DATE: September 14, 2020

TO: Council Sustainability Committee

FROM: Director of Public Works

SUBJECT: Review and Comment on the 2018 Greenhouse Gas Emissions Inventory and Preliminary 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 Hayward (City) community. To track progress, staff historically completed a full community GHG inventory every five years. Due to an opportunity with East Bay Energy Watch (EBEW) and StopWaste, staff has completed interim inventories annually starting in 2017. This report provides the results of the calendar year 2018 inventory and compares it to the previous four inventories. Table 1 on page 2 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).

This report also includes an estimate of the 2019 GHG inventory. For the 2019 inventory, staff has made assumptions to calculate electricity and waste-related emissions. Staff anticipates receiving the missing data by the end of 2020 and will update the Committee with the verified total reduction at that time. 2019 is also the first full calendar year that the City received a full year of East Bay Community Energy's service.

Table 1: GHG Emissions by Sector (MT C02e)

	2005	2010	2015	2017	2018	% Change from 2005	2019*	% Change from 2005
Electricity	185,890	165,304	141,854	75,118	47,531	-74.4%	11,013	-94.1%
Natural Gas	189,995	191,526	176,803	186,110	187,991	-1.1%	176,649	-7.0%
Transportation	636,581	580,238	571,556	553,298	531,104	-16.5%	522,897	-17.9%

[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.

BART	3,440	3,425	4,276	3,994	556	-83.5%	547	-84.1%
Off-Road Vehicles	24,345	37,630	71,034	69,279	36,064	+48.1%	51,392	+111.1%
Waste	50,924	38,338	38,148	47,555	52,209	+2.5%	52,209	+2.5%
Total	**1,091,174**	**1,016,461**	**1,003,670**	**935,354**	**855,465**	**-21.6%**	**814,707**	**-25.3%**
Hayward Population	140,530	143,921	155,753	159,623	159,603		160,197	
Total Emissions/ Capita	**5.2**	**4.8**	**4.4**	**4.1**	**3.7**	**-28.9%**	**3.5**	**-32.5%**

*Electricity and waste sectors are estimated data in 2019

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BACKGROUND

The last report on the City's GHG emissions was presented to the CSC in January 2020.[3] The 2018 report and previous reports are available on the City's Climate Action Plan page.[4] 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.

[2] 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.

[3] https://hayward.legistar.com/LegislationDetail.aspx?ID=4300975&GUID=03727954-DAC6-4ABC-8906-477CFB078E75&Options=&Search=

[4] https://www.hayward-ca.gov/services/city-services/climate-action

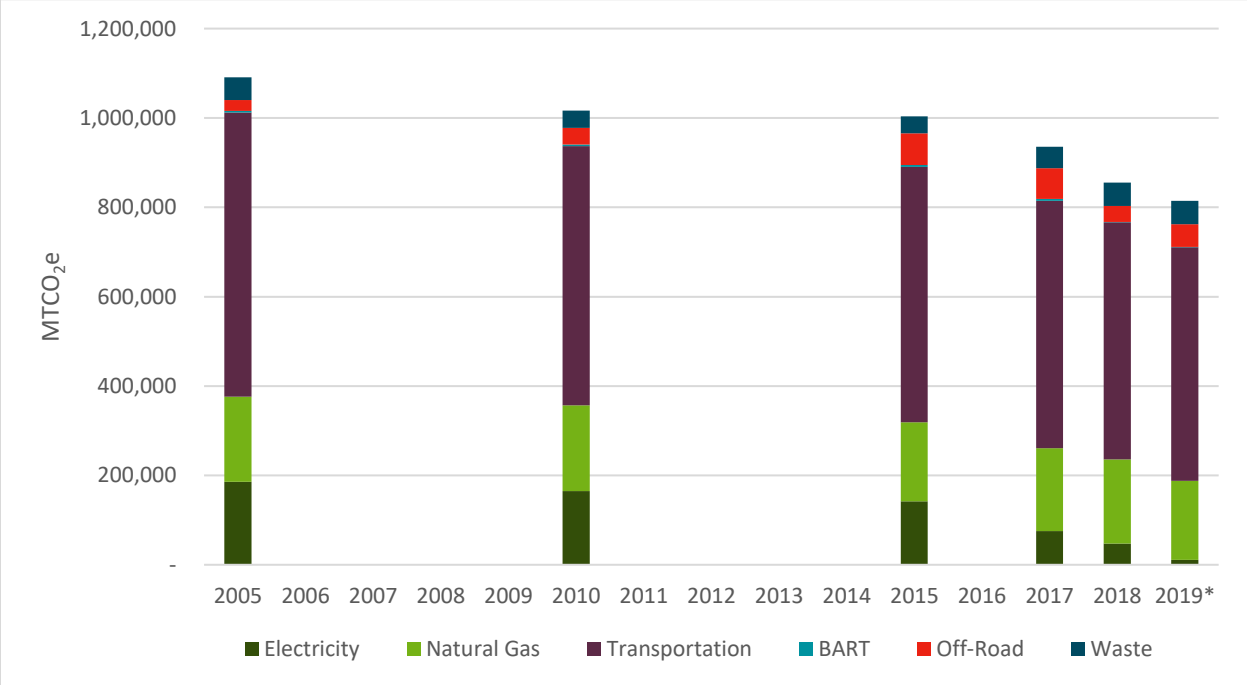
To track compliance with these targets, the City has historically conducted community GHG emissions inventories every five years, starting with 2005 as the baseline year. Starting with the 2017 inventory, the City has begun to conduct community GHG emission inventories annually. The first three inventories were completed with assistance from ICLEI–Local Governments for Sustainability, StopWaste, and the Statewide Energy Efficiency Collaborative (SEEC). For the 2017 and 2018 inventories, Alameda County and Contra Costa County jurisdictions hired a consultant through EBEW and StopWaste. All five inventories use the U.S. Protocol for Community-Scale methodology to calculate GHG emissions.

Over the past thirteen 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

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 57-62% of the total. BART accounts for 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 5-17% of emissions and natural gas, shown in light green, accounts for 17-22% of emissions.

Figure 1: GHG Emissions by Subsector (MT C02e)[5]



*Electricity and waste sectors are estimated data in 2019

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

Energy Sector

Overall energy emissions in 2018 were 37.3% below 2005 levels, with a 74.4% decrease in electricity emissions and a 1.1% decrease in natural gas emissions from 2005 to 2018. From 2017 to 2018, residential and nonresidential electricity emissions decreased, and residential and nonresidential natural gas emissions increased. While electricity emissions have declined, electricity usage has not changed drastically. Residential electricity use has decreased by 1% and nonresidential electricity use has decreased by 13% since 2005, compared to a 61.9% decrease and 79.6% decrease in emissions, respectively. The primary reason that electricity emissions have decreased is that Pacific Gas & Electric Company (PG&E) sources have become cleaner as PG&E strives to meet the State's Renewable Portfolio Standard goal of 33% by 2020 and PG&E's continued use of large hydro and nuclear energy, which have no GHG emissions. Additionally, starting in 2018, the City's customers were transitioned to electricity provided by East Bay Community Energy. The default product for the majority of the City's customers is Brilliant 100, a carbon-free product. Electricity usage (kWh) in the table below (Table 2) is actual data received from PG&E and EBCE. However, electricity emissions (GHG) for 2019 are estimated as EBCE's 2019 emission factor for Bright Choice[6] will not be finalized until later this year.

There was a 1% increase in natural gas emissions from 2017 to 2018. The increase in natural gas emissions in 2018 may be related to the new residential homes built and new commercial operations in the City, as well a slight increase in heating degree days (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 natural gas will have peaked in 2019.

The overall small reduction in natural gas emissions may also be credited to milder winters that Hayward has experienced since 2005, which reduced the need for residents to heat their homes. A mild winter equates to fewer HDD. HDD is the unit which measures how many degrees, and for how many days, outside air temperatures were lower than the base temperature of 65 degrees Fahrenheit. As shown in Table 2, residential gas emissions have increased since 2015. This aligns with the increase in HDD since 2014 (see Figure 3).

Table 2: Energy Sector GHG Emissions

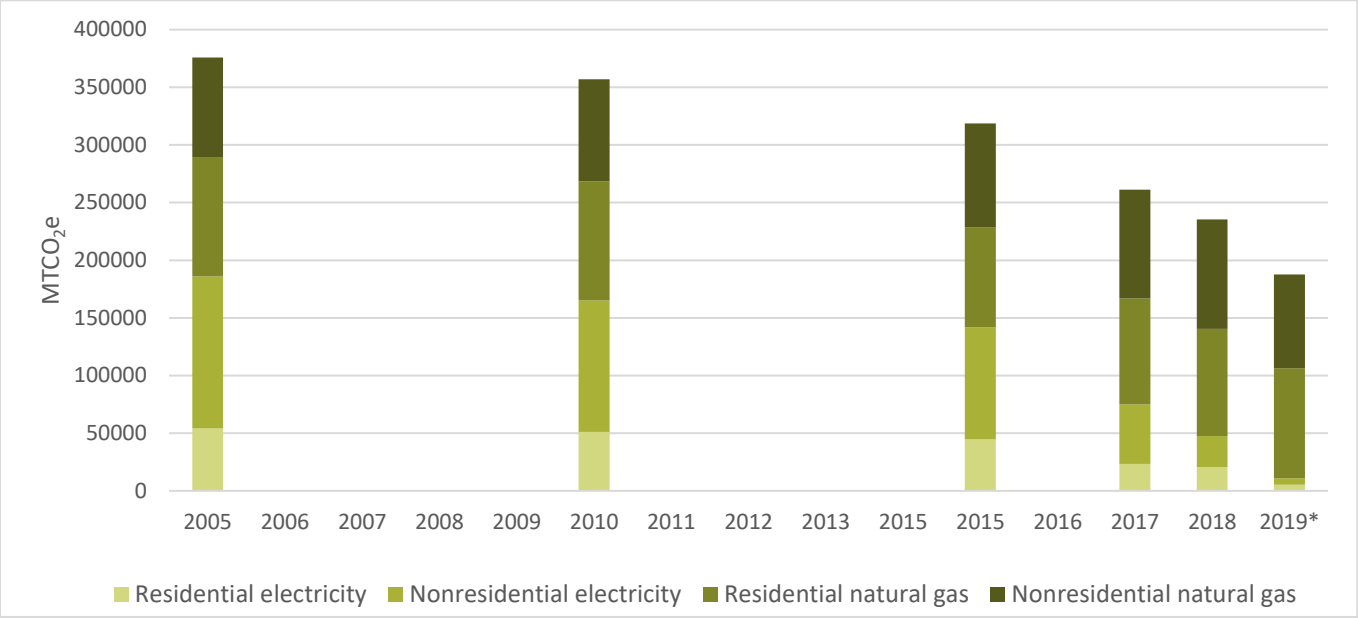
		2005	2010	2015	2017	2018	% Change from 2005	2019*	% Change from 2005
Residential Electricity	GHG Emissions	54,042	51,207	44,819	23,502	20,582	-61.9%	5,198	-90.4%
	kWh	242,161,904	252,327,941	242,783,315	243,910,202	239,735,346	-1.0%	239,006,697	-1.3%
Non-Residential Electricity	GHG Emissions	131,848	114,097	97,034	51,616	26,949	-79.6%	5,815	-95.6%
	kWh	590,811,842	562,228,183	525,628,036	535,682,182	513,657,102	-13.1%	511,639,672	-13.4%
Residential Natural Gas	GHG Emissions	103,502	103,027	86,736	91,719	93,019	-10.1%	95,291	-7.9%
	therms	19,489,985	19,400,629	16,332,954	17,271,164	17,516,060	-10.1%	17,943,901	-7.9%
Non-Residential	GHG Emissions	86,493	88,499	90,066	94,392	94,972	+9.8%	81,358	-5.9%

[6] Approximately 25% of Hayward customers receive Bright Choice.

		2005	2010	2015	2017	2018	% Change from 2005	2019*	% Change from 2005
Natural Gas	therms	16,287,167	16,664,879	16,960,038	17,774,540	17,883,737	+9.8%	15,320,155	-5.9%
Total GHG Emissions		**375,885**	**356,830**	**318,657**	**261,228**	**235,522**	**-37.3%**	**187,663**	**-41.1%**

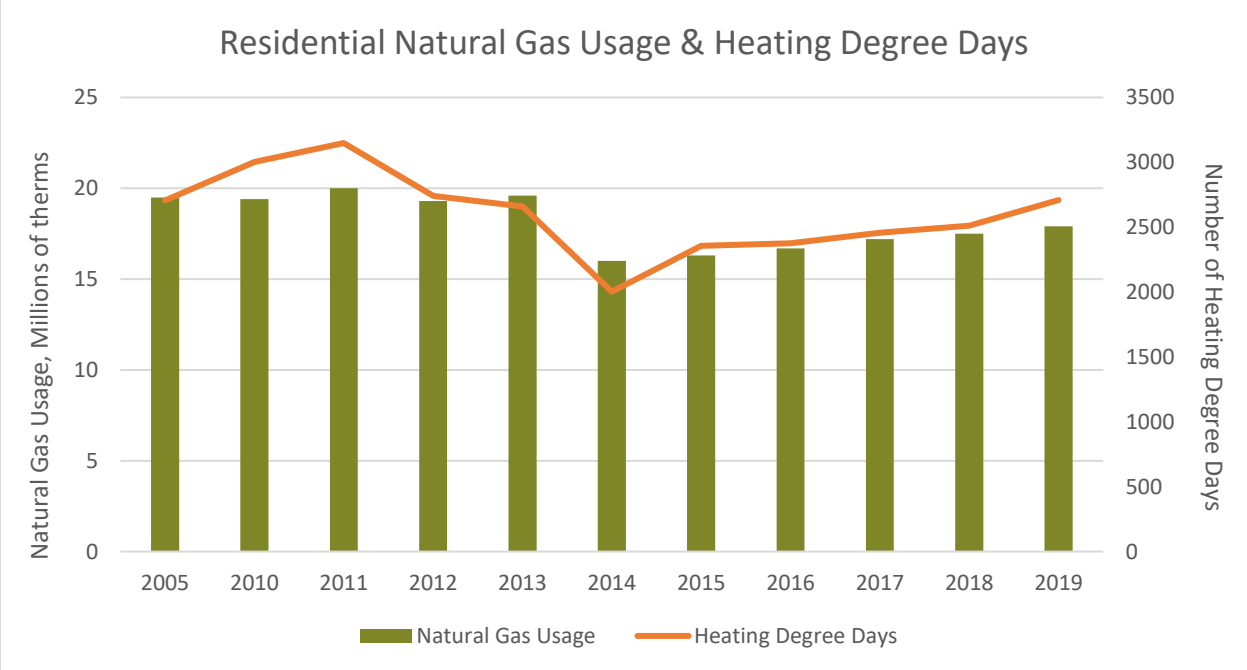
*Electricity and waste sectors are estimated data in 2019

Figure 2: Energy Sector GHG Emissions (MT C02e)



*Electricity emissions are estimated data in 2019

Figure 3: Residential Natural Gas Usage & Heating Degree Days



Transportation Sector

As shown in Table 3, transportation emissions in 2018 were 16.5% 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, and 2018. This is likely related to the economic recession and recovery.

Overall emissions factors have decreased in all categories over the last thirteen years as vehicles have become cleaner. The decrease in emission factor value is why we have seen an overall decrease in emissions of 16.5%, while only seeing a 4.4% decrease in VMT.

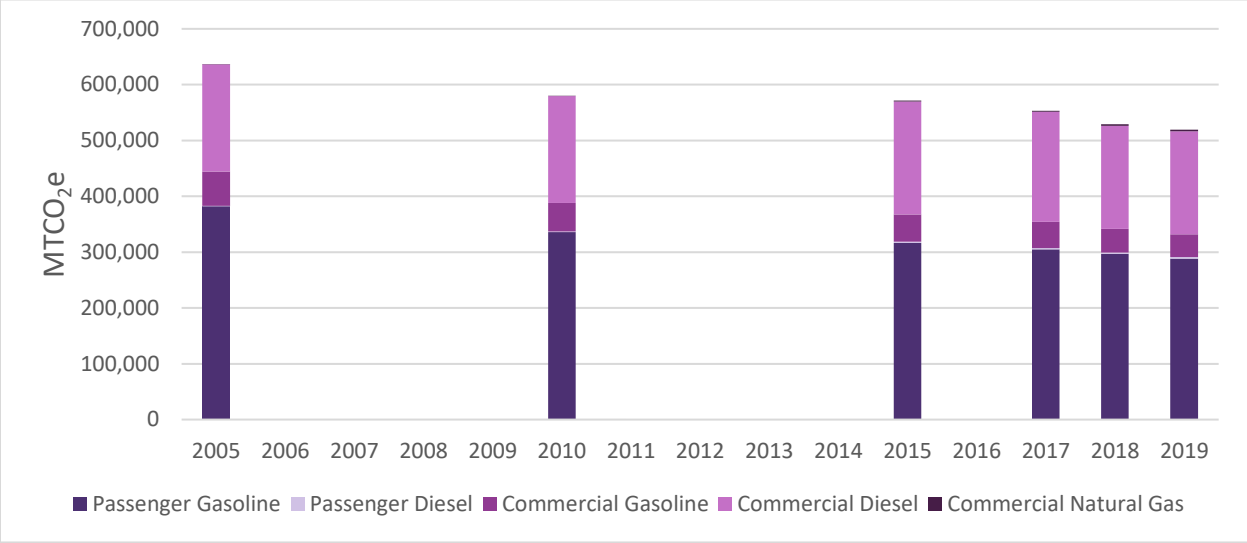
Table 3: Transportation Sector GHG Emissions

		2005	2010	2015	2017	2018	% Change from 2005	2019	% Change from 2005
Passenger Gasoline	GHG Emissions	381,808	336,036	316,516	305,005	296,722	-22.3%	288,273	-24.5%
	VMT	956,623,171	858,832,865	884,055,725	891,575,635	889,818,652	-7.0%	888,130,583	-7.2%
Passenger Diesel*	GHG Emissions	849	896	2,418**	2,430	2,561	+201.7%	2,661	+213.4%
	VMT	2,349,479	2,719,823	8,153,097**	8,105,329	8,663,158	+268.7%	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	+6,242.0%	13,587,918	+6857.2%
Commercial Gasoline	GHG Emissions	61,642	51,326	48,542	46,969	42,598	-30.9%	41,141	-33.3%
	VMT	48,729,452	41,099,193	39,351,019	38,745,467	35,376,067	-27.4%	34,399,386	-29.4%
Commercial Diesel	GHG Emissions	191,821	191,556	202,565	196,815	184,611	-3.8%	184,253	-3.9%
	VMT	123,825,051	122,518,404	137,833,264	140,567,582	134,860,040	+8.9%	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	-5.9%	45,710	-6.6%
Commercial Natural Gas	GHG Emissions	462	424	1,514	2,078	2,681	+480.3%	2,817	+509.7%
	VMT	175,959	126,375	434,689	636,407	894,571	+408.4%	939,111	+433.7%
Total GHG Emissions		**636,581**	**580,238**	**571,556**	**553,298**	**531,104**	**-16.5%**	**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**	**-4.4%**	**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 48% from 2005 to 2018. However, from 2017 to 2018, emissions decreased, primarily due to a decrease in the construction and mining equipment emissions. Staff received the 2019 emissions associated with this sector and see emissions increase back up to 51,392 $MTCO_2e$, primarily due to an increase in the construction and mining equipment emissions. Overall, the off-road vehicle sector accounts for 4.2% of the City's total emissions.

Table 4: Off-road Sector GHG Emissions

	2005	2010	2015	2017	2018	% Change from 2005	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	-50%*	20,447	+78%*
Dredging	0	0	0	0	0		0	
Entertainment Equipment	83	83	83	85	83	+1%	83	0%
Industrial Equipment	12,564	13,030	14,007	14,350	14,522	+16%	14,697	+17%
Lawn and Garden Equipment	2,470	2,460	2,562	2,664	2,640	+7%	2,653	+7%
Light Commercial Equipment	4,958	5,009	5,046	5,141	5,185	+5%	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	+47%	2,311	+51%
Recreational Equipment	379	455	544	597	608	+60%	628	+66%
Transport Refrigeration Units	2,359	3,000	3,832	4,461	5,083	+115%	5,342	+126%
Total GHG Emissions	**24,345**	**37,265**	**68,251**	**67,348**	**36,064**	**+48%**	**51,392**	**+111%**

*Percent change is compared to 2010

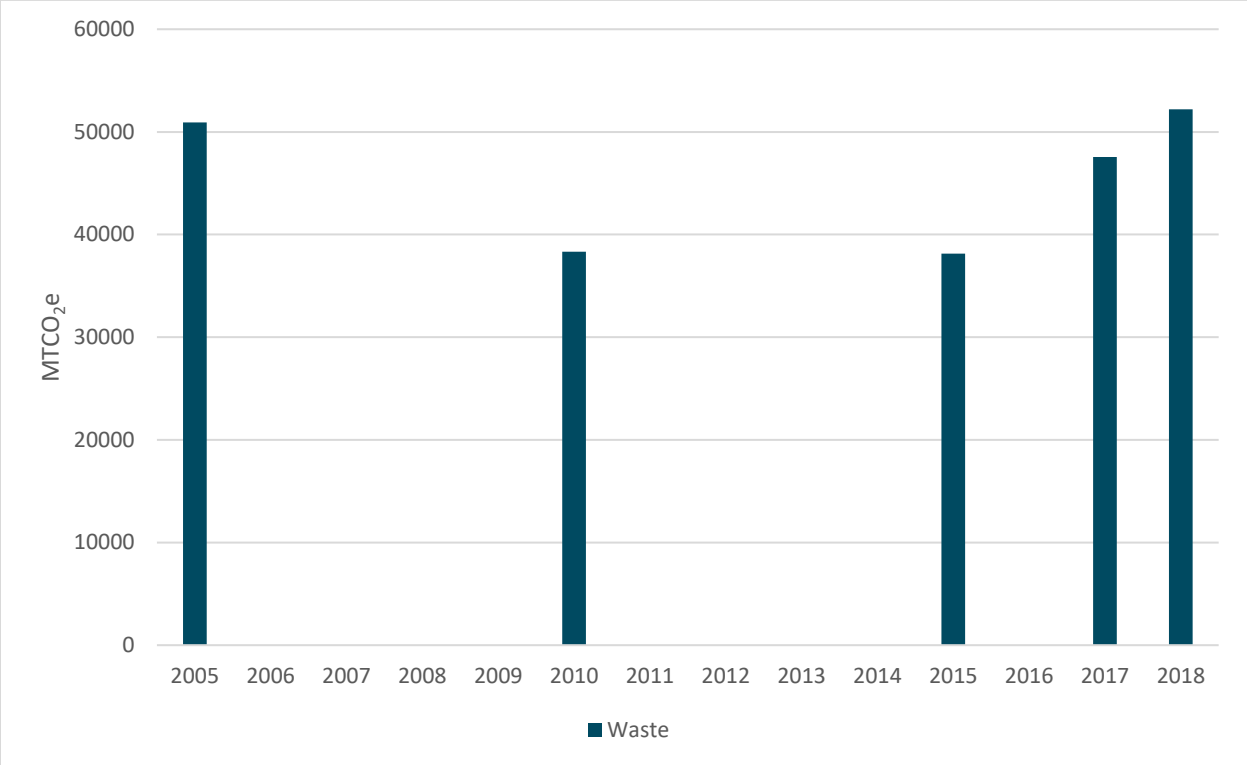
Solid Waste Sector

Solid waste emissions in 2018 were 2.5% above 2005 levels. As shown in Table 5, emissions have increased since 2015. This increase is most likely due to an increase in economic activity. Waste data for 2019 is not yet available. For the purposes of the overall GHG emissions shown in Table 1 and Figure 1, it is assumed that 2019 waste data is equal to that of 2018.

Table 5: Solid Waste Sector GHG Emissions

		2005	2010	2015	2017	2018	% Change from 2005
Waste Sent to Landfill	GHG Emissions	50,924	38,338	38,148	47,555	52,209	+2.52%
	Tons of waste	173,908	130,806	136,261	167,434	185,432	+6.63%

Figure 5: Solid Waste Sector GHG Emissions



Progress Towards the 2020 Goal

Hayward has met its goal of 20% below 2005 levels by 2020 two years early by achieving a reduction of 21.6% in 2018. For the 2019 inventory, staff has made assumptions to calculate electricity and waste-related emissions. With these assumptions, staff projects around a 25.3% reduction of GHG emissions in 2019.

Meeting this goal is attributed in large part to the roll out of East Bay Community Energy (EBCE) and Council's decision to set the majority of customers' default product to Brilliant 100 (carbon-free), which began in mid-2018. The full impact of EBCE will be seen in the 2019 inventory. However, due to the likely retirement of the Brilliant 100 product, the City could see an increase in emissions associated with the electricity sector beginning in 2021. Staff has calculated how this could affect the City's emissions using 2018 data. If in 2018, the Brilliant 100 product had the same emissions factor as the Bright Choice product, the City would have seen a total reduction of community-wide emissions of 20.6% (Table 6).

Table 6: 2018 GHG Emission Reduction Predictions without EBCE's Brilliant 100 Product

	2005	2018 - Actual	*2018 - Scenario*
Electricity	185,890	47,531	*58,655*
Natural Gas	189,995	187,991	*187,991*
Transportation	636,581	531,104	*531,104*
BART	3,440	566	*566*
Off-Road	24,345	36,064	*36,064*
Waste	50,924	52,209	*52,209*
Total	1,091,174	855,465	*866,589*
Percent Change from 2005 to 2018		21.6%	*20.6%*

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.

As mentioned above, 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[7] for Bay Area cities.[8] Staff has concerns with the data sources used for this project, but feels that the intent is meaningful.

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

[8] 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

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 2018 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. Once the 2019 inventory is finalized, staff will present an update to the Committee.

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. Staff will bring to the Committee suggested revisions to the Strategic Roadmap in Fall 2020.

Prepared by: Nicole Grucky, Sustainability Specialist
Erik Pearson, Environmental Services Manager

Recommended by: Alex Ameri, Director of Public Works

Approved by:

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Kelly McAdoo, City Manager