San Leandro Community and Municipal Greenhouse Gas Emission Inventory for 2015

July 17, 2017

Credits and Acknowledgements

The 2015 greenhouse gas emissions inventory was completed by Benjamin Davenport, the 2016-2017 AmeriCorps Civic Spark Fellow, and Sally Barros, Sustainability Manager, for the City of San Leandro.

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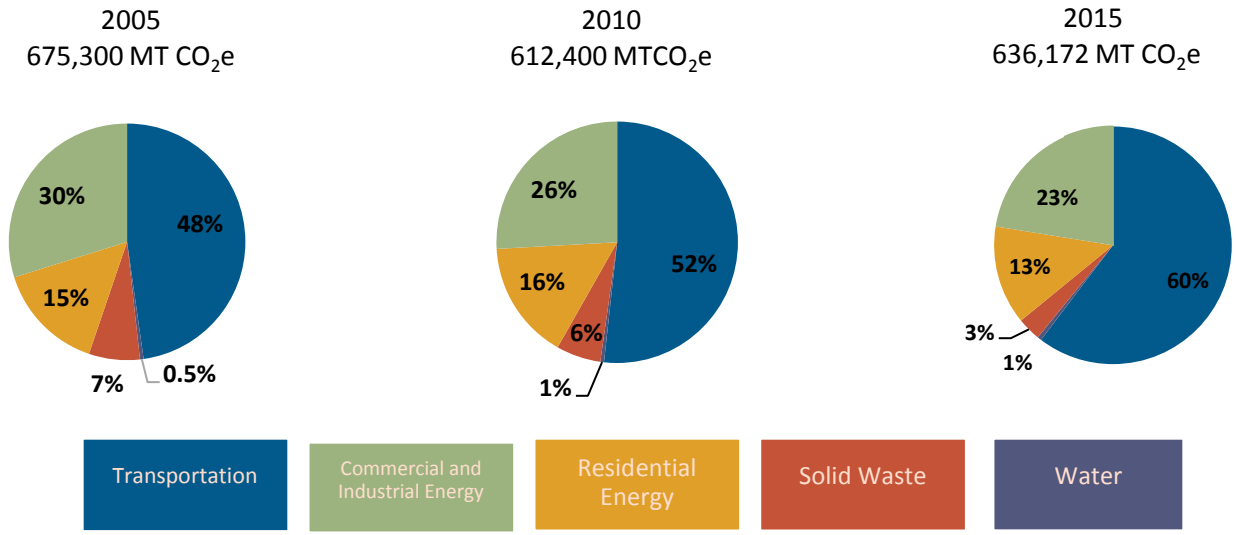
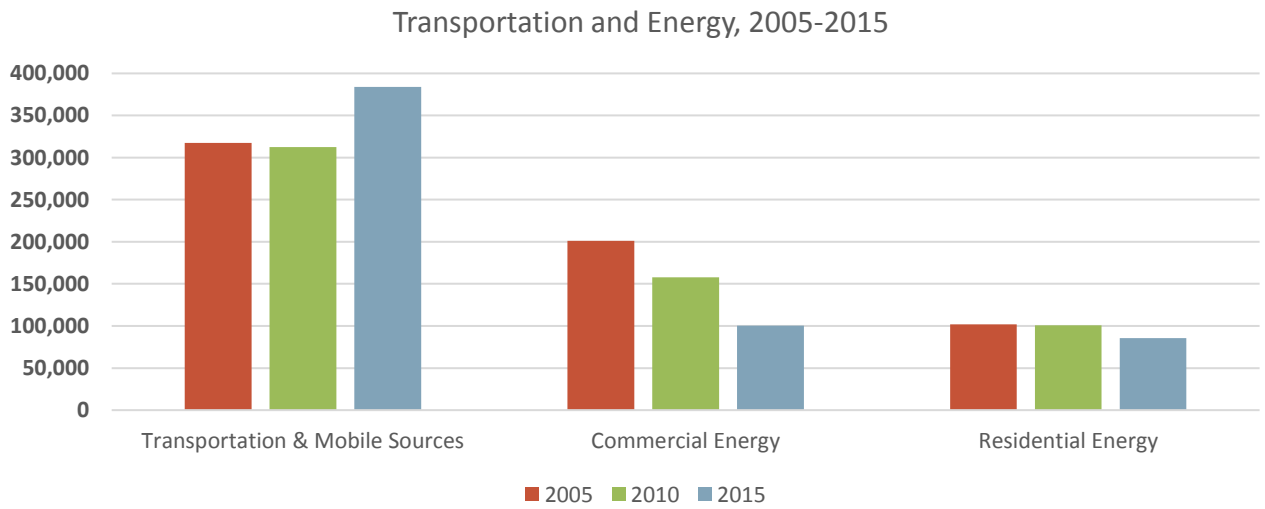
The Public Works Department is grateful to other City staff who provided data, as well as the numerous outside agencies such as the Metropolitan Transportation Commission (MTC), Pacific Gas and Electricity (PG&E), Bay Area Rapid Transit (BART), Oro Loma Sanitary District, East Bay Municipal Utility District (EBMUD), and Alameda-Contra Costa Transit (AC Transit) that provided data and guidance for the inventory.

Executive Summary

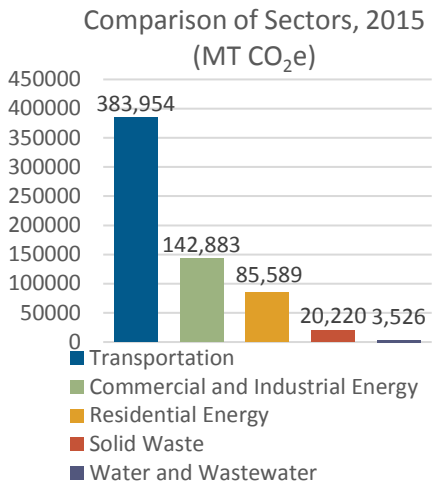
The City of San Leandro is committed to the measurement and reduction of greenhouse gas emissions within its management and control. The City has conducted inventories every five years since 2005 to continuously evaluate the scale and scope of emissions. Greenhouse gas inventories provide policymakers with information necessary to assess the existing state of carbon emissions within their jurisdictions and to make decisions on where to focus mitigation efforts. The community inventory represents all the energy used and waste produced within the City of San Leandro and its contribution to greenhouse gas emissions. The municipal inventory is a subset of the community inventory, and includes emissions derived from internal government operations.

In 2015, community emissions were 636,172 metric tons (MT) CO_2e, a reduction from the 2005 baseline of 675,288 MT CO_2e by 39,116 MT CO_2e. Municipal operations and facilities contributed 6,225 MT CO_2e, about 1% of the total inventory. The largest sectors contributing to are transportation (60%), commercial and industrial energy use (23%), and residential energy use (13%). Solid waste and wastewater emissions contributed only about 4% of total emissions.





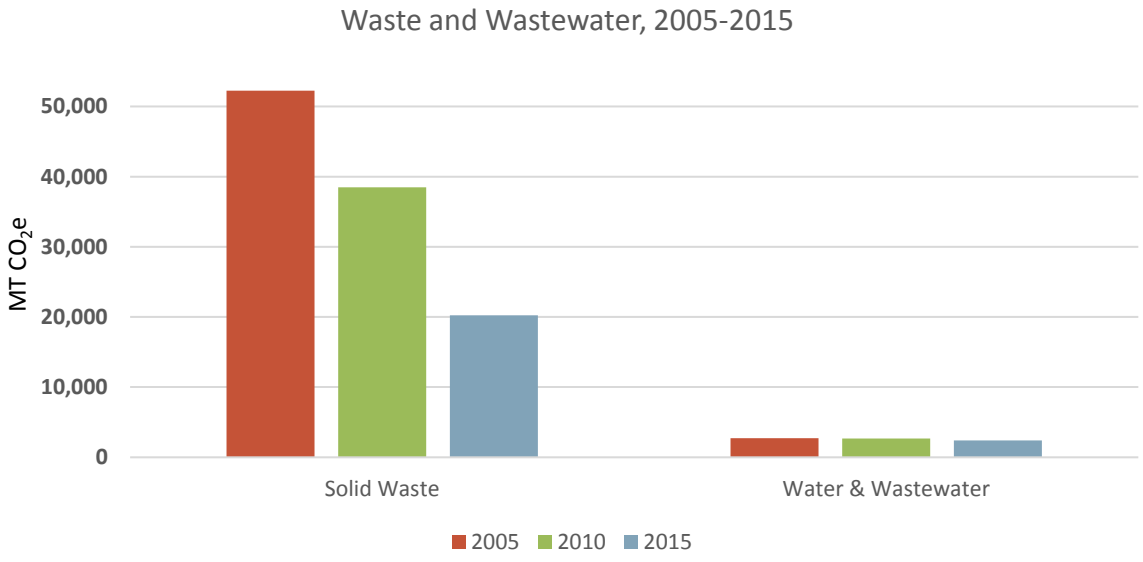
This mixed result can be attributed to a reduction in energy usage during the 2008-2010 Great Recession – a period of decreased economic activity with greater vacancies in San Leandro's building stock and associated slowdown in building and goods shipments – followed by an uptick in development and population growth between 2010 and 2015. The surge in transportation, especially in the through-traffic of commercial trucks and passenger vehicles, are outside the direct control of the City of San Leandro.



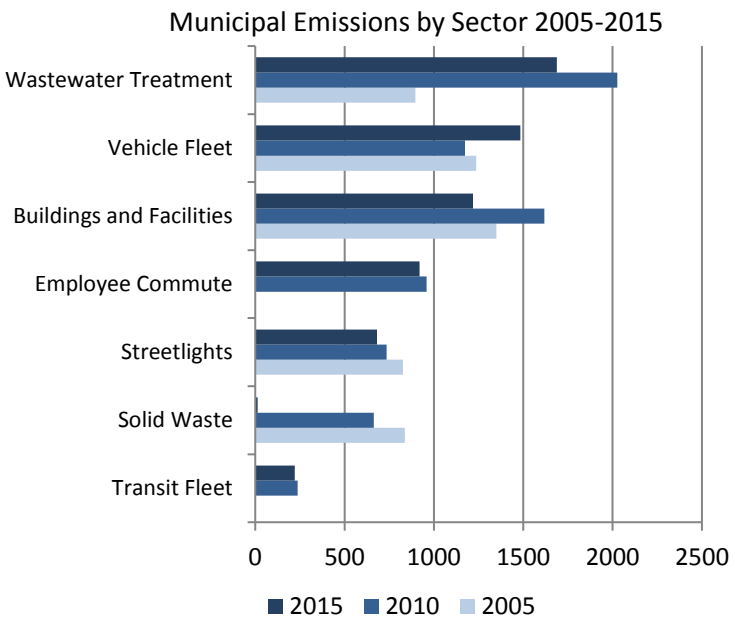
The largest source of carbon emissions in San Leandro is transportation, accounting for 60% of all community emissions. Vehicle miles travelled (VMT) have increased over the past few years and overall transportation emissions, after declining slightly in 2010, went up significantly between 2010 and 2015. Analysis of the VMT data shows that much of this increase is due to heavy-truck traffic through San Leandro. As the economy has improved, goods movement up and down the I-880 corridor has increased transportation-related emissions occurring within city limits.

Commercial and Industrial emissions from building and process energy use, which accounts for 23% of citywide emissions, showed steep declines to approximately 29% less than 2005 levels. Residential building emissions also dropped 16% from 2005 levels. Variation in weather patterns can influence building energy usage, but efforts by residents, commercial/industrial building owners and utilities (as part of the state-mandates and incentive programs under AB 32) have also played a role in improving the energy performance of San Leandro's building stock.

The types of power sources that make up a utility's electricity generation mix also have had a significant impact on a city's greenhouse gas emissions in the commercial, industrial and residential sectors. Over the past several years, PG&E's electric grid has reduced its reliance on carbon-intensive energy sources. PG&E's power mix in 2015 comprised of approximately 25% natural gas, 23% nuclear, 6% large hydro-electric and 30% renewable energy, with 17% remaining from "unspecified" sources. In 2015, PG&E's electricity created only one-third as many greenhouse gas emissions per kilowatt-hour compared to the industry average and produced over two times the amount of renewable energy than in 2005.



Waste diversion policies – mandatory recycling and composting though county-wide regulations – contributed to steep decreases in emissions from the Solid Waste sector. The 50% reduction in tons landfilled in 2015 compared to 2005 resulted in a decrease of 60% in emissions from solid waste. Wastewater treatment emissions remained flat between 2005 and 2015 even while San Leandro's Water Pollution Control Plan (WPCP) decreased its process emissions by 41%. The inclusion of emissions data from the Oro Loma Sanitary district in the 2015 emissions calculation offset the significant upgrades made at the WPCP.



Over the past ten years, San Leandro's municipal emissions have increased by 21% to approximately 6,225 MT of CO_2e from the 2005 baseline[1] of 5,150 MT CO_2e. This increase may not reflect actual increase in emissions; improved methods of measurement and calculation as well as new sources counted in 2015 that were not included in the 2005 inventory. 2015 emissions are 16% lower than in 2010 and, while the target for 25% reductions by 2020 has not been met, ongoing energy efficiency and renewable energy projects for city facilities will enable municipal operations to make greater progress towards the 2020 goals.

City Buildings and Facilities emissions have decreased significantly since 2005, showing a decrease of 10%. This sector represents approximately 20% of municipal emissions. This decrease is due to the installation of more energy-efficient building equipment in 2010-2012, as well as the cleaner power mix coming from PG&E. Wastewater treatment emissions, which represent 27% of municipal emissions, have decreased by approximately 16% since first accurately measured in 2010.

Substantive increases in city emissions have only been noted in one sector: the city's vehicle fleet (representing 24% of emissions) increased by 20% since 2005. Staff is taking a closer look at the data associated with these percentages, as the number of fleet vehicles/mobile equipment has stayed flat between 2005-2015, and with the State-mandated diesel retrofits having been installed prior to 2010.

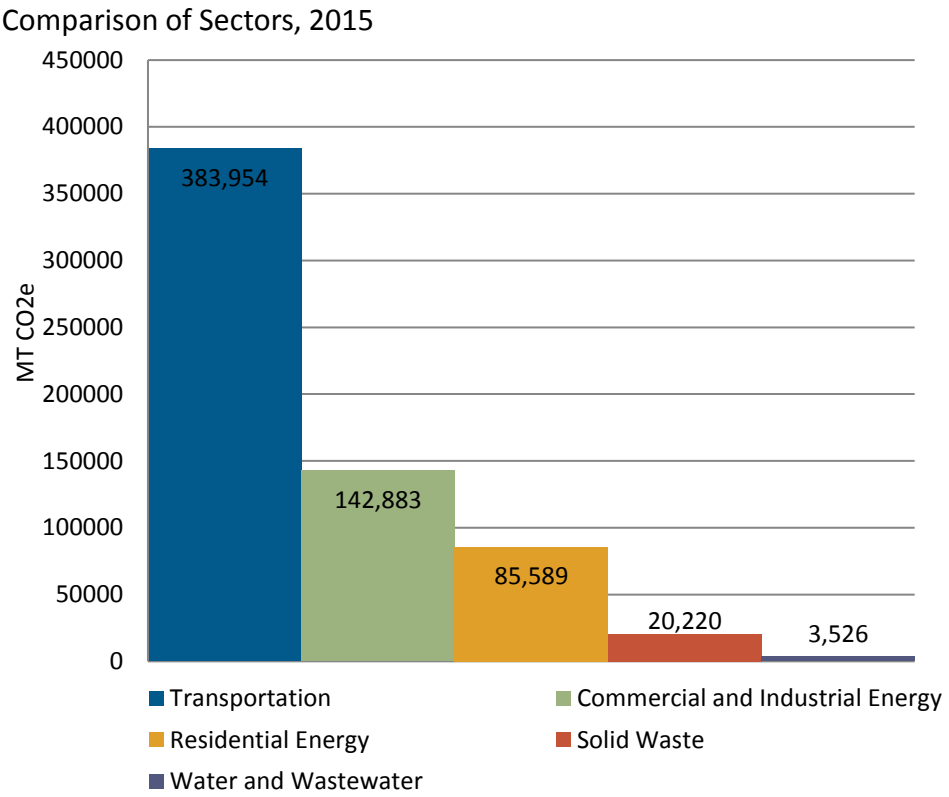
Conversely, Streetlights and Traffic Signals show reductions of 18% since 2005, due to the partial conversion of some streetlights (14%) and all traffic signals to LEDs in 2012. The remaining 86% of streetlights are being retrofitted to smart controllers and LED light fixtures in 2017 through a guaranteed energy savings contract with Climatec, as are City buildings/parks interior/exterior lighting, which will result in greater reductions in emissions in the next inventory.

[1] Updated totals based on methodology updated in 2014 by StopWaste

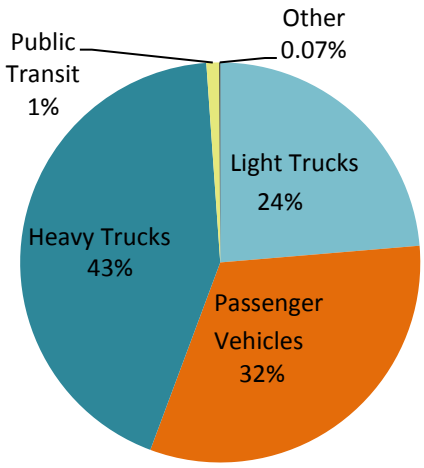
Detailed 2015 Community Emissions

Methodology:

The City utilized Local Governments for Sustainability's (ICLEI) Clear Path software, which complies with the Global Protocol for Community-Scale Emissions (GPC) standards, to create the community inventory for 2015. This international standard was combined with global warming potential from the International Panel on Climate Change's (IPCC) 4th Assessment Report on Climate Change in order to determine the carbon dioxide equivalent (CO_2e of emissions).



Transporation Emissions by Vehicle Type



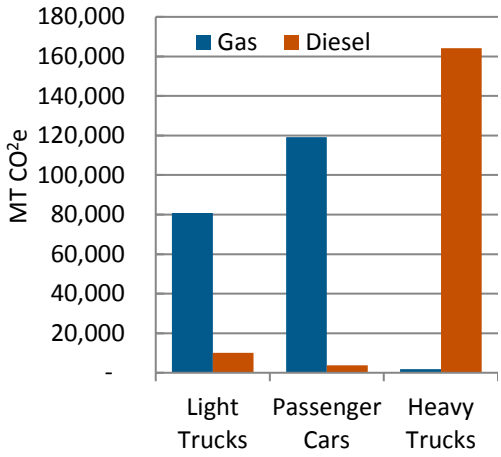
Transportation and Mobile Sources

Transportation emissions are the result of travel that begins or ends within city boundaries or is associated with resident activity. This includes both commercial and personal vehicle travel within San Leandro and includes BART, AC Transit, waterborne traffic, and Amtrak. In 2015, there were 383,954 MT CO_2e, accounting for 60% of all community emissions. The largest single contributor toward emissions was commercial diesel trucks (164,000 MT CO_2e) followed by gasoline passenger vehicles (200,000 MT CO_2e).

Due to the inherent difficulty of measuring vehicle miles traveled (VMT) or gasoline and diesel usage within city boundaries, the inventory relies on a VMT model provided by Metropolitan Transportation Commission (MTC). While VMT briefly declined at the 2010 Inventory, likely due to the recession, it has increased beyond the 2005 baseline by about 12%, and CO_2e emissions have increased by about 21%.

While VMT and emissions have gone up for the region, the population has increased over time. In San Leandro, VMT has only increased by 9% while population has increased by 11%. The California Air Resources Board (CARB) has

On-Road Emissions by Fuel Type, 2015

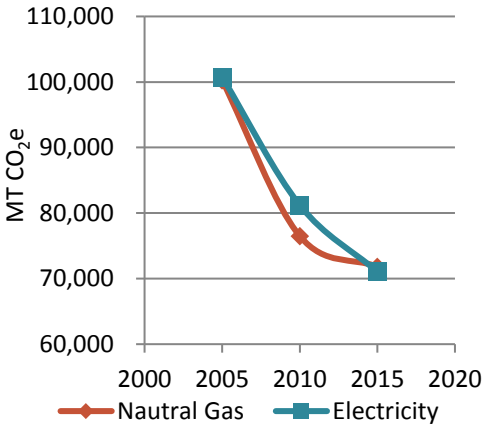


stringent fuel economy standards that require exhaust emissions for new vehicles to drop from 301 g CO_2e/mile in 2009 to 213 g CO_2e/mile in 2015 (and further to 205 g CO_2e/mile from 2016 onwards). These standards help keep our emissions lower even as our VMT increases. Beyond that, CARB has a rebate program that encourages purchases and leases of electric vehicles because they have the highest potential to reduce passenger vehicle emissions. San Leandro residents have purchased 368 such vehicles through CARB's rebate program to date.

Commercial and Industrial Energy

Commercial and Industrial energy emissions are caused by combustion of natural gas within city boundaries and procurement of electricity from PG&E for non-residential users. While the electricity data and commercial natural gas usage is available from PG&E, the industrial natural gas usage was not available for 2015 due to privacy restrictions[2]. Instead, industrial natural gas usage for 2015 was modeled using available industrial gas data from 2009-2013. Commercial and industrial energy usage accounts for 23% of community emissions. This share is smaller than in previous years, in part because of a decrease in emissions within this sector and partially due to a relative increase in emissions from the transportation sector.

Commercial and Industrial Emissions by Source, 2005-2015

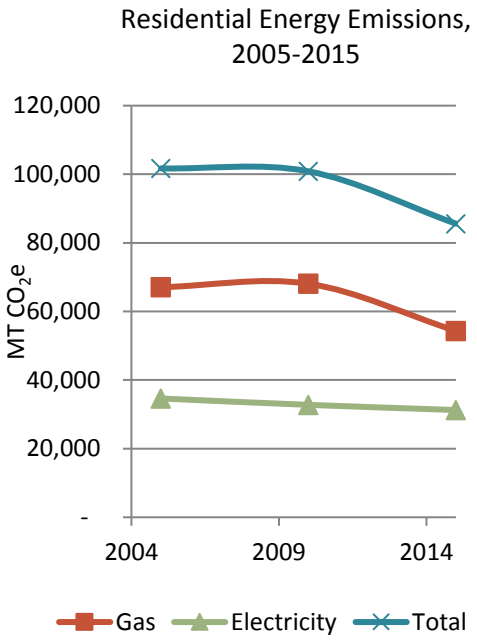


Emissions from commercial and industrial energy have dropped steadily since 2005 and continued to drop after the recession to 142,883 MT CO_2e in 2015. Emissions are now 29% lower than they were at baseline. This decrease is mostly attributable to a drop in usage, likely from energy efficiency measures installed by San Leandro's largest industrial companies. The 2015 inventory shows a 28% reduction in natural gas usage (and 28% reduction in CO_2e) and 19% reduction in electricity usage (29% reduction in CO_2e) since 2005. The remaining difference with CO_2e emissions is attributable to a PG&E's increased sourcing of renewable energy since 2005.

Residential Energy

Emissions from residential energy, like commercial and industrial energy, are a result of the use of electricity and natural gas. PG&E aggregates and provides all data.

[2] PG&E adheres to the 15/15 Rule adopted by the California Public Utilities Commission requiring aggregated information be made up of at least 15 customers and any single customer's load must be less than 15% of that category.

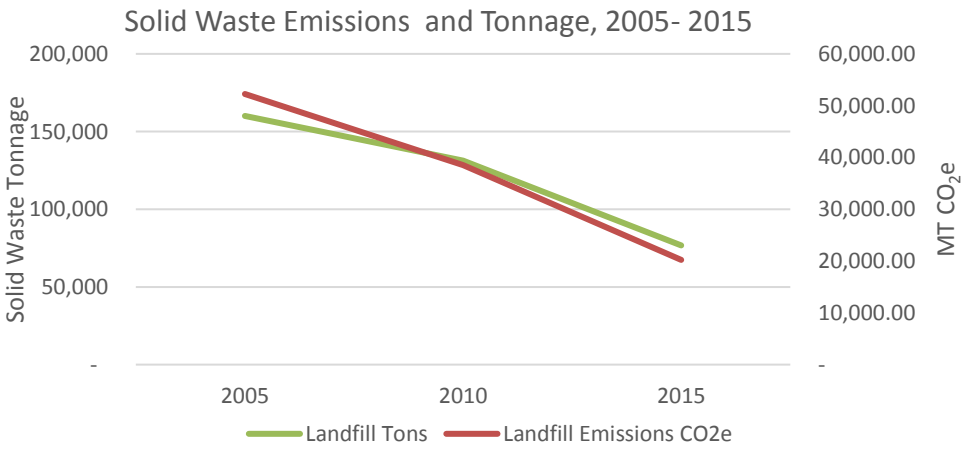


In 2015, Residential Energy usage emitted 85,589 MT CO_2e which accounted for 13% of community emissions. Overall, residential energy emissions are down by 16%. Electricity usage rose by 3% over the last 10 years, nearly a 9% increase per household. Even so, due to PG&E's cleaner energy portfolio, total CO_2e emissions from that electricity declined by 10%.

A large portion of the 16% CO_2e reductions in residential energy is attributable to a 19% decrease in natural gas usage over the last ten years. While electricity usage remains relatively unchanged by temperature, if there are fewer cold days there is a decrease in usage of gas-powered furnaces. The heating degree-day measurement estimates weather-related heating demand based on outside temperature. In 2015, there were 14% fewer heating degree-days in San Leandro than in 2010 and 25% fewer than in 2005. It is likely that the reduction in natural gas usage is in part due to warmer weather in 2015 than for the previous two inventories.

Solid Waste Disposal

When solid waste is landfilled, organic material decomposes in the anaerobic (absent oxygen) environment and releases methane. San Leandro sent 76,725 tons of solid waste to landfills in 2015, resulting in 20,200 metric tons of CO_2e. Nearly 30,000 tons of waste were diverted through recycling or composting, a 28% diversion rate. Overall, this is a significant 60% reduction in emissions and a 50% reduction in tons landfilled since 2005.



Water and Wastewater Treatment

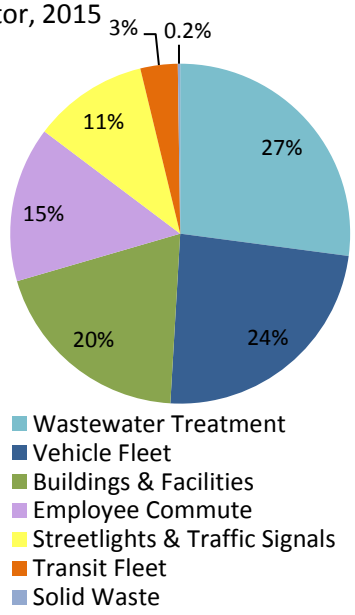
Wastewater treatment in San Leandro is shared between the San Leandro Water Pollution Control Plant and the Oro Loma Wastewater Plant. Greenhouse gases are emitted from the burning of natural gas, use of electricity, and nitrous

oxide (N_2O) released during the treatment process. The Plant is the largest consumer of electricity for municipal operations and accounts for a large portion of municipal emissions. In 2015, 2,710 metric tons of CO_2e were released from wastewater treatment, about the same as previous inventories (2005: 2,706 MT CO_2e; 2010 2,703 MT CO_2e).

Greenhouse gas emissions also result from the electricity used to clean and supply potable water to the City by EBMUD. The community used 3,092 million gallons resulting in 816 MT CO_2e. In total, water and wastewater account for 3,526 MT CO_2e, or about 0.55% of overall emissions.

The 2015 inventory is not exactly comparable to previous inventories, though, due to the recent inclusion of emissions from wastewater sent to Oro Loma and a new method of categorization. Despite that, it is clear that the largest sector of emissions for San Leandro's Water Pollution Control Plant, process-related emissions of N_2O, has decreased by about 41% over 10 years despite an increase in population in San Leandro. This decrease is almost exactly offset by the energy and process emissions from San Leandro's wastewater that is processed at Oro Loma's Wastewater Plant. Thus, overall wastewater treatment emissions appear to remain unchanged despite significant upgrades in energy and processing efficiency.

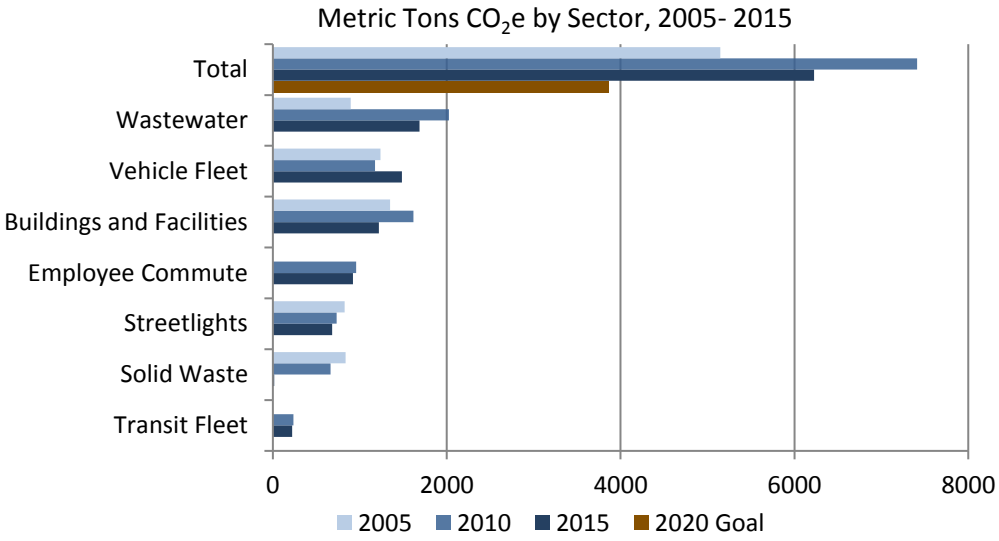
Municipal Inventory by Sector, 2015



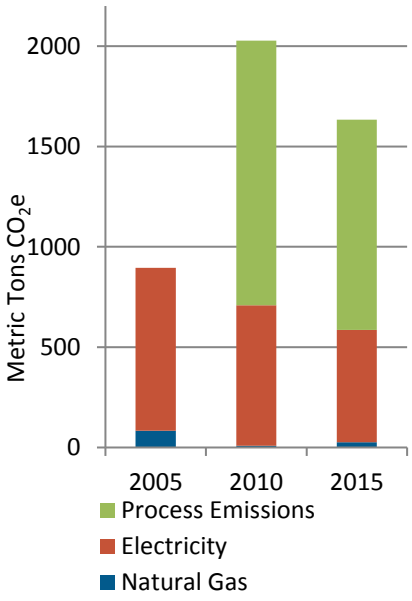
Detailed 2015 Municipal Emissions

The Buildings and Facilities sector has significantly decreased emissions by 10% since 2005. This is important because it represents about 20% of emissions. This is largely a factor of cleaner energy coming from PG&E. Wastewater treatment emissions, which represent about 27% of City emissions, have decreased by about 16% since first accurately measured in 2010.

Increase in city emissions has only been seen in one sector. Emissions from the City's vehicle fleet, representing about 24% of emissions, have increased about 20% since 2005. Conversely, due to converting traffic signals to LEDs around San Leandro, emissions in that sector have reduced by 18% since 2005.



Wastewater Treatment Plant Emissions, 2005-2015



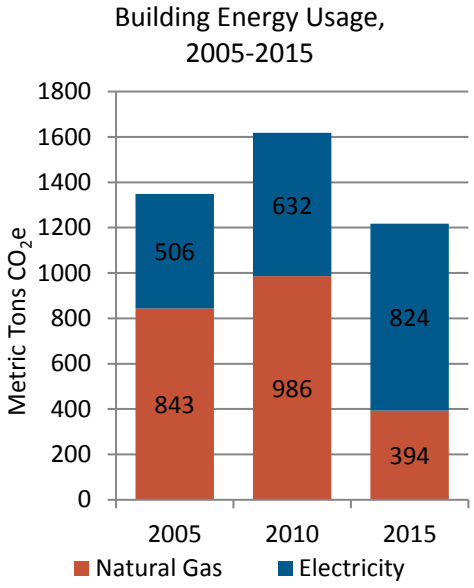
Wastewater

Wastewater is rich in carbon and nitrogen and must be collected, treated and discharged appropriately. This process creates and releases the greenhouse gases methane and nitrous oxide. San Leandro has operated the San Leandro Water Pollution Control Plant (WPCP) since 1939, and it serves approximately two thirds of the city's residential population as well as industrial users. The WPCP, beyond releasing greenhouse gases from the treatment process, also consumes a large amount of electricity and natural gas. Wastewater treatment is separated from the municipal Buildings and Facilities subsection because it uses significantly more natural gas and electricity than other city buildings.

At 1,687 MT CO_2e emissions from the WPCP and its processes, the water treatment plant represents 27% of the city's overall emissions. Of those emissions, nearly 60% come from N_2O emissions related to processing and

discharging effluent. Another 33% come from the plant's electricity load necessary for it to run 24/7.

Emissions from the WPCP, including its energy use, are about 16% lower than they were in 2010. Accurate numbers for comparison are not available from the original 2005 baseline inventory.

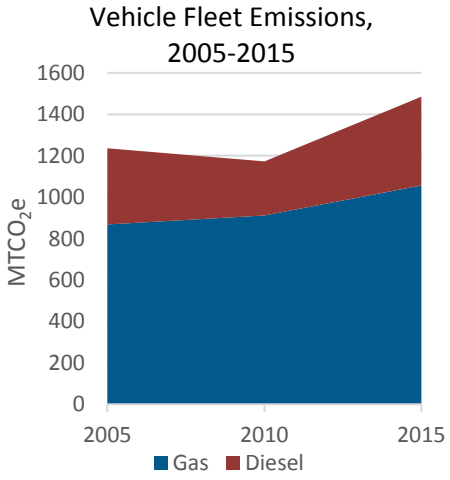


Buildings and Facilities

Facility operations contribute greenhouse gas emissions through consumption of electricity and natural gas. Emissions data for San Leandro's buildings and facilities was gathered from PG&E. Buildings and facilities represent 1,218 MT CO_2e, 20% of the City's total. Emissions from natural gas are down 53% from the 2005 baseline and 60% from 2010 due largely to HVAC retrofits at the Police Station and City Hall. Emissions from electricity have increased by 63% from the 2005 baseline and 30% from 2010, but the energy mix from PG&E now includes more renewables. This results in an overall 10% decrease in emissions for buildings and facilities since 2005 and a 25% decrease since 2010.

Streetlights, Traffic Signals, and Other Public Lighting

San Leandro operates public traffic signals, streetlights, median lights, park lights, etc. which created 682 MT CO_2e emissions through the consumption of electricity. PG&E supplied the data for municipal electricity consumption. The majority of energy use in this sector, 84%, is attributable to streetlights while traffic signals use about 12%. The remainder goes to irrigation of medians, and other sources. In total, streetlights and traffic signals are a smaller sector, making up about 11% of total City emissions.



Vehicle Fleet and Mobile Equipment

The vehicles and equipment used by San Leandro range from light-duty trucks, stationary equipment, heavy street sweepers, and sedans. They burn gasoline and diesel fuels that release greenhouse gas directly into the air. In 2015, San Leandro had 205 vehicles and emissions were estimated using the total gallons of diesel and gasoline used from the refueling pumps at Public Works Corporation Yard. Fleet emissions represent 24% of the overall inventory with 1,483 MT CO2e released. Emissions have increased by 20% since 2005 and 25% since 2010.

Transit Fleet

The City of San Leandro partners with San Leandro Transportation Management Organization to run the LINKS and Kaiser shuttles. These shuttles are run on gasoline and compressed natural gas which directly emit greenhouse gases. Despite their emissions, these shuttles provide a lower-carbon alternative to trips in private cars. These shuttles represent about 221 MT CO_2e, or 4% of the City's total emissions.

Solid Waste

Solid waste generated by government operations (e.g. paper, boxes, plant debris, construction debris, food waste) can be recycled or composted though some still ends up in landfills. Once in landfills, organic materials decompose in anaerobic conditions releasing methane, a potent greenhouse gas. Due to consistent efforts, landfilled waste represents only 0.2% of city emissions releasing only 14 MT of CO_2e in 2015 compared to about 830 and 660 MT CO_2e in 2005 and 2010 respectively.

Employee Transportation Mode, 2015	
Drive Alone	89%
Carpool	5%
Bike and Walk	4%
Public Transit	2%

Employee Commute

Emissions from employee commuting results from the fuels used in private vehicles and the average miles traveled to work by employees reporting to city facilities. Results from an internal survey (with an impressive 38% response rate) allowed for effective modelling of employee commuting habits. Employee commuting to and from work represents nearly 15% of the city's emissions, releasing about 920 MT CO_2e in 2015. Results show a small but encouraging increase in hybrid and electric vehicles.

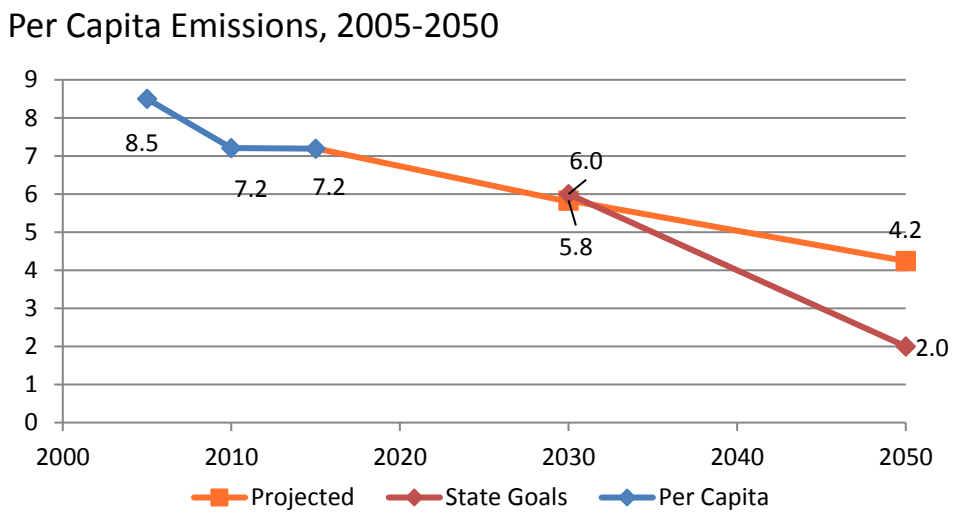
Employee Commute Vehicle Fuels		
	2010	2015
Gasoline	92%	90%
Diesel	3%	3%
Hybrids	5%	5%
Electric	0%	1.5%

Per Capita Emissions

Per capita measures of greenhouse gas emissions are useful for determining the efficiency, or intensity, of greenhouse gases emitted within a community. This allows for scalability of the metric across regions, counties, and cities as well as a method to compare smaller and larger communities.

The State of California committed to the *Under 2 MOU* in 2015, an agreement between subnational governments to limit emissions of greenhouse gases to fewer than two metric tons per capita by 2050. The current draft of the CARB's 2017 Scoping Plan focuses on per capita emissions reductions goals for 2030, 6 MT CO_2e per capita, and 2050, the aforementioned 2 MT CO_2e per capita.

Per capita emissions in San Leandro have decreased by 15% since 2005 to 7.2 MT CO_2e in 2015. If this 15% over ten years reduction were to continue, we would achieve the 2030 goal but would have to substantially decrease emissions by 33% every 10 years until 2050 to reach state targets. If, instead of ramping up after 2030, efforts started sooner, we would only need to reduce by about 24% every ten years to reach 2050 targets. The fact that per capita emissions have remained relatively stable between 2010 and 2015 indicates a need to increase efforts to reduce emissions across the community.

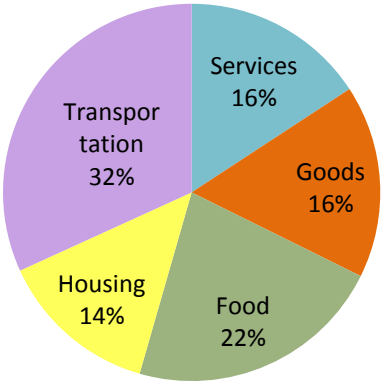


Consumption Based Inventory

A consumption based inventory (CBI) takes a different approach to calculating per capita and community emissions. The CBI takes into account greenhouse gas emissions from a full life-cycle analysis of goods and services consumed by local residents regardless of the location of the emissions. This method of inventorying recognizes the impacts of consumption of services in an integrated, global economy and encourages reduced emissions through green-buying practices.

The Cool Climate Network at UC Berkeley, in conjunction with Bay Area Air Quality Management District (BAAQMD), created a CBI for all of the cities in the Bay Area. The model relies heavily on consumption levels being correlated with income. The City of San Leandro has a footprint of 1.4 million tons of CO_2e, well below the Bay Area average of 115 million tons of CO_2e. Nearly a third of these emissions are a result of transportation emissions. Gasoline-related emissions alone represent about a quarter of the entire CBI for San Leandro.

Average San Leandro Household, Consumption Based Emissions



39.3 MT CO_2e / year

Future Inventories and Next Steps

The City is committed to continued tracking of greenhouse gas emissions. Municipal inventories will be updated on a regular basis, while updates to citywide inventories (which rely on outside information more difficult to obtain) will continue to be conducted every five years. The City's transition to the ICLEI ClearPath platform will allow for more consistent tracking of greenhouse gas trends in future years. To translate the information contained in these inventories into action, the City and its partners continue to develop and execute policies intended to help mitigate greenhouse gas emissions. Overall, the 2015 Greenhouse Gas Emissions Inventory reveal a need to place emphasis on the City's efforts to reduce carbon emissions, especially in the transportation sector.

Transportation emissions within municipal operations can be addressed over the next few years by switching to renewable diesel for trucks and heavy equipment and electric vehicles (EVs) for certain city vehicles as fleet vehicles are replaced. To attain emissions reductions in the private use of vehicles and commercial trucks, the City can continue to promote the use of EVs but primarily must rely upon state- or utility-sponsored programs for fuel efficiency and fuel switching (converting from gasoline or regular diesel to electric, hydrogen, or renewable diesel fuels).

Certain energy efficiency projects (municipal LED streetlighting and efficient HVAC projects and community-wide residential energy upgrade incentive and DIY programs) outlined in the 2009 CAP were pursued with federal Energy Efficiency Community Block Grant (EECBG) funding in 2010-2012. However, after the Great Recession, overall coordination of climate action activities ceased and those federal programs were terminated when the EECBG funding ended in 2012. Mandatory measures that were proposed in the 2009 CAP to require residential or commercial energy conservation in local ordinances were not implemented. Again, state-wide regulations such as the CalGreen building code will be important elements in achieving energy efficiency in existing and new building projects.

In 2017, the City will complete a guaranteed energy savings project for streetlights, irrigation controls and building equipment as well as begin the design and installation of approximately 1 megawatt (MW) of solar photovoltaic at the Water Pollution Control Plant, a result of the award by the California Energy Commission of a $1.996M grant.

In the building and facilities sector, greener building codes will ensure that new construction is more energy efficient. The statewide energy benchmarking and disclosure program for large commercial buildings, mandated to begin in 2017 under AB 802, will help building owners, operators, and tenants better understand the opportunity to save energy and reduce carbon emissions in existing facilities. Finally, the overall electricity mix will become more weighted with renewables under the Community Choice Aggregation project, East Bay Community Energy. When combined with microgrid development, new renewable energy projects in San Leandro's private and public sector will contribute to decreased emissions in building energy use.

Appendix 1: General Inventory Methodology Guidelines

Local Government Operations Protocol

A national standard called the Local Government Operations Protocol (LGO Protocol) has been adopted by the California Air Resources Board (ARB) in conjunction with ICLEI, the California Climate Action Registry, and The Climate Registry. This standard provides accounting principles, boundaries, quantification methods and procedures for reporting greenhouse gas emissions from local government operations. The LGO Protocol provides the basis of ICLEI's ClearPath software's government track. This software allows local governments to compile data and perform emissions calculations with standardized methods.

Greenhouse Gases and Carbon Dioxide Equivalent

In accordance with LGO Protocol, this inventory includes all six greenhouse gases regulated under the Kyoto Protocol (CO_2, CH_4, N_2O, HFCs, PFCs, and SF_6). Emissions from various greenhouse gases are converted into a carbon dioxide equivalent (CO_2e) because different greenhouse gases have different half-lives and stronger or weaker impacts on the greenhouse effect. This conversion is made based on the global warming potential of each gas as determined by the IPCC's 4th Assessment Report. All reported CO_2e is in metric tons ($MTCO_2e$).

Calculating Emissions

There are two methods by which emissions are calculated. Measurement-based methods are direct measurements of greenhouse gas emissions from a monitored system. This includes emissions from a power plant, wastewater treatment plant, landfill, or other industrial facilities. This is the most accurate method of measuring emissions but is only available for a few, stationary sources.

The other method of calculating emissions is using a calculation-based method. This method estimates emissions based on activity data and emissions factors. The activity data (e.g. kilowatt hours of electricity consumed, therms of natural gas consumed, gallons of gasoline, etc.) is multiplied by the emissions factor (e.g. CO_2 emitted / kWH, CO2 emitted/therm, etc.) which determines the estimated amount of emitted emissions.

The Scopes Framework

This inventory follows the LGO Protocol differentiation of emissions by sector and by three different "scopes".

Scope 1 is direct emissions from sources with a government's operations that it owns and controls with the exception of biogenic sources of CO_2. This includes stationary combustion for heat, electricity, or power, the mobile combustion of fuels (e.g. cars or equipment), process emissions from physical or chemical processing, and any fugitive emissions resulting from processing, transmission, and storage of fuels and refrigerants.

Scope 2 is indirect emissions associated with consumption of purchased electricity, steam, heating, or cooling.

Scope 3 is all other emissions sources relevant to the local government that can be measured and reported. This includes indirect emissions not covered in Scope 2 that occur within the operational boundary of the local government. This includes (but is not limited to) emissions from employee commuting, employee business travel, and emissions from government-generated solid waste.

Organizational Boundaries:

The organizational boundary for an inventory determines which operations are included and which are not. Under the LGO Protocol, there are two approaches for determining an organization's boundaries: operational control or financial control. A government has operational control over an operation if it has full authority over policies that impact the operation. A government has financial control if the operation is fully consolidated in financial accounts. LGO Protocol encourages local governments to utilize operational control for organizational boundaries for greenhouse gas inventories. This represents sources that the government can directly influence and runs in parallel to other environmental programs and reporting requirements. For these reasons, this inventory was conducted with an operational control framework.

Types of Emissions:

Per the LGO Protocol, there are multiple types of greenhouse gas emissions:

- Stationary or mobile combustion emissions are emissions from on-site combustion of fuels (e.g. natural gas, diesel or gasoline) to generate heat, electricity, or to power mobile vehicles and equipment.
- Purchased electricity emissions are produced by the purchase of power generated by utilities outside the municipal jurisdiction (e.g. PG&E)
- Fugitive emissions are greenhouse gases that are unintentionally released into the atmosphere (e.g. methane from waste decomposition, refrigerant leaking, etc.).
- Process emissions are greenhouse gas emissions from the physical or chemical processing of materials (e.g. wastewater treatment).

Understanding Totals:

The totals and sub-totals listed throughout this report represent complete totals for San Leandro's operations as measured. However, these totals only represent inventoried emissions available for estimation or direct measurement methods. Each sector may have additional emissions sources that are unaccounted for and could not be estimated.

Appendix 2: Climate Change background

Climate Change Background

Naturally occurring gases dispersed in the atmosphere determine the Earth's climate by trapping solar radiation. This phenomenon is the greenhouse effect. Overwhelming scientific 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.

Climate scientists expect changing temperatures to result in more frequent and damaging storms accompanied by flooding and landslides, summer water shortages due to reduced snow pack, and the disruption of ecosystems, habitats, and agricultural activities. Sea level rise will particularly hurt Bay communities such as San Leandro, with sewage, water, and transit infrastructure along the coast.

Reducing fossil fuel use in the community can have co-benefits in addition to reducing greenhouse gas emissions. Increasing energy efficiency 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 further improves air quality, helping to decrease rates of asthma, heart attacks, and other health complications. At the same time, increasing opportunities for walking and bicycling improves residents' health by increasing activity, mobility, and resource accessibility.