

## 18 GREENHOUSE GASES

This chapter of Novato's Existing Conditions Report describes emissions, relevant State regulations and local policies in Novato and discusses Novato's current strategy and actions to address climate change.

### *A. Greenhouse Gases and Climate Change*

Climate change is a significant, extended change in any measures of average weather over time. Changes may be seen in sustained rising or falling temperatures, significantly higher or lower amounts of precipitation, or changes in wind patterns. Studies predict some positive but mostly negative impacts resulting from human contributions to greenhouse gas (GHG) emissions. Based on these climate change studies, federal, State and local legislation are increasingly encouraging and/or mandating policies that address and mitigate the impacts of climate change.

The earth's atmosphere contains a group of naturally occurring gases that maintain a habitable climate. These gases allow sunlight to enter the earth's atmosphere freely and prevent some of the sun's heat from exiting the atmosphere. Because of their ability to contain heat, the gases are known as greenhouse gases, or GHGs. Natural levels of GHGs exist in balanced proportion, resulting in steady maintenance of the temperature within earth's atmosphere. However, emissions of GHGs from human activities, such as electrical production and motor vehicle use, continue to elevate the concentrations of GHGs, upsetting their natural balance. When GHG concentrations exceed natural concentrations in the atmosphere, the "greenhouse effect" of trapped heat is enhanced, and the phenomenon known as global warming occurs.

#### **1. Greenhouse Gases**

California State law defines GHGs to include the following: carbon dioxide, methane, nitrous oxide, and three halocarbons – hydrofluorocarbons, perfluorocarbons and sulfur hexafluoride [Health and Safety Code, Section 38505(g)]. The most common GHG that results from human activity is carbon dioxide, followed by methane and nitrous oxide. Many other trace gases have a more powerful effect on global warming, however, these gases are not as plentiful. For this reason, and to gauge the potency of GHGs, scientists at the Intergovernmental Panel on Climate Change (IPCC) have established a Global Warming Potential (GWP) for each GHG based on its ability to absorb and re-radiate thermal radiation. The GWP of a gas is determined using carbon dioxide as the standard unit to assess and add together the impacts of the different gases on global warming. Thus, the GWP of each gas is expressed in carbon dioxide equivalents (CO<sub>2</sub>e), where the GWP for carbon dioxide is equal to 1.

##### **a. Carbon Dioxide (CO<sub>2</sub>)**

Carbon dioxide is primarily generated by fossil fuel combustion in stationary sources, such as power plants, and mobile sources such as vehicles and airplanes. Over the past 250 years, the concentration of carbon dioxide in the atmosphere has increased 35 percent. The vast majority of GHG emissions come from the combustion of fossil fuels such as petroleum, coal and natural gas. Carbon dioxide is a by-product of this process, which is elemental to traditional energy production. The production of energy in electrical power plants and automobile engines are two common examples of fossil fuel combustion and resulting carbon dioxide emissions. For this reason, energy use and driving are inextricably

linked to global warming. In 2011, energy-related carbon dioxide accounted for approximately 84 percent of GHG emissions in the United States.<sup>1</sup>

b. Methane (CH<sub>4</sub>)

Methane is the primary component of natural gas, which is used for space and water heating, steam production and power generation. The GWP of methane is 21. Methane, which accounted for approximately 9 percent of 2011 GHG emissions in the United States, results from the process of organic decomposition.<sup>2</sup> Modern landfills, agricultural operations, coal mines and oil and natural gas operations are the primary sources of methane emissions.

c. Nitrous Oxide (N<sub>2</sub>O)

Nitrous oxide is produced by both natural and human related sources. Natural sources are bacteria in the soil and oceans. The majority of nitrous oxide produced by human activity is a result of agriculture, including nitrogen fertilizers and animal waste, which promote nitrous oxide production from naturally-occurring bacteria. Industrial processes and the internal combustion engine also produce nitrous oxide. The GWP of nitrous oxide is 310. Nitrous oxide accounted for 5 percent of total nationwide emissions in 2011.<sup>3</sup>

d. Hydrofluorocarbons (HFCs)

HFCs are typically used as refrigerants for both stationary refrigeration and mobile air conditioning. The use of HFCs for cooling and foam blowing is growing as chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs) continue to be phased out. The GWP of HFCs ranges from 140 to 6,300.

e. Perfluorocarbons (PFCs)

Perfluorocarbons are compounds consisting of carbon and fluorine, primarily created as byproducts of aluminum production and semi-conductor manufacturing. They are very potent GHGs with a GWP ranging from 5,700 to 11,900. PFCs are a particular concern because their atmospheric lifetime may last up to 50,000 years.

f. Sulfur Hexafluoride (SF<sub>6</sub>)

This gas is colorless, odorless, nontoxic and nonflammable. It is most commonly used as an electrical insulator in high voltage equipment that transmits and distributes electricity. Sulfur hexafluoride is the most potent GHG that has been evaluated by the IPCC, with a GWP of 23,900. However, its global climate change contribution is not as high when compared to carbon dioxide because of its relatively small presence.

## 2. Other Compounds

In addition to the six major GHGs discussed above, many other compounds have the potential to contribute to the greenhouse effect. Some of these substances are already being phased out because they are stratospheric ozone depleters. These compounds include hydrochlorofluorocarbons (HCFCs), 1,1,1 trichloroethane, chlorofluorocarbons (CFCs) and ozone.

---

<sup>1</sup> United States Energy Information Administration website, <http://www.epa.gov/climatechange/ghgemissions/gases.html>, accessed October 29, 2013.

<sup>2</sup> United States Energy Information Administration website, <http://www.epa.gov/climatechange/ghgemissions/gases.html>, accessed October 29, 2013.

<sup>3</sup> United States Energy Information Administration website, <http://www.epa.gov/climatechange/ghgemissions/gases.html>, accessed October 29, 2013.

### 3. Sources of Greenhouse Gas Emissions

As described above, carbon dioxide, methane, nitrous oxide and other GHGs are emitted as the result of certain natural and technological processes. Emissions levels can be minimized by reducing human activities that rely on those processes. In 2007, CO<sub>2</sub> emissions in the Bay Area came from the following sources:

- ◆ Transportation: about 41 percent;
- ◆ Industrial and commercial: about 34 percent;
- ◆ Electricity: about 15 percent;
- ◆ Residential uses (such as home heating and home products like refrigerants or hairspray): about 7 percent; and
- ◆ Off-road equipment and agriculture and farming processes: approximately 3 percent.<sup>4</sup>

### 4. Effects of Global Warming

Although there is strong evidence that global warming is occurring and influencing weather patterns, precipitation rates, ocean currents and ocean pH levels, it is difficult if not impossible to know exactly what will happen to the environment and the economy because of climate change. Some parts of the world may benefit from global warming, receiving longer growing seasons for cultivating crops and less bitter winters.<sup>5</sup> However, many studies predict that more people are likely to see the detrimental effects of climate change, and California and the San Francisco Bay Area are no exception.<sup>6</sup>

According to the California Air Resources Board (CARB), GHG will worsen air quality problems. Scientists predict that rising temperatures as a result of global warming will reduce the Sierra snowpack, thus reducing water quality and supply to the State and increasing risk for catastrophic wildfires, droughts and flash floods. Rising sea levels will displace thousands of businesses and homes, damage the land and marine ecosystems.

## ***B. Regulatory Environment***

The section describes state and local regulations relevant to GHG emissions and emissions reduction in the City of Novato.

---

<sup>4</sup> *Source Inventory of Bay Area Greenhouse Gas Emissions: Base Year 2007*, Bay Area Air Quality Management District, December 2008, page 10.

<sup>5</sup> "Understanding and Responding to Climate Change: Highlights of National Academies Reports, 2008 edition." The National Academies, 2008, page 2.

<sup>6</sup> "Backgrounder: The Greenhouse Effect and California." California Air Resources Board, as part of California Assembly Bill 1493 (Pavley), July 2002, <http://www.arb.ca.gov/cc/factsheets/ccbackground.pdf>, accessed January 26, 2009.

## 1. State Regulations

### a. Executive Order S-3-05

In June 2005, Governor Schwarzenegger established California's GHG emissions reduction targets in Executive Order S-3-05. The Executive Order established goals to reduce statewide GHG emissions to 2000 levels by 2010; to 1990 levels by 2020; and to 80 percent below 1990 levels by 2050.

The Secretary of the California EPA (the Secretary) is required to coordinate efforts of various agencies in order to collectively and efficiently reduce GHGs, in addition to submitting biannual progress reports to the Governor and State Legislature disclosing progress made toward GHG emissions reductions. In addition, another biannual report must be submitted illustrating the impacts of global warming on California's water supply, public health, agriculture, coastline and forests as well as reporting possible mitigation and adaptation plans to combat these impacts.

### b. Assembly Bill 32

In 2006, the California State Legislature adopted Assembly Bill (AB) 32, known as the California Global Warming Solutions Act (Section 38560.5 of the Health and Safety Code) to further the goals of Executive Order S-3-05. AB 32 represents the first enforceable statewide program to limit GHG emissions from all major industries, with penalties for noncompliance. This legislation sets a cap on statewide GHG emissions and establishes the regulatory framework to achieve corresponding reductions in emissions. AB 32 charges CARB, the State agency responsible for regulating statewide air quality, with implementation of the act. CARB is also required to adopt rules and regulations to achieve the maximum technologically feasible and cost effective GHG emission reductions.

CARB's responsibilities include monitoring compliance and enforcing adopted regulations or emission reduction measures. As part of AB 32, CARB was required to adopt mandatory reporting rules for significant sources of greenhouse gases. These rules were adopted by CARB in December 2007 and became effective in January 2009. AB 32 also required CARB to prepare a Scoping Plan to guide the State in reducing significant sources of GHGs. The Scoping Plan, approved by CARB in December 2008, includes direct regulations, alternative compliance mechanisms, monetary and non-monetary incentives, voluntary actions, and market-based mechanisms such as a cap-and-trade system.<sup>7</sup>

Citing local governments as an essential partner, the Scoping Plan states that local governments have "...broad influence and, in some cases, exclusive authority over activities that contribute to significant direct and indirect greenhouse gas emissions through their planning and permitting processes, local ordinances, outreach and education efforts, and municipal operations."<sup>8</sup> The Scoping Plan further notes that "cities and counties will need to actively engage in implementing Scoping Plan measures at the local level and undertake other emission reduction actions that make sense for each community."

### c. Senate Bill 97

Senate Bill (SB) 97 (2007) required the California Office of Planning and Research (OPR) to develop CEQA guidelines for the analysis and, if necessary, mitigation of GHG emissions or the effects of GHG emissions. OPR adopted these guidelines in 2009, and the amendment became effective in March 2010. The guidelines include the following points:

---

<sup>7</sup> California Air Resources Board website, <http://www.arb.ca.gov/homepage.htm>, accessed February 9, 2009.

<sup>8</sup> California Air Resources Board, Climate Change Scoping Plan, December 2008, page 26.

- Lead agencies must analyze the greenhouse gas emissions of proposed projects, and must reach a conclusion regarding the significance of those emissions.
- When a project's greenhouse gas emissions may be significant, lead agencies must consider a range of potential mitigation measures to reduce those emissions.
- Lead agencies must analyze potentially significant impacts associated with placing projects in hazardous locations, including locations potentially affected by climate change.
- Lead agencies may significantly streamline the analysis of greenhouse gases on a project level by using a programmatic greenhouse gas emissions reduction plan meeting certain criteria.
- CEQA mandates analysis of a proposed project's potential energy use (including transportation-related energy), sources of energy supply, and ways to reduce energy demand, including through the use of efficient transportation alternatives.

d. Senate Bill 375

The purpose of SB 375 (2008) is to reduce GHG emissions by coordinating transportation funding and land use planning on a regional level. SB 375 directs CARB to reduce emissions from cars and light trucks by incentivizing compact development, calculate statewide emissions reductions targets, and to assign regional emissions reduction targets to each metropolitan planning organization (MPO) in the State. The first step outlined in SB 375 calls for the state's 18 MPOs and the California Air Quality Board to establish a region's greenhouse gas reduction target. Then, the MPO must develop a sustainable community's strategy (SCS) that demonstrates how the region will meet the target. SB 375 requires the greenhouse gas reduction target and the SCS be incorporated into the Regional Transportation Plan (RTP). The Bay Area's target is a 7 percent per capita reduction by 2020 and a 15 percent reduction by 2035.

Transportation and development projects consistent with the SCS will be given priority for some state and regional funding. Additionally, certain SCS-consistent residential development projects receive streamlined environmental review processes. SB 375 also changes housing element law, extending the planning period for the housing element to eight years, and linking Housing Element timelines to RTP timelines for increased consistency.

## 2. Local Policies

a. Novato Climate Change Action Plan

The purpose of a Climate Action Plan is to compile existing and potential strategies that a local government and the community at large can take to address climate change. A Climate Action Plan typically contains these elements:

- A community-wide greenhouse gas emissions inventory and a "business-as-usual" forecast.
- A greenhouse gas reduction target consistent with AB 32.
- Local and state policies and actions that may impact greenhouse gas emissions within the city or town.
- Quantification of greenhouse gas reduction measures demonstrating that, if fully implemented, the greenhouse gas reduction target will be met.

The City of Novato adopted the Novato Climate Change Action Plan (CCAP) in 2009. The plan outlines strategies to achieve a greenhouse gas reduction target of 15% below 2005 emission levels by the year 2020, consistent with the State's direction to local governments in Assembly Bill 32 Scoping Plan. The 2009 CCAP also suggests a 2035 goal of 40

percent below 2005 levels, consistent with the Governor’s Executive Order S-3-05 to achieve an 80 percent statewide reduction by 2050. The 2009 CCAP utilizes the Novato 2005 Greenhouse Gas Inventory in establishing baseline emissions. For this report, the Action Plan was updated to incorporate the results of the Novato 2010 Greenhouse Gas Inventory and current sources for projecting future emission levels. Estimated reductions from implementing CCAP programs were recalculated using updated data and calculation methodologies.

The CCAP includes a business-as-usual forecast, in which emissions are projected in the absence of any policies or actions that would occur beyond the base year to reduce emissions. The forecasts are derived by “growing” baseline emissions by forecasted changes in population, number of households, and jobs according to projections developed by the Association of Bay Area Governments. Transportation emissions are projected utilizing data provided by the Metropolitan Transportation Commission, which reflects vehicle miles traveled (VMT) forecasts after implementation of Plan Bay Area. If no state or local actions are implemented (excluding Plan Bay Area programs), emissions are projected to increase approximately 2 percent between 2010 and 2035.

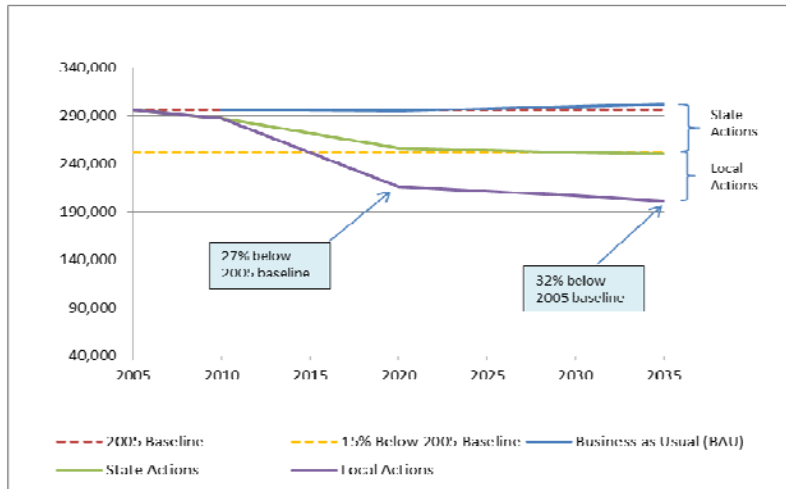
The CCAP contains 28 local mitigation measures to reduce greenhouse gas emissions through 2035. These are grouped around eight goals as follows:

- **Energy Efficiency and Conservation.** Reduce emissions from the energy sector through energy efficiency and conservation efforts within municipal and community operations.
- **Renewable Energy.** Reduce emission associated with energy generation through promotion and support of renewable energy generation and use.
- **Green Building and Design.** Reduce emissions from the built environment through “green building” and urban design principles that minimize the urban heat island effect and reduce energy consumption.
- **Water Conservation.** Reduce emissions from water and wastewater sources by increasing water conservation.
- **Vehicle Efficiency and Alternative Fuels.** Reduce emission from transportation sources by promoting use of alternative fuels and efficient use of traditional automobiles.
- **Citywide Land Use and Design.** Reduce emission by decreasing Vehicle Miles Traveled (VMT) within the City through strategic land use and design.
- **Alternative Transportation Modes.** Reduce emissions from transportation sources through promotion of non-vehicular modes of travel.
- **Waste.** Reduce emission from waste sources.

Emission reductions estimated from full implementation of these local measures total approximately 28,000 metric tons CO<sub>2e</sub> by year 2020 and 37,500 metric tons CO<sub>2e</sub> by year 2035. In addition to these actions, emissions are projected to be reduced about 11,000 metric tons CO<sub>2e</sub> through community participation in Marin Clean Energy and 350 metric tons CO<sub>2e</sub> through SMART train ridership by 2035. State actions, which include the renewable portfolio standard for electricity providers, Title 24 requirements for increased energy efficiency and conservation in residential and non-residential

buildings, vehicle fuel efficiency and low carbon fuel standards, and incentives for solar installation, are projected to reduce emissions about 39,000 metric tons CO<sub>2</sub>e by year 2020 and 52,500 metric tons CO<sub>2</sub>e by year 2035. As shown in Figure 18-1, local and state actions combined are projected to reduce emissions approximately 27 percent below 2005 emission levels by year 2020 and 32 percent below 2005 emission levels by year 2035.

FIGURE 18-1 CUMULATIVE IMPACT OF REDUCTION MEASURES



b. Novato Green Building Ordinance

In 2010, Novato adopted a green building ordinance that incorporated energy efficiency and conservation and green building requirements for residential and commercial development. In 2013, with the adoption of the updated 2013 California Building Standards Code (California Code of Regulations, Title 24), Novato eliminated its local green building regulations and adopted the 2013 CAL Green Building Code which now regulates both new and remodeled/expanded residential and non-residential buildings. The energy requirements of the new State code are significantly more stringent than the prior code (an approximately 25 percent reduced energy budget for new home, 30 percent reduction for commercial buildings and 14 percent reduction for multi-family structures) and are intended to progress to net zero energy homes by 2020 and commercial structures by 2030. The City also adopted CAL Green Tier 1 requirements for new construction only. These measures incorporate greener building standards related to planning and design, water efficiency and conservation, material conservation and resource efficiency, and environmental quality.

c. Novato General Plan

Several policies in the existing Novato General Plan, adopted in 1996, relate to climate change issues. The Environment chapter addresses energy conservation and air quality with the following objectives and related policies:

- ◆ EN Objective 8: Reduce dependence on non-renewable energy and materials.
  - EN Policy 28: Energy Conservation. Consider land use patterns and policies that promote energy conservation. *The Land Use Chapter encourages mixed use projects in and near the Downtown and in neighborhood shopping centers. The Transportation Chapter contains policies and programs that encourage reductions in the use of single-occupant vehicles and encourage the use of bicycles and other travel modes that do not consume fossil fuels.*

- EN Policy 29: Energy Conservation Measures in Buildings. Reduce energy consumption by requiring structures to meet the energy conservation requirements stipulated in the State Building Code and State Title 24 regulations.
- EN Policy 30: Energy Efficiency in Public Programs. Assure energy efficiency in local government operations.
- EN Policy 31: Development Review Process. Consider energy conservation in the development review process.

◆ EN Objective 9: Work to protect and improve air quality.

- EN Policy 32: Regional Planning to Improve Air Quality. Continue to cooperate with the Bay Area Air Quality Management District (BAAQMD) in implementing the regional Clean Air Plan.
- EN Policy 33: Vehicle Trips. Encourage transportation facilities and modes that minimize motor vehicle use.
- EN Policy 34: Local Efforts. Encourage local efforts to improve air quality.

d. Community Strategic Plan

*Novato 2028: A Vision for the Future* provides policy recommendations to guide local decision-makers on the future of Novato for the next 25 years. Under the topic “Sustainable Community: Natural Environment, Economy and Social Equity,” Novato citizens describe the following vision and policies for the Natural Environment:<sup>9</sup>

- ◆ Vision 2: A community in which conservation, reclamation, recycling, efficient use of resources, and exploration of renewable sources of energy and materials are the norm.
  - 2(b): Implement Novato’s official commitment to the “Cities for Climate Protection” (CCP) program to reduce GHG emissions.
  - 2(c): Encourage new construction or retrofitting to use the most advanced “Green Building” technologies.
  - 2(d): Encourage the water agencies serving Novato to increase water recycling and reuse plans, and encourage energy efficiency in water processing and movement.

**C. Greenhouse Gas Emissions Inventory**

In 2013, the Marin Climate & Energy Partnership, a collaboration of the 11 Marin cities and towns (including the City of Novato), the County of Marin, the Transportation Authority of Marin and the Marin Municipal Water District, prepared a greenhouse gas inventory for Novato’s community and local government operations emissions. The inventory uses 2005 as the baseline year and compares emission to 2010, the latest inventory year.

a. Community Inventory

The community inventory quantifies greenhouse gas emissions from the following sectors:

- Residential. The residential sector includes emissions generated by the use of electricity, natural gas and propane in residences.

---

<sup>9</sup> City of Novato, 2003. *Novato 2028: A Vision For the Future*. October 20, page 22.



- Commercial & Industrial. The commercial and industrial sector includes emissions generated by the use of electricity and natural gas in commercial and industrial buildings. Emissions generated by schools, governments, and public agencies are included in this sector.
- Transportation. The transportation sector includes emissions from on-road vehicles travelling on local roads and state highways within the city limits.
- Off-Road Vehicles & Equipment. The off-road sector includes emissions from vehicles and equipment used for construction and lawn and garden activities.
- Waste. The sector includes emissions generated by the decomposition of solid waste generated by the Novato community and deposited in landfills.
- Water. The water sector inventories emissions generated by the use of electricity in treating, conveying and distributing water from the water source to water users in the community.
- Wastewater. The wastewater sector includes emissions generated by the treatment of wastewater.

As shown in Table 18-1, community emissions declined nearly 3 percent between 2005 and 2010, from 296,318 metric tons carbon dioxide equivalents (CO<sub>2</sub>e) in 2005 to 287,645 metric tons CO<sub>2</sub>e in 2010. This represents a reduction of 8,673 metric tons CO<sub>2</sub>e. Reductions occurred in all sectors except the commercial sector. On a percentage basis, the greatest declines occurred in the waste (-33 percent), off-road vehicles and equipment (-12 percent) and water and wastewater (-10 percent each) sectors. In absolute terms, the greatest reductions were made in the transportation (5,160 metric tons CO<sub>2</sub>e), waste (3,754 metric tons CO<sub>2</sub>e), and wastewater (587 metric tons CO<sub>2</sub>e) sectors.

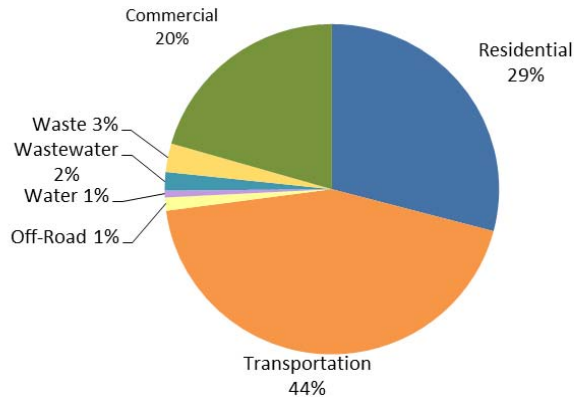
Figure 18-2 shows sector emissions by share of community emissions. Emissions from the transportation sector are responsible for the greatest percentage of greenhouse gas emissions (44 percent), followed by emissions from the residential sector (29 percent) and the commercial sector (20 percent). The waste, wastewater, off-road and water sectors are each responsible for 3 percent or less of total community emissions.

**TABLE 18-1 NOVATO COMMUNITY EMISSIONS BY SECTOR, 2005 AND 2010**

Sector	2005 Metric Tons CO <sub>2</sub> e	2010 Metric Tons CO <sub>2</sub> e	Change Metric Tons CO <sub>2</sub> e	% Change
Residential	84,137	83,908	-229	-0.3%
Commercial/Industrial	57,196	58,971	1,775	3.1%
Transportation	131,019	125,859	-5,160	-3.9%
Off-Road	4,179	3,683	-496	-11.9%
Water	2,151	1,930	-221	-10.3%
Wastewater	6,145	5,558	-587	-9.6%
Waste	11,490	7,736	-3,754	-32.7%
<b>Total</b>	<b>296,318</b>	<b>287,645</b>	<b>-8,673</b>	<b>-2.9%</b>

Source: "City of Novato 2010 Greenhouse Gas Emissions Inventory," Marin Climate & Energy Partnership, May 2013.

**FIGURE 18-2 NOVATO COMMUNITY EMISSIONS BY SECTOR SHARE, 2010**



Source: “City of Novato 2010 Greenhouse Gas Emissions Inventory,” Marin Climate & Energy Partnership, May 2013.

**b. Local Government Operations Inventory**

The local government operations inventory quantifies emissions from six sectors: buildings and facilities; vehicle fleet, public lighting, water delivery, waste and employee commute. In 2010, emissions from government operations totaled approximately 2,352 metric tons CO<sub>2</sub>e, which represents less than 1 percent of Novato community emissions.

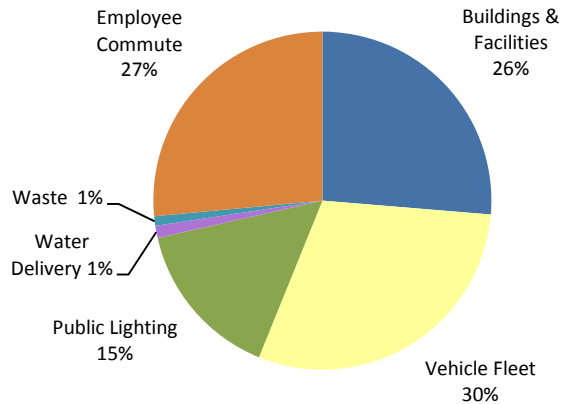
As shown in Table 18-2, emissions from government operations declined in all sectors between 2005 and 2010. The greatest reduction occurred in the vehicle fleet sector, which saw emissions declined by 130 metric tons CO<sub>2</sub>e, or 16 percent. Other significant reductions occurred in the employee commute sector (108 metric tons CO<sub>2</sub>e) and the buildings and facilities sector (96 metric tons CO<sub>2</sub>e). Figure 18-3 shows that the vehicle fleet sector was the largest emitter of greenhouse gas emissions in 2010 (30 percent of total emissions), followed by the employee commute sector (27 percent) and the buildings and facilities sector (26 percent).

**TABLE 18-2 GOVERNMENT OPERATIONS EMISSIONS BY SECTOR, 2005 AND 2010**

Sector	2005 Metric Tons CO <sub>2</sub> e	2010 Metric Tons CO <sub>2</sub> e	Change Metric Tons CO <sub>2</sub> e	% Change
<b>Buildings &amp; Facilities</b>	714.7	618.6	-96.1	-13%
<b>Vehicle Fleet</b>	831.1	701.2	-129.9	-16%
<b>Public Lighting</b>	366.7	360.2	-6.5	-2%
<b>Water Delivery</b>	30.3	27.3	-3.0	-10%
<b>Waste</b>	35.0	21.5	-13.5	-39%
<b>Employee Commute</b>	730.7	622.7	-108.0	-15%
<b>Total</b>	<b>2,708.5</b>	<b>2,351.5</b>	<b>-357.0</b>	<b>-13.2%</b>

Source: "City of Novato 2010 Greenhouse Gas Emissions Inventory," Marin Climate & Energy Partnership, May 2013.

FIGURE 18-3 GOVERNMENT OPERATIONS EMISSIONS BY SECTOR SHARE, 2010



Source: "City of Novato 2010 Greenhouse Gas Emissions Inventory," Marin Climate & Energy Partnership, May 2013.

***D. Regional Greenhouse Gas Emissions***

The Marin Climate & Energy Partnership estimates countywide greenhouse gas emissions were approximately 2.2 million metric tons CO<sub>2</sub>e in 2010, a 5 percent decline from 2005 emission levels.<sup>10</sup> The Novato community contributed approximately 13 percent of Marin County's emissions.

Of the emissions attributed to Marin County, about 63 percent of emissions come from transportation, 20 percent from residential sources, and 12 percent from industrial and commercial energy use. The remainder, approximately 4 percent, is attributed to off-road vehicles and equipment, the decomposition of solid waste in landfills, energy used in the water sector, and process emissions from wastewater treatment.

<sup>10</sup> Marin Climate & Energy Partnership website, <http://www.marinclimate.org/results/greenhouse-gas-inventories>, accessed October 10, 2013.