



INVENTORY OF GREENHOUSE GASES from Local Government Operations

January 2018

2007 - 2016



INTRODUCTION

Starting in 2009, the City of Hillsboro began to track emissions of greenhouse gases (GHG) from City operations, using 2007 as the baseline year. 2007 was chosen because it was the most recent best year for which data was readily available. This report provides emissions trends for the City for the ten-year period of 2007-2016. It also highlights some of the actions the City has taken to reduce emissions. The inventory is a tool to identify actions, track progress and manage risk. It shows significant progress in reducing emissions from scope 1 and 2 sources, in spite of significant community and organizational growth.

Policy Context

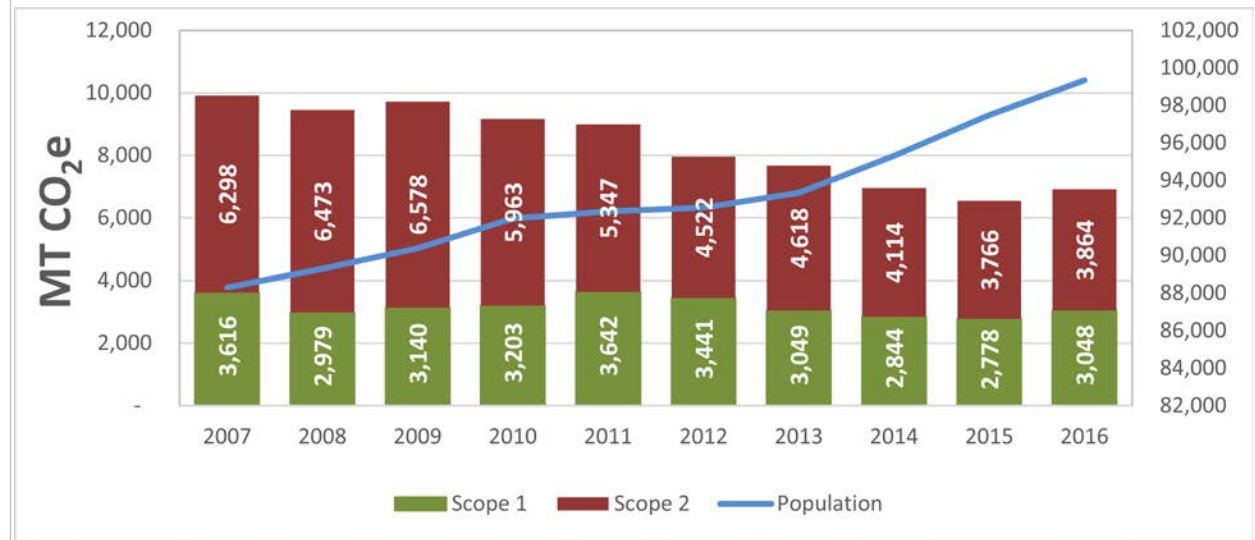
In September 2010, the City Council adopted the City's first Sustainability Plan for City operations. The Plan's long-term goals provide the foundation that guides sustainability work at the City. The Plan includes a goal to reduce GHG emissions 80% below 2007 levels by 2030.

The City of Hillsboro is one of more than 1,000 cities across the U.S. that signatories to the US Conference of Mayors Climate Protection Agreement. A comprehensive emissions inventory is an important component of a signatory's commitments. The City is also a partner in the U.S. Department of Energy Better Buildings Challenge to reduce energy consumption, and is a leader in the U.S. Environmental Protection Agency Green Power Challenge to increase use of renewable energy.

In 2007, the Oregon legislature established statewide GHG emissions reduction goals to stop emissions increases by 2010; reduce emissions to 10% below 1990 levels by 2020 and 75% by 2050. In 2012, the Governor's 10-year Energy Action Plan established goals to meet 100% of new electricity load growth with energy conservation and renewable energy; to implement policies that increase clean energy infrastructure development; and to help transition to a cleaner transportation system. In 2016, Oregon's Clean Fuels Program began, with the goal of reducing lifecycle fuel emissions by 10% over 10 years.

Figure 1: City of Hillsboro Local Government Operations GHG Inventory 2007-2016

Scope 1 and 2 GHG emissions decreased by 3,002 metric tons carbon dioxide equivalent (MT CO₂e), or 30.2%, from 2007 to 2016.



City of Hillsboro 2030 Goal

80% reduction in greenhouse gas emissions; 100% of remaining emissions offset (based on 2007 baseline)

FUNCTIONAL VALUE OF THE INVENTORY

In light of the City's adopted goal to reduce GHG emissions from operations, this inventory's 2007 baseline assessment and subsequent updates serve to track progress towards meeting GHG emissions reduction goals and to maintain the City's commitment to environmental sustainability. By regularly monitoring performance, City management can understand in quantified terms which activities produce the greatest quantities of GHG emissions, and which actions can most cost-effectively reduce the greatest quantities of emissions.

CONCLUSIONS

The City is making measurable progress towards reducing emissions from scope 1 and 2 sources by improving City facility energy efficiency, and by ensuring that a greater portion of the energy supplying those facilities is from renewable sources. Significant reductions have occurred despite community and organizational growth. Since 2007 Scope 1 and 2 emissions have *decreased* 30.2%, while population has *increased* over 11% and City facility square footage has *increased* 17%. The City is on track to meet the adopted 2030 emissions reduction goals for scopes 1 and 2. However, the larger emissions from Scope 3 sources, including the supply chain (purchasing and capital construction) and purchased water, has *increased* 22% since 2007. Scope 3 emission sources remain an area of opportunity to reduce emissions.

To date, some of the steps taken by the City to reduce GHG emissions include:

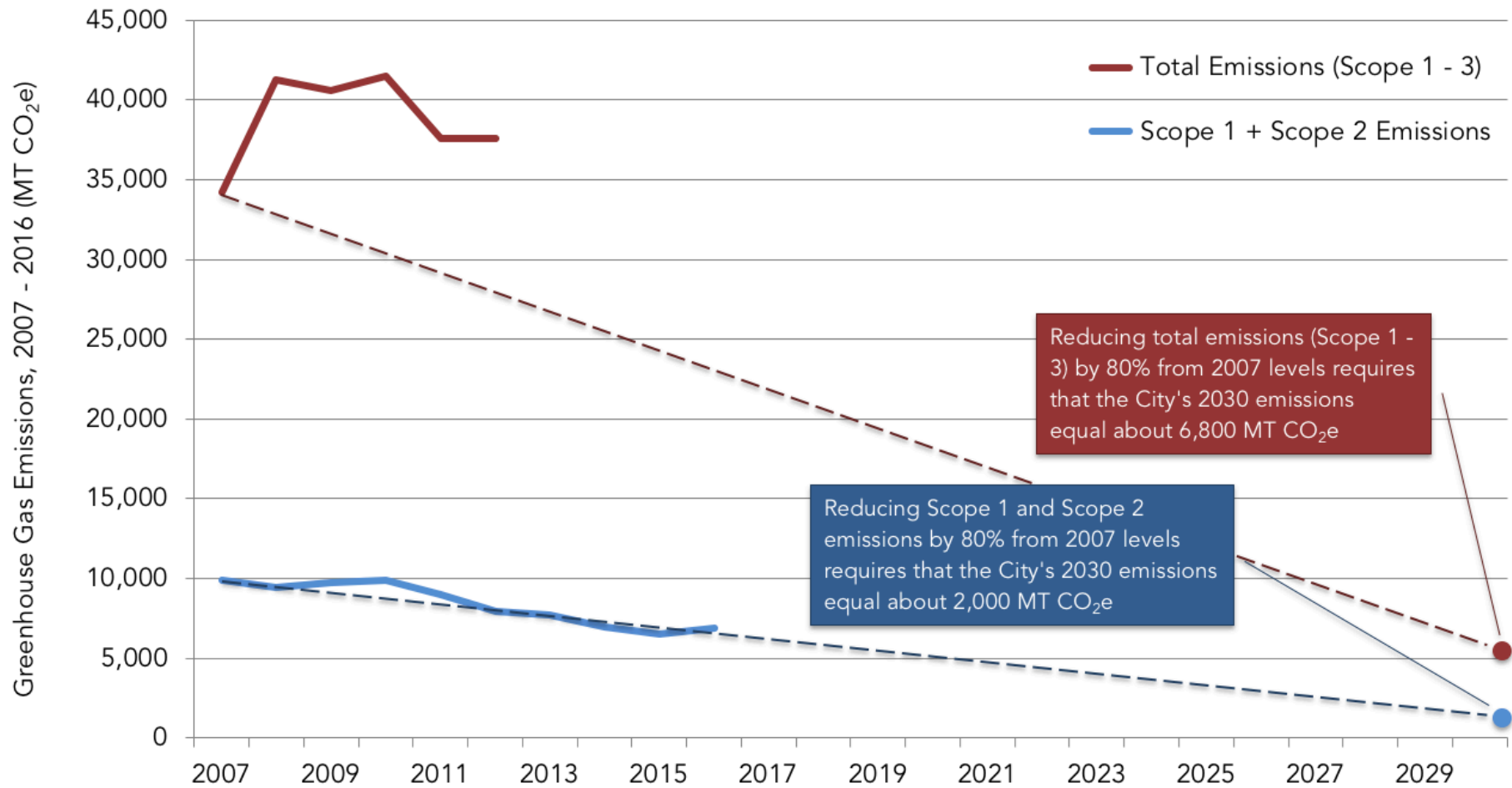
- Renewable power purchases and generation (over 35% of electricity is from renewable sources)
- Focused facility energy efficiency upgrades and programmatic energy management
- Greener practices in new facility construction
- Incentives to encourage employee commute alternatives
- Increased Gas-electric hybrid and alternative fuel vehicles and infrastructure, including electric vehicles and chargers
- Advanced technology tools to reduce water use
- More efficient purchasing practices

As Figure 2 below shows, Scope 1 and 2 emissions for City operations have decreased between 2007 and 2016, but Scope 3 emissions have increased, due to supply chain purchases and the embedded emissions from water supplied by the Joint Water Commission. Supply chain purchases are comprised of over 50% construction-related purchases, some of which have a large GHG emissions footprint (e.g., concrete). Implementing emission reduction actions for Scope 3 emissions, particularly for supply chain, is challenging but important – the inventory makes clear that supply chain emissions are large in scale and therefore represent a significant opportunity for reductions. However, it is important to stress that Scope 3 emissions are relatively harder to control since they are mostly outside the City's direct control¹. Action there requires a different approach, one that actively engages vendors and leverages the City's purchasing power to affect external practices.

¹ For example, means of business travel vary and depend on individual vendor choices, commutes are made by employees who have a wide variety of commute options, and different products are influenced by their own supply chain, which affects greenhouse gas outcomes.

Key near- to mid-term actions that could impact scope 3 emissions include consideration of emissions from major facility and infrastructure projects, steps to encourage lower-impact commutes, and a focused effort to reduce supply chain emissions, in particular those associated with construction materials.

Figure 2: Progress Needed to Achieve Long Term Emissions Reduction Goal



BOUNDARIES

In GHG inventory protocols, emissions sources and activities are classified as either producing direct or indirect emissions. Direct emissions are those from sources directly controlled by the organization. Indirect emissions result from the organization's actions, but the direct source of emissions is controlled by a separate entity.

To distinguish direct from indirect sources, three "scopes" are defined for GHG accounting and reporting purposes.

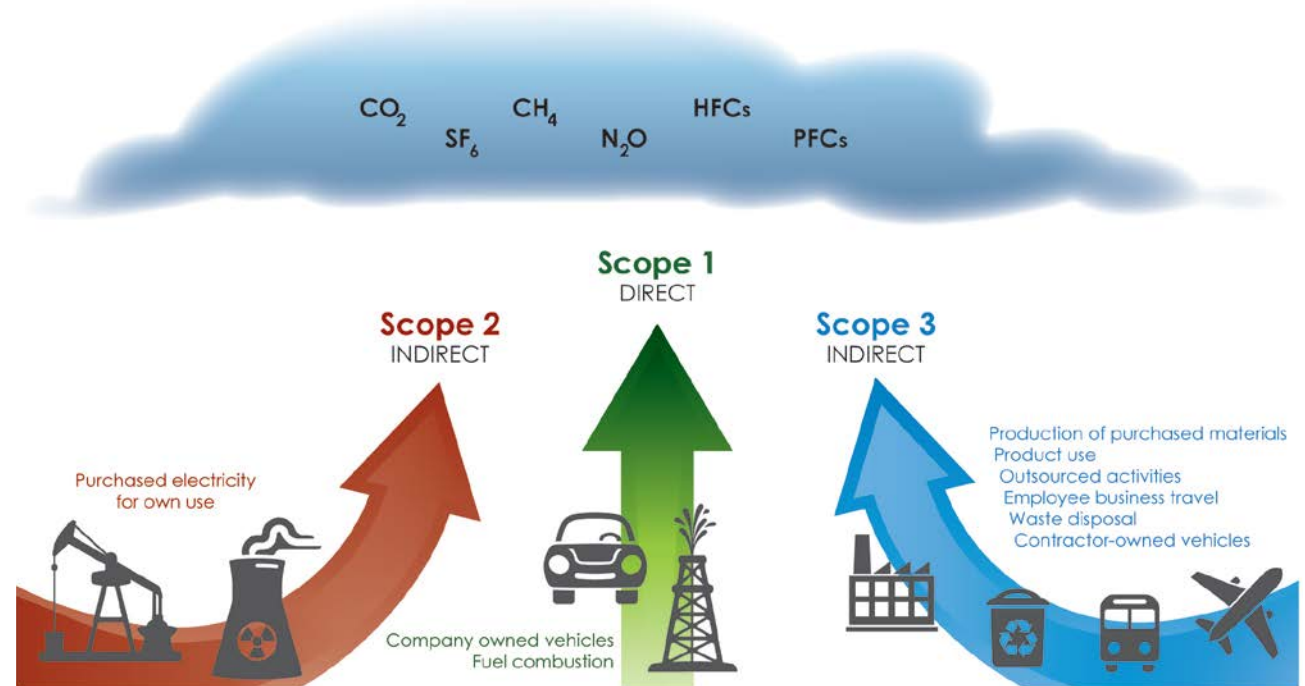
Scope 1 – Direct sources of emissions that originate from equipment and facilities owned or operated by the City of Hillsboro.

Scope 2 – Indirect emissions from purchased electricity, heat or steam.

Scope 3 – All other indirect sources of emissions that may result from the City's operations but occur from sources owned or controlled by another entity, such as: business air travel; embodied emissions in material goods purchased by the City; emissions from solid waste sent to landfill; and emissions from City employee commutes.

Scope 1 and Scope 2 emissions must be reported for most protocols and registries. Scope 3 emissions are usually considered optional when reporting emissions, but they serve to clarify an organization's entire carbon footprint and to illuminate the potential regulatory and financial risks an organization may face due to its carbon footprint. It is also becoming increasingly clear that given the relatively large portion of emissions that come from sources reflected in Scope 3, namely the procurement of goods and services (supply chain), the Scope 3 assessment holds great potential to reduce emissions. Developing an appropriate and effective approach to manage and track supply chain emission will be a near term focus for continued action. Figure 3 illustrates the three scopes of emissions.

Figure 3: Greenhouse Gases and Accounting and Reporting Scopes



Source: WRI/WBCSD Greenhouse Gas Protocol, Corporate Accounting and Reporting Standard (Revised Edition), Chapter 4

RESULTS

Scope 1 emissions have been reduced by 15.7% and are attributed to decreases in fleet and natural gas emissions. The decrease in emissions from fleet is due to implementation of Oregon's Renewable Fuels Mandate, fleet logistics tracking technology and efforts to improve overall fleet fuel efficiency. Decreases in emissions from natural gas are attributable to increases in building heating and cooling efficiencies, extensive energy conservation measures implemented at the City's aquatic center, and relatively warmer winters. The decrease in emissions from natural gas has occurred in spite of an increase in the total facility square footage (approximately 17% since 2007).

Scope 2 emission decreases are attributable to numerous implemented energy efficiency projects. Additionally, since 2007 the City has voluntarily offset 100% of the electricity used by the following facilities with renewable energy purchases: Hillsboro Civic Center, Cherry Lane Fire, Jones Farm Fire, Brookwood Library, Water Operations, Police Main Precinct, and Ron Tonkin Field. In 2016, the City purchased renewable energy equal to 37% of the City's total facility electricity consumption. In line with current best practices for tracking electricity emissions toward climate goals, the City used "market-based" electricity accounting, which quantifies the emissions associated with the City's electricity contracts, including renewable energy purchases. Also in line with best practices, the City considers electricity emissions from "location-based" accounting, which quantifies emissions using the average carbon intensity of the regional electricity grid. A comparison of emissions accounting using "location-based" and "market based" can be found in Figure 4 below.

Equivalent Comparisons

Scopes 1 and 2 yield 6,912 MT CO₂e in 2016. For a sense of scale, this is *equivalent* to:

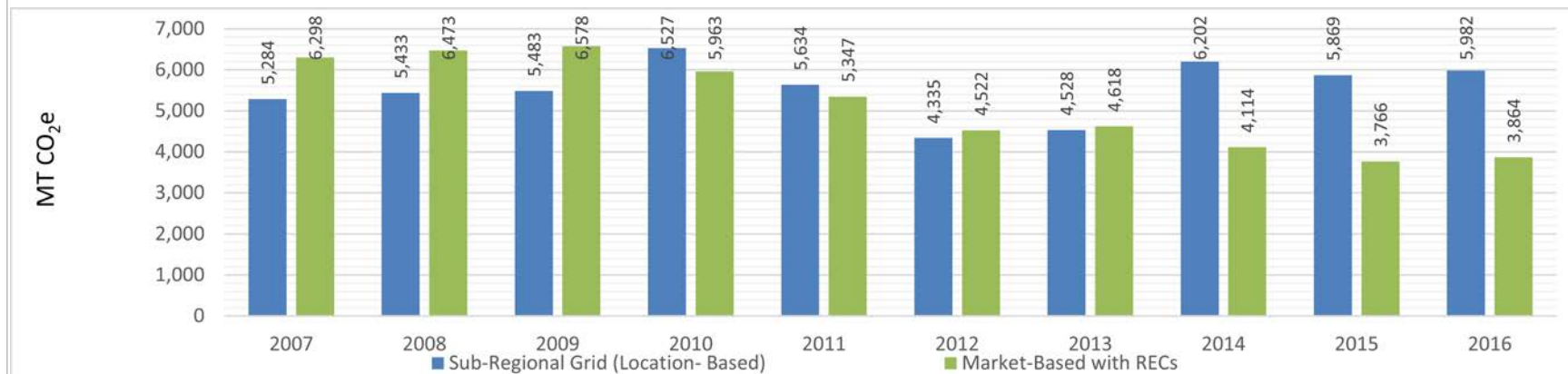
- Annual emissions from 1,480 passenger vehicles;
- Annual emissions from the energy consumed by 746 homes (US average);
- 16.9 million miles/year driven by an average passenger vehicle.

At \$10 per ton (the current California Carbon Market rate) the market value for Scope 1 emissions is \$30,480 and for Scope 2 \$28,315.

¹ <http://www.epa.gov/cleanenergy/energy-resources/calculator.html>

Table 1: Comparison of 2007-2016 Scope 1 and 2 GHG Emissions from City of Hillsboro Local Government Operations

Category	Emissions (MT CO ₂ e)										2007-2016 change	Notes	
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016			
Scope 1	Fleet	2,212	1,646	1,797	1,862	1,988	1,933	1,787	1,847	1,852	1,895	-14.3%	Between 2007 and 2016, gasoline use dropped 6.9% to 142,015 gallons; diesel use rose by 73% to 61,249 gallons. Overall reduction in emissions is due in large part to the State Renewable Fuel Mandate, which began in 2008.
	Natural gas	1,384	1,313	1,343	1,341	1,654	1,508	1,262	935	883	1,110	-19.8%	Use of natural gas for space heating decreased by nearly 20% between 2007 and 2016, largely due to conservation projects done at the City's aquatic center and updates to building mechanical control systems.
	Refrigerants	20	20	0	0	0	0	0	62	43	43	+115.0%	In 2014 – 16, Heating, Ventilation and Air Conditioning (HVAC) leaks required 311 pounds of HCFC-22 and R410A refrigerants to recharge systems. Data was unavailable for 2009 – 2012 as the refrigerants were not tracked.
Scope 1 Sub-Total	3,616	2,979	3,140	3,203	3,642	3,441	3,049	2,844	2,778	3,048	-15.7%	GHG emissions from Scope 1 have decreased 568 MT CO₂e from 2007 to 2016.	
Scope 2	Electricity (Market-Based)	6,298	6,473	6,578	5,963	5,347	4,522	4,618	4,114	3,766	3,864	-38.6%	Emissions from City electricity use decreased by 38.6% from 2007 to 2016, in spite of an increase in total square footage of over 17%. This is due to numerous mechanical and lighting efficiency investments made during this time to limit load growth and a significant investment in RECs as noted below. The total kWh used by the City has increased by 4.4%.
		Since 2007 the City has voluntarily offset 100% of the electricity used by the Hillsboro Civic Center with purchased renewable energy credits (REC). As of 2016, several additional facilities are offset 100%; total offsets now amount to 4,770,996 kWh, or just over 35% of the total City facility electricity consumption.											
Scope 1 & 2 Totals	9,914	9,452	9,718	9,166	8,989	7,963	7,667	6,958	6,544	6,912	-30.2%	GHG emissions from Scopes 1 and 2 have decreased 3,002 MT CO₂e from 2007 to 2016.	

Figure 4: Comparison of Scope 2 Emissions by Emission Factor

SCOPE 3 RESULTS

Data for Scope 3 emissions, which includes business travel, solid waste, employee commute, supply chain, and purchased water was not recorded for 2013-2016. The reason is that business travel, solid waste, and employee commutes represent relatively small emissions that do not justify the significant effort required to assemble the data on an annual basis. Emissions for the other Scope 3 sources, supply chain and purchased water, are significant sources of emissions but were also not captured due to the relative effort required. In addition to the effort needed, the nature of the Scope 3 assessment is much less precise. The results give an order of magnitude for emissions, so that priority actions can be identified to reduce emissions. Collecting and analyzing the Scope 3 emissions every five years is sufficient for the City to understand the relative portion of emissions that they represent, and to develop actions that can be taken to reduce them.

Variations to emissions from commutes correlate to the 2008-2010 economic downturn and reduced employee count, and subsequent increase in employee counts after 2011. More recent efforts to encourage and incent alternative commute modes have also positively benefitted emissions from commuting, albeit slightly. Increases in emissions from purchasing are attributable to numerous large building and infrastructure projects, as well as increases in the scope of operations overall as Hillsboro continues to grow.

Included for reference below is *Table 2: Comparison of 2007-2012 Scope 3 GHG Emissions from the City of Hillsboro's Local Government Operations*.

Table 2: Comparison of 2007-2012 Scope 3 GHG Emissions from the City of Hillsboro's Local Government Operations

Category	Emissions (MT CO ₂ e)						07-12 Change	Notes
	2007	2008	2009	2010	2011	2012		
Business travel	146	186	130	88	157	139	-4.8%	Total business travel from 2007 to 2012 fell by 4.8%, to 350,708 miles.
Solid waste	311	314	313	298	269	289	-7.1%	City waste was historically disposed at the Riverbend landfill in Yamhill County, which captures 80% of methane gas from the landfill for energy production. Since January 2017 waste is now disposed at the Coffin Butte landfill near Corvallis, which captures approximately 80% of methane generated, using roughly 84% of that for energy production and the balance to flare.
Transmission & distribution loss	343	353	356	424	366	346	+0.9%	As electricity travels via transmission and distribution lines, some of it is lost due to forces such as friction. Nationally, about 6% of electricity generation is lost in transmission and distribution (T&D). ²
Commute	1,868	1,927	1,509	1,757	1,821	1,916	+2.6%	From 2007 – 2012, the overall amount of employee commuting increased slightly. The total employee count has increased, but there was also a decrease in estimated annual employee commute days and a slight reduction in the CO ₂ emissions factor for single occupancy vehicle miles.
Supply chain	14,000	14,000	14,000	22,484	17,742	18,017	+28.7%	The 2007 estimate covers \$35.6 million worth of goods and services purchased by the City; this estimate was used for 2008 and 2009 since supply chain inventories were not conducted for those years. Significant increases in 2010 – 2012 are attributed to several City facility construction projects.
Purchased Water	7,696	8,049	7,627	8,202	6,599	9,005	+17%	Hillsboro purchased 49.7% of Joint Water Commission (JWC) water in 2012, up from 35.9% in 2007. Hillsboro's water usage grew by 38%, but emissions grew by only 17% due to improved efficiency in water distribution.
Totals	24,364	24,829	23,935	33,253	26,954	29,712	22.0%	Total Scope 3 GHG emissions increased 5,348 MT CO₂e from 2007 to 2012.

² Draft Federal Greenhouse Gas Accounting and Reporting Guidance: Technical Support Document (<http://www.whitehouse.gov/administration/eop/ceq/sustainability/fed-ghg>)

Table 3: Description of GHG Operational Categories

Category		Description
Scope 1	Fleet	This category includes emissions from owned fleet vehicles (90% unleaded gasoline/10% ethanol blend vehicles, ultra-low sulfur diesel vehicles, gas-electric hybrids, and compressed natural gas vehicles) and other owned equipment powered by gasoline, diesel, biodiesel, and propane.
	Natural gas	As of 2016, the City uses natural gas for space heating at 27 facilities, which includes the pools at the aquatic center.
	Refrigerants	The City's HVAC systems use HCFC-22 (commonly known as R-22) refrigerant.
Scope 2	Electricity	Electricity emissions were calculated using market-based emissions factors and included City-purchased RECs. The City calculated the electricity consumption from 29 buildings. In addition to buildings, the calculation includes the electricity consumed for a range of other activities such as street lighting, traffic signals, lighting at city parks, and small storage structures at parks and other facilities that use power.
Scope 3	Business travel	Business travel encompasses employees' use of airlines, rental cars, personal vehicles, bus and rail for work-related travel.
	Solid waste	Six franchised waste haulers collect residential and commercial waste within City limits. Three of the haulers provide waste collection services to City facilities and parks. Waste includes dry (e.g., construction debris), wet (e.g., municipal solid waste), yard debris, and recyclable materials including paper, plastic, metal and glass. The non-recyclable waste from City facilities has historically been landfilled at the Riverbend landfill in Yamhill County, which captures 80% of the methane that is produced. Effective January 2017, landfill-bound waste is deposited at Coffin Butte Landfill, which also captures roughly 80% of the methane that is produced.
	Transmission & distribution loss	Measuring transmission and distribution losses provides a more accurate picture of total Scope 3 emissions rather than looking at emissions from plug-load only.
	Commute	City employees were surveyed to collect commuting data for these emissions.
	Supply chain	The supply chain category estimates the emissions attributed to the life cycle (from production to use to disposal) of goods and services purchased by the City. The supply chain is a gross estimate of emissions from purchases and is useful as a broad gauge of emissions. The City will conduct a full supply chain inventory every five years.
	Purchased Water	The City of Hillsboro purchases water from the Joint Water Commission (JWC), the partnership organization that treats and delivers water to customers in the Tualatin Valley, including City facilities. The emissions reported here are based on a GHG inventory of the JWC and are prorated for Hillsboro based on the amount of water delivered to Hillsboro customers.



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