DATE: January 11, 2021

TO: Council Sustainability Committee

FROM: Director of Public Works

SUBJECT 2019 Greenhouse Gas Emissions Inventory

RECOMMENDATION

That the Council Sustainability Committee (CSC) reviews and comments on this report.

SUMMARY

The Council-adopted General Plan includes greenhouse gas (GHG) emission reduction targets for the community. This report provides the results of the calendar year 2019 inventory and compares it to the previous five inventories. Table 1 summarizes the emissions totals for the six sectors – electricity, natural gas, transportation, BART, off-road vehicles, and waste. Emissions are displayed in metric tons of carbon dioxide equivalent[1] (MTC02e). The table shows that emissions were reduced by 25.7% since 2005, exceeding the goal of 20% by 2020.

Table 1: GHG Emissions by Sector (MT C02e)

	2005	2010	2015	2017	2018	2019	% Change from 2005
Electricity	185,890	165,304	141,854	75,118	47,531	13,093	-93.0%
Natural Gas	189,995	191,526	176,803	186,110	187,991	176,649	-7.0%
Transportation	636,581	580,238	571,556	553,298	531,104	522,897	-17.9%
BART	3,440	3,425	4,276	3,994	556	547	-84.1%
Off-Road Vehicles	24,345	37,630	71,034	69,279	36,064	51,392	+111.1%
Waste	50,924	38,338	38,148	47,555	52,209	46,187	-9.3%
Total	**1,091,174**	**1,016,461**	**1,003,670**	**935,354**	**855,465**	**810,765**	**-25.7%**
Hayward Population	140,530	143,921	155,753	159,623	159,603	160,197	
Total Emissions/	**5.2**	**4.8**	**4.4**	**4.1**	**3.7**	**3.5**	**-32.9%**

[1] Carbon dioxide is not the only gas that contributes to climate change. Each greenhouse gas causes varying amounts of warming. For example, one ton of methane (CH4) causes the same amount of warming as 23 tons of CO2 (1 ton of CH4 = 23 tons CO2e). To simplify reporting, it is standard practice to report carbon equivalent emissions (CO2e) as opposed to the actual emissions of each gas.

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BACKGROUND

The last report on the City's GHG emissions, presented to the CSC in September 2020,[2] showed that Hayward's emissions were reduced by 21.6 percent from 2005 to 2018. The report presented to the CSC in September also provided preliminary 2019 inventory results, predicting a 25.3 percent reduction. This report presents the finalized 2019 inventory results, which show a 25.7 percent reduction. This report and previous reports are available on the City's Climate Action Plan page.[3] The City of Hayward's General Plan Policy NR-2.4 sets the following GHG emissions reduction targets.

> *NR-2.4: Community Greenhouse Gas Reduction*
> The City shall…reduce community-based GHG emissions by 20 percent below 2005 baseline levels by 2020, 30 percent below 2005 baseline emissions levels by 2025, 55 percent below 2005 baseline emissions levels by 2030, and work with the community to develop a plan that may result in the reduction of community-based GHG emissions to achieve carbon neutrality by 2045.

To track compliance with these targets, the City has historically conducted community GHG emissions inventories every five years, starting with 2005 as the baseline year. Starting with the 2017 inventory, the City has conducted inventories annually. The first three inventories were completed with assistance from ICLEI–Local Governments for Sustainability, StopWaste, and the Statewide Energy Efficiency Collaborative (SEEC). For the 2017, 2018, and 2019 inventories, Alameda County and Contra Costa County jurisdictions hired a consultant through the East Bay Energy Watch (EBEW) and StopWaste. All six inventories use the U.S. Community Protocol methodology to calculate GHG emissions. The U.S. Community Protocol methodology is an industry-standard used by local governments to account for and report on GHG emissions in a standardized method.

Over the past fourteen years, organizations have continuously refined and updated the methodology to estimate emissions more accurately. In response, staff has recalculated emissions for the 2005, 2010, 2015, and 2017 in the tool created by EBEW's consultant to make an apples-to-apples comparison. Therefore, the emissions totals reported in this report do not match the numbers from previous reports.

DISCUSSION

As shown below in Table 2, Hayward met its goal of 20% below 2005 levels by 2020 two years early by achieving a reduction of 21.6% in 2018. As of 2019, Hayward has achieved a 25.7% reduction and is on track to reduce emissions by 30% by 2025 compared to the 2005 baseline.

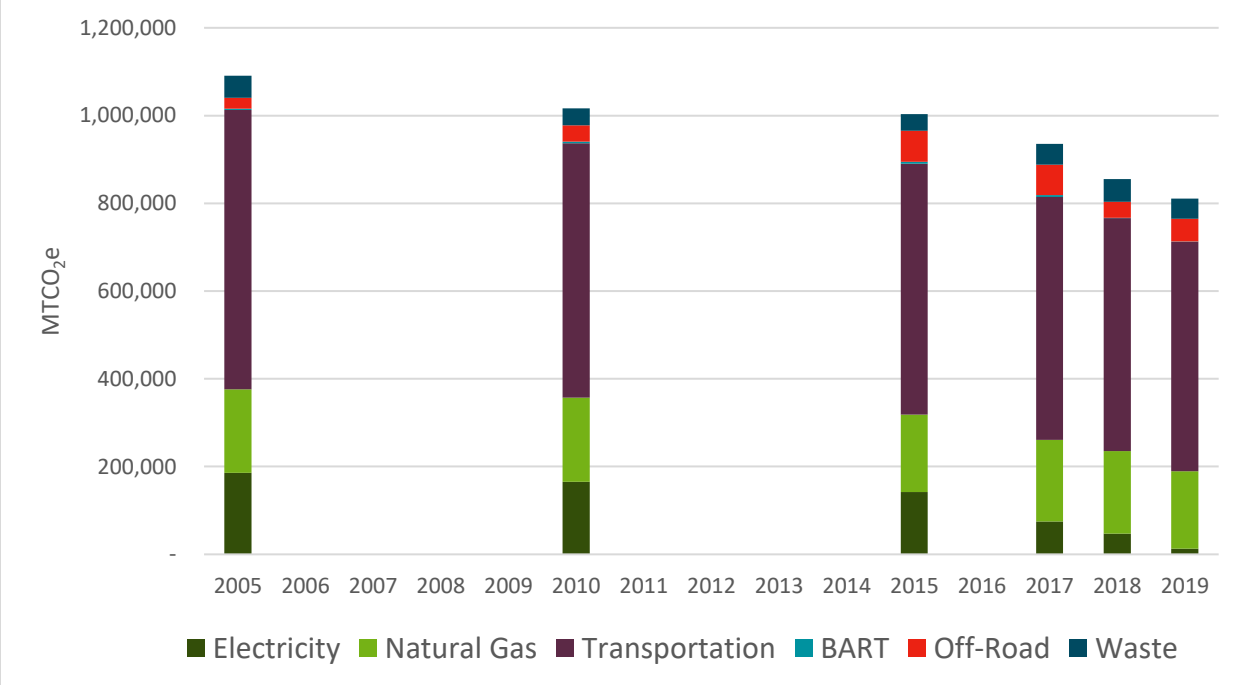
[2] https://hayward.legistar.com/LegislationDetail.aspx?ID=4640826&GUID=10F65424-CD3A-4E36-BE9E-D66D415B8314&Options=ID|Text|
[3] https://www.hayward-ca.gov/services/city-services/climate-action

Table 2: GHG Emission Reduction Goals and Actual Emission Reductions

Year	Goal	Actual Reduction
2005	Baseline	
2018		21.6%
2019		25.7%
2020	20%	
2025	30%	
2030	55%	
2045	Carbon neutrality	

The City's GHG inventory is comprised of six sectors: electricity, natural gas, transportation, BART, off-road vehicles, and solid waste. Figure 1 below shows the subsector breakdown for each year and the percent of each subsector for that year. Transportation, shown in purple, is the largest sector, making up 57-64% of the total. BART accounts for far less than 1% of all emissions, off-road vehicles account for 2-7% of emissions, and solid waste makes up 3-6% of emissions. Electricity, shown in dark green, makes up 2-17% of emissions and natural gas, shown in light green, accounts for 17-22% of emissions.

Figure 1: GHG Emissions by Subsector (MT C02e)[4]



Energy Sector

Overall energy emissions in 2019 were 40.5% below 2005 levels, with a 93% decrease in electricity emissions and a 7% decrease in natural gas emissions from 2005 to 2019 (see

[4] The percentages for each subsector are relative to the total emissions for each year.

Table 3). From 2018 to 2019, residential and nonresidential electricity emissions decreased, nonresidential natural gas emissions decreased, and residential natural gas emissions increased. While electricity emissions have declined significantly, the change in electricity usage has been much smaller. Residential electricity use has decreased by 1% and nonresidential electricity use has decreased by 13% since 2005, compared to an 88% decrease and 95% decrease in emissions respectively. The primary reason that electricity emissions have decreased is the City's customers, starting in mid-2018, were transitioned to electricity provided by East Bay Community Energy. The default product for the majority of Hayward customers is Brilliant 100, a carbon-free product. While EBCE launched in 2018, 2019 was the first full year Hayward customers were enrolled in EBCE.

There was a 2.4% increase in residential natural gas emissions from 2018 to 2019. The increase in natural gas emissions in 2019 may be related to the new residential homes built, as well a slight increase in heating degree days[5] (HDD) (see Figure 3 below). With a new building code and electrification reach code going into effect in 2020, it is possible that emissions from residential natural gas will have peaked in 2019.

Table 3: Energy Sector GHG Emissions

		2005	2010	2015	2017	2018	2019	% Change from 2005
Residential Electricity	GHG Emissions	54,042	51,207	44,819	23,502	20,582	6,498	-88.0%
	kWh	242,161,904	252,327,941	242,783,315	243,910,202	239,735,346	239,006,697	-1.3%
Non Residential Electricity	GHG Emissions	131,848	114,097	97,034	51,616	26,949	6,595	-95.0%
	kWh	590,811,842	562,228,183	525,628,036	535,682,182	513,657,102	511,639,672	-13.4%
Residential Natural Gas	GHG Emissions	103,502	103,027	86,736	91,719	93,019	95,291	-7.9%
	therms	19,489,985	19,400,629	16,332,954	17,271,164	17,516,060	17,943,901	-7.9%
Non Residential Natural Gas	GHG Emissions	86,493	88,499	90,066	94,392	94,972	81,358	-5.9%
	therms	16,287,167	16,664,879	16,960,038	17,774,540	17,883,737	15,320,155	-5.9%
Total GHG Emissions		**375,885**	**356,830**	**318,657**	**261,228**	**235,522**	**189,742**	**-40.5%**

[5] Heating degree day is the unit which measures how many degrees, and how many days, outside air temperatures were lower than the base temperature of 65 degrees Fahrenheit.

Figure 2: Energy Sector GHG Emissions (MT C02e)

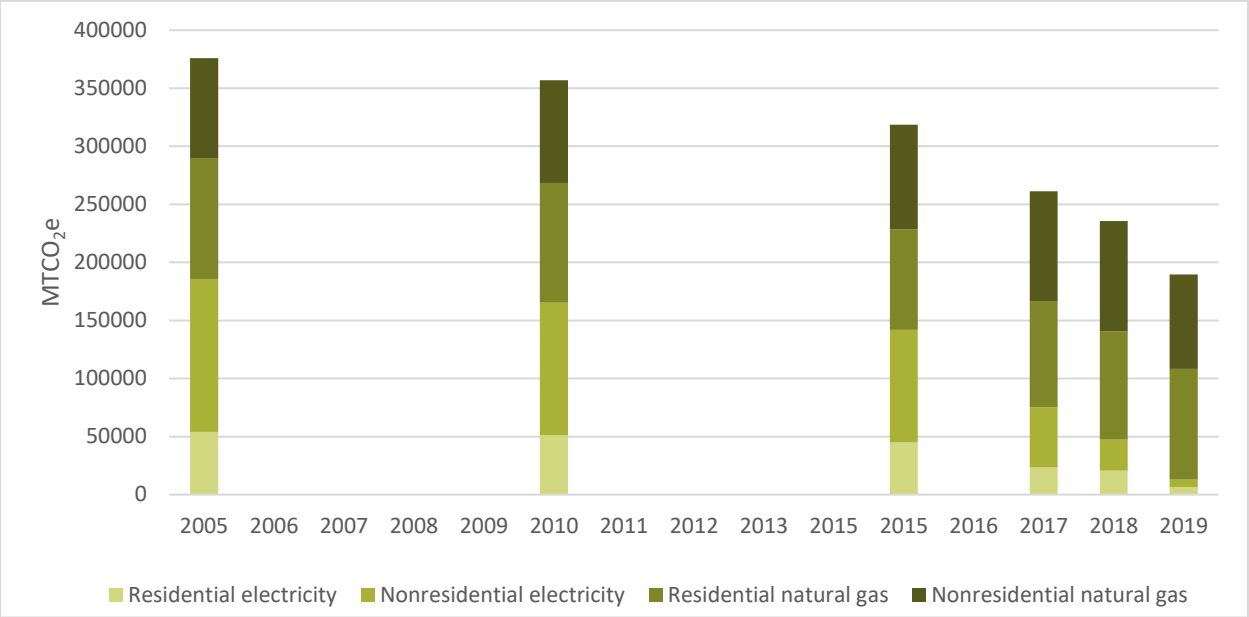
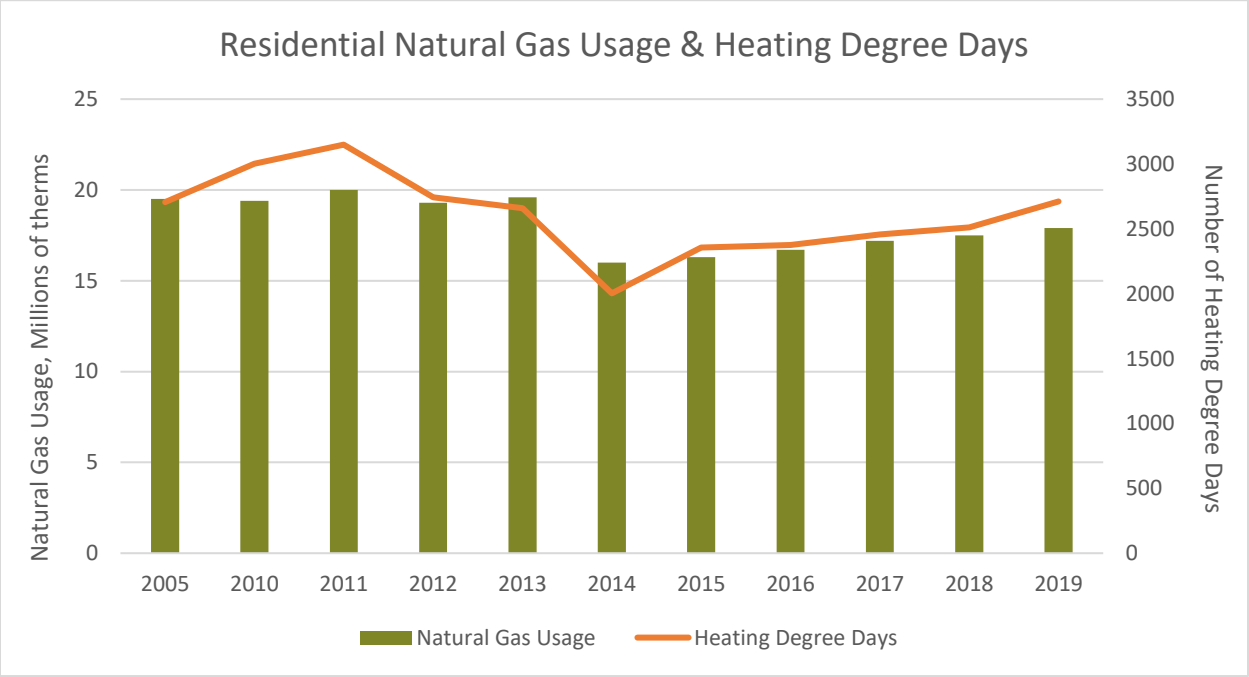


Figure 3: Residential Natural Gas Usage & Heating Degree Days in Hayward



Transportation Sector

As shown in Table 4, transportation emissions in 2019 were 17.9% below emissions in 2005. As seen in the table below, the total vehicle miles traveled (VMT) decreased in 2010 and then increased again in 2015, 2017, 2018, and 2019. This is likely related to the economic recession and recovery.

Overall emissions factors have decreased in all categories over the last fourteen years as vehicles have become cleaner. The decrease in emission factor value is why we have seen an overall decrease in emissions of 17.9%, while only seeing a 4.3% decrease in VMT.

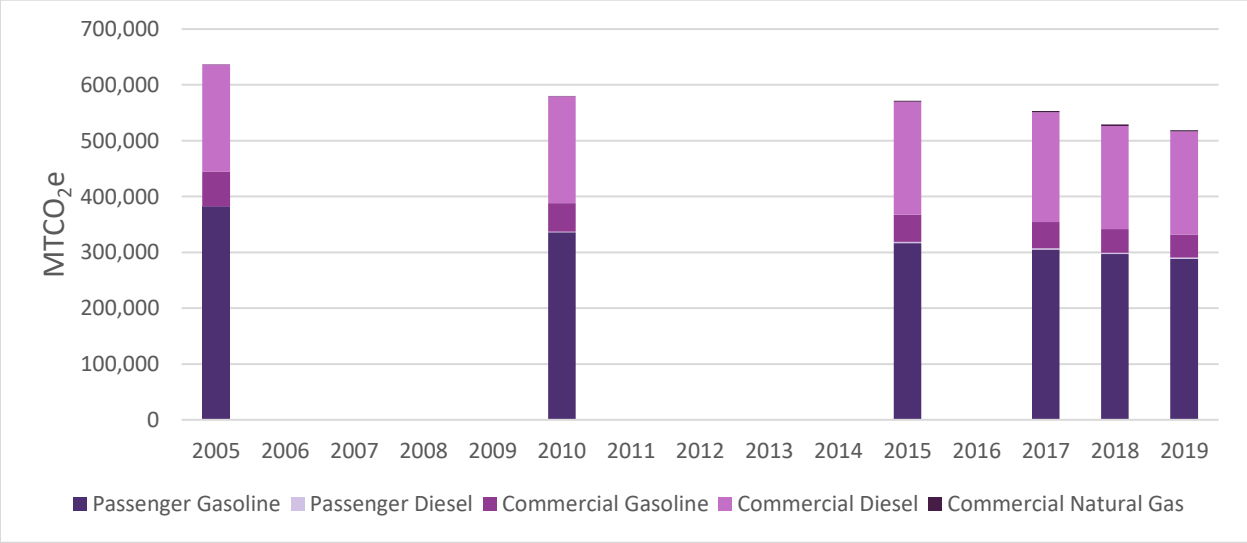
Table 4: Transportation Sector GHG Emissions

		2005	2010	2015	2017	2018	2019	% Change from 2005
Passenger Gasoline	GHG Emissions	381,808	336,036	316,516	305,005	296,722	288,273	-24.5%
	VMT	956,623,171	858,832,865	884,055,725	891,575,635	889,818,652	888,130,583	-7.2%
Passenger Diesel*	GHG Emissions	849	896	2,418**	2,430	2,561	2,661	+213.4%
	VMT	2,349,479	2,719,823	8,153,097**	8,105,329	8,663,158	9,149,605	+289.4%
Passenger Electric	GHG Emissions**	0	0	0	0	0	0	
	VMT	195,306	296,949	7,157,788	11,187,141	12,386,296	13,587,918	+6857.2%
Commercial Gasoline	GHG Emissions	61,642	51,326	48,542	46,969	42,598	41,141	-33.3%
	VMT	48,729,452	41,099,193	39,351,019	38,745,467	35,376,067	34,399,386	-29.4%
Commercial Diesel	GHG Emissions	191,821	191,556	202,565	196,815	184,611	184,253	-3.9%
	VMT	123,825,051	122,518,404	137,833,264	140,567,582	134,860,040	137,208,117	+10.8%
Commercial Electric	GHG Emissions**	0	0	0	0	0	0	
	VMT	48,918	0	54,340	49,251	46,022	45,710	-6.6%
Commercial Natural Gas	GHG Emissions	462	424	1,514	2,078	2,681	2,817	+509.7%
	VMT	175,959	126,375	434,689	636,407	894,571	939,111	+433.7%
Total GHG Emissions		**636,581**	**580,238**	**571,556**	**553,298**	**531,104**	**522,897**	**-17.9%**
Total VMT		**1,131,703,112**	**1,025,296,660**	**1,069,827,794**	**1,079,630,420**	**1,082,044,806**	**1,083,460,430**	**-4.3%**

*Change between 2010 and 2015 in Passenger Diesel vehicles in most likely due to a reclassification of vehicle types

**GHG Emissions associated with these vehicles are considered zero because the emissions are accounted for in the energy emissions sector

Figure 4: Transportation Sector GHG Emissions (MT CO2e)



Off-road Vehicles Sector

Off-road (including construction and industrial equipment) vehicles emissions have increased by 111% from 2005 to 2019, primarily due to an increase in construction activity. Given the level of construction activity we have seen in Hayward in the last few years, staff believes the dip in emissions from construction and mining equipment in 2018 may be an error and will continue to investigate.

Table 5: Off-road Sector GHG Emissions

	2005	2010	2015	2017	2018	2019	% Change from 2005
Agricultural Equipment	0	0	0	0	0	0	
Airport Ground Support Equipment	0	0	0	0	0	0	
Construction and Mining Equipment	0	11,478	40,143	37,833	5,696	20,447	+78%*
Dredging	0	0	0	0	0	0	
Entertainment Equipment	83	83	83	85	83	83	0%
Industrial Equipment	12,564	13,030	14,007	14,350	14,522	14,697	+17%
Lawn and Garden Equipment	2,470	2,460	2,562	2,664	2,640	2,653	+7%
Light Commercial Equipment	4,958	5,009	5,046	5,141	5,185	5,230	+5%
Logging Equipment	0	0	0	0	0	0	
Military Tactical Support Equipment	0	0	0	0	0	0	
Oil Drilling	0	0	0	0	0	0	
Pleasure Craft	1,531	1,751	2,036	2,218	2,247	2,311	+51%
Recreational Equipment	379	455	544	597	608	628	+66%
Transport Refrigeration Units	2,359	3,000	3,832	4,461	5,083	5,342	+126%
Total GHG Emissions	**24,345**	**37,265**	**68,251**	**67,348**	**36,064**	**51,392**	**+111%**

*Percent change is compared to 2010

Solid Waste Sector

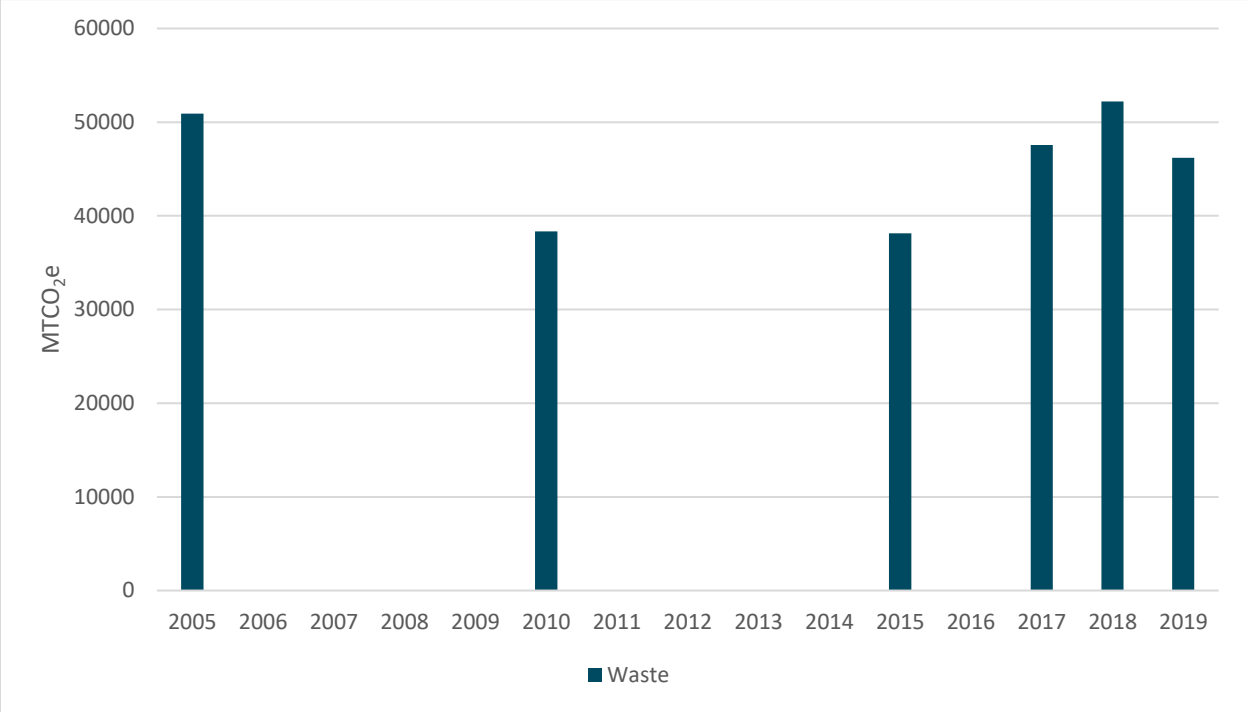
Solid waste emissions in 2019 were 9.3% below 2005 levels. As shown in Table 6, after several years of emissions increasing, which was likely due to an increase in economic activity, emissions decreased in 2019. The peak in 2018 is likely due to disruptions in recycling markets caused by China's "National Sword" policies.

Table 6: Solid Waste Sector GHG Emissions

		2005	2010	2015	2017	2018	2019	% Change from 2005
	GHG Emissions	50,924	38,338	38,148	47,555	52,209	46,187	-9.3%

Waste Sent to Landfill	Tons of waste	173,908	130,806	136,261	167,434	185,432	163,196	-6.2%

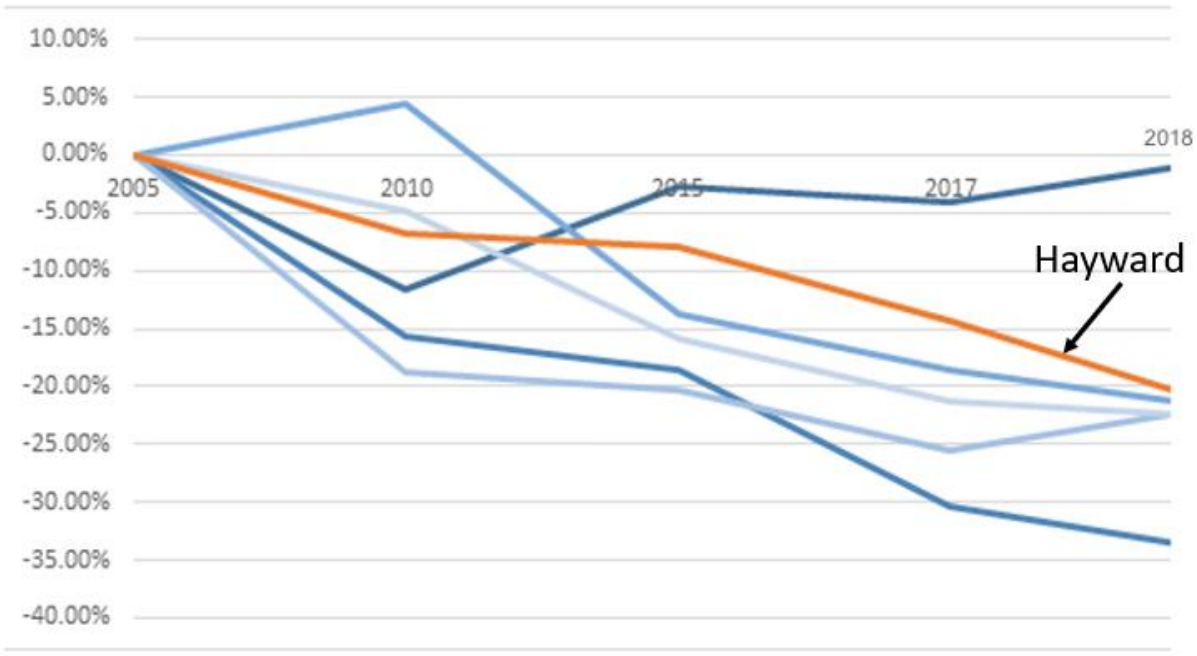
Figure 5: Solid Waste Sector GHG Emissions



Progress Toward GHG Reduction Goals – Alameda County Cities

Data and privacy issues make it difficult for cities to share GHG emission data with each other. Staff was able to obtain data for some Alameda County cities, but only through 2018 as most have not yet completed an inventory for 2019. In Figure 6 (below), six cities' GHG emission reduction trajectories are shown, with Hayward in orange. The other cities included are Dublin, Emeryville, Oakland, Pleasanton, and San Leandro; however, their pathways are not labeled for data privacy concerns. Other Alameda County cities were excluded from this dataset due to inconsistencies in PG&E data. Due to a change in the application of privacy rules, some cities' PG&E data includes industrial sector emissions until 2013, but then excludes industrial emissions from 2014 onward. Cities whose GHG emission inventory reporting was significantly affected by this privacy rule change were excluded.

Figure 6: Change in Emissions From 2005-2018 for Alameda County Jurisdictions *



* Individual cities are not labeled due to privacy concerns

Limitations of this Inventory

The GHG inventory method that the City's uses, along with most cities worldwide, was originally designed by ICLEI and partners in the early 2000s. The focus then and now is on measuring emissions from the data sources that are most readily available, such as utility data. This approach is practical, but it comes with limitations.

The inventories completed omit large sources of emissions over which the City may have some influence. Specifically, the inventory does not include the upstream emissions of the goods consumed in the City. For example, emission reductions from green purchasing policies would not be reflected in the current inventory. Also, one of the biggest contributors to GHG emissions worldwide, food, is not reflected in Hayward's inventory.

The reason upstream emissions are not included is that it is difficult to obtain data on consumer consumption patterns. However, some attempts are being made. In 2016, the Bay Area Air Quality Management District (BAAQMD) launched a project with UC Berkeley to

create consumption-based inventories[6] for Bay Area cities.[7] Staff has concerns with the data sources used for this project, but feels that the intent is meaningful.

ECONOMIC IMPACT

There is no economic impact associated with the completed inventory. However, the information acquired from the inventory provides staff with insight on what needs to be done to meet the City's GHG reduction goals. Meeting the City's ambitious GHG reduction goals will require significant investment throughout the community and has the potential to create new local jobs, however some necessary improvements are not currently cost-effective.

FISCAL IMPACT

Through the partnership with EBEW, StopWaste, and other Bay Area cities, the 2019 GHG inventory was prepared at no cost to the City.

STRATEGIC ROADMAP

This agenda item supports the Strategic Priority of Combat Climate Change. This item is not specifically related to a project identified in the Strategic Roadmap. However, this agenda item does help keep track of progress of projects identified in the Strategic Roadmap, such as:

Project 1: Reduce dependency on fossil fuels
Project 2: Work with EBCE to transition citywide electricity use to 100% carbon free
Project 4: Adopt & implement 2030 GHG Goal & Roadmap
Project 7: Reduce Carbon Emissions – transition 15% of total city fleet to EV/hybrid model

SUSTAINABILITY FEATURES

Meeting GHG reduction goals is the primary objective of the City's Climate Action Plan. Meeting the goals will require reducing emissions in every sector and will entail improving energy efficiency in buildings, decarbonizing buildings, increasing the use of renewable energy, and reducing vehicle-related emissions. All these actions will result in cleaner air for Hayward residents and for the region.

NEXT STEPS

Staff will continue to work with EBCE, StopWaste and regional agencies to identify potential opportunities to streamline GHG inventories on a county or regional level, with the goal of maintaining annual reporting.

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[6] http://www.baaqmd.gov/about-air-quality/research-and-data/emission-inventory/consumption-based-ghg-emissions-inventory

[7] The City's current inventory is a hybrid of consumption and production. For example, energy consumed by residents is consumption-based and energy consumed by industry is production-based. The State of California performs a true production-based inventory, measuring all emissions produced in California from all sectors, including agriculture.

One of the projects identified under the Combat Climate Change priority in the Strategic Roadmap is to adopt a 2030 GHG target and develop a roadmap to meet the 2030 target. In June 2020, Hayward adopted a 2030 GHG target and staff is now coordinating next steps to develop the 2030 roadmap.

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