), all agree that humans are the primary driver of greenhouse gas emissions. Human activities such as deforestation, burning fossil fuels to produce energy, and industrial processes are some of the primary sources of greenhouse gases (GHGs) that present serious threats to our ecosystem and well-being. In order to protect the health and livelihood of humans and the environment, local governments, business, organizations, and individuals need to take immediate action.

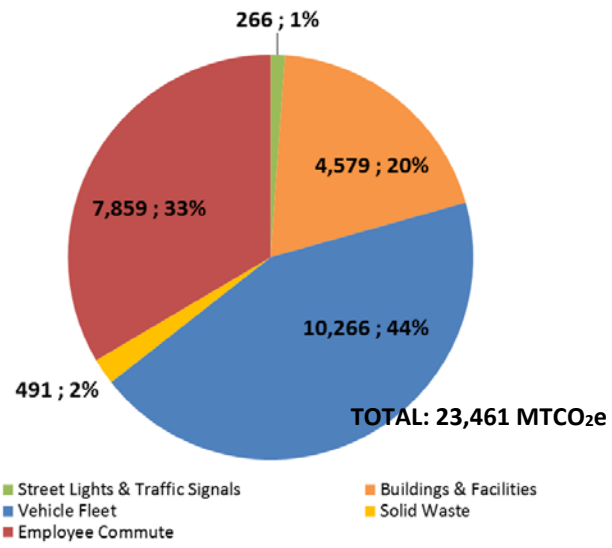
This report presents the results from a 2014 GHG inventory associated with Snohomish County government operations only, however it should be noted that the County plans to conduct a GHG inventory for community-based emissions in the near future. Snohomish County is working to address climate change through specific policies, planning, and establishing emissions reduction goals. The County's goal to reduce GHGs from government operations to 20% below year 2000 levels by 2020 was established via Executive Order 13-48A as part of Snohomish County's Sustainable Operations Action Plan (SOAP)[1], a policy document unanimously adopted by County Council in 2013. Additional policy documents building GHG reduction in County operations include the County's Comprehensive Plan and Environmentally Preferable Purchasing and Product Utilization.

Snohomish County's first GHG assessment was published in 2008 and compared GHG emissions levels for County Government in 2000 (baseline year) with 2006 emissions. In that first GHG assessment, 2006 emissions rose 24% compared to 2000 levels, and the County was not forecast to meet its 20% reduction goal by 2020. This report contains an updated assessment of the GHG emissions from County operations in 2014 compared to 2000 and 2006 levels, and the findings demonstrate that considerable progress has been made when compared to the 2008 assessment.

2014 Greenhouse Gas Emission Findings for Snohomish County Government Operations

- 2014 GHG emissions decreased 8.5% from 2000 levels and the County is on-track to meet its 20% goal by 2020[2].
- GHGs associated with the County's vehicle fleet and employee commute represent 77% of 2014 total emissions.
- 2014 GHG emissions from County fleet vehicles decreased 35% compared to 2006 levels.
- 2014 GHG emissions from employee commuting increased 27% compared to 2000 levels and 2% from 2006 levels.
- 2014 GHG emissions from 83 County buildings (facilities) decreased 47% from 2000 levels and 40% from 2006 levels.
- Emissions from solid waste and streetlights constitute a relatively small proportion of the County's total GHG emissions, at 2% and 1%, respectively.

Figure 4: Distribution of 2014 Total GHG Emissions by Sector ($MTCO_2e$ and %)



[1] Goal established in Executive Order 07-48, 13-48A, and Sustainable Operations Action Plan (Goal 2, Objective 2E).

[2] This assessment uses the same Local Government Operations Protocol for governmental GHG emissions reporting as was used in the 2000 and 2006 measurements. The Protocol was developed by ICLEI (International Council for Local Environmental Initiatives). The scientific methodology of assigning a GHG output to various emission model inputs was developed by the Intergovernmental Panel on Climate Change "Guidelines for the Preparation of National Inventories 2nd Amendment", although 2014 data is also reported using the recently updated 4th Amendment calculations that use updated climate science.

The primary factors that contributed to the County's reduction in GHG emissions include the following:

- Buildings and Facilities
  - Reduced consumption of electricity and natural gas in County facilities from conservation and energy efficiency efforts
  - "Greening" of the local electric utility's energy sources, which in turn reduces the County's GHG emissions.
- Transportation
  - Reduction in fuel consumption from increases in vehicle fuel efficiency and/or vehicle mile reduction.
  - Increased use of biodiesel in diesel vehicles. Biodiesel results in fewer GHG emissions for the same volume of diesel fuel.

Implications and Next Steps

While the findings of this report indicate that the County is on track to meet our 20% reduction goal by 2020, the significant increase in emissions from the transportation sector is concerning and may present an obstacle to meeting that goal in the next few years. Because 77% of the County's total emissions are generated from fleet vehicles and employee commuting, the County needs to further investigate the likely causes of that may be attributed to the substantial increase in this sector in recent years.

The County's second largest share of GHG emissions by sector are County Buildings, which represent 20% of the total government emissions. The County has made significant progress in reducing emissions within this sector in recent years, largely due to investments in energy and water conservation retrofits. Nonetheless, this sector is an important area to focus on as the County has a greater ability to manage and influence emissions within this sector.

In order to continue making progress in emissions reduction over the next four years, the primary recommendations for the County include:

1. Start tracking greenhouse gas emissions associated with the Transportation and Building sectors biennially, and report on these findings to the Executive, County Council, and appropriate Departments.
2. Develop a plan to investigate the significant increase in GHG emissions in the Transportation sector. Part of this plan will likely include the need to collect additional data related to vehicle fleet and employee commuting, and collecting this data with more frequency.
3. Develop a greenhouse gas emissions reduction plan for County operations that establishes specific goals and action items by sector.

Background

This Greenhouse Gas Emissions Inventory Report is an accounting of the GHGs generated from County government operations in 2014. Greenhouse gas emissions (GHGs) are comprised a variety of gases, primarily carbon dioxide (CO^2), Methane (CH^4), Nitrous Oxide (N^2O), and fluorinated gases. There is overwhelming consensus among the global scientific community that human activity is responsible for climate change[3]. Conducting an inventory of greenhouse gas emissions from County operations will help County government prioritize actions to reduce emissions, particularly from areas that generate the most GHGs. This report analyzes the amount of GHGs attributable to County government operations, namely energy consumption in County buildings, fuel usage in County fleet vehicles and employee commuting, the transportation and decomposition of solid waste created by County government, and operation of street lights.

Like other jurisdictions and organizations, Snohomish County has established a local GHG emission reduction goal to demonstrate our commitment to help reduce global emissions. The County's first 2006 GHG inventory estimated that County operations account for just under 1% of all GHGs generated within Snohomish County[4]. While this may be a relatively small share of GHG emissions County-wide, Snohomish County recognizes the urgent need for every organization to do their part to address climate change. Local, state, and federal governments have adopted plans to reduce their GHG emissions, and here are just a few examples:

- Washington State established a goal of reducing emissions statewide to 50% below 1990 levels by the year 2050. In order to be consistent with global GHG reduction goals after the recent Paris Climate Summit, Washington State decided to revise their goals to cut emissions 80-95% below 1990 levels[5].
- King County has a goal to reduce 2007 GHG emissions by 80% by 2050[6].
- The United States has committed to a 28% reduction below 2005 levels by 2025.[7]

A summary of the methodology for this inventory can be found in Section 2, and additional information on ClearPath (the GHG inventory software) can be found in Appendix B. It is important to note that this report does not include GHG emissions generated from employee air travel, as the County currently does not collect this data. The report also does not include embodied emissions from items purchased for government operations, as compiling and analyzing this data is not practical or feasible at this time.

[3] United Nations Environment Programme. Intergovernmental Panel on Climate Change. "5th Assessment Report Summary for Policy Makers".
[4] "Greenhouse Gas Emissions Inventory and Forecast". Snohomish County Government. April 28, 2008.
[5] http://under2mou.org/wp-content/uploads/2015/04/Under-2-MOU-English.pdf
[6] 2010 King County Energy Plan.
[7] https://www.whitehouse.gov/the-press-office/2015/12/12/us-leadership-and-historic-paris-agreement-combat-climate-change

Methodology Summary for Snohomish County Government 2014 GHG Emissions

This report was completed using ClearPath, an emissions management software developed by ICLEI (Local Governments for Sustainability), an international organization that develops tools and resources to assist local governments in addressing environmental sustainability issues. ClearPath models GHG impacts based upon internationally accepted climate science. This report uses the climate science of the United Nation's Intergovernmental Panel on Climate Change (IPCC) 2nd Assessment Report in order to match the methodology of the County report completed in 2008. Three IPCC Assessment Reports have been issued since the 2nd Assessment was published, and the subsequent IPCC reports have each shown that climate impacts from GHG emissions have a more significant impact than previously reported.

Using the ClearPath software, the 2014 GHG emission impact of all County government activities was modeled by inputting primary data for a several sources such as energy use, waste generation, and fuel consumption. Each of these inputs is assigned an emissions intensity multiplier, typically expressed in metric tons of carbon dioxide equivalent (CO2e), which is dependent upon the fuel source or input. Below is a summary of some of the sector inputs and intensity data sources used to compile Snohomish County's 2014 GHG Inventory. Please visit Appendix C for more information.

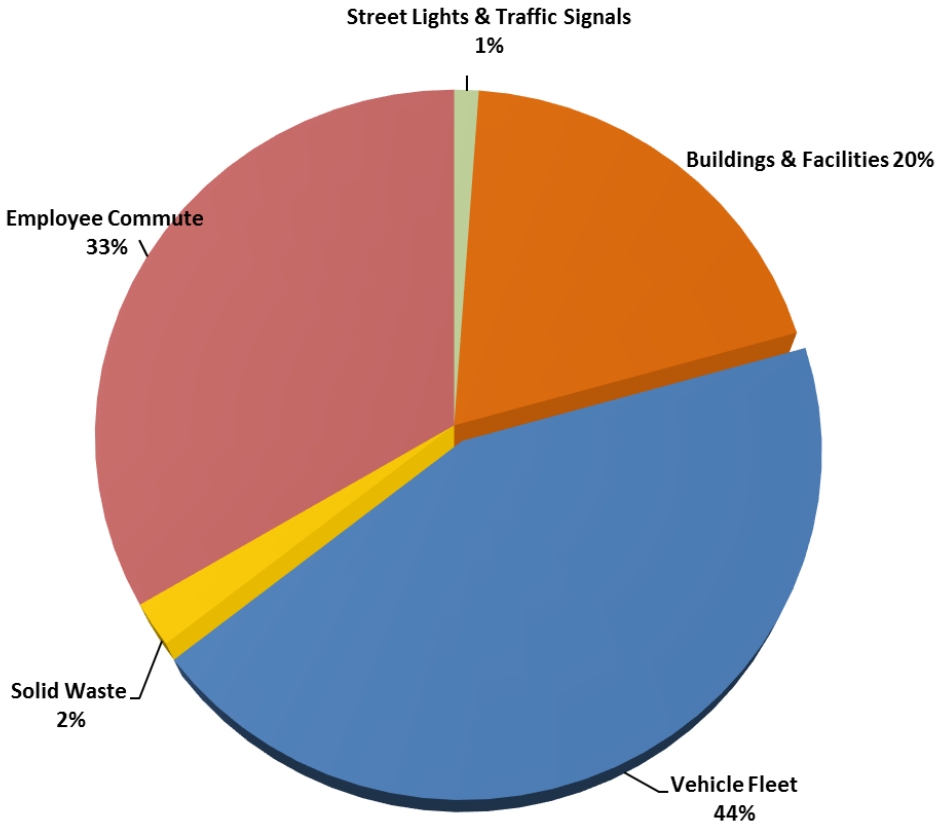
Sectors	Data Inputs	GHG Intensity Modifier Inputs
Buildings and Facilities *(Electricity, Natural Gas, Propane)*	Electric consumption data provided by Snohomish County Public Utility District (PUD) Natural Gas Data provided by Puget Sound Energy and Cascade Natural Gas. Propane provided by various vendors typically used in emergency generators.	Emissions intensity of electricity delivered as defined in EPA's 2009 eGrid Summary Table for the WECC region in the Northwest Power Plan. Carbon content of natural gas per the national EPA inventory.
Transportation *(Fleet vehicles and employee commuting)*	Annual fuel consumption by vehicle type provided by Snohomish County Fleet Division. Employee commute data from County's 2014 Commute Trip Reduction survey.	Emissions factors provided by ICLEI software from Annex 3 of the EPA's 2012 US GHG Emissions Inventory.
Solid Waste *(Garbage generated at County Facilities)*	Garbage utility bills provided by local waste haulers.	Landfill gas recovery rates, also provided by King County Solid Waste Division and Seattle Public Utilities.
Streetlights *(County-owned street and traffic lights)*	Electricity data provided by Snohomish County Public Utility District.	Emissions intensity of electricity delivered in EPA's 2009 eGrid Summary Table.

2014 GHG Inventory results for County Government operations

Results by Sector

The results from this report documents the release of GHG emissions from five sectors of Snohomish County Government Operations, which include Buildings and Facilities, Transportation (County vehicles and employee commute), Solid Waste, and Street Lights and Traffic Signals. Figure 1, below, shows 2014 GHG emissions by category.

Figure 1: Snohomish County 2014 GHG Emissions Results by Sector



Snohomish County 2014 government emissions totaled 23,461 metric tons of carbon dioxide equivalent ($MTCO_2e$). As indicated in Figure 1, left, transportation from the vehicle fleet and employee commuting accounts for 77% of the County's total emissions. Buildings comprise the next largest share of total GHG emissions at 20%. Solid waste and traffic signals make up a very small percentage of total government emissions at 2% and 1%, respectively.

Carbon dioxide equivalents, or CO2e, is the predominant unit of measurement for GHG reporting. The prevalence of individual gases that comprise CO2e (i.e. methane, carbon dioxide, nitrous oxide, and fluorinated gases) varies, as does their individual global warming potentials. As such, all GHG emissions in this report are represented as CO2e in order to accurately reflect their global warming potential and for easy comparison. It would otherwise be difficult to compare the impact of solid waste decomposition emissions with emissions from internal engine combustion in vehicles, for example. This report also examines GHG emissions by direct and indirect emissions, also called emissions scoping, which is described in more detailed on Page 8.

The Buildings and Facilities sector refers to GHG emissions resulting from energy consumption (i.e. electricity, natural gas and propane) from 83 County owned and operated facilities. These 83 buildings are primary County buildings with the largest profile in size and energy consumption. Streetlights refers to GHG emissions resulting from electricity used to power County owned or leased street and traffic lights. Solid Waste refers to GHG emissions from garbage generated at County buildings and facilities once it is deposited in a landfill, and it is important to note that this sector does not

include public garbage received at County transfer stations. Employee Commute refers to the emissions from fuel combustion in passenger cars, carpools, and buses associated with employee travel to and from work. Vehicle Fleet refers to the GHG emissions from fuel combustion in County vehicles and fuel-consuming work equipment such as generators, chainsaws, and lawnmowers. Vehicle Fleet does not include the electricity consumption of electric vehicles in the County Fleet as this consumption takes place at charging stations already included in Buildings and Facilities sector totals.

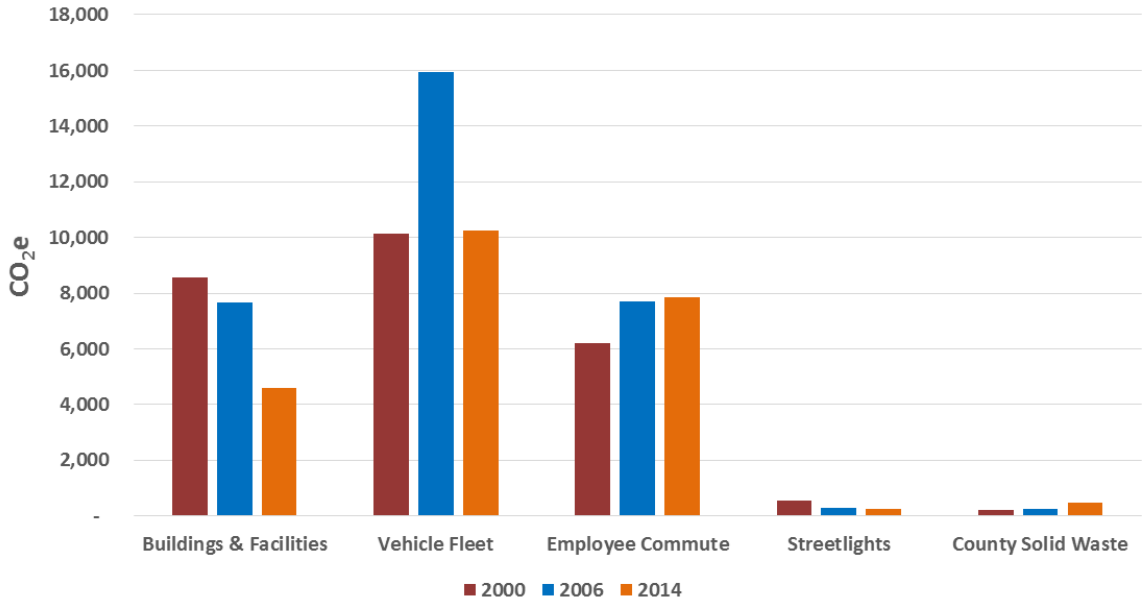
Table 1 shows total emissions for each of the four primary sectors, and subsectors for the Transportation sector, for the baseline year (2000) and subsequent reporting years (2006, 2014). Snohomish County Government 2014 GHG emissions are below baseline year levels by 9%, and 26% less than 2006 measured levels.

Table 1. Snohomish County Government Emissions by Sector in $MTCO_2e$

Sector	Subsector	2000 Emissions	2006 Emissions	2014 Emissions	Change from Baseline (2000)
Buildings and Facilities		8,563	7,678	4,579	-46.5%
Transportation		16,346	23,660	18,125	+11%
	Vehicle Fleet	10,153	15,593	10,266	+1%
	Employee Commute	6,193	7,707	7,859	+27%
Solid Waste		200	254	491	+145%
Streetlights		558	274	266	-52%
TOTAL		**25,667**	**31,866**	**23,461**	**-9%**

Examining total GHG emissions in Figure 2 (below), by sector reveals a few notable trends. The first is that between 2000 and 2014, GHG emissions decreased in the Buildings and Facilities sector by 47% and in the Streetlights sector by 52%.

Figure 2: Comparison of GHG Emissions by Sector



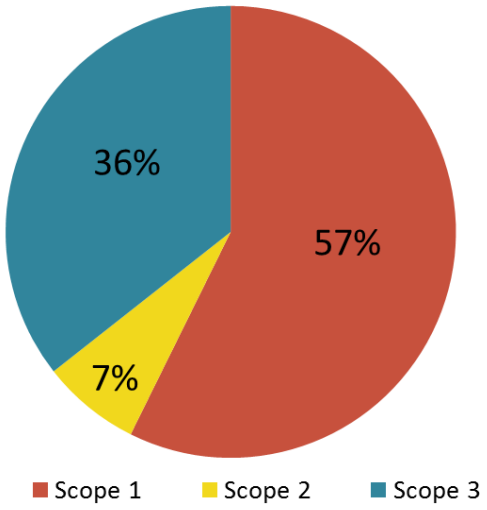
By contrast, GHG emissions from the Transportation and Solid Waste sector both increased during that time. The Buildings and Facilities sector has consistently decreased since 2000, which is a result of County conservation efforts and 'greening' of the electrical grid to use less emissions intensive fuel sources. The significant decrease in the Buildings and Facilities sector has contributed to GHG emissions from the Transportation sector comprising a larger share of the total

government emissions in 2014. This factor, combined with an actual increase in Transportation sector emissions between 2000 and 2014, has resulted in the Transportation sector comprising 77% of 2014 government emissions compared to 64% in 2000. GHG emissions reductions in Transportation sector is the biggest opportunity for continued emissions reductions.

Results by Emissions Scope

In addition to categorizing emissions by sector, this report also classifies GHG emissions using a three scope system which helps distinguish between direct and indirect emissions, as outlined in Box 1. Figure 3, below, shows the proportion of direct and indirect emissions from 2014 Snohomish County government by scope. Scope 1 emissions comprise the largest share of total County emissions at 57%. Scope 2 emissions comprise a relatively small portion of the total government emissions at 7%, largely due to the fact that 81% of Snohomish County Public Utility District's fuel mix comes from hydropower[8]. As such, Snohomish County's

Figure 3. County 2014 GHG Emissions by Scope



Box 1. GHG Emissions by Scope

This report uses a three scope system to help categorize direct and indirect GHG emissions.

Scope 1: *Direct emissions generated primarily from stationary source and mobile combustion, such as fuel combustion in fleet vehicles and natural gas use in buildings.*

Scope 2: *Indirect emissions associated with the consumption of purchased or acquired electricity for heating, cooling, or steam.*

Scope 3: *Other sources of indirect emissions that are not captured in Scope 2, such as employee commuting and outsourced activities like solid waste disposal in a landfill.*

Scope 2 emissions are a lot less than that of communities across the country who do not have a clean, renewable energy source as their dominant power supply. Washington State policies and national policy have facilitated utilities moving away from carbon intensive sources such as coal and natural gas, to less carbon intensive generation such as hydro, solar, wind, and other renewable energy sources. Washington State has been a leader in progressive clean energy policy, namely Initiative 937 (I-937). I-937 passed in 2006 and requires the State's largest utilities to develop a renewable energy mix of at least 15% of their portfolio by 2020 while pursuing all cost-effective energy conservation activities. Lastly, Scope 3 emissions at 36% of the total can largely be explained by the abundance of single-occupant commuters in Snohomish County Government.

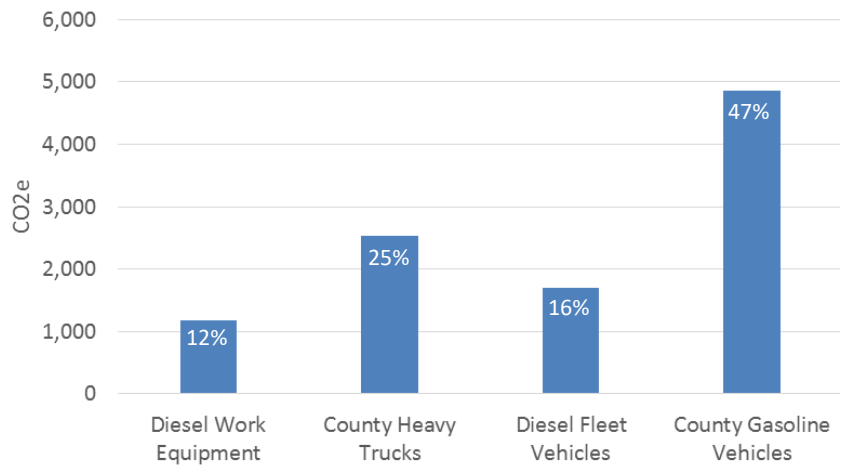
[8] Snohomish County PUD fuel mix as of 12/31/2014, as published on website: http://www.snopud.com/PowerSupply.ashx?p=1105

Government GHG Emissions BY Sector

Transportation: Fleet Vehicles

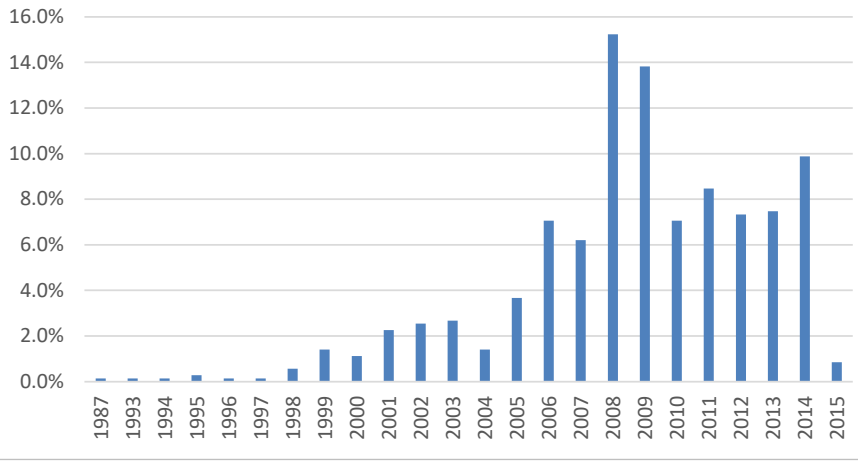
2014 fleet emissions are almost equivalent to baseline year 2000 levels, despite the fact that the County's 2006 GHG Inventory Report noted a sharp increase (See Table 1 and Figure 2). Figure 4 shows the 2014 distribution of County Fleet GHG emissions by vehicle category. Gasoline vehicles represent the largest share of the GHG emissions among the County's vehicle fleet and the largest share of vehicle fleet emissions at 47%. Heavy trucks make up the second largest share of vehicle fleet emissions at 25% and diesel fleet vehicles are close behind at 16%. Diesel work equipment, which includes items like generators, backhoes and steamrollers, comprise the smallest share of GHG emissions within the County's vehicle fleet at 12%.

Figure 4: 2014 GHG Emissions by Vehicle Type



While 2014 GHG emissions from the County Fleet decreased slightly from 2000 levels, 2014 may represent an anomalous year, as a large volume of County equipment was utilized to respond to the State Route 520 landslide and subsequent response.

Figure 5: Age Distribution of County Vehicle Fleet (as of 2014)



A decrease in the average emissions of the County Fleet since 2000 can likely be explained in part by increased fuel efficiency as older vehicles are replaced. Figure 5 shows the current age distribution of vehicles in the County fleet, most of which are model year 2008 and 2009 or newer. As the County continues to replace aging vehicles in the future, a larger share of Fleet vehicles will be more fuel efficient due to higher corporate average fuel economy (CAFE) standards, which the Federal government raised for the first-time in more than 25 years in 2011. County efforts to purchase fuel efficient vehicles above industry standards will help accelerate fuel efficiency within the County Fleet. The fuel efficiency and GHG emissions benefits of purchasing more fuel efficient vehicles is particularly applicable to Sheriff deputy vehicles and light-duty Public Works trucks, which make up a substantial portion of the total vehicle fleet and the presumed vehicle miles travelled.

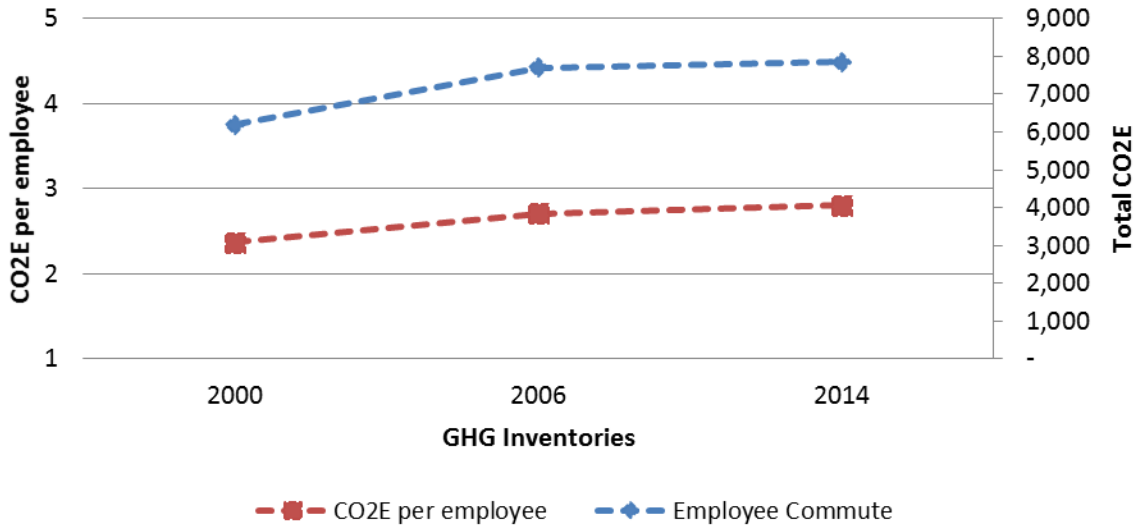
The amount of GHG emissions generated from the County's vehicle fleet are largely dependent upon the total number of fleet vehicles, the total distance driven, and the fuel efficiency of the vehicles. Currently, County fleet data consistently tracks total gasoline or fuel consumed, with only subsets of actual mileage being tracked for certain vehicle

types. In the future, consistently tracking vehicle miles traveled (VMT) will allow for additional analysis in fuel efficiency trends, emissions trends, and potential operational cost opportunities in Fleet operations.

Transportation: Employee Commute[9]

Since 2000 there has been a 27% increase in the total emissions from employee commuting, as well as a 19% increase in the commute emissions per employee. The increase in GHG emissions per employee demonstrates that commuting patterns of employees have changed since 2000, and that more employees are driving to work alone. Figure 6, below, shows changes in CO2e per employee and in total in 2000 (baseline year), 2006, and 2014 for this Greenhouse Gas Emissions Inventory. Predicting future emissions from employee commuting is dependent on a number of factors, such as the average distance to work, availability of on-site parking and free parking, and the efficiency and accessibility of transit or other alternative commute trip options.

Figure 6: County Employee GHG Emissions from Commuting



The primary factors driving employee commute emissions are the proportion of single-occupant vehicle (SOV) commutes and the average distance to work. According to a recent employee survey, more than 2,000 of Snohomish County employees (70%) commute to work alone in a personal vehicle, and travel an average distance of 17 miles each way. Like many other large organizations and local governments, the County already offers financial incentives for alternatives to commuting alone, including an annual bus pass that is free to employees. The County also conducts regular marketing and outreach on commute trip alternatives, benefits, and financial incentives through the SmartRide Program.

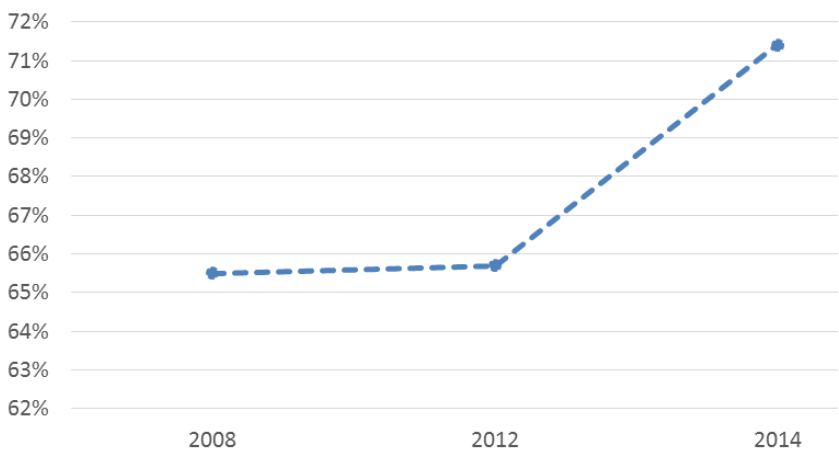
Figure 7 shows a consistent increase in the number of employees commuting to work in a single-occupant vehicle (SOV) over the last six years. Based on this data alone, which is obtained from employee surveys through the Commute Trip Reduction Program, indicates that SOV commuting will continue to rise in future years. Survey data shows that the average commute distance for SOV commuters is about 44% longer on average than bus commuters, which suggests that transit may not be a viable option or may not meet the needs of some employees. When asked why employees choose to drive alone to work, 25% of survey respondents indicated that 'Riding the bus or train takes is inconvenient or takes too long' and the same percentage of respondents indicated that they 'Like the convenience of having their car'. Family and community obligations was another key reason for driving alone, as indicated by 18% of survey responders.

[9] Data for the employee commute was gathered through the Commute Trip Reduction Program survey conducted in November, 2014, as required per Washington State's Commute Trip Reduction law.

Other factors not assessed in this report, such as lower gas prices, changes to regional bus transportation to the County campus in recent years, and free parking around the County campus all have likely had an impact on employee commute trends.

Employee commuting is projected to be the County's single largest source of CO_2e emissions in 2017. As such, County staff must continue working with local, regional, and state partners, including transit agencies and state legislators, to enhance and expand alternative commute trip options to better meet the needs of County employees.

Figure 7: County Employee Single Occupant Vehicle Commuting



Buildings and Facilities

Figures 8 and 9 compare total energy consumption of all County buildings and facilities with subsequent GHG emissions by fuel source (i.e. electricity and natural gas). As seen in Figures 8 and 9, while electricity makes up more than 55% of County energy use, it only represents 30% of the carbon emissions resulting from energy use. This is due to the fact that Snohomish County Public Utility District's (PUD) electric fuel mix is 81% hydroelectric power, which has lower GHG emissions associated with it when compared to natural gas.

Natural gas on the other hand, represents 45% of the total energy consumption, but comprises 70% of the total GHG emissions from County buildings and facilities. The most practical ways to reduce emissions from natural gas consumption in buildings is through conservation, such as retrofitting outdated equipment to more efficient models or switching more building equipment from natural gas to electric where feasible and practical.

Figure 8. Building Energy Consumption by Fuel Source

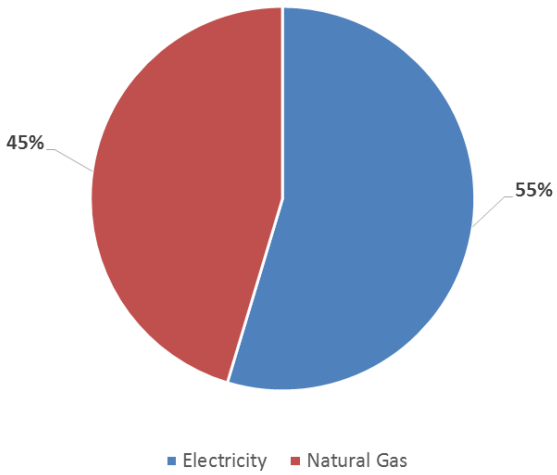


Figure 9. GHG Emissions from Building Energy by Fuel Source

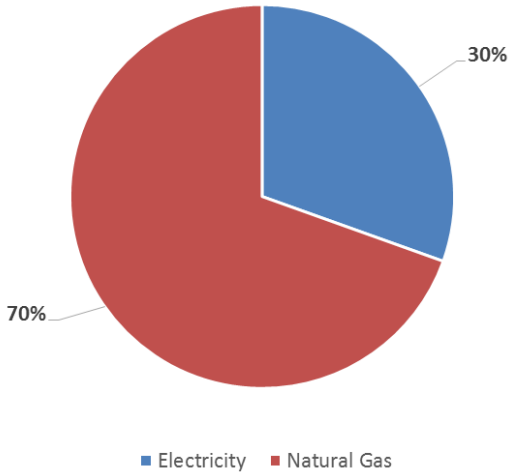


Figure 10 illustrates the general trend in GHG emissions associated with building electricity consumption since 2000. While 2014 electricity consumption decreased by approximately 4% since 2000, the GHG emissions associated with the energy consumption show a much more significant decrease of nearly 50%. This is primarily due to Snohomish County Public Utility District (PUD) 'greening' the electric grid by integrating cleaner fuel sources into their fuel mix over time.

In 2000, approximately 22% of the PUD's fuel mix consisted of coal. By 2006, the PUD's fuel mix included only about 8% coal, as it has increasingly moved toward cleaner fuels, namely hydroelectric power. Hydroelectric power in PUD's total fuel mix increased from 64% in 2000 to 76% in 2005, and in 2014 it comprised 81% of the total fuel mix.

Figure 10: Total Electric Consumption and CO_2e from County Buildings and Facilities

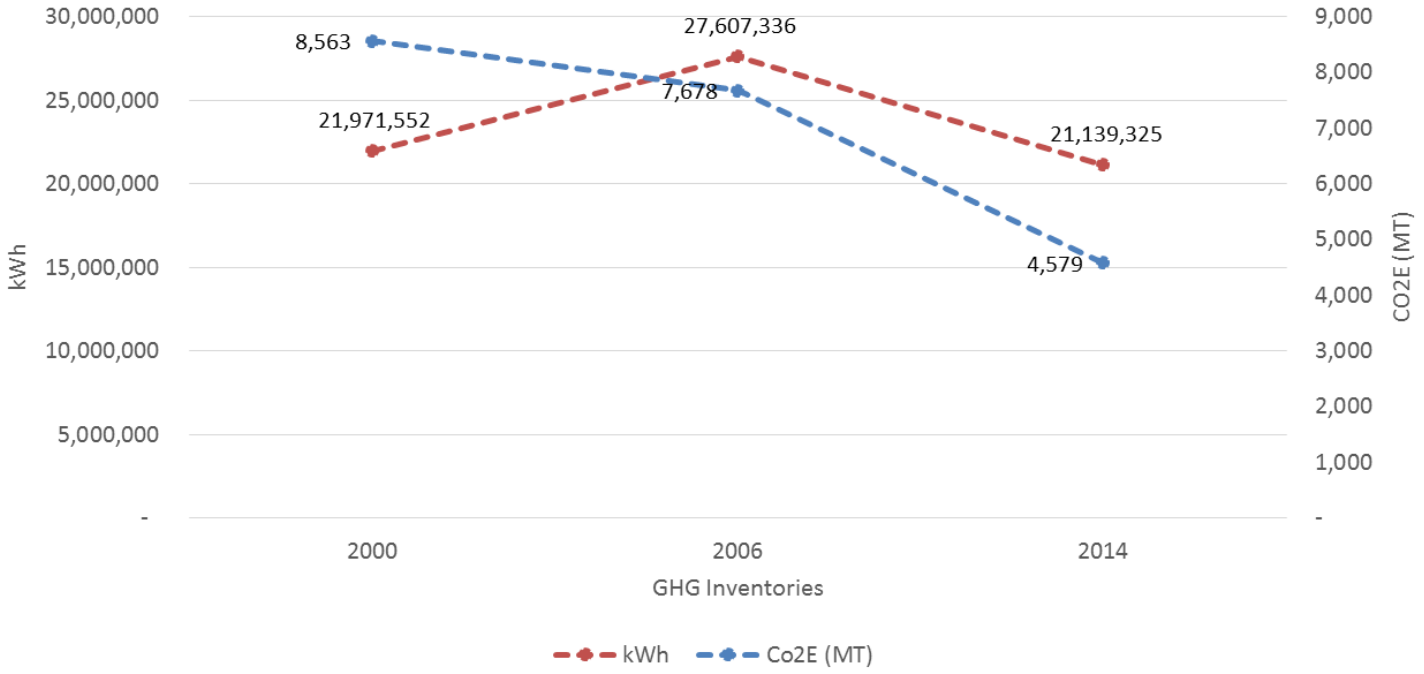
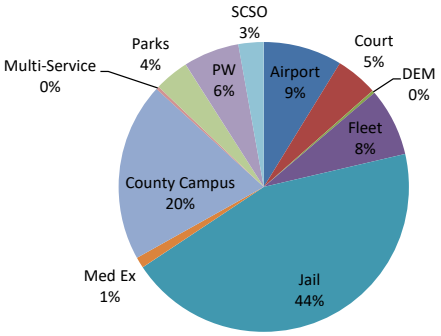


Figure 11 displays the distribution of GHG emissions as a percent of the total County GHG emissions from buildings and facilities. The Jail and County Campus are the two largest sources of CO_2e, comprising 64% of the County's total building related emissions. The Airport campus, Fleet facilities, Public Works facilities, and satellite courts make-up the next tier of the GHG emissions from government buildings.

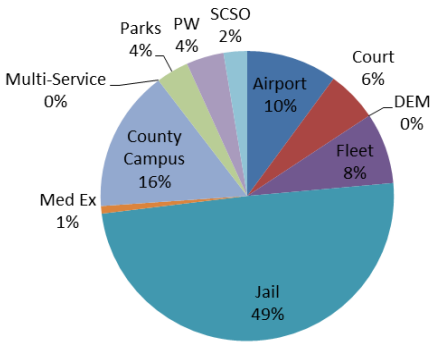
Figures 12 shows GHG emissions from buildings by Scope (i.e. 1 and 2) and Department. Emissions data by Scope clearly shows that the Jail comprises the largest share of Scope 1 and Scope 2 emissions, with the County Campus being the second largest share. These findings are not surprising, as the Jail is the County's largest, single energy consuming facility. Similarly, the County Campus buildings, which include the two County administration buildings, the main Courthouse, the Mission Building, County parking garage, and café, comprise the majority of the County workforce and serves as the primary location for serving the public.

Figure 11: Total GHG Emissions from County Buildings by Department

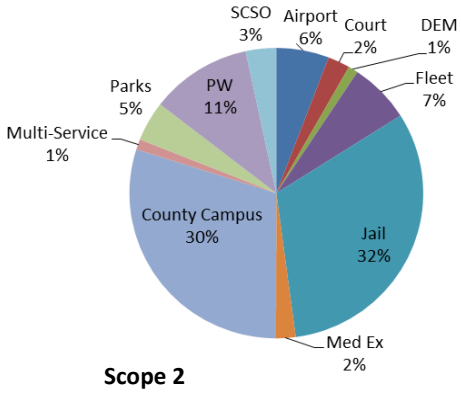


Total

Figure 12: Scope 1 and Scope 2 GHG Emissions from County Buildings by Department



Scope 1



Scope 2

Solid Waste

The amount of GHG emissions generated from the solid waste produced at County facilities is relatively small at 2% of the County's total carbon impact. Figure 14 shows that the amount of garbage produced from primary County facilities since 2000 has steadily increased, and the associated GHG emissions have increased as well. This total excludes waste produced from County operations that is currently not tracked, such as building product waste generated building demolition, deconstruction, and renovation, hazardous waste products, and waste products from public works road and bridge projects.

It is important to note that the County's tracking of solid waste across departments has improved since 2000. The steady increase in County garbage shown in Figure 14 may be attributable to the fact that garbage data tracking mechanisms are more accessible and accurate, and therefore the County is now tracking the totality of the waste stream.

Figure 14: Snohomish County Garbage and GHG Trends

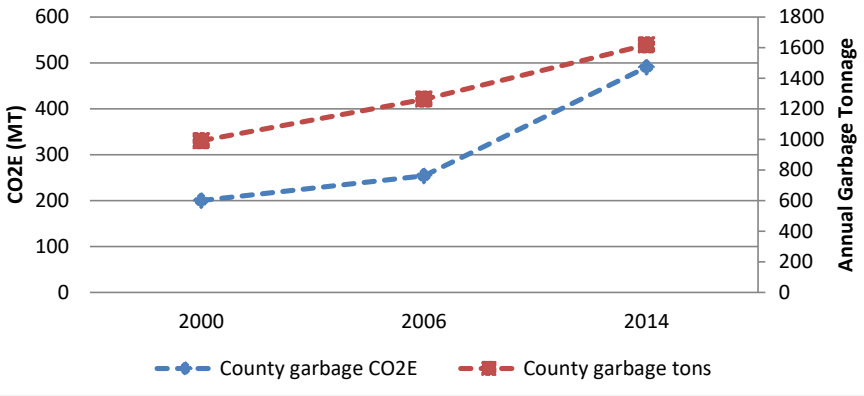
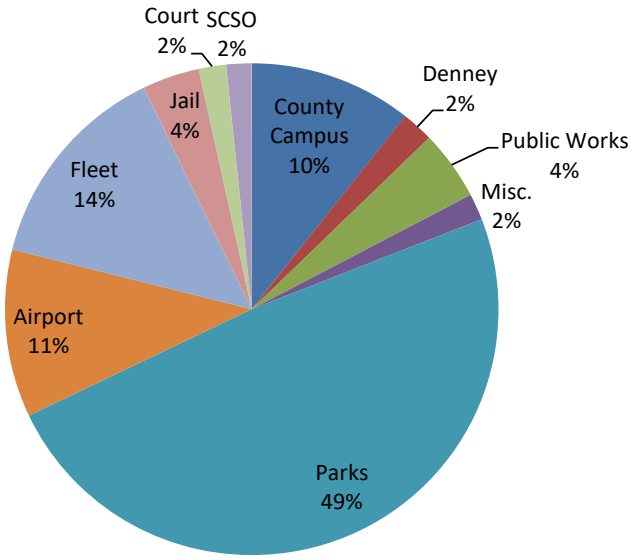


Figure 15 shows the sources of total County garbage generated at County facilities by Department. Parks has the largest waste stream of any Department; five times greater than the waste generated at the County Campus. However, Parks' total garbage also includes waste generated by the public at Parks facilities, including the annual Evergreen State Fair with approximately 350,000 annual visitors. In just two weeks, the annual Fair generates approximately 120 tons of garbage. By comparison, the County Campus generates approximately 185 tons of waste annually. Snohomish County Parks Department, in partnership with the Office of Energy and Sustainability, started a Zero Waste Fairgrounds initiative in 2014 to not only reduce the amount of waste generated at the Fair, but to reach a Zero Waste Goal by 2017.

In its first two years, the Zero Waste Initiative was successful in that 33% and 45% of total waste was recycled or composted in 2014 and 2015, respectively.

Snohomish County sends its solid waste to the Roosevelt Landfill in Klickitat County, which is a facility that recovers methane from the landfill. The Roosevelt Landfill claims a methane recovery rate that exceeds 80%. That is a higher rate than the 75% modeled rate used for this report which is a commonly accepted landfill modeling rate methodology for GHG inventories. As such, the County's actual GHG emissions associated with government solid waste are lower than modeled. Some landfill facilities across the country do not have methane recovery, which has an enormous impact on GHG emissions attributed to the solid waste landfilled at those facilities. Landfills with no methane recovery have 1,500 metric tons or 300% more of CO_2e attributable to the same amount of waste as a landfill with methane recovery.

Figure 15: Scope 2 GHG Emissions from County Solid Waste by Department



Streetlights

Streetlights represent the smallest share of total GHG emissions from County activities at 275 metric tons of CO_2e, or about 1% of total County government emissions. Total GHG emissions from County owned streetlights has decreased by 52% since 2000, which is largely due to the fact that nearly all have been retrofitted with energy efficient, long-lasting LED fixtures. Progress in this area can also be attributed to the electric grid transitioning to cleaner fuels, as described in previous sections of this Report. Nonetheless, this significant reduction in streetlight emissions has been achieved in spite of the fact that the County's total street and traffic lights doubled between the 2000 GHG Inventory Report and this 2014 Report.

Forecasted GHG Emissions for County operations

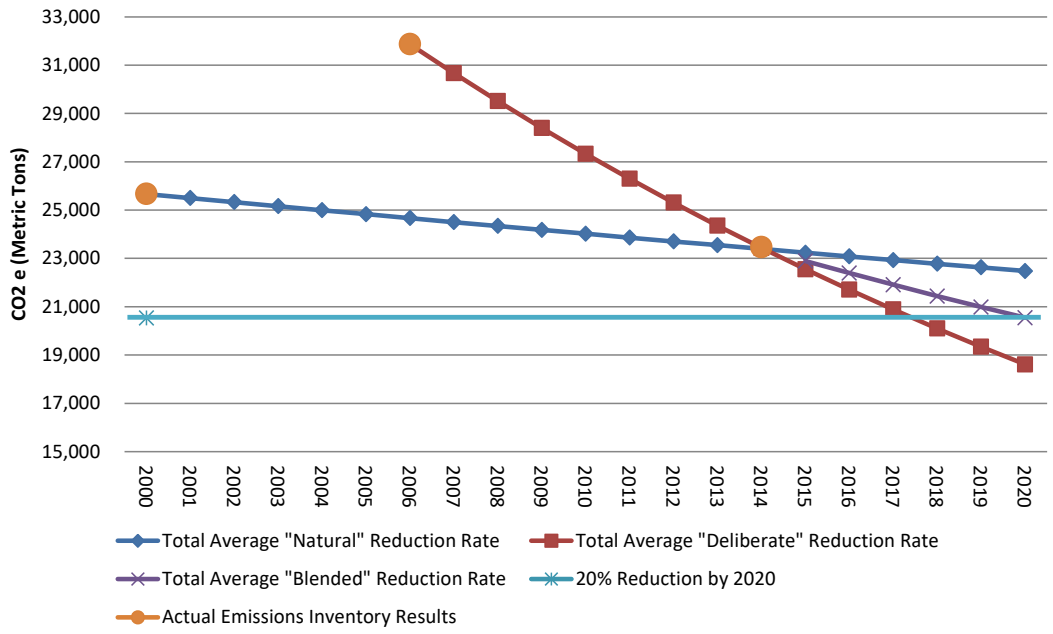
Forecasting County government emissions can be difficult, as only about half (57%) of 2014 total County government GHG emissions are Scope 1 emissions directly controlled by County government. The future of GHG emissions can be significantly impacted a myriad of changes in all of the sectors examined in this Report, along with other local and global changes such as modifications to the fuel mix of the electric grid, advances in equipment technology, and policy change. Nonetheless, this Report outlines two potential GHG forecasting scenarios, one that uses a historical methodology, and another that uses an internal variables methodology.

The Historical methodology utilizes trends and changes from the past as the basis for forecasting future outcomes. As such, this methodology assumes that future GHG emissions will follow historical trends in each sector established from 2000-2014 and 2006-2014; the time periods between the County's first and second GHG Emissions Inventory Reports.

Forecasted Emissions: Historical Methodology

Figure 16 shows three 2020 forecast scenarios based upon the historical data. The average "Natural" reduction rate is based upon the 2000-2014 rate change in emissions, and is named as such because it includes significant periods of time when GHG reduction was not a priority concern, and then later when it became a priority issue for the County. The total average "Deliberate" reduction rate is based upon the 2006-2014 rate of change and is labeled as such because this time period includes deliberate County action to reduce GHG emissions. Lastly, the total average "Blended" reduction rate is based upon the average of those two historical rates of change. As shown in Figure 16, the County is forecast to meet its 20% GHG reduction goal by 2020 under both the "Deliberate" and "Blended" rate forecasts.

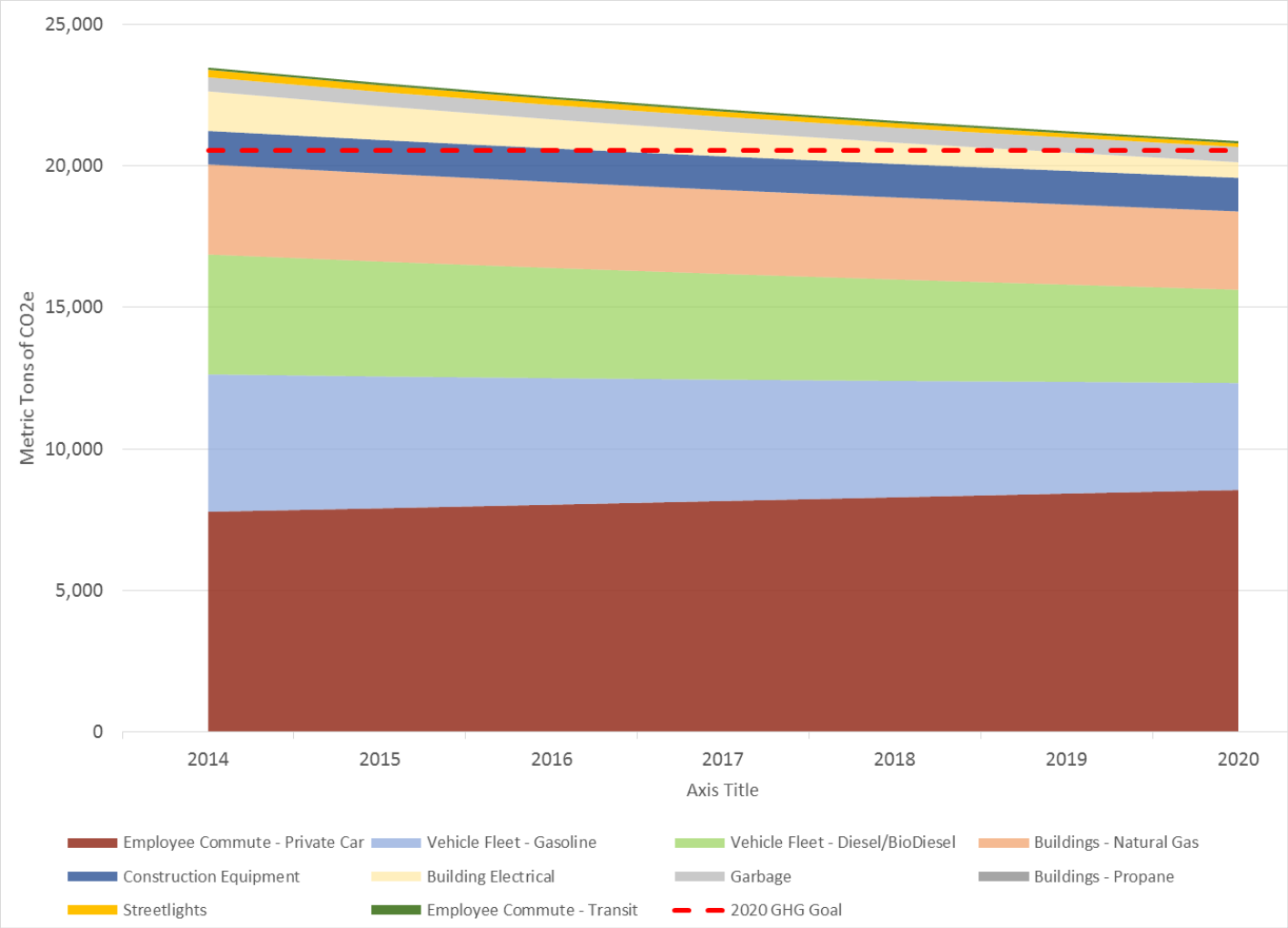
Figure 16: Projected 2020 Government GHG Emissions Based on Historical Reduction



The second methodology assumes that each sector likely has an individual rate of change and a ceiling for potential reductions, all which is based on internal variables. The Buildings and Facilities Sector, for example, has a historical rate of energy reduction from conservation and energy efficiency retrofits, as well as a historical rate of electrical grid "greening" since 2006. The combination of these two factors is likely to produce a meaningful forecast for 2020 emissions for this Sector. Other Sectors also have observable and verifiable trends that can be applied as well, such as vehicle fuel efficiency and commuter mode patterns, just to name a few. Figure 17, below, shows a 2020 GHG emissions forecast that is broken out by Sector, and demonstrates that the County is likely to reach its GHG reduction goal within a year or two of the 2020 milestone. This forecast estimates that under the "Blended Reduction Rate" (as described in Figure 16), the timeframe for meeting the GHG reduction goal is within several months of the average historical rate

reduction forecast, providing some level of confidence that the County is likely to meet its GHG reduction goal near the 2020 target date.

Figure 17: Projected 2020 Government GHG Emissions Based on Internal Variables



The following conclusions can be drawn from the two GHG emissions forecasts through 2020:

- Persistent increases in employee commuting will become the largest single source of County government GHG emissions, and will likely also be the Sector with the most aggressive rate of increase.
- GHG emissions from County fleet vehicles are projected to decrease over time as vehicles become more efficient and vehicle technology shifts towards hybrid and all electric fuel.
- GHG emissions in both the Building and Streetlight Sectors are projected to decrease, primarily due to the replacement of old equipment with more efficient models along with continued 'greening' of the electrical grid.

Key Findings and Next Steps

Key Findings

This 2014 Greenhouse Gas Inventory evaluates the Snohomish County's progress in reducing emissions from County government operations by 20% by the year 2020 compared to a year 2000 baseline. The Report quantified emissions from four primary Sectors; Buildings and Facilities, Transportation, Solid Waste, and Street Lights. Analysis presented in this report supports the following conclusions:

- The County is on track to meet its 20% GHG reduction goal within a couple months of the 2020 deadline, assuming that observed reduction trends in County buildings and vehicle fleet continue.
- The County's primary source of GHG emissions, at 77% of 2014 total emissions, is from the Transportation Sector which includes both the vehicle fleet and employee commuting.
- The County has made the largest carbon reductions in its buildings, through energy conservation, efficiency retrofits, and from SnoPUD continuing to 'green' its power supply through less carbon intensive fuel sources.

Next Steps

Continued emissions reductions from government operations is a priority for Snohomish County, and the results of this 2014 Inventory highlight priority opportunities for continued progress toward the 20% reduction goal within each Sector. The following next steps are recommended strategies and tools for Snohomish County to continue making progress with GHG emissions reduction:

- ***Buildings and Facilities***
  - Establish an annual budget allocation in Facilities Management, and other Departments that manage facilities, for energy and water conservation retrofit projects. An annual allocation for this purpose will help ensure that the County continues to invest in cost-effective projects that will lower greenhouse gas emissions from County facilities.
  - Continue energy use monitoring, benchmarking, and reporting through the Office of Energy and Sustainability and utilize the various financial incentives and rebates offered through local utilities.
- ***Transportation***
  - Develop a vehicle efficiency replacement plan within the County's Fleet Division, such that replacement vehicles are substantially more fuel efficient than the existing vehicle.
  - Continue to engage in technologies that allow for the use of higher bio-content (B20 and up) biofuels for biodiesel vehicles.
  - Identify additional strategies to reduce GHG emissions from the County vehicle fleet.
  - Investigate new strategies and technologies to enhance the existing SmartRide commuter program with a goal of reducing the rate of single-occupant vehicle commuting among County staff. Potential strategies include increasing incentives for alternative commuting, raising the cost of parking in the County garage, and moving from a monthly parking garage payment plan to a daily plan to allow for more commute flexibility.
- ***Waste***
  - Continue implementation of the Zero Waste Fairgrounds initiative, as the 12 day Fair accounts for approximately 14% of annual waste from County buildings. Expand the Zero Waste initiative to annual Fairgrounds events.
  - Increase recycling amenities in County buildings where possible.
  - Continue implementation of Parks Department's "Pack It In, Pack It Out" initiative.

- ***Streetlights***
  - The County should continue to retrofit any outdated and inefficient streetlights and traffic signals to LEDs.

APPENIDIX A: Glossary of Terms

1. **CAFÉ**: Corporate Average Fuel Economy Standards
2. **ClearPath:** ClearPath is a greenhouse gas emissions accounting software program developed by ICLEI.
3. **CO_2e:** Carbon dioxide equivalents, or CO_2e, is the widely used unit of measurement for GHG reporting. There are many different emissions sources that contribute to global warming, and the associated gas emissions (such as methane, carbon dioxide, and nitrous oxide) vary in their relative volumes and warming impacts. In this report, all GHG emissions are converted to the metric tons of carbon dioxide equivalent as it relates to global warming potential so that emissions sources can be measured and compared to each other. It would otherwise be difficult to compare the impact of solid waste decomposition emissions with emissions from internal engine combustion in vehicles, for example.
4. **Emissions Scoping**: To avoid double-counting emissions at local and regional levels, and to provide richer data on the level of control that local governments have over emissions outputs, local GHG accounting uses a three scope system. *Scope 1* emissions are direct emissions by the entity and include items like fuel combustion in fleet vehicles or natural gas use in buildings. *Scope 2* emissions are indirect emissions from purchased energy not generated on site, such as electricity produced off-site and distributed through the grid. *Scope 3* emissions are all indirect emissions not captured in Scope 2 and include sources like fuel use emissions from third-party vehicles (like employees), and decomposition of generated solid waste in a third-party landfill. All three scopes combined create the total GHG emission of an organization, but only Scope 1 emissions are directly controllable by the organization.
5. **GHG**: Greenhouse gas emissions are primarily comprised of carbon dioxide (CO^2), Methane (CH^4), Nitrous Oxide (N^2O), and fluorinated gases.
6. **ICLEI**: Local Governments for Sustainability is a non-profit membership organization of more than 1,500 cities, towns, and regions working for a sustainability future. ICLEI's ClearPath accounting software is widely used and recognized in the environmental industry as a common, accurate, and effective tool for calculating GHG inventories.
7. **IPCC**: International panel on climate change.

APPENIDIX B: Report Methodology-Additional Information

The Clean Air and Climate Protection (CACP) software package has been used by over 350 U.S. cities and counties to calculate their GHG emissions, including several local governments in Washington. Although the software provides Snohomish County with a useful tool, calculating emissions with precision is difficult. The model depends upon numerous assumptions, and is limited by the quantity and quality of available data. The specific numbers generated by the model are approximations, rather than exact values. Despite the limitations of the data, the software holds tremendous value in allowing the county to generate comparable reports over time, showing a trend in county emissions.

The software estimates emissions from energy consumption and waste generation within a community using inputs of total fuel and waste consumed. It determines emissions using specific factors (or coefficients) according to the type of fuel used. Emissions are aggregated and reported in terms of equivalent carbon dioxide units, or CO2e. Converting all emissions to equivalent carbon dioxide units allows for the consideration of different greenhouse gases in comparable terms. For example, methane is twenty-one times more powerful than carbon dioxide in its capacity to trap heat, so the model converts one unit of methane emissions to 21 units of CO2e. Greenhouse gas emissions are reported in metric tons, or tonnes, as it is the most common standard of measuring greenhouse gas emissions, and is useful to adopt in this report for purposes of comparison. A metric ton is slightly larger than the short ton: 1.1 metric tons equals 1 short ton.

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

Snohomish County Greenhouse Gas Emissions Inventory and Forecast

The inventory is composed of two assessments, analyzed independently: a Community Analysis and a Government Analysis. The Community Analysis explores emissions sources within the Snohomish County limits. Both incorporated and unincorporated county land is included. The Government Analysis includes only those sources that are under the operational control of Snohomish County government. Snohomish County has developed Community and Government Analyses based on the year 2000 (baseline year). In addition, the county conducted interim inventories to track recent trends. The year 2005 is inventoried for the Community Analysis and 2006 is inventoried for the

Government Analysis

The Community and Government Analyses are not cumulative. The Government Analysis is a subset of the Community Analysis. These two categories are explored independently for several reasons. The Community Analysis explores general sectors of emissions (residential, transportation, etc.), while a more detailed analysis is possible in the Government Analysis (energy use by facility, for example). Additionally, when considering where emissions reductions are possible, there will be a different set of options for county-owned facilities than for private sector emissions. Each of these categories is further broken down by sources and sectors. Sources are the fuel or energy that is the basis of the emissions. In this inventory, the main sources considered are electricity, natural gas, diesel, gasoline, and waste. Sectors are the portion of the community or government operations to which the emissions are attributable. In the Community Analysis the sectors considered are residential buildings, commercial buildings, industrial buildings, transportation, and waste. Emissions related to land clearing, maritime activities, and air transportation are not included. In Government Analysis the sectors considered are buildings, vehicle fleet, employee commute, streetlights, traffic signals, and waste4. The Community Analysis includes calculations of energy consumed in Snohomish County. For example, even if the electricity used by residents is produced elsewhere, this energy and its associated emissions appear in the inventory. The decision to calculate emissions in this manner reflects the general philosophy that a community should take full ownership of the impacts associated with its energy consumption, regardless of whether the generation occurs within the geographical limits of the community. For the same reasons, when calculating the county's community emissions inventory, all municipal solid waste generated in the county was included, though it is landfilled outside the county.

Appendix C

This is the list of the 83 County buildings analyzed in this report:

No	Dept	Description
1	Airport	Airport Admin Building
2	Airport	Airport Fire Station
3	Airport	Airport - Future of Flight
4	Airport	Airport - Building 219 (maintenance)
5	Airport	Airport - Building 219 (maintenance)
6	Airport	Airport - Future of Flight
7	Airport	Airport Admin Building
8	Airport	Airport Fire Station
9	County Campus	County Campus
10	County Campus	County Campus - Admin West
11	County Campus	County Campus - Carnegie Bldg
12	County Campus	County Campus - Mission

13	County Campus	County Campus - Courthouse
14	Court	Court - South District Court
15	Court	Court - Cascade Courthouse
16	Court	Court - Evergreen Court
17	Court	Court - Evergreen Court
18	DEM	DEM/EOC
19	Fleet	Fleet Bldg - Arlington
20	Fleet	Fleet - McDougall Fleet
21	Fleet	Fleet Bldg - Cathcart
22	Fleet	Fleet - Wash Building - Cathcart
23	Fleet	Fleet Bldg - Arlington
24	Fleet	Fleet - McDougall Fleet
25	Fleet	Fleet Bldg - Cathcart
26	Fleet	Fleet - Wash Building - Cathcart
27	Jail	Old Jail
28	Jail	New Jail
29	Jail	Denney Juvenile Justice Center
30	Jail	Old Jail
31	Jail	New Jail
32	Jail	Denney Juvenile Justice Center
33	Med Ex	Medical Examiner's Office
34	Med Ex	Medical Examiner's Office
35	Multi-Service	Multi-Service Center
36	Parks	Parks - McCollum Park
37	Parks	Parks - Lake Stevens Community Park
38	Parks	Parks - Lord Hill Barn
39	Parks	Parks - Willis Tucker Park
40	Parks	Parks - Lake Goodwin
41	Parks	Parks - Flowing Lake County Park
42	Parks	Parks - Darrington Fields
43	Parks	Parks - Twin Rivers
44	Parks	Parks - Paine Field Baseball Park
45	Parks	Fair - New Maintenance Annex
46	Parks	Parks - Martha Lake Airport Park
47	Parks	Parks - Macchias Trailhead
48	Parks	Parks - Wenberg State Park
49	Parks	Parks - Willard Wyatt Park
50	Parks	Parks - Three Lakes Shop
51	Parks	Parks - Martha Lake Park
52	Parks	Parks - Squire Creek Park
53	Parks	Parks - River Meadows Park
54	Parks	Parks - Thomas' Eddy residence
55	Parks	Kayak Point Park
56	Parks	Fair - Evergreen Fairgrounds
57	Parks	Parks - Willis Tucker Park

58	Parks	Parks - McCollum Park
59	Parks	Fair - Evergreen Fairgrounds
60	PW	PW - Admin Modular - Arlington
61	PW	PW - Southwest Recycle and Transfer Station
62	PW	PW - Sand Hill Pit
63	PW	PW - Vactor Decant - Arlington
64	PW	PW - Admin Operations - Cathcart
65	PW	PW - Bridge Crew Arlington
66	PW	PW - Paine Field Transfer Station
67	PW	PW - Sultan Recycling Center
68	PW	PW - Bridge Crew Modular - Arlington
69	PW	PW - Building K - Cathcart
70	PW	PW - Admin Operations - Cathcart
71	Pw	PW - Vactor Decant - Arlington
72	Pw	PW - Southwest Recycle and Transfer Station
73	Pw	PW - Heated Shop - Cathcart
74	PW	PW - Bridge Crew Arlington
75	PW	PW - Sand Hill Pit
76	SCSO	SCSO - Gun Range
77	SCSO	SCSO - Marine Unit - Monroe
78	SCSO	SCSO - Records Storage Building
79	SCSO	SCSO - Unit Guard Impound - Cathcart
80	SCSO	SCSO - Sultan Office
81	SCSO	SCSO - Gun Range
82	SCSO	SCSO - Sultan Office
83	SCSO	SCSO - Records Storage Building