



City of Eugene, Oregon Operational Greenhouse Gas Inventory *For years 2000 – 2017*



Report prepared by Good Company, March 2019



INTRODUCTION

Historically, the City of Eugene has conducted operational fossil fuel use and greenhouse gas (GHG) inventories based on these years: 2000, 2005, 2010, 2013, and 2016 data. This inventory, based on 2017 data, provides an update to allow the City to assess its progress towards meeting the Climate Recovery Ordinance (CRO). To show this progress, many statistics in this report are compared to the 2010 baseline inventory.

The Climate Recovery Ordinance (CRO) Goals related to City Operations¹ are as follows:

- GHG neutrality by 2020 (with a minimum of 60% mitigation of Scope 1 and Scope 2 emissions)²
- 50% reduction in fossil fuel use by 2030 (based on a 2010 baseline)

The sources of the City of Eugene's fossil fuel use and GHG emissions include: natural gas combustion by buildings, gasoline and diesel combustion by city-owned vehicles and equipment, and electricity use by city buildings.³ Historical data also includes emissions from district steam use, which was discontinued in 2013.

SUMMARY OF FINDINGS

Between 2010 and 2017, the City's GHGs have *decreased* by 2,250 MT CO₂e, or -31% compared to 2010, using market-based accounting for electricity.⁴ This is primarily the result of Eugene's fleet rapidly shifting from fossil fuel diesel to renewable diesel. Other factors include the discontinuation of district steam energy for heating in 2013 and a reduction in GHGs from Eugene Water & Electric Board's (EWEB) electricity supply.

The City's Scope 2 GHGs⁵ have *decreased* by 1,678 MT CO₂e or -87% since 2010 (using market-based accounting⁹), primarily due to the substitution of building-level natural gas heating for EWEB district steam heat. Scope 1 GHGs⁶ from natural gas used to heat space and water at City facilities have *increased* by 573 MT CO₂e or +26% since 2010. City operational emissions have continued to *decrease* even as Eugene's population *increased* by 6% since 2010⁷. As a result, City operational emissions per resident served (MT CO₂e/person) has *decreased* by 36% since 2010. **To meet Eugene's Climate Recovery Ordinance (CRO) GHG neutrality target, emissions will need to decrease at least another 2,070 MT CO₂e by 2020, or another 29% from to 2010 emissions.**

¹ City of Eugene Climate Recovery Ordinance (20567) <https://www.eugene-or.gov/DocumentCenter/View/31138>

² If carbon neutrality is not achieved through operational changes, the CRO allows the remaining emissions to be offset through the funding of GHG reduction projects or the purchase of carbon offsets.

³ Fugitive refrigerant leakage, a Scope 1 emissions source included in previous inventories, is excluded from this update because these emissions were previously found to be relatively small in scale and data is time intensive to collect.

⁴ While inventories were conducted in 2000 and 2005, 2010 is the first year presented here because the City's Climate Recovery Ordinance (20567) states that targets should be set and measured against a 2010 baseline.

⁵ Scope 2 is a category used in GHG accounting that includes indirect sources of emissions from electricity and district heating or cooling energy products.

⁶ Scope 1 is a category used in GHG accounting that includes direct emissions from City-owned facilities, vehicles and equipment.

⁷ Portland State University [Oregon Population Report](#).

Figure 1 shows emissions by Scope 1 and Scope 2 GHG source for 2010 and 2017 compared to the CRO goal of carbon neutrality for City operations by 2020. Note that the grey bar on Figure 1 represents the 60% minimum mitigation component of the goal only.

As can be seen, significant progress has been made towards the CRO’s GHG mitigation goal, with the City more than half way as of 2017. Recent progress towards the goal is the overwhelming result of the City’s substitution of renewable diesel fuel for conventional fossil diesel fuel (see Figure 2). After this change, natural gas surpassed gas/diesel to become the City largest source of GHGs.

Figure 1: Summary of Scope 1 and Scope 2 (market-based) emissions for 2010 and 2017 versus the CRO goal.

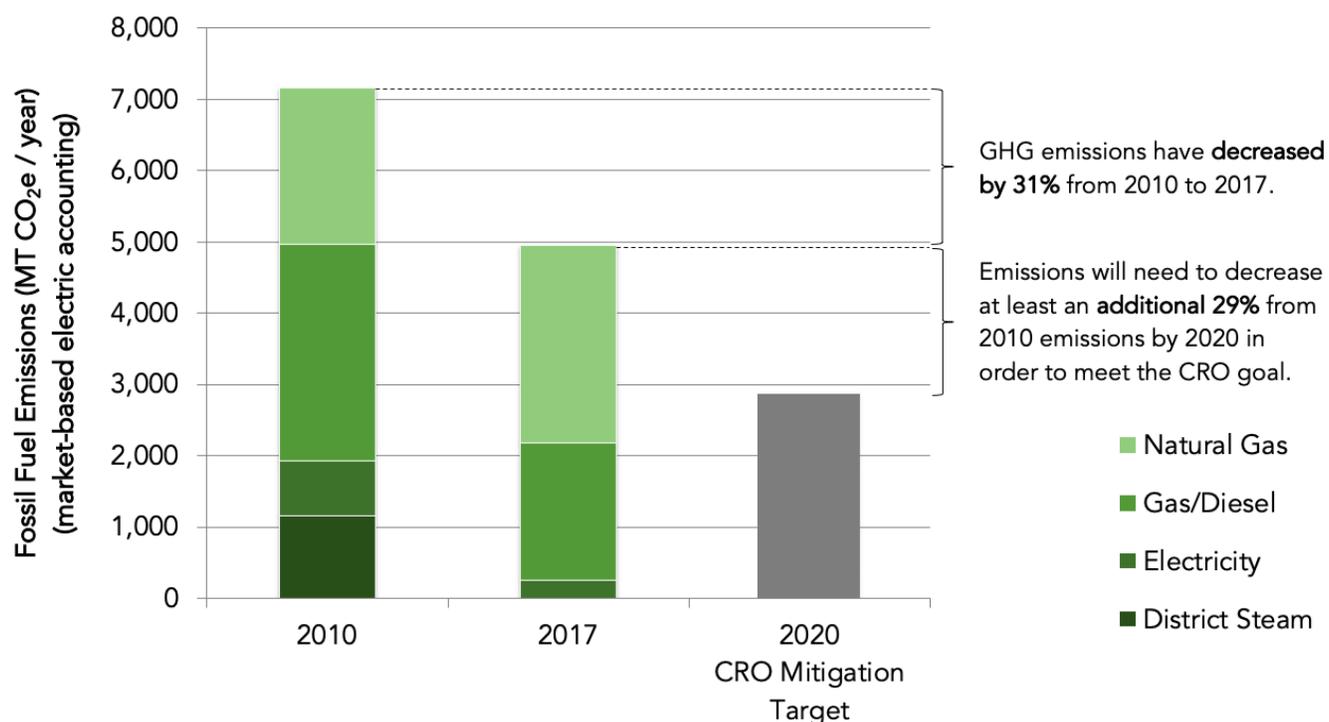


Figure 2: Detailed breakdown of GHG change for 2010 vs 2017 (using market-based electric accounting).

Subsector	Difference 2010-2017 %	Difference 2010-2017 MT CO ₂ e	Notes
Natural gas	+26%	+573	
Fleet	-36%	-1,110	Switch of diesel to renewable diesel
Sub-Total scope 1	-11%	-572	
Electricity	-68%	-515	Market-based electric accounting
District steam	-100%	-1,163	Discontinued in 2013
Sub-Total scope 2	-87%	-1,678	
Scope 1 and Scope 2 Total	-31%	-2,250	Scopes 1 and 2

Note: percentage figures are rounded.

Figure 3 shows energy use by source for 2010 and 2017 compared to the CRO goal of 50% fossil fuel reduction for City operations by 2030. Note that the grey bar on Figure 3 represents the 50% minimum reduction component of the goal.

As can be seen, significant progress has been made towards the CRO’s fossil fuel reduction goal, with the City more than most of the way there as of 2017. Again, recent progress towards the goal is the overwhelming result of the City’s substitution of renewable diesel fuel for conventional fossil diesel fuel as well as discontinuing district steam energy.

Figure 3: Summary of Scope 1 and Scope 2 (market-based) fossil fuel energy use for 2010 and 2017 versus the CRO goal.

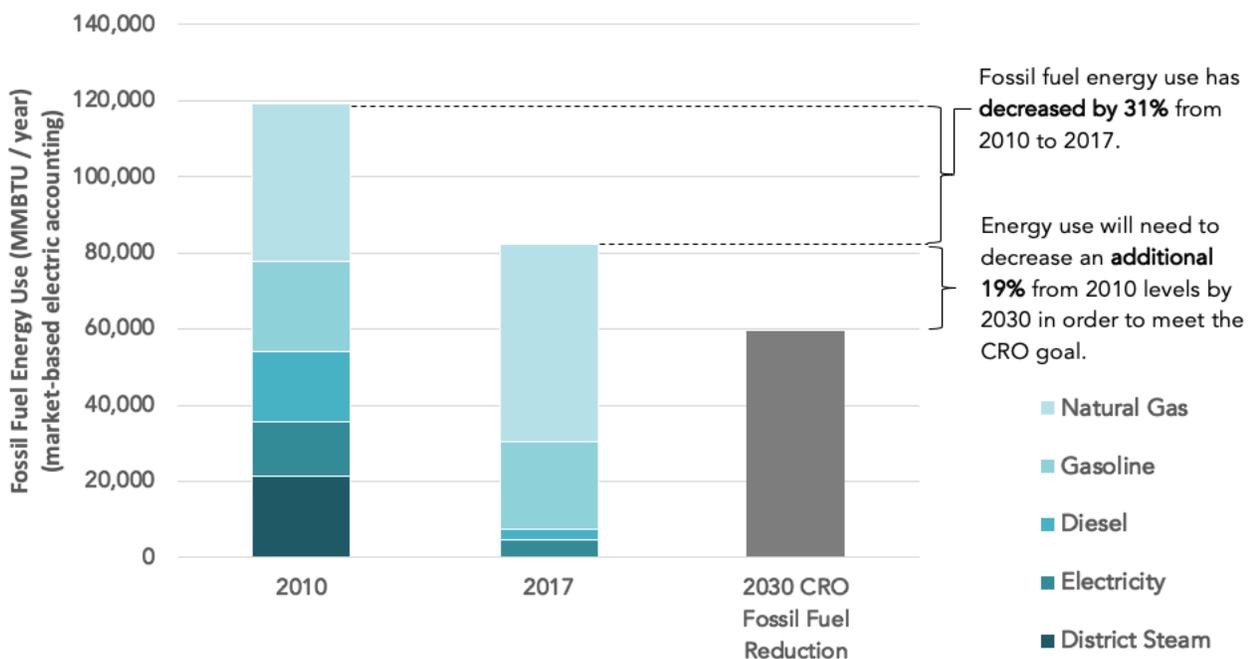




Figure 4 provides a summary of historic inventory results and provides a percent comparison of 2017 GHGs to 2010 GHGs. As can be seen, the City's electricity emissions have decreased by 68%. EWEB's electricity (contracted from Bonneville Power Administration) has become even cleaner (see page 7 for more details). Note the difference in Figure 4 in GHGs using the location-based and market-based accounting methods for electricity. These results show that the City's / EWEB's electricity supply contracts (market-based) are very low GHG compared to GHGs from average electricity generation for the regional electricity grid. The implication of the two methods of accounting is that whatever electricity consumption reduction we have in Eugene, means EWEB can sell low GHG power to the grid to displace higher GHG sources of electricity.

Natural gas GHGs have increased since 2010, which at first glance might appear problematic. Instead, it is a positive change as natural gas was substituted in 2013 for district steam (less efficient) which had the net effect of lowering the City's GHGs for space heating.

Figure 4: Detailed summary of Eugene's 2017 and historic emissions for emissions by energy type with percent change from 2010.

Notes: this table includes emissions using two accounting methods for electricity – location-based and market based. These two methods are described in more detail on page 7. **The sub-totals (light green highlighted rows) include market-based emissions for electricity.** The Greenhouse Gas Protocol guidance states that market-based accounting is the preferred method for organizational goal-related tracking.

Total Emissions (MT CO ₂ e / year)	2000	2005	2010	2013	2016	2017	Change since 2010
Facilities	3,481	3,809	4,119	3,381	2,661	3,014	-27%
Electricity (Location-Based)	11,311	10,521	9,778	7,809	7,647	7,367	-25%
<i>Electricity (Market-Based)</i>	823	765	762	537	257	247	-68%
Natural Gas	1,939	2,324	2,194	2,844	2,404	2,767	+26%
District Steam	719	720	1,163	<i>Steam plant decommissioned in 2012</i>			-100%
Transportation	3,305	3,307	3,157	3,274	3,228	1,917	-39%
Gasoline	2,008	2,014	1,769	1,903	1,723	1,698	-4%
Diesel	1,297	1,293	1,388	1,371	1,505	219	-84%
Total Emissions (Market-Based)	6,786	7,116	7,276	6,655	5,889	4,931	-32%

Figure 5 shows a similar accounting as Figure 4, except this figure is based in units of fossil fuel. The fossil fuel accounting is used to track the City's progress towards the CRO's 2030 goal for fossil fuel use. See the previous page for explanations for 2010 to 2017 percent changes.

Figure 5: Detailed summary Eugene's 2017 and historic emissions by energy type with percent change from 2010.

Note: This table only includes Market-based accounting. This approach was selected by the City as the preferred approach for accounting towards the CRO fossil fuel target, per guidance from Greenhouse Gas Protocol – Scope 2 Guidance. The guidance states that market-based accounting is the preferred method for organizational goal-related tracking.

Total Energy (MMBTU / year)	2000	2005	2010	2013	2016	2017	Change since 2010	
Facilities	N/A	N/A	77,082	63,815	50,151	56,815	-26%	
Electricity (Location-Based)	<i>Market-based accounting used for CRO fossil fuel target</i>							
Electricity (Market-Based)	N/A	N/A	14,388	10,180	4,847	4,670	-68%	
Natural Gas	36,563	43,832	41,378	53,635	45,304	52,145	+26%	
District Steam	12,951	13,144	21,316	<i>Steam plant decommissioned in 2012</i>			-100%	
Fleet	43,959	44,381	42,067	43,503	43,099	25,624	-39%	
Gasoline	26,669	27,151	23,587	25,228	23,031	22,705	-4%	
Diesel	17,290	17,230	18,480	18,275	20,068	2,919	-84%	
Total Fossil Fuel Use (Market-Based)	N/A	N/A	119,149	107,318	93,250	82,439	-31%	

Note: Oregon Department of Environmental Quality does not provide an EWEB specific factor for fossil fuel use as they do provide for GHGs (MT CO₂e / MWh). Therefore Good Company calculated the values above using EWEB's GHG factor from ODEQ combined with factors from U.S. Energy Information Administration for natural gas (heat rate and GHG emissions factors). These factors were used to calculate the MMBTUs of fossil fuels for electricity assuming a natural gas benchmark.

DETAILED FINDINGS

Electricity

In 2017, City buildings consumed 24,785 MWh of electricity and emitted 247 MT CO₂e using market-based accounting (or 7,367 MT CO₂e using location-based accounting). Within City operations, the largest consumers of electricity include: Street Lights; Public Works; Library, Recreation, and Cultural Services (LRCS); and Planning and Development (PDD). Overall, the City's electricity use has decreased by 2.6% between 2010 and 2017 (i.e. MWh not GHGs).

Location vs. Market-Based Electricity Accounting

This inventory follows the *Local Government Operational Protocol* for the majority of emissions sources with an exception for electricity. More recent guidance is available that has become standard in the GHG inventory protocol, *Greenhouse Gas Protocol's Scope 2 Guidance*. *Scope 2 Guidance* suggests that organizations account for electricity emissions using two distinct accounting methods: 1) Location-based⁸ and 2) Market-based.⁹

Figure 6: Summary of 2017 electricity use by department/service area

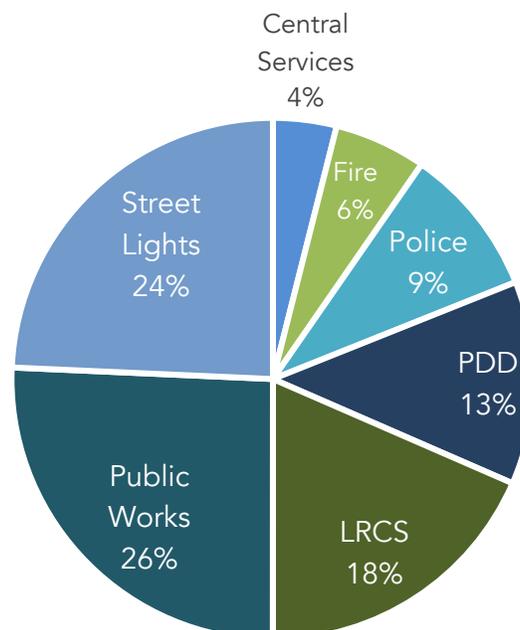


Figure 7: Details of location-based and market-based emissions calculations.

Accounting Method	Provider	Energy Consumption	Emissions Factor	Total Emissions
Location-Based	NWPP	24,785 MWh	0.297 MT CO ₂ e/MWh	7,367 MT CO ₂ e
Market-Based	EWEB	24,785 MWh	0.010 MT CO ₂ e/MWh	247 MT CO ₂ e

Note 1: Activity data based on City of Eugene's 2017 electricity consumption.

Note 2: Northwest Power Pool (NWPP) Emissions Factor is from eGRID 2016. 2016 is the most recent factor available.

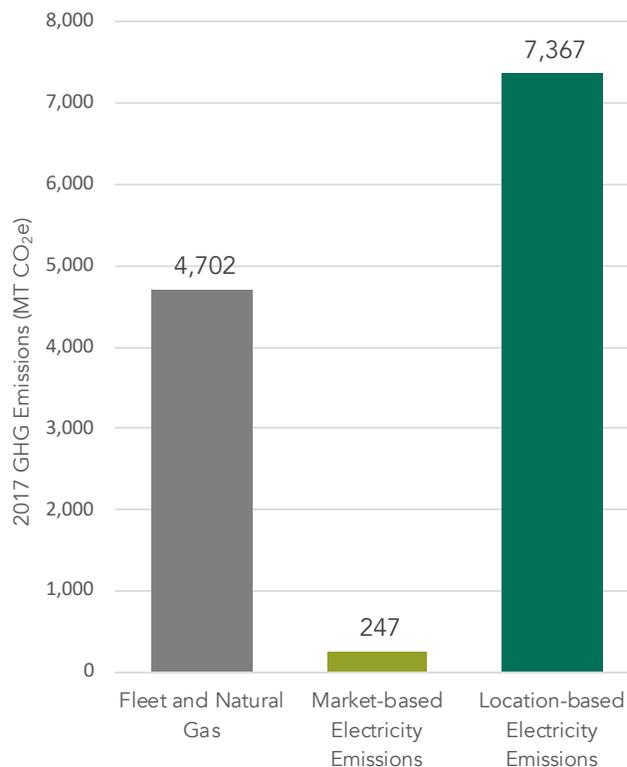
Note 3: Utility-Specific factor is based on 2016 reporting by Oregon Department of Environmental Quality (ODEQ). 2016 is the most recent factor available.

⁸ **Location-based method (or regional grid)** represents the average emissions intensity of a specific electricity grid with defined geographic and temporal boundaries. It therefore represents the average GHG impacts associated with using or not using (due to efficiency or conservation) a kilowatt-hour of electricity by an organization. This method is focused on the connection between collective consumer demand and the emissions associated with supplying that demand and maintaining grid stability.

⁹ **Market-based method (or utility-specific)** represents emissions from the electricity generation contracts that an organization has purposefully chosen. Related choices could include selection of a specific electricity utility (in markets with more than one); contracting with a specific supplier (in a Power Purchase Agreement (PPA)); or the purchase of renewable energy credits (RECs). This accounting method documents the carbon intensity of "contractual instruments" that convey the "environmental attributes" from a specific electricity supplier to the purchaser.

Figure 8 provides a comparison of GHGs calculated using the location-based and market-based accounting methodologies. As is shown in Figure 8, the City purchases its electricity exclusively from EWEB; therefore, market-based emissions are calculated solely using EWEB’s utility-specific emissions factor. EWEB’s emissions factor is nearly 30 times less carbon-intensive than the regional average because EWEB is predominantly supplied through contracts with Bonneville Power Administration (BPA) whose generation supply is largely from low-carbon, hydroelectric and nuclear resources. What supply is not from BPA comes from EWEB’s owned-generation resources which are also from low-carbon sources (hydroelectric and wind).

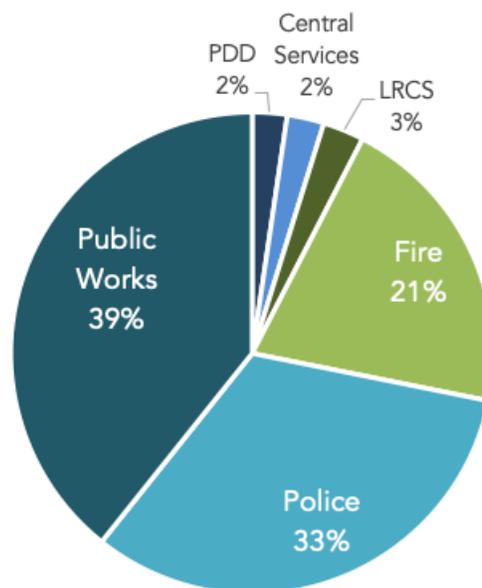
Figure 8: Comparison of the City’s location-based vs. market-based electricity emissions.



Fleet

In 2017, the City’s fleet consumed 387,039 gallons of fuel and emitted 1,935 MT CO₂e.¹⁰ The City’s fleet is made up of a variety of vehicles and equipment that were primarily fueled in 2017 with gasoline blended with 10% ethanol (E10) and diesel fuel made with 99% renewable diesel (R99). The fleet also uses R20 and B5 diesel blends for certain applications as well as a small, but growing fraction of electricity for sedans.

Figure 9: 2017 vehicle fuel volume by department



Approximately 52% of the City’s liquid fuel-use are gasoline blends, and 48% are diesel blends. Renewable R99 diesel made up roughly 83% of the City’s total diesel use in 2017. Figure 9 summarizes gas and diesel fuel volumes, by department. Within City operations the largest consumers of fleet fuels include Public Works, Police, and Fire & Emergency Services.

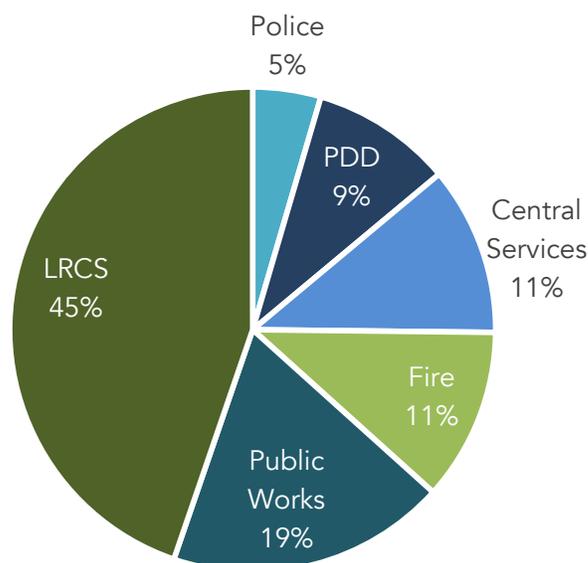
¹⁰ It’s important to note that Scope 3, upstream emissions from fuels are not being accounted for in the results. These emissions can be better or worse than conventional fuels, particularly for renewable and biofuels that require harvest of agricultural or forest inputs in their production. The City should require that fuel vendors provide lifecycle carbon intensity values (as certified under Oregon’s Clean Fuels Program) by fuel blend and consider these values when purchasing bio and renewable fuel blends.

Facility Heat (Natural Gas)

In 2017, City buildings consumed 521,447 therms (MMBTUs) of natural gas and emitted 2,767 MT CO₂e. Figure 9 summarizes natural gas use by department. Within City operations, the largest consumers of natural gas include LRCS Recreation facilities, Fire and Emergency Services, and Central Services.

City operations no longer use district steam as an energy source for heating; these facilities have been transitioned to high-efficiency, building-level natural gas furnaces, which resulted in a *net decrease* in overall GHG emissions, but an *increase* in natural gas use by City-owned facilities. The natural gas furnaces are more efficient at converting the fuel to heat than the aged district steam system was, which is why emissions are down since the transition. As a result of this and other factors (e.g. some winters are warmer than others), the City's emissions from natural gas have *increased* by 26% since 2010.

Figure 10: 2017 natural gas use by department



METHODOLOGY

Data for this inventory was provided by City staff and included facility electricity and natural gas use as well as fleet fuel use. Facilities staff developed a methodology and provided energy data that allows for allocation of facility energy use to multiple departments sharing the same facility.

The methodology used for this inventory follows The Climate Registry's *Local Government Operations Protocol*, which is supplemented with Greenhouse Gas Protocol's *Scope 2 Guidance*. City refrigerant emissions were not found to be large in previous inventories, and the data is time consuming to collect so there are excluded from the 2017 inventory. Note: Eugene's wastewater treatment plant emissions are under the management of a cooperative community partnership, Metropolitan Wastewater Management Commission (MWMC) and therefore is excluded from the City's inventory. MWMC completes independent GHG inventories and has inventories complete for calendar years 2010, 2012, 2014, and 2016. See above link for reports.

Inventory data is cataloged in an Audit Trail, which documents and organizes all data files and related calculation files used to calculate the City's GHGs and fossil fuel use. GHGs and energy use are calculated with Good Company's Greenhouse Gas Calculator (G3C). Other resources related to Eugene's Climate Recovery Ordinance, including past GHG inventory reports, may be downloaded at <https://www.eugene-or.gov/2170/Climate-Recovery-Resources>. Note that due to an update in previous years emissions factors and improved calculation methodology, the data in this document may not exactly match previous reports.