City of Manhattan Beach

2017 Inventory of Local Government Operations Greenhouse Gas Emissions

Produced by ICLEI - Local Governments for Sustainability USA for City of Manhattan Beach

CREDITS AND ACKNOWLEDGEMENTS

City of Manhattan Beach

Dana Murray, Environmental Sustainability Manager
Kanesha Pompey, Environmental Sustainability Intern
Mike Grafton, Equipment Maintenance Supervisor
Anna Luke-Jones, Public Works Senior Management Analyst

Regional Entities

Frank Fuchs, West Basin Water District
Kim Fuentes, South Bay Cities Council of Governments
Diana Grajeda, SoCalGas
Jason Greenspan, Southern California Association of Governments
Hsi-Hwa Hu, Southern California Association of Governments
Jason Sung, West Basin Water District

ICLEI-Local Governments for Sustainability USA

This report was prepared by Hoi-Fei Mok, Senior Program Officer – Climate Equity at ICLEI USA. ICLEI USA would like to thank City of Manhattan Beach staff for providing much of the insight and local information necessary for the completion of this report.

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Introduction

Naturally occurring gases dispersed in the atmosphere determine the Earth's climate by trapping solar radiation. This phenomenon is known as the greenhouse effect. Overwhelming evidence shows that human activities are increasing the concentration of greenhouse gases and changing the global climate. The most significant contributor is the burning of fossil fuels for transportation, electricity generation and other purposes, which introduces large amounts of carbon dioxide and other greenhouse gases into the atmosphere. Collectively, these gases intensify the natural greenhouse effect, causing global average surface and lower atmospheric temperatures to rise.

The City of Manhattan Beach is likely to be impacted by climate change. Like the rest of California, Manhattan Beach may expect increased upstream water shortages, air pollution from wildfire, flooding, and the disruption of ecosystems, habitats, and agricultural activities.

Reducing fossil fuel use in the community can have many benefits in addition to reducing greenhouse gas emissions. More efficient use of energy decreases utility and transportation costs for residents and businesses. Retrofitting homes and businesses to be more efficient creates local jobs. In addition, money not spent on energy is more likely to be spent at local businesses and add to the local economy. Reducing fossil fuel use improves air quality, and increases opportunities for walking and bicycling which improves residents' health.

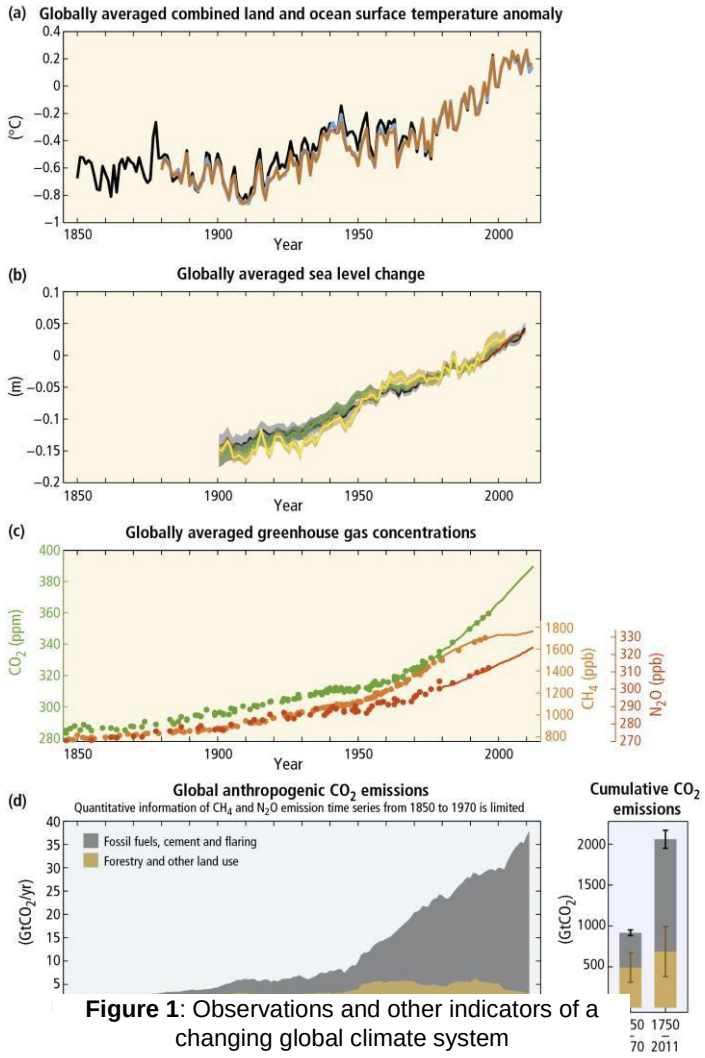


Figure 1: Observations and other indicators of a changing global climate system

EVIDENCE OF HUMAN-CAUSED CLIMATE CHANGE

There is overwhelming scientific consensus that the global climate is changing, and that human actions, primarily the burning of fossil fuels, are the main cause of those changes. The Intergovernmental Panel

on Climate Change (IPCC) is the scientific body charged with bringing together the work of thousands of climate scientists. The IPCC's Fifth Assessment asserts that:

> "It is *extremely likely* that more than half of the observed increase in global average surface temperature from 1951 to 2010 was caused by the anthropogenic increase in GHG concentrations and other anthropogenic forces together. Globally, economic and population growth continued to be the most important drivers of increases in CO2 emissions from fossil fuel combustion. Changes in many extreme weather and climate events have been observed since about 1950. Some of these changes have been linked to human influences, including a decrease in cold temperature extremes, an increase in warm temperature extremes, an increase in extreme high sea levels and an increase in the number of heavy precipitation events in a number of regions".

In short, the Earth is already responding to climate change drivers introduced by mankind.

Inventory Methodology

UNDERSTANDING A GREENHOUSE GAS EMISSIONS INVENTORY

The first step toward achieving tangible greenhouse gas emission reductions requires identifying baseline emissions levels. This report presents emissions from the City of Manhattan Beach government;

Community-wide emissions are presented in a separate report. The government operations inventory is a subset of the community inventory; for example, data on commercial energy use by the community includes energy consumed by municipal buildings, and community vehicle-miles-traveled estimates include miles driven by municipal fleet vehicles.

As local governments have continued to join the climate protection movement, the need for a standardized approach to quantify GHG emissions has proven essential. This inventory uses the approach and methods provided by the Local Government Operations Protocol (LGO Protocol)[1].

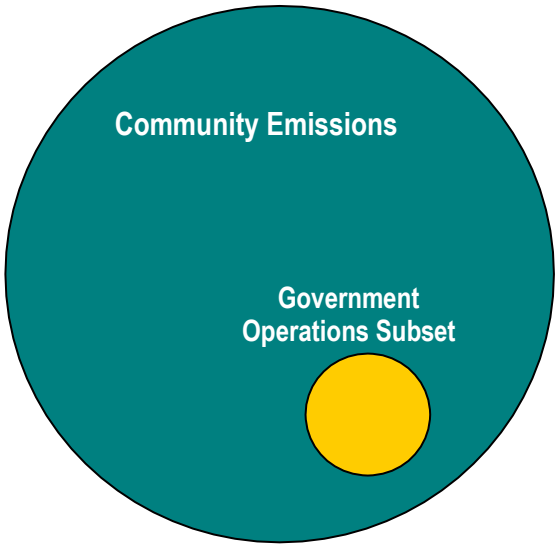


Figure 2: Relationship of Community and Government Operations Inventories

Quantification Methods

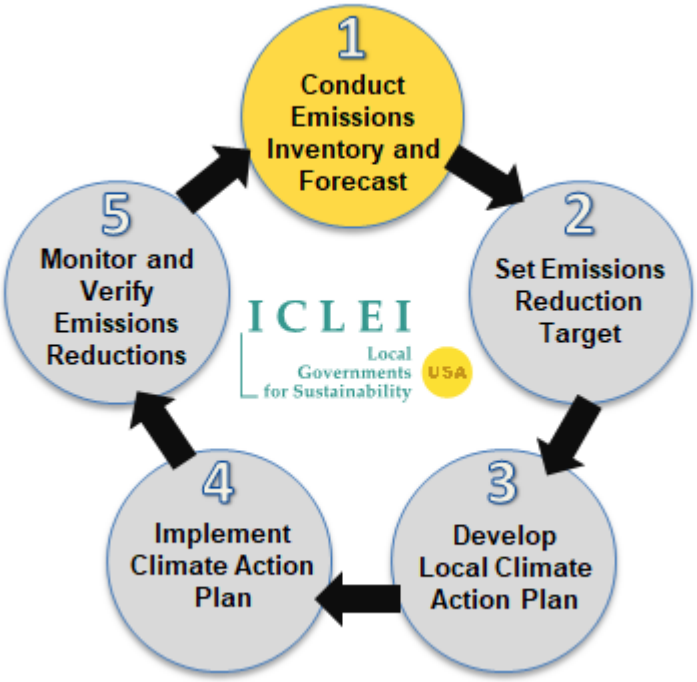
Greenhouse gas emissions can be quantified in two ways:

- Measurement-based methodologies refer to the direct measurement of greenhouse gas emissions (from a monitoring system) emitted from a flue of a power plant, wastewater treatment plant, landfill, or industrial facility.
- Calculation-based methodologies calculate emissions using activity data and emission factors. To calculate emissions accordingly, the basic equation below is used:

  Activity Data x Emission Factor = Emissions

All emissions sources in this inventory are quantified using calculation based methodologies. Activity data refer to the relevant measurement of energy use or other greenhouse gas-generating processes such as fuel consumption by fuel type, metered annual electricity consumption, and annual vehicle miles traveled. Known emission factors are used to convert energy usage or other activity data into associated quantities of emissions. Emissions factors are usually expressed in terms of emissions per unit of activity data (e.g. lbs CO_2/kWh of electricity).

[1] https://www.theclimateregistry.org/tools-resources/reporting-protocols/local-goverment-operations-protocol/



WHAT IS THE FIVE MILESTONES FRAMEWORK?

The Five Milestones build on ICLEI's 20+ years of experience as the leader in local emissions management. Over 1000 communities nationwide have benefited from ICLEI's well-managed approach to building more sustainable, climate-friendly communities. The proven Five Milestones framework offers a systematic approach for analyzing baseline greenhouse gas emissions, developing an emissions reduction target, developing and implementing a climate action plan, and monitoring emissions reduction progress. This framework helps you reduce energy costs, be a responsible steward of the global environment, and improve quality of life for your community.

ICLEI's Five Milestones program provides a framework, methodology, and comprehensive assistance for local governments to identify and reduce greenhouse gas emissions.

1. Conduct an inventory and forecast of local greenhouse gas emissions;
2. Establish a greenhouse gas emissions reduction target;
3. Develop a climate action plan for achieving the emissions reduction target;
4. Implement the climate action plan; and,
5. Monitor and report on progress.

INVENTORY DATA SOURCES

Energy for Buildings, Streetlights, and Irrigation

Electricity and natural gas usage data for the year 2017 was obtained from Southern California Edison and SoCalGas respectively for City of Manhattan Beach accounts. The emission factors for electricity and natural gas were obtained from Southern California Edison and the US Community Protocol respectively (Table 1). Electricity usage was separated into the building/facility usage, streetlights and traffic controls, and irrigation pumps based on the utility rates provided by Southern California Edison (Table 2).

Table 1: Emissions Factors for 2017 LGO Inventory

Sector	Emission Factor	Unit	Source
Electricity	549	CO2 lb/kWh	Southern California Edison 2017
Natural Gas	53.02	CO2 kg/MMBtu	US Community Protocol
Water Energy	549	CO2 lb/kWh	Southern California Edison 2017
Solid Waste Disposal	0.4	Tons/employee/year	City of Manhattan Beach LGO Inventory 2007

Table 2: Utility Electricity Usage and Rates

Utility Rate	Electricity (kWh)	Category
LS-1-ALLNITE	1,019,692	Streetlight
LS-2	88,706	Streetlight
LS-3-B	128,575	Streetlight
OL-1	14,400	Streetlight
TC-1	97,569	Streetlight
TGS3-CPP	1,473,280	Commercial
TOU-GS1A	81,507	Commercial
TOU-GS1B	257,193	Commercial
TOU-GS2A	817,732	Commercial
TOU-GS2B	1,424,636	Commercial
TOU-PA2A	468,881	Water Pumping
TOU-PA2B	437,968	Water Pumping
TOU-PA3A	30,799	Water Pumping

Solid Waste

Solid waste emissions were calculated based on the methane commitment model outlined in the GPC. Solid waste disposal is not tracked for the City of Manhattan Beach facilities as it is included in the total community disposal. According to previous inventory methodology, local government solid waste disposal was estimated based on the number of full time and part time employees. Based on Manhattan

Beach's employment of 300 full time and 275 part time employees for 2017[2], it was assumed that the part time employees are equivalent to 0.5 full time. A total of 437.5 employees was multiplied to the solid waste disposal rate of 0.4 tons/employee/year (Table 1) to calculate the total local government operations tonnage.

Waste characterization data were obtained from California's statewide waste agency, CalRecycle. The waste characterization data comes from a statewide survey and is likely not specific to the City of Manhattan Beach beyond population proportion and the type of industries operating in the area. The waste categories listed in Table 3 are categories that appear from CalRecycle's profile. However, ClearPath's waste characterization profile has slightly different sectors, so some of the categories were aggregated based on best fit.

Table 3: CalRecycle Waste Characterization Profile

Sector	Percentage	Included Categories
Newspaper	2.05%	Newspaper
Office paper	2.37%	White Ledger Paper
		Other Office Paper
Magazines/Third Mail	13.96%	Magazines and Catalogs
		Phone Books and Directories
		Other Miscellaneous Paper - Compostable
		Other Miscellaneous Paper - Other
		Remainder / Composite Paper - Compostable
		Remainder / Composite Paper - Other
		Paper Bags
Cardboard	8.86%	Cardboard
Food scraps	20.64%	Food scraps
Grass	5.81%	Leaves and Grass
Leaves	1.71%	Prunings and Trimmings
Branches	0.26%	Branches and Stumps
Lumber	5.84%	Clean Dimensional Lumber
		Clean Engineered Wood
		Clean Pallets & Crates
		Other Wood Waste

Fleet Vehicles

Fleet vehicle fuel and mileage data was provided by Mike Grafton, City of Manhattan Beach's equipment maintenance supervisor (Table 4). Emissions were calculated through ClearPath based on fuel, mileage, and the vehicle type breakdown. National average transportation emission factors were utilized to calculate fleet vehicle emissions, based on the US Community Protocol (Table 5).
No updated data was available for contractor vehicles, thus it was assumed that the same operations were utilized and the 2012 inventory results were used as a proxy.

[2] Provided by Dana Murray from City financial report

Table 4: Fleet Vehicle Fuel Usage and Mileage for 2017

Vehicle Type	Fuel Type	Fuel Used (Gallons)	Miles Driven
Passenger	Gasoline	5,894	93,188
	CNG	91	1,366
	EV	Included in SCE data	3,375
	Gas/Hybrid	1,678	44,174
Light Truck	Gasoline	67,857	588,089
	CNG	6,367	59,100
	Gas/Hybrid	983	16,370
	Diesel	1,850	23,833
Heavy Duty	Diesel	6,994	28,946
	CNG	1,100	5,200

Table 5: Transportation N2O and CH4 Emissions Factors by Inventory Years (g/mile) from US Community Protocol

Inventory year	Gasoline passenger car		Gasoline light truck	
	N2O	**CH4**	**N2O**	**CH4**
2015	0.011	0.0187	0.017	0.0201
2014	0.0126	0.0193	0.0194	0.0212
2013	0.0143	0.02	0.0223	0.0225
2012	0.0143	0.02	0.0254	0.0241
2011	0.0184	0.022	0.0291	0.026
2010	0.0174	0.0201	0.0251	0.0232
2009	0.0201	0.0214	0.0294	0.0251
2008	0.023	0.023	0.0343	0.0274
2007	0.0262	0.0249	0.0399	0.0302
2006	0.0297	0.0271	0.0461	0.0336
2005	0.0333	0.0299	0.0531	0.0375
2004	0.0369	0.0332	0.0601	0.0419
2003	0.0408	0.0368	0.0675	0.0471
2002	0.0444	0.0408	0.0744	0.0523
2001	0.0477	0.0451	0.0799	0.0576
2000	0.0513	0.0496	0.0871	0.0642
	Diesel Passenger		**Diesel Light Truck**	
	N2O	**CH4**	**N2O**	**CH4**
All	0.001	0.005	0.0015	0.001
	Commercial Gasoline		**Commercial Diesel**	
	N2O	**CH4**	**N2O**	**CH4**
All	0.0134	0.0333	0.0048	0.0051

Employee Commute

The employee commute mode and fuel breakdown data from 2012 was used in lieu of updated survey data. This was paired with the 2017 employment at City of Manhattan Beach and scaled up to calculate the 2017 emissions. The 2012 gasoline VMT of 887,427 and diesel VMT of 7,345 was scaled by 1.38 (ratio of 2012 employees to 2017) to 1,228,637 and 10,169 respectively.

INVENTORY CALCULATIONS

The 2016 inventory was calculated following the US Community Protocol and ICLEI's ClearPath software, which City of Manhattan Beach has used before. To be consistent with the past inventories, the 4th IPCC Climate Assessment was used for the methane conversion for all inventories. ClearPath's inventory calculators allow for input of the sector activity (i.e. kWh or VMT) and emission factor to calculate the final CO2e emissions.

2017 Inventory Key Findings

The total emissions for the 2017 inventory were calculated at 4,089 MTCO2e. Table 6 shows the inventory comparisons from the baseline at 2005 to 2017. Overall there was a 1,227 MTCO2 decrease or 23% reduction since the 2005 baseline.

Table 6: Inventory Comparisons 2005-2017

Year	Buildings & Facilities	Street Lights & Traffic Signals	Vehicle Fleet	Employee Commute	Solid Waste Facilities	Water & Wastewater Treatment Facilities	Total
2005	804	590	2,540	756	44	582	5,316
2007	1,262	613	1,239	766	44	446	4,370
2010	1,225	544	1,860	382	34	687	4,732
2012	1,470	627	1,655	382	34	682	4,850
2017	1,458	337	1,536	475	49	234	4,089

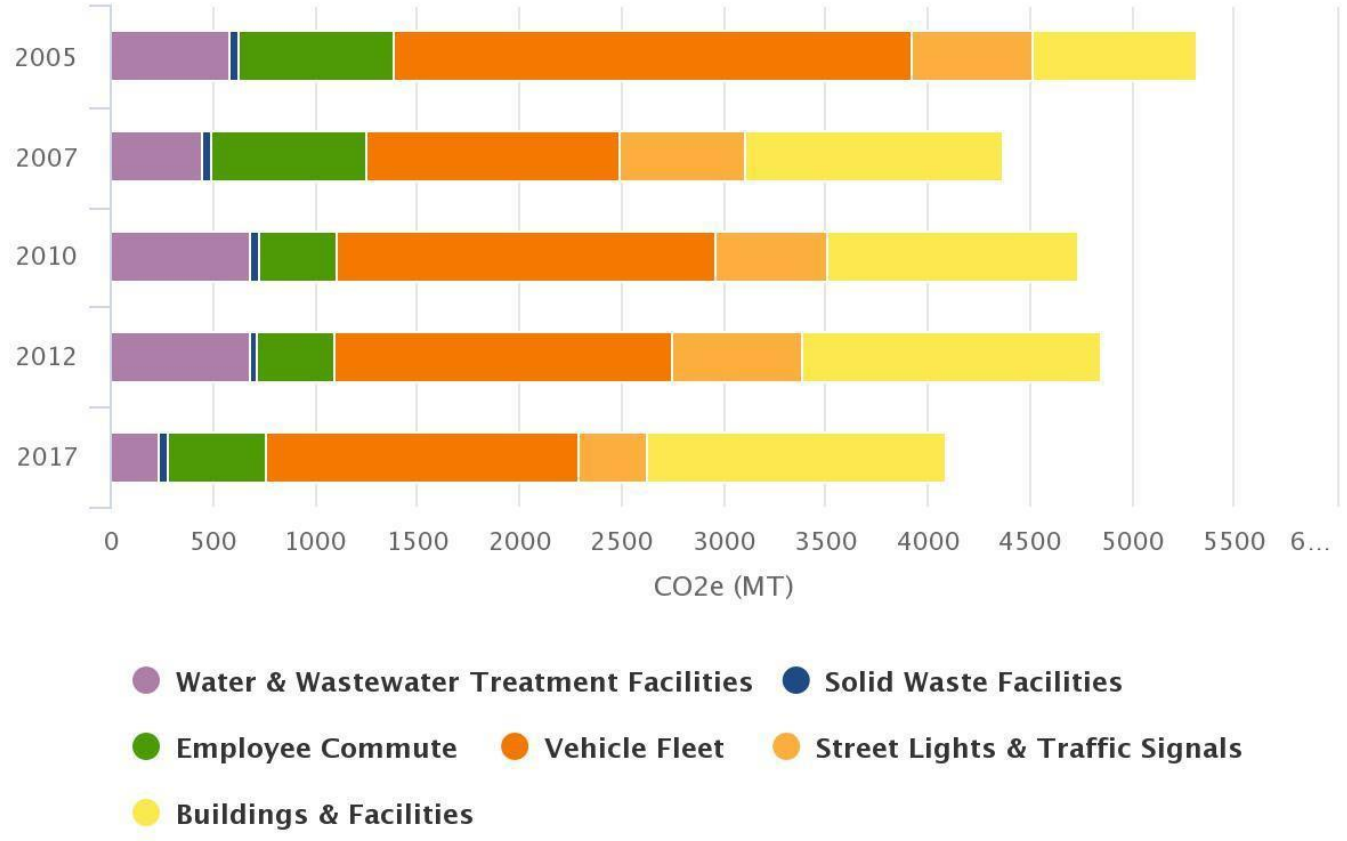


Figure 2: City of Manhattan Beach 2004-2017 GHG Inventories

Table 7 shows the comparison of inventory emissions by sector from 2012 to 2017. Streetlights, water pumping, and building electricity all had emission reductions.

Table 7: Comparison of Inventory Sector Emissions for 2012 and 2017

Sector	2012 (MTCO2e)	2017 (MTCO2e)	Change (MTCO2e)	Percentage
Streetlights	627.95	337.15	-290.80	-46.31%
Water Pump	682.39	234.35	-448.04	-65.66%
Buildings Natural Gas	362.19	444.97	82.78	22.85%
Buildings Electricity	1108.14	1013.30	-94.84	-8.56%
Solid Waste	34.24	49.58	15.34	44.80%
Vehicle Fleet (Contractors)	769.26	769.26	0.00	0.00%
Vehicle Fleet (City)	728.78	767.67	38.89	5.34%
Employee Commute	382.02	475.56	93.54	24.48%

Table 8 shows the inventory activities by sector for 2012 and 2017. Overall, streetlight and water pumping electricity decreased, as did fleet fuel usage.

Table 8: Comparison of Inventory Activities by Sector for 2012 and 2017

Activity	Unit	2012	2017	Change	Percentage
Streetlights	kWh	1,963,682	1,348,942	-614,740	-31.31%
Water Pump	kWh	2,133,921	937,648	-1,196,273	-56.06%
Buildings Natural Gas	therms	68,113	83,680	15,567	22.85%
Buildings Electricity	kWh	3,465,274	4,054,348	589,074	17.00%
Solid Waste	wet tons	139	175	36	25.72%
Vehicle Fleet Fuel - Gasoline	gallons	80,973	76,412	-4,561	-5.63%
Vehicle Fleet Fuel - Diesel	gallons	13,660	8,844	-4,816	-35.26%
Vehicle Fleet Fuel - CNG	gallons	301,440	7,558	-293,882	-97.49%
Employee Commute - mileage	VMT	894,773	1,238,807	344,035	38.45%

INTERPRETATION

Although building energy usage increased, the electricity emissions decreased. This is due to the cleaner electricity grid in 2017. The streetlights and water pumping sectors had reductions as well, which may be due to energy efficiencies or changes in equipment. The large drop in water pumping electricity usage in particular may also be due to account changes. To facilitate a closer comparison in the future, City of Manhattan Beach may want to track the specific accounts.

Although the fleet vehicle emissions increased slightly, there were significant reductions in the fleet fuel usage, which can be attributed to the shifts to hybrid and electric vehicles. Previous records in ClearPath do not indicate the number of vehicles for 2012, but this data is likely tracked by the equipment maintenance supervisor and can help answer whether the transitions to hybrid and EV are indeed reducing emissions.

Given that the solid waste disposal data is scaled from the City employment, there are not many conclusions that can be drawn there. ICLEI recommends that the City of Manhattan adopt another waste monitoring technique. If local government operations waste cannot be physically separated from community-wide waste, facility waste can be estimated based on the number of sites and volume of waste containers that are picked up on a weekly basis. While still a coarse estimate, it will at least give a more accurate picture of what is happening at each site than a blanket assumption based on number of employees.

ICLEI recommends that a contribution analysis is done for a more thorough comparison between inventory years and understanding of what drives emission changes, be it the increased renewable energy in the grid, weather, or population**.** The contribution analysis will allow for breakdown of each sector by drivers like weather or population. Such an analysis can also account for differences in methodology since multiple consultants have worked on Manhattan Beach's inventories with potentially different methodologies or data sources. It is important to recognize if a decline in emissions is due to policy implementation, external forces like weather/population, or changes in methodology/data sources. Resources for doing the contribution analysis are available publicly on ICLEI USA's website under the Department of Energy's Cities Leading on Energy Analysis Program (CLEAP).

Conclusion

This inventory marks completion of Milestone One of the Five Milestones for Climate Mitigation. In addition, the City of Manhattan Beach should continue to track key transportation activity and emissions indicators on an on-going basis. ICLEI recommends completing a re-inventory at least every five years to measure emissions reduction progress.

Emissions reduction strategies to consider for the climate action plan include energy efficiency, renewable energy, vehicle fuel efficiency, alternative transportation, vehicle trip reduction, land use and transit planning, and waste reduction among others. Through these efforts and others, the City of Manhattan Beach can achieve additional benefits beyond reducing emissions, including saving money and improving Manhattan Beach's economic vitality and its quality of life.