CITY OF LAKEWOOD'S 2015 GREENHOUSE GAS EMISSIONS INVENTORY SUMMARY REPORT

OCTOBER 2016

lotus
engineering & sustainability

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Contents

Why a Greenhouse Gas Emission Inventory Matters

The greenhouse gas (GHG) emissions inventory described in this document is a critical step in maintaining Lakewood's leadership in local climate action.

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 scientific evidence clearly shows that human activities are increasing the concentration of GHGs and changing the global climate. The most significant contributions to climate change are the burning of fossil fuels for transportation and energy and the breakdown of waste, which introduce large amounts of carbon dioxide (CO_2), methane (CH_4), and other GHGs[1] into the atmosphere. Collectively, these gases intensify the natural greenhouse effect, causing global average surface and lower atmospheric temperatures to rise.

While Colorado is already experiencing some changes due to climate change, various studies[2] released in the last few years detail potentially severe impacts of climate change in Colorado. Common themes include:

- Average temperatures are expected to increase by 1.5 degrees Fahrenheit to 4.5 degrees Fahrenheit.
- Seasonal shifts in precipitation.
- Reductions in available water.
- Increase in the number of days that exceed 90 degrees and 100 degrees.[3]
- More severe storms and flooding and more extreme wildfires.
- Increase in heat related illnesses and poor air quality.
- Increase in pine beetle and related tree-killing outbreaks; 3.5 million trees infested to date.[4]

Colorado's ecosystems, public health and safety, and economic viability (particularly tourism and agriculture industries) are at risk, and Colorado residents, businesses, and municipal operations will be impacted. A GHG inventory assesses a community's contribution to global climate change and informs community policies and programs that will reduce GHG emissions.

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[1] The six GHGs include: carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride.
[2] Results from various studies cited in: http://www.coclimatenetwork.org/images/ColoLocalResilienceProjectRpt-lowres.pdf.
[3] For more information see: http://www.denverpost.com/2016/09/22/front-range-climate-change-heat/.
[4] For more information see: http://csfs.colostate.edu/forest-management/common-forest-insects-diseases/mountain-pine-beetle/

What We Can Learn from a GHG Inventory

The United Nations Environment Programme estimates that cities produce 60% to 80% of all GHG emissions, making cities a critical participant and partner in the sustainability movement.[5,6]

Lakewood's GHG inventory provides a picture of GHG emissions created by the activities of Lakewood residents, businesses, institutions, and industries. By comparing inventories over time, Lakewood can track the success of existing and future climate change related policies and programs. These comparisons create a dynamic feedback loop that can inform and shape future improvement strategies.

Practicing Accountability and Leadership

In 2015, Lakewood committed to the global Compact of Mayors (Compact), a worldwide effort to highlight the leadership of cities in addressing climate change and demonstrate the collective impact of city efforts. One of the requirements of the Compact is the completion of a GHG inventory that is *Global Protocol for Community-Scale GHG Emissions* (GPC) compliant. Lakewood's 2015 GHG inventory is GPC compliant and fulfills the first step Lakewood has committed to under the Compact.

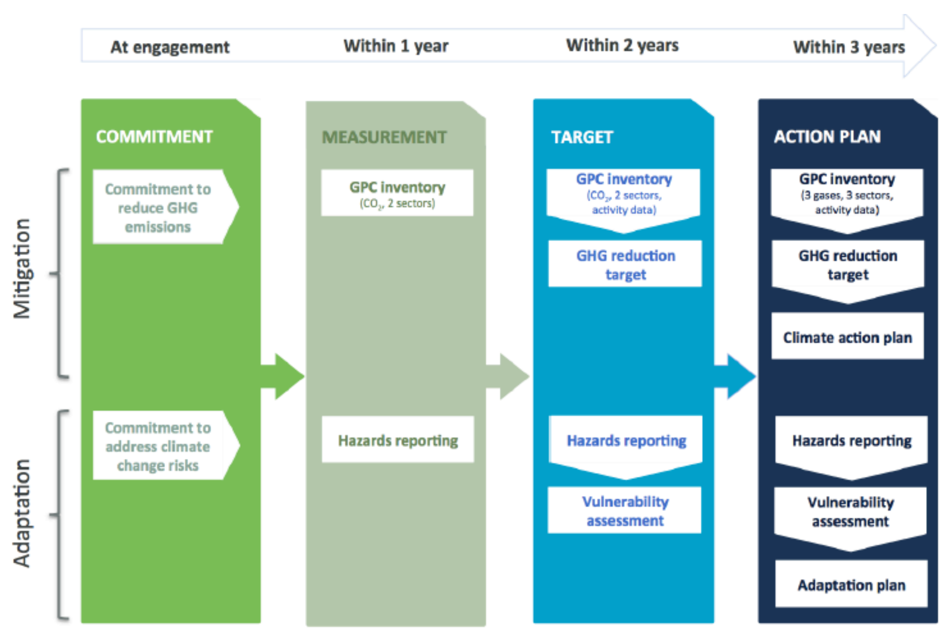

FIGURE 1. COMPACT REQUIREMENTS

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[5] For more information see: http://www.unep.org/SBCI/pdfs/Cities_and_Buildings-UNEP_DTIE_Initiatives_and_projects_hd.pdf

[6] For more information on the role of cities and climate change see Lotus' blog: *The Power of Municipalities:* http://www.lotussustainability.com/blog/2015/8/11/the-power-of-municipalities.

Inventory Methodology

The 2015 Lakewood GHG inventory uses the approach and methods provided by GPC. The GPC is the official protocol specified by the Compact of Mayors, and defines what categories of emissions must be reported and how. In addition, this inventory draws on methods from the U.S. Community Protocol, which provides more detailed methodology specific to U.S. communities.

2007 Inventory Methodology

A Lakewood community inventory was previously completed for 2007 emissions using a Demand-Centered, Hybrid Life-Cycle Methodology. The GPC and the Demand-Centered, Hybrid Life-Cycle methodologies align in some ways but also have some notable differences.

TABLE 1. DIFFERENCES BETWEEN 2007 AND 2015 METHODOLOGIES

Practice	2007 Demand-Centered Hybrid Life-Cycle Inventory	2015 GPC Inventory
Emission factors	Various, including ICLEI	ICLEI or site specific
Emission sources	Includes consumption-based sources	Excludes consumption-based sources from reportable total, but includes as "Information items"
Reporting	Does not clearly align with global reporting platforms: Compact, CDP, and cCR	Aligns with global reporting platforms: Compact, CDP, and ccR

For consistency, Lakewood revised the 2007 inventory to be GPC compliant.

2015 Inventory Methodology

The GPC protocol was released in 2014 and provides a transparent GHG accounting methodology for reporting community GHG emissions, and unlike many other protocols, provides a consistent structure that will enable better comparisons among different cities.[7] There are two reporting levels for the community framework:

- **BASIC**: The BASIC methodology covers stationary energy, in-boundary transportation, and community-generated waste.
- **BASIC+:** The BASIC+ level includes BASIC emission sources, as well as trans-boundary transportation; energy transmission and distribution losses; industrial processes and product use; and agriculture, forestry and other land uses.

[7] For more information see: http://www.ghgprotocol.org/city-accounting.

Based on available data, Lakewood has chosen the BASIC reporting level, which is consistent with many other cities to date. To ensure consistency with previous inventories, the 2015 inventory includes additional BASIC+ sources. While the GPC protocol excludes avoided emissions from renewable energy credits and renewable energy, these avoided emissions were calculated as information-only items.

GPC defines emission scopes by whether emissions occur within the city boundary or outside the city boundary, whereas BASIC emission scopes are defined as follows:

- **Scope 1:** GHG emissions from sources located within the city boundary, including:
  - Energy and transportation fuel combustion.
  - Fugitive emissions.
  - Solid waste treated within the city.
  - Wastewater treated within the city.
- **Scope 2:** GHG emissions occurring as a consequence of the use of grid-supplied electricity, heat, steam and/or cooling within the city boundary.
- **Scope 3**: GHG emissions that occur outside the city boundary as a result of activities taking place within the city boundary, including:
  - Solid waste treated outside the city.
  - Wastewater treated outside the city.
- **Non-GPC Scope 3 (Consumption-Based)**: All GHG emissions that are not required to be reported per GPC protocol but may help cities better understand GHG emissions that result from consumption-based activities. For Lakewood, consumption-based emissions were originally calculated in the 2007 inventory and were calculated again for the 2015 inventory to support comparisons. These sources include:
  - Treating drinking water.
  - Well-to-pump fuel production.
  - Cement use.
  - Food purchases.

It should be noted that trans-boundary aviation, airline travel from Denver International Airport (DIA) attributed to Lakewood, was recorded as a BASIC+ Scope 3 emission source.

With the exception of electricity and natural gas emission factors, the GPC protocol uses the most up-to-date emission factors based on ICLEI's *U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions, Version* 1.0, July 2013. Electricity and natural gas emission factors are sourced from Xcel Energy's 2015 Annual Community Report.[8]

[8] For more information see: https://www.xcelenergy.com/working_with_us/municipalities/community_energy_reports.

Emissions Analysis

Key Findings from 2015 Inventory

The 2015 Lakewood GHG inventory calculated a total emission value of 2,391,358 mtCO_2e and a total BASIC emission value of 1,652,223 mtCO_2e.

Sector		Total by scope ($mtCO2_e$)					Total by scope ($mtCO2_e$)	Total by scope ($mtCO2_e$)
		Scope 1 (Territorial)	Scope 2	Scope 3 - BASIC	Scope 3 - BASIC+	Other Scope 3	BASIC	Partial BASIC+
Stationary Energy	Energy use	327,452	771,930				1,099,382	1,099,382
	Energy generation supplied to the grid						0	0
Transportation	All emissions	528,556	2,237		119,354		530,793	650,147
Waste	Disposed in the City						0	0
	Disposed outside the City			22,047			22,047	22,047
Consumption-Based						619,782	0	0
	Total	**856,008**	**774,167**	**22,047**	**119,354**	**619,782**	**1,652,223**	**1,771,577**
	Total including Other Scope 3						**2,272,004**	**2,391,358**

FIGURE 2. TOTAL EMISSIONS AND BASIC EMISSIONS

Commercial, institutional, and industrial building energy use were the largest contributors to Lakewood's emissions in 2015, contributing 25% of overall emissions. On-road transportation (which includes gasoline and diesel-powered vehicles and public transit), and energy use in residential buildings follow closely behind at 22% and 21% of overall emissions, respectively. Emissions for all sectors are shown in Figure 3. All together, these three sectors account for approximately 68% of Lakewood's total emissions.

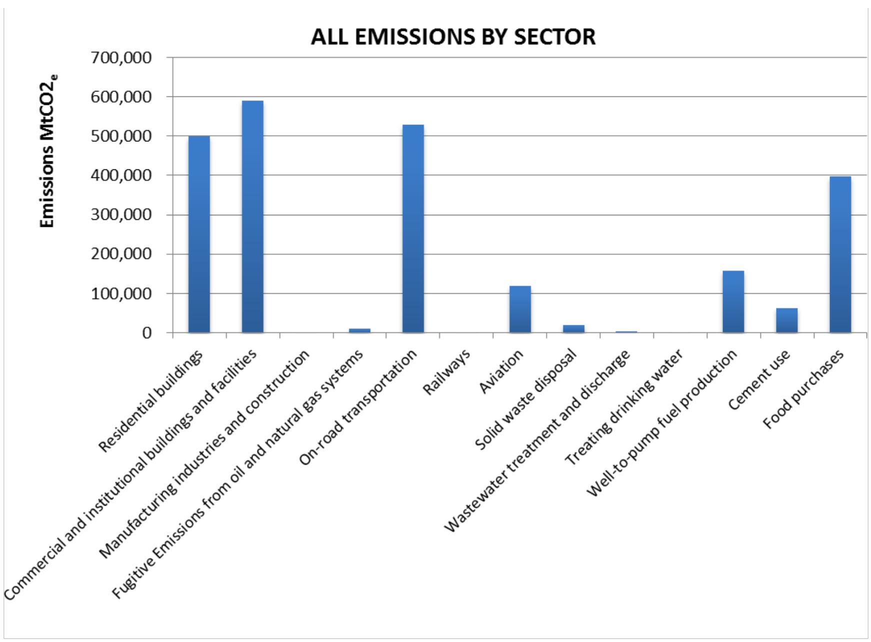

FIGURE 3. TOTAL EMISSIONS BY SECTOR

It should be noted that when consumption-based emissions are excluded (i.e. a BASIC emission total), commercial, institutional and industrial building energy use accounts for 36% of total emissions, on-road transportation accounts for 32% of total emissions, and residential building energy use accounts for 30% of total emissions. These three emission sources represent 98% of total BASIC emissions.

Comparison between Inventories

Between 2007 and 2015, overall GHG Emissions in Lakewood reduced by 2.3%. Excluding consumption-based GHG emissions (i.e. a BASIC emission total), Lakewood's emissions decreased by 8.5% between 2007 and 2015. This reduction is notable in light of a 6.6% increase in the community's population and a 10.2% increase in community jobs. See Figures 4 and 12 for more information.

EMISSIONS	Units	2007	2015	% Change Against Baseline
Residential Electric	$MTCO_{2e}$	367,314	307,481	-16.3%
Residential Nat Gas	$MTCO_{2e}$	203,406	192,820	-5.2%
C&I Electric	$MTCO_{2e}$	518,273	464,449	-10.4%
C&I Nat Gas	$MTCO_{2e}$	129,537	124,726	-3.7%
Fugitive emissions from natural gas s	$MTCO_{2e}$	10,386	9,906	-4.6%
Total Buildings	***$MTCO_{2e}$***	***1,228,916***	***1,099,382***	***-10.5%***
Vehicle Travel	$MTCO_{2e}$	556,347	528,556	-5.0%
Railways	$MTCO_{2e}$		2,237	
Air Travel	$MTCO_{2e}$	131,735	119,354	-9.4%
Total Transportation	***$MTCO_{2e}$***	***688,082***	***650,147***	***-5.5%***
Landfill	$MTCO_{2e}$	18,174	18,931	4.2%
WWTP Process	$MTCO_{2e}$	2,922	3,116	6.6%
Total Waste	***$MTCO_{2e}$***	***21,096***	***22,047***	***4.5%***
Consumption-based	$MTCO_{2e}$	509,652	619,782	21.6%
Total Consumption-based	***$MTCO_{2e}$***	***509,652***	***619,782***	***21.6%***
Total with Consumption-based	***$MTCO_{2e}$***	***2,447,746***	***2,391,358***	***-2.3%***
Total without Consumption-based	***$MTCO_{2e}$***	***1,938,094***	***1,771,577***	***-8.6%***
Total BASIC	***$MTCO_{2e}$***	***1,806,359***	***1,652,223***	***-8.5%***

FIGURE 4. COMPARISON BETWEEN 2007 AND 2015 GHG INVENTORIES

When emissions are broken down by sector, we see that each sector's contribution has changed between 2007 and 2015. Emissions from buildings have decreased by 10.5%, and emissions from transportation have decreased by 5.5%. However, the total reduction was offset by an increase in consumption-based emissions (21.6% increase) and waste emissions (4.5% increase).

Commercial, institutional, and industrial building energy use, residential energy use, and on-road transportation consistently account for a majority of GHG emissions (both under a total emissions profile and a BASIC emission profile), as demonstrated by Figures 5 and 6.

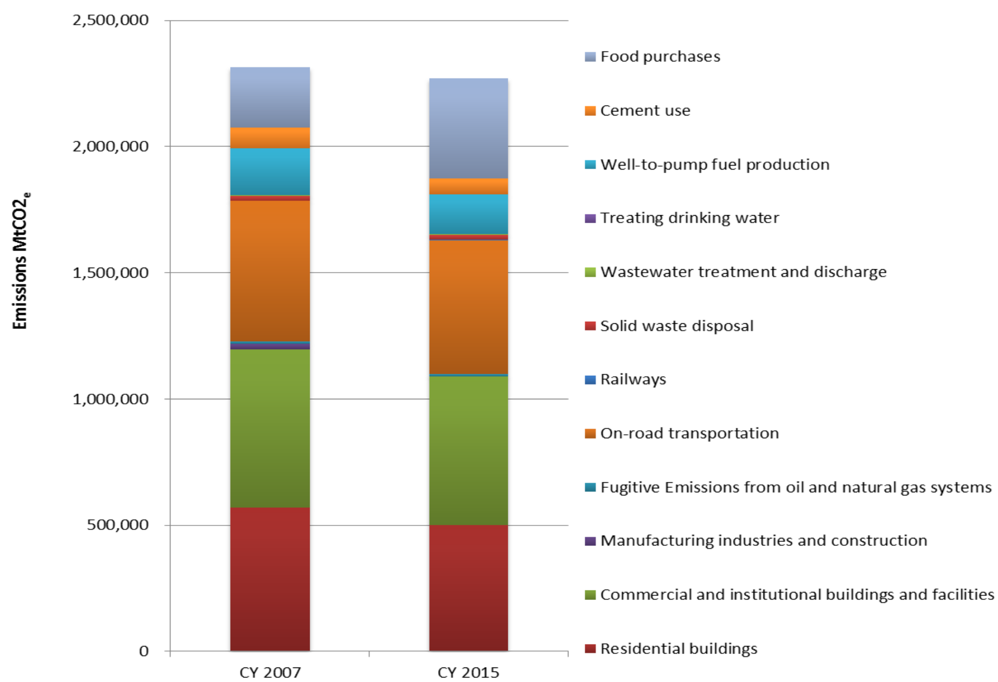

FIGURE 5. COMPARISON OF TOTAL EMISSIONS OVER TIME BY SECTOR

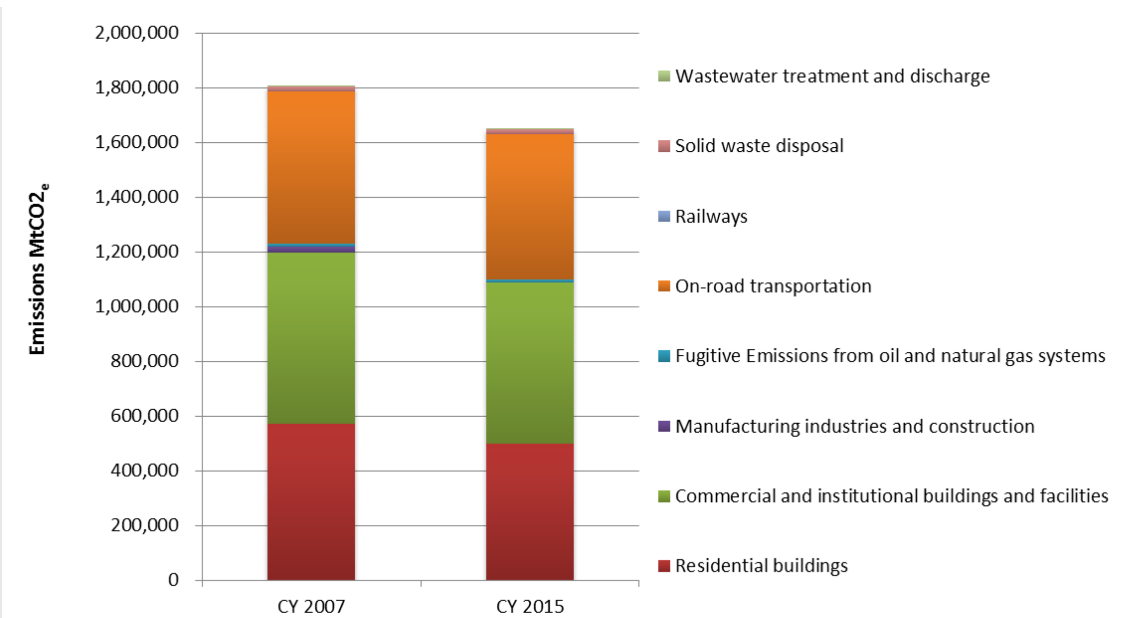

FIGURE 6. COMPARISON OF BASIC EMISSIONS OVER TIME BY SECTOR

Electricity continues to be the largest emission source followed by transportation (on-road transportation and airline travel). In 2015, consumption-based activities (including cement and

food purchases and treating drinking water) make up a large percentage of the GHG emissions at almost 26%.

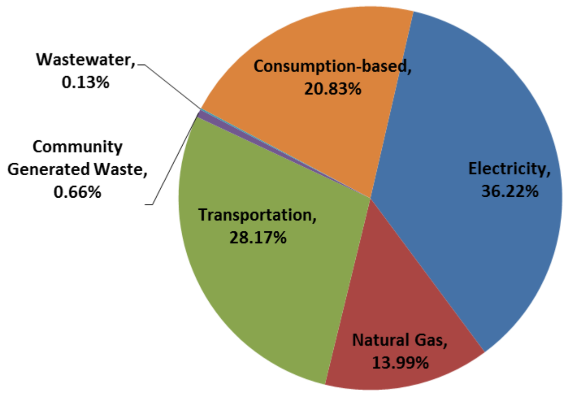

FIGURE 7. 2007 TOTAL EMISSIONS BY SOURCE

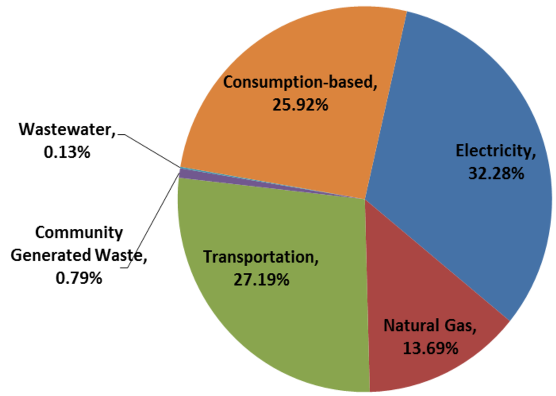

FIGURE 8. 2015 TOTAL EMISSIONS BY SOURCE

Using a BASIC inventory methodology (non-consumption based), the leading sources of emissions in Lakewood's 2015 inventory remains consistent with the 2007 baseline inventory. These high-emissions sources include electricity and natural gas used in buildings and fuel used for transportation, including on-road transportation and airline travel.

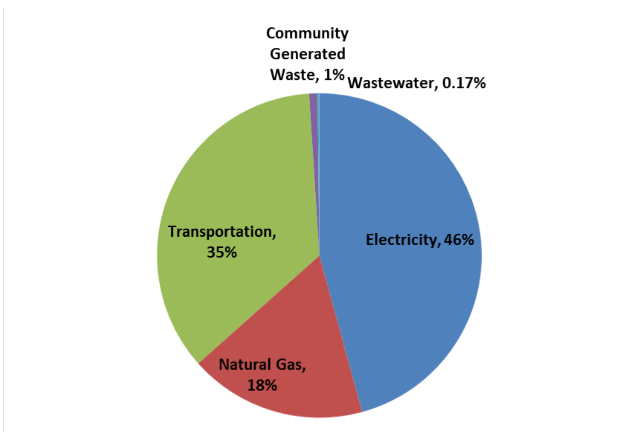

FIGURE 9. 2007 GPC BASIC TOTAL EMISSIONS BY SOURCE

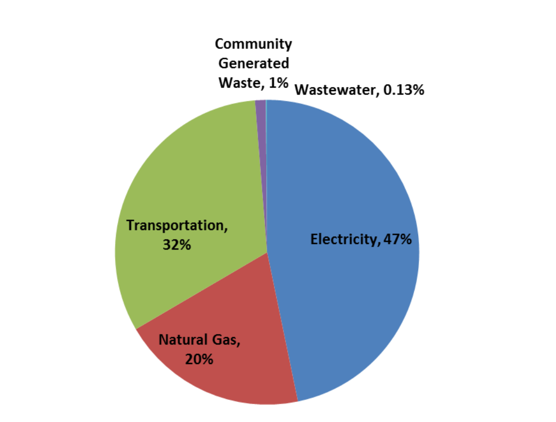

FIGURE 10. 2015 GPC BASIC TOTAL EMISSIONS BY SOURCE

Factors Influencing Emissions

Emissions are a product of emission factors and activity data. Activity data is influenced by consumption and generation behaviors and community indicators (i.e. population, economic growth, etc.). Changes in emissions result from the interplay of these factors. Lakewood can influence positive changes in emissions through various programs, policies, and outreach, and education efforts. A review of emission changes and the factors that influence those changes inform how well Lakewood's climate change initiatives are working and may notify where Lakewood should focus future efforts.

The following is an overview of the drivers that effected the GHG emissions between 2007 and 2015.

Emission Factor Trends

Colorado's Renewable Energy Standard[9] requires Xcel Energy to increase the efficiency of their operations and source increasing amounts of energy from low- to zero-carbon sources (i.e. renewable energy, recycled energy, etc.). As a result, the mix of energy sources that supply Xcel Energy's electric grid changes every year and the resulting electricity emission factor decreases every year. Based on data from Xcel Energy, electricity emission factors decreased nearly 16% from 2007 to 2015. It should be noted that the while Xcel Energy publishes a natural gas emission factor, it is not expected to change annually.

Energy	Units	2007	2015	% Change Against Baseline
Electricty Emissions Factor	MTCO2e/MWh	0.83855	0.70794	-15.6%

FIGURE 11. CHANGES IN EMISSION FACTORS

This has an enormous impact on Lakewood's emissions. A significant portion of any reduction in electricity-generated emissions is attributable to the reduced emission factor. The reduced emission factor may result in reductions in electricity-generated emissions, even when electricity activity data increased.

Community Indicator Trends

Between 2007 and 2015, Lakewood experienced significant growth in population and revenue, and the number of households, jobs, and businesses. Each of these trends affects GHG emissions through the increase in consumption, square footage, transportation needs, and expenditures.

[9] For more information see: https://www.xcelenergy.com/staticfiles/xe/Corporate/CRR2013/environment/renewable-energy.html.

	2007	2015	% Change Against Baseline
City of Lakewood Population	143,109	152,597	6.6%
Number of Households	60,017	61,986	3.3%
Retail Sales Tax	$58,024,910	$72,920,929	25.7%
Total City Revenue	$142,651,192	$164,990,675	15.7%
Number of Jobs	66,483	73,255	10.2%
Number of commercial businesses, institutions, and industries	5,439	5,844	7.4%
Heating Degree Days	5,687	5,126	-9.9%
Cooling Degree Days	784	690	-12.0%

FIGURE 12. CHANGES IN COMMUNITY INDICATORS

While growth can benefit the community of Lakewood through added tax revenues and raise other city indicators, it makes the task of achieving significant reductions in GHG emissions more challenging. Fortunately, Lakewood is reducing overall GHG emissions in the face of growth, and in some cases, normalized metrics present drastic reductions.

Along with a rising population, the number of households, jobs, and businesses has increased between 7% and 26% since the baseline year, yet total natural gas consumption has decreased by 4.6% and electricity consumption has only slightly increased (2.3%).

Energy	Units	2007	2015	% Change Against Baseline
Residential Electric	kWh	460,547,000	452,426,346	-1.8%
Residential Natural Gas	dTh	3,824,394	3,625,350	-5.2%
C&I Electric	kWh	649,822,000	683,389,093	5.2%
C&I Natural Gas	dTh	2,435,527	2,345,061	-3.7%
Total Electric	kWh	1,110,369,000	1,135,815,439	2.3%
Total Natural Gas	dTh	6,259,920	5,970,411	-4.6%
Electricty Emissions Factor	MTCO2e/MWh	0.83855	0.70794	-15.6%

FIGURE 13. CHANGES IN ENERGY ACTIVITY DATA

When emissions take into account community indicators (i.e. population, households, and employees), we see drastic emission reductions ranging from 15.1% to 17.8% (see Figure 14) and usage reductions ranging from 4.9% to 12.6% (Figure 15).

PER CAPITA EMISSIONS METRICS	Units	2007	2015	% Change Against Baseline
Residential Emissions per Household	MTCO2e/HH	9.51	8.07	-15.1%
Residential Emissions per person	MTCO2e/person	3.99	3.28	-17.8%
C&I Emissions per employee	MTCO2e/FTE	9.75	8.04	-17.5%

FIGURE 14. NORMALIZED EMISSION DATA

PER CAPITA ENERGY METRICS	Units	2007	2015	% Change Against Baseline
Residential Electricity per Household	kWh/HH	7,674	7,299	-4.9%
Residential Electricity per person	kWh/person	3,218	2,965	-7.9%
C&I Electricity per employee	kWh/FTE	9,774	9,329	-4.6%
Residential Nat Gas per Household	dTh/HH	63.72	58.49	-8.2%
Residential Nat Gas per person	dTh/person	26.72	23.76	-11.1%
C&I Nat Gas per employee	dTh/FTE	36.63	32.01	-12.6%

FIGURE 15. NORMALIZED ENERGY DATA

Economic Trends

Normalized economic metrics show substantial reductions since the baseline year. Lakewood is very successful in reducing total emissions in light of significant economic growth.

ECONOMIC METRICS	Units	2007	2015	% Change Against Baseline
Total city revenue per emissions	MTCO2e/$	0.01358	0.01074	-20.9%
Collected sales tax per emissions	MTCO2e/$	0.03338	0.02429	-27.2%
Jobs per emissions	MTCO2e/FTE	29.132	24.184	-17.0%

FIGURE 16. ECONOMIC TRENDS

Energy Trends

As shown in Figure 15, residential electricity usage per person decreased by 7.9% from 2007 to 2015. This decrease was somewhat offset by population growth, with overall residential electricity use decreasing only 1.8% (see Figure 13).

Between 2007 and 2015, electricity usage per employee decreased by 4.6% (see Figure 15). This decrease was not large enough to offset growth in businesses and number of employees, and overall commercial electricity use *increased* by 5.2% (see Figure 13).

In addition to a drastic reduction in electricity emission factors, electricity-generated GHG emissions are a function of reduced electricity consumption.

Figure 13 showed that Lakewood experienced a 4.6% reduction in natural gas consumption between 2007 and 2015. This may, in part be driven by the reduction in Heating Degree Days

(HDD).[10] Between 2007 and 2015, Lakewood experienced a 9.9% decrease in HDD's (presumably reducing natural gas and electricity to heat buildings) and 12% decrease in CDD's (presumably reducing electricity use to cool buildings). Looking at residential natural gas usage per person per Heating Degree Day, usage decreased by 1.4%, and usage per household per Heating Degree Day increased by 1.8% (average number of people per household increased slightly, explaining the difference between per household and per person comparisons). Conversely, all weather normalized metrics for electricity increased. This suggests this is an area where actions may be needed to prevent emission increases in the future.[11]

WEATHER NORMALIZED PER CAPITA METRICS	Units	2007	2015	% Change Against Baseline
Heating Degree Days	HDD	5,687	5,126	-9.9%
Cooling Degree Days	CDD	784	690	-12.0%
Residential Nat Gas per Household	dTh/HH/HDD	0.011	0.011	1.8%
Residential Nat Gas per person	dTh/person/HDD	0.005	0.005	-1.4%
C&I Nat Gas per employee	dTh/FTE/HDD	0.006	0.006	-3.1%
Residential Electricity per Household	kWh/HH/CDD	9.788	10.578	8.1%
Residential Electricity per person	kWh/person/CDD	4.105	4.297	4.7%
C&I Electricity per employee	kWh/FTE/CDD	12.467	13.520	8.4%

FIGURE 17. COMPARISON OF ENERGY FACTORS

Transportation Trends

As shown in Figure 4, emissions from transportation were reduced by 5.5% between 2007 and 2015. The 2015 transportation value includes vehicle travel from on-road gasoline and diesel vehicles and public transit and airline travel from DIA. Emission data is based on several factors: emission factors, fuel efficiencies, vehicle miles traveled, and vehicle type distribution by vehicle fuel. The emission factors for gasoline, diesel, and jet fuel are not expected to change significantly each year, which suggests that decreases in transportation emissions are a result of changes in activity data. Figure 18 provides more information on the 2015 breakdown of transportation activity data

[10] A Heating Degree Day (HDD) and Cooling Degree Day (CDD) are roughly proportional to the energy used for heating and cooling a building. They are calculated by taking the difference between the average daily temperature and the balance point temperature. The balance point temperature is the average daily outside temperature at which a building maintains a comfortable indoor temperature without heating or cooling. When the average daily temperature is above the balance point temperature, the result is cooling degree days (i.e. you need to cool the building to maintain the balance point temperature). When the average daily temperature is below the balance point temperature the result is heating degree days (i.e. you need to heat the building to maintain the balance point temperature).

[11] Note: That without completing a linear regression for each fuel type it is impossible to understand if there is a strong enough correlation between energy usage and degree days to extrapolate a trend for future years. In other words, it is impossible to know if Lakewood's building energy will vary significantly as temperature changes.

TRANSPORTATION	Units	2007	2015	% Change Against Baseline
Gasoline	VMT	1,002,420,104	929,926,828	-7.2%
Diesel	VMT	101,236,314	107,894,860	6.6%
Public Transit	Gallons	187,868	298,497	58.9%
Railways	kWh	0	3,291,810	
Aviation	Gallons	13,751,269	12,458,843	-9.4%

FIGURE 18. BREAKDOWN OF TRANSPORTATION ACTIVITY DATA

Vehicle Miles Traveled for on-road transportation decreased between 2007 and 2015. While the difference could be the discrepancy in data collection[12], it could also be a partial function of a shift in transportation modality; 2015 saw a dramatic increase in public transit and light rail ridership compared to 2007.

Jet fuel consumption dropped 9.4% between 2007 and 2015. The reasons behind this drop are unknown but could be due to reduced travel (unlikely) or more efficient airplanes (more likely).

Waste Trends

As shown in Figure 19, emissions from waste increased by 4.5% between 2007 and 2015.

Emission data is based on the amount of waste generated, waste characterization, and emission factors. The same assumptions of waste generation per household and per business were applied for both inventories; therefore, estimated waste emissions increased in proportion to the increase in number of households and number of businesses. Improved tracking of solid waste collection would allow a more informative comparison of solid waste emissions between inventories in the future. Wastewater treatment emissions are simply a function of the population served, and the increase in associated emissions matched the increase in Lakewood's population.

WASTE	Units	2007	2015	% Change Against Baseline
Landfilled waste	Tons	87,185	90,817	4.2%
Wastewater treatment	Population served	143,109	152,597	6.6%

FIGURE 19. BREAKDOWN OF WASTE ACTIVITY DATA

Consumption-based Trends

Both the 2007 and 2015 inventories include consumption-based emissions, covering the categories of cement usage, food usage, and upstream emissions from the production of

[12] This result should be interpreted with caution because the type of data used for VMT was not the same between the two years. The data source for on-road transportation used between the two inventories is slightly different. The 2007 inventory used a value for community-wide VMT produced by the Denver Regional Council of Governments (DRCOG) demand model, while the 2015 inventory used a figure for per-capita VMT, also provided by DRCOG.

transportation fuels. The consumption based emissions increased by 21.6% from 2007 to 2015. The increased consumption of food is largely responsible for the increase; however, considerable caution should be taken in interpreting this result. The methodology used for these emissions is based on national consumption trends, rather than data on local consumption. In addition, the method does not distinguish between changes in spending because of food price changes and changes in the amount or types of food consumed (i.e. local produce, less meat consumption).

EMISSIONS	Units	2007	2015	% Change Against Baseline
Treating drinking water	MTCO2e	882	1,007	14.2%
Well-to-pump fuel production	MTCO2e	185,240	158,418	-14.5%
Cement use	MTCO2e	82,080	62,159	-24.3%
Food purchases	MTCO2e	241,450	398,198	64.9%
Total Consumption-based	***$MTCO_{2e}$***	***509,652***	***619,782***	***21.6%***

FIGURE 20. BREAKDOWN OF CONSUMPTION-BASED TRENDS

Conclusions and Next Steps

As part of the Compact, Lakewood must complete four phases within three years:

- Phase 1 - Register Commitment. Lakewood has completed this Phase by signing onto the Compact of Mayors
- Phase 2 - Take Inventory: Within one year of its commitment, Lakewood must assess the current impacts of climate change on Lakewood by:
    - 2.1: Completing a GHG emissions inventory utilizing Global Protocol for Community-Scale Emissions (GPC) standard;
    - 2.2: Identify climate risks; and
    - 2.3: Report on both via the CDP or carbonn questionnaires.
- Phase 3 - Create Targets: Within two years of signing onto the Compact, Lakewood must:
    - 3.1: Update its GHG Inventory.
    - 3.2: Set a target to reduce its GHG emissions;
    - 3.3: Conduct a “climate change vulnerability assessment” using the Compact Standard; and
    - 3.4: Report both in the chosen platform.
- Phase 4 – Establish An Action Plan: Within three years, Lakewood must:
    - 4.1: Show how it will meet its GHG reduction commitment;
    - 4.2: Develop climate resiliency plan; and
    - 4.3: Report both in the chosen platform.

This inventory fulfills Lakewood's commitment to Tasks 2.1: Complete a GHG emission using the GPC standard. Several other aforementioned tasks have been completed through the creation of Lakewood's 2015 Sustainability Report and the GHG reduction targets of:

- Reduce community- wide GHG emissions by 20% below 2007 levels by 2025;
- Reduce communitywide GHG emissions by 50% below 2007 levels by 2050; and
- Reduce municipal GHG emissions annually through 2025.

In addition to the above steps, it is recommended that Lakewood complete a re-inventory at a regular interval. This will allow the City to track effectiveness of the sustainability plan and progress towards the emissions reduction targets. When setting up programs and policies to reduce emissions, the City should also plan for collecting data needed to measure the impact of these individual policies and projects.